EN

fx-9860GIII *(Version 3.21)*
fx-9750GIII *(Version 3.21)*
fx-7400GIII *(Version 3.20)*

Software
User's Guide

CASIO Worldwide Education Website

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Getting Acquainted — Read This First!

0

■ About this User's Guide

• Model-specific Function and Screen Differences

This User's Guide covers multiple different calculator models. Note that some of the functions described here may not be available on all of the models covered by this User's Guide. All of the screen shots in this User's Guide show the fx-9860GIII screen, and the appearance of the screens of other models may be slightly different.

• Math natural input and display

Under its initial default settings, the fx-9860GIII or fx-9750GIII is set up to use the "Math input/output mode", which enables natural input and display of math expressions. This means you can input fractions, square roots, differentials, and other expressions just as they are written. In the "Math input/output mode", most calculation results also are displayed using natural display.

You also can select a "Linear input/output mode" if you like, for input and display of calculation expressions in a single line. The initial default setting of the fx-9860GIII and fx-9750GIII input/output mode is the Math input/output mode.

The examples shown in this User's Guide are mainly presented using the Linear input/output mode. Note the following points if you are using an fx-9860GIII or fx-9750GIII.

- For information about switching between the Math input/output mode and Linear input/output mode, see the explanation of the "Input/Output" mode setting under "Using the Setup Screen" (page 1-30).
- For information about input and display using the Math input/output mode, see "Using the Math Input/Output Mode" (page 1-12).

• For owners of models not equipped with a Math input/output mode (fx-7400GIII)...

The fx-7400GIII does not include a Math input/output mode. When performing the calculations in this manual on the fx-7400GIII, use the linear input mode.
fx-7400GIII owners should ignore all explanations in this manual concerned with the Math input/output mode.

• SHIFT x^2 ($\sqrt{\ }$)

The above indicates you should press SHIFT and then x^2, which will input a $\sqrt{\ }$ symbol. All multiple-key input operations are indicated like this. Key cap markings are shown, followed by the input character or command in parentheses.

• MENU EQUA

This indicates you should first press MENU, use the cursor keys (▲, ▼, ◀, ▶) to select the **EQUA** mode, and then press EXE. Operations you need to perform to enter a mode from the Main Menu are indicated like this.

• Function Keys and Menus

- Many of the operations performed by this calculator can be executed by pressing function keys F1 through F6. The operation assigned to each function key changes according to the mode the calculator is in, and current operation assignments are indicated by function menus that appear at the bottom of the display.
- This User's Guide shows the current operation assigned to a function key in parentheses following the key cap for that key. F1(Comp), for example, indicates that pressing F1 selects {Comp}, which is also indicated in the function menu.
- When (▷) is indicated in the function menu for key F6, it means that pressing F6 displays the next page or previous page of menu options.

• Menu Titles

- Menu titles in this User's Guide include the key operation required to display the menu being explained. The key operation for a menu that is displayed by pressing OPTN and then {LIST} would be shown as: **[OPTN]-[LIST]**.
- F6(▷) key operations to change to another menu page are not shown in menu title key operations.

• Command List

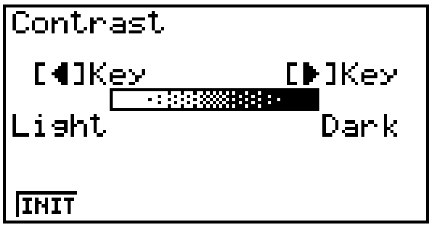
The **PRGM** Mode Command List (page 8-41) provides a graphic flowchart of the various function key menus and shows how to maneuver to the menu of commands you need.

Example: The following operation displays Xfct: **[VARS]-[FACT]-[Xfct]**

■ Contrast Adjustment

Adjust the contrast whenever objects on the display appear dim or difficult to see.

1. Use the cursor keys (▲, ▼, ◀, ▶) to select the **SYSTEM** icon and press EXE, then press F1( ) to display the contrast adjustment screen.



2. Adjust the contrast.
   - The ▶ cursor key makes display contrast darker.
   - The ◀ cursor key makes display contrast lighter.
   - F1(INIT) returns display contrast to its initial default.

3. To exit display contrast adjustment, press MENU.

Chapter 1 Basic Operation

1. Keys

■ Key Table

Key	SHIFT function	ALPHA character	Page
F1	Trace		5-30
F2	Zoom		5-5
F3	V-Window		5-3
F4	Sketch		5-29
F5	G-Solv		5-31
F6	G↔T		5-1, 5-25
SHIFT			1-2
OPTN			1-26
VARS	PRGM		1-30 (PRGM), 1-27
MENU	SET UP		1-31 (SET UP), 1-2
ALPHA	A-LOCK		2-8 (A-LOCK), 1-2
x^2	$\sqrt{}$	r	2-16 ($\sqrt{}$), 2-16
^	$\sqrt[x]{}$	θ	1-22, 2-15 ($\sqrt[x]{}$), 2-15
EXIT	QUIT		
X,θ,T	∠	A	2-32 (∠)
log	10^x	B	2-15
ln	e^x	C	
sin	$\sin^{-1}$	D	2-15 ($\sin^{-1}$), 2-15
cos	$\cos^{-1}$	E	2-15
tan	$\tan^{-1}$	F	
Fraction key *1	Mixed fraction	G	1-12 (SHIFT), 1-14, 1-22, 2-21
S↔D *2	$a\frac{b}{c} \leftrightarrow \frac{d}{c}$	H	2-21 (SHIFT), 1-23, 2-21
(	$\sqrt[3]{}$	I	2-1
)	x^{-1}	J	2-1
,		K	10-11 (SHIFT)
→		L	10-10 (SHIFT), 2-7

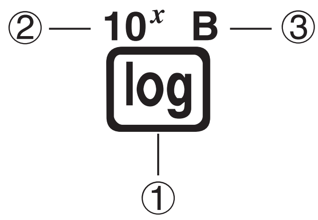
Key	SHIFT function	ALPHA character	Page
7	CAPTURE	M	1-34 (CAPTURE)
8	CLIP	N	1-8 (CLIP)
9	PASTE	O	1-9 (PASTE)
DEL	INS	UNDO	1-6, 1-16 (INS), 1-18 (UNDO), 1-6
AC/ON	OFF		
4	CATALOG	P	1-9 (CATALOG)
5		Q	
6		R	
×	{	S	2-1
÷	}	T	2-1
1	List	U	3-2 (List)
2	Mat	V	2-44 (Mat)
3		W	
+	[	X	2-1
−	]	Y	
0	i	Z	2-32 (i)
•	=	SPACE	
×10^x	π	"	2-15 (π), 2-8 ("), 2-1
(−)	Ans		2-10 (Ans), 2-1
EXE	↵		

*1 fx-7400GIII: a b/c   *2 fx-7400GIII: F↔D

Not all of the functions described above are available on all models covered by this manual. Depending on calculator model, some of the above keys may not be included on your calculator.

■ Key Markings

Many of the calculator's keys are used to perform more than one function. The functions marked on the keyboard are color coded to help you find the one you need quickly and easily.



	Function	Key Operation
①	log	[log]
②	10^x	[SHIFT] [log]
③	B	[ALPHA] [log]

The following describes the color coding used for key markings.

Color	Key Operation
Yellow	Press [SHIFT] and then the key to perform the marked function.
Red	Press [ALPHA] and then the key to perform the marked function.

- [ALPHA] (A-LOCK) **Alpha Lock**

  Normally, once you press [ALPHA] and then a key to input an alphabetic character, the keyboard reverts to its primary functions immediately.
  If you press [SHIFT] and then [ALPHA], the keyboard locks in alpha input until you press [ALPHA] again.

2. Display

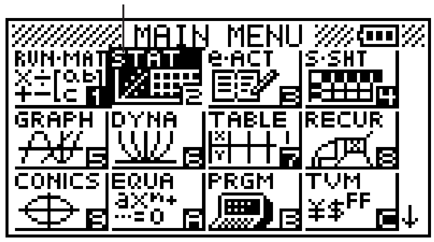
■ Selecting Icons

This section describes how to select an icon in the Main Menu to enter the mode you want.

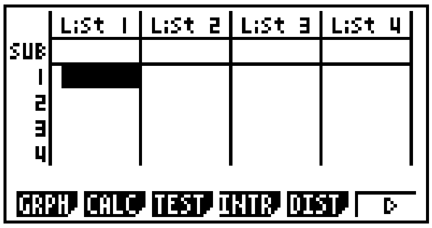
• To select an icon

1. Press [MENU] to display the Main Menu.
2. Use the cursor keys (◀, ▶, ▲, ▼) to move the highlighting to the icon you want.

Currently selected icon

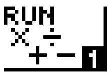


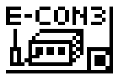
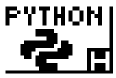
3. Press EXE to display the initial screen of the mode whose icon you selected. Here we will enter the **STAT** mode.



- You can also enter a mode without highlighting an icon in the Main Menu by inputting the number or letter marked in the lower right corner of the icon.
- Use only the procedures described above to enter a mode. If you use any other procedure, you may end up in a mode that is different than the one you thought you selected.

The following explains the meaning of each icon.

Icon	Mode Name	Description
	RUN (fx-7400GIII only)	Use this mode for arithmetic calculations and function calculations, and for calculations involving binary, octal, decimal, and hexadecimal values.
	RUN • MAT* (Run • Matrix • Vector)	Use this mode for arithmetic calculations, function calculations, binary, octal, decimal, and hexadecimal calculations, matrix calculations, and vector calculations.
	STAT (Statistics)	Use this mode to perform single-variable (standard deviation) and paired-variable (regression) statistical calculations, to perform tests, to analyze data and to draw statistical graphs.
	e • ACT* (eActivity)	eActivity lets you input text, math expressions, and other data in a notebook-like interface. Use this mode when you want to store text or formulas, or built-in application data in a file.
	S • SHT* (Spreadsheet)	Use this mode to perform spreadsheet calculations. Each file contains a 26-column × 999-line spreadsheet. In addition to the calculator's built-in commands and **S • SHT** mode commands, you can also perform statistical calculations and graph statistical data using the same procedures that you use in the **STAT** mode.
	GRAPH	Use this mode to store graph functions and to draw graphs using the functions.
	DYNA* (Dynamic Graph)	Use this mode to store graph functions and to draw multiple versions of a graph by changing the values assigned to the variables in a function.
	TABLE	Use this mode to store functions, to generate a numeric table of different solutions as the values assigned to variables in a function change, and to draw graphs.
	RECUR* (Recursion)	Use this mode to store recursion formulas, to generate a numeric table of different solutions as the values assigned to variables in a function change, and to draw graphs.
	CONICS*	Use this mode to draw graphs of conic sections.
	EQUA (Equation)	Use this mode to solve linear equations with two through six unknowns, and high-order equations from 2nd to 6th degree.
	PRGM (Program)	Use this mode to store programs in the program area and to run programs.

Icon	Mode Name	Description
	TVM* (Financial)	Use this mode to perform financial calculations and to draw cash flow and other types of graphs.
	E-CON3*	Use this mode to control the optionally available Data Logger.
	LINK	Use this mode to transfer memory contents or back-up data to another unit or PC.
	MEMORY	Use this mode to manage data stored in memory.
	SYSTEM	Use this mode to initialize memory, adjust contrast, and to make other system settings.
	PYTHON*	Use this mode to create and execute Python programming language scripts.

* Not included on the fx-7400GIII.

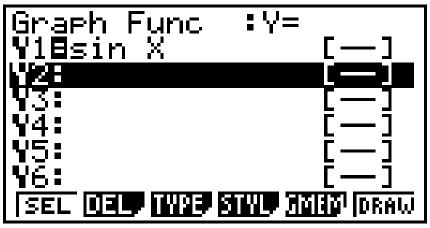
■ About the Function Menu

Use the function keys (F1 to F6) to access the menus and commands in the menu bar along the bottom of the display screen. You can tell whether a menu bar item is a menu or a command by its appearance.

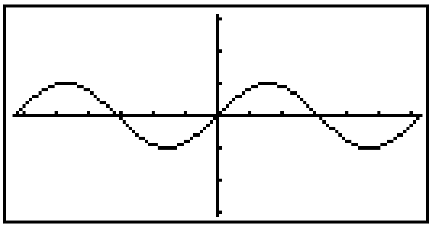
■ About Display Screens

This calculator uses two types of display screens: a text screen and a graph screen. The text screen can show 21 columns and 8 lines of characters, with the bottom line used for the function key menu. The graph screen uses an area that measures 127 (W) × 63 (H) dots.

Text Screen



Graph Screen



■ Normal Display

The calculator normally displays values up to 10 digits long. Values that exceed this limit are automatically converted to and displayed in exponential format.

- **How to interpret exponential format**

```
1.2E12
                 1.2E+12
```

1.2E+12 indicates that the result is equivalent to 1.2×10^{12}. This means that you should move the decimal point in 1.2 twelve places to the right, because the exponent is positive. This results in the value 1,200,000,000,000.

```
1.2E-3
                 1.2E-03
```

1.2E–03 indicates that the result is equivalent to 1.2×10^{-3}. This means that you should move the decimal point in 1.2 three places to the left, because the exponent is negative. This results in the value 0.0012.

You can specify one of two different ranges for automatic changeover to normal display.

Norm 1 .... 10^{-2} (0.01) > $|x|$, $|x| \geqq 10^{10}$

Norm 2 .... 10^{-9} (0.000000001) > $|x|$, $|x| \geqq 10^{10}$

All of the examples in this manual show calculation results using Norm 1.

See page 2-12 for details on switching between Norm 1 and Norm 2.

■ Special Display Formats

This calculator uses special display formats to indicate fractions, hexadecimal values, and degrees/minutes/seconds values.

- Fractions

```
456⌟12⌟23
            456⌟12⌟23
```

.... Indicates: $456 \frac{12}{23}$

- Hexadecimal Values

```
ABCDEF1
              0ABCDEF1
```

.... Indicates: $0ABCDEF1_{(16)}$, which equals $180150001_{(10)}$

- Degrees/Minutes/Seconds

```
12.58244
          12°34’56.78”
```

.... Indicates: 12° 34’ 56.78”

- In addition to the above, this calculator also uses other indicators or symbols, which are described in each applicable section of this manual as they come up.

3. Inputting and Editing Calculations

■ Inputting Calculations

When you are ready to input a calculation, first press [AC] to clear the display. Next, input your calculation formulas exactly as they are written, from left to right, and press [EXE] to obtain the result.

Example **2 + 3 – 4 + 10 =**

[AC] [2] [+] [3] [–] [4] [+] [1] [0] [EXE]

```
2+3-4+10
                    11
```

■ Editing Calculations

Use the ◀ and ▶ keys to move the cursor to the position you want to change, and then perform one of the operations described below. After you edit the calculation, you can execute it by pressing [EXE]. Or you can use ▶ to move to the end of the calculation and input more.

- You can select either insert or overwrite for input*1. With overwrite, text you input replaces the text at the current cursor location. You can toggle between insert and overwrite by performing the operation: [SHIFT] [DEL] (INS). The cursor appears as "❙" for insert and as "▬" for overwrite.

*1 fx-9860GIII or fx-9750GIII: Insert and overwrite switching is possible only when the Linear input/output mode (page 1-31) is selected.

• To change a step

Example **To change cos60 to sin60**

[AC] [cos] [6] [0]	cos 60
◀ ◀ ◀	cos 60
[DEL]	60
[sin]	sin 60

• To delete a step

Example **To change 369 × × 2 to 369 × 2**

[AC] [3] [6] [9] [×] [×] [2]	369××2
◀ [DEL]	369×2

In the insert mode, the [DEL] key operates as a backspace key.

• To insert a step

Example **To change 2.36^2 to $\sin 2.36^2$**

[AC] [2] [•] [3] [6] [x^2]	2.36²
◀ ◀ ◀ ◀ ◀	2.36²
[sin]	sin 2.36²

■ Using Replay Memory

The last calculation performed is always stored into replay memory. You can recall the contents of the replay memory by pressing ◀ or ▶.
If you press ▶, the calculation appears with the cursor at the beginning. Pressing ◀ causes the calculation to appear with the cursor at the end. You can make changes in the calculation as you wish and then execute it again.

- Replay memory is enabled in the Linear input/output mode only. In the Math input/output mode, the history function is used in place of replay memory. For details, see "History Function" (page 1-19).

Example 1 **To perform the following two calculations**
4.12 × <u>6.4</u> = 26.368
4.12 × <u>7.1</u> = 29.252

Key operation	Display
AC 4 . 1 2 × 6 . 4 EXE	4.12×6.4 26.368
◀ ◀ ◀ ◀	4.12×6.4
SHIFT DEL (INS)	4.12×6.4
7 . 1	4.12×7.1_
EXE	4.12×7.1 29.252

After you press AC, you can press ▲ or ▼ to recall previous calculations, in sequence from the newest to the oldest (Multi-Replay Function). Once you recall a calculation, you can use ▶ and ◀ to move the cursor around the calculation and make changes in it to create a new calculation.

Example 2

Key operation	Display
AC 1 2 3 + 4 5 6 EXE 2 3 4 − 5 6 7 EXE	123+456 579 234−567 -333
AC	
▲ (One calculation back)	234−567
▲ (Two calculations back)	123+456

- A calculation remains stored in replay memory until you perform another calculation.
- The contents of replay memory are not cleared when you press the AC key, so you can recall a calculation and execute it even after pressing the AC key.

■ Making Corrections in the Original Calculation

Example **14 ÷ 0 × 2.3 entered by mistake for 14 ÷ 10 × 2.3**

Key operation	Display
AC 1 4 ÷ 0 × 2 . 3	14÷0×2.3

[EXE]

```
14÷0×2.3
  Ma ERROR
   Press:[EXIT]
```

Press [EXIT].

```
14÷0×2.3
```

Cursor is positioned automatically at the location of the cause of the error.

Make necessary changes.

[◀] [1]

```
14÷10×2.3
```

Execute again.

[EXE]

```
14÷10×2.3
                  3.22
```

■ Using the Clipboard for Copy and Paste

You can copy (or cut) a function, command, or other input to the clipboard, and then paste the clipboard contents at another location.

- The procedures described here all use the Linear input/output mode. For details about the copy and paste operation while the Math input/output mode is selected, see "Using the Clipboard for Copy and Paste in the Math Input/Output Mode" (page 1-20).

• To specify the copy range

1. Move the cursor (▌) to the beginning or end of the range of text you want to copy and then press [SHIFT] [8] (CLIP). This changes the cursor to "⧉".

```
14÷10×2.3
```

2. Use the cursor keys to move the cursor and highlight the range of text you want to copy.

```
14÷10×2.3
```

3. Press [F1] (COPY) to copy the highlighted text to the clipboard, and exit the copy range specification mode.

```
14÷10×2.3
```

The selected characters are not changed when you copy them.

To cancel text highlighting without performing a copy operation, press [EXIT].

• To cut the text

1. Move the cursor (▌) to the beginning or end of the range of text you want to cut and then press [SHIFT] [8] (CLIP). This changes the cursor to "⧉".

```
14÷10×2.3
```

2. Use the cursor keys to move the cursor and highlight the range of text you want to cut.

```
14÷10×2.3
```

3. Press [F2](CUT) to cut the highlighted text to the clipboard.

```
14÷2.3
```

Cutting causes the original characters to be deleted.

• Pasting Text

Move the cursor to the location where you want to paste the text, and then press [SHIFT] [9](PASTE). The contents of the clipboard are pasted at the cursor position.

[AC]

```
▌
```

[SHIFT] [9](PASTE)

```
10×▌
```

■ Catalog Function

The Catalog is an alphabetic list of all the commands available on this calculator*. You can input a command by calling up the Catalog and then selecting the command you want.

* fx-9860GIII, fx-9750GIII:

- Selecting "1:All" for the category list in the procedure below, displays all of the names of the commands available with this calculator in alphabetical order.
- Selecting any other category list option displays function names instead of command names. Using function names is helpful when you do not know the command name.
- In the **PYTHON** mode, only **PYTHON** mode-specific commands are displayed in the Catalog.

• To use the Catalog to input a command

1. Press [SHIFT] [4](CATALOG) to display an alphabetic Catalog of commands.
   - The screen that appears first is the last one you used for command input.
2. Press [F6](CTGY) to display the category list.
   - You can skip this step and go straight to step 5, if you want.

```
Select Category
 1:All
 2:Calculation
 3:Statistics
 4:Graph
 5:Program Command
 6:Change Setup    ↓
EXE            EXIT
```

3. Use the cursor keys (▲, ▼) to highlight the command category you want, and then press [F1](EXE) or [EXE].
   - This displays a list of commands in the category you selected.
   - fx-9860GIII, fx-9750GIII: If you select "2:Calculation" or "3:Statistics", a sub-category selection screen will appear. Use ▲ and ▼ to select a sub-category.

4. Input the first letter of the command you want to input. This will display the first command that starts with that letter.
   - fx-9860GIII, fx-9750GIII: You can input up to eight letters to search for a command (only when "1:All" is selected in the category list). For details, see "Searching for a Command (fx-9860GIII/fx-9750GIII only)" (page 1-10).
5. Use the cursor keys (▲, ▼) to highlight the command you want to input, and then press [F1](INPUT) or [EXE].

Note **(fx-9860GIII/fx-9750GIII)**

- You can scroll between screens by pressing [SHIFT] ▲ or [SHIFT] ▼.

Example **To use the Catalog to input the ClrGraph command**

[AC] [SHIFT] [4](CATALOG) [ln](C) ▼ ~ ▼ [EXE]

Pressing [EXIT] or [SHIFT] [EXIT](QUIT) closes the Catalog.

● Searching for a Command (fx-9860GIII/fx-9750GIII only)

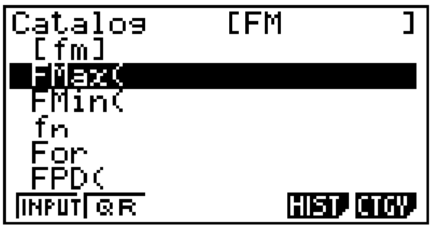
This method is helpful when you know the name of the command you want to input.

1. Press [SHIFT] [4](CATALOG) to display the catalog screen.
2. Press [F6](CTGY) to display the category list.
3. Move the highlighting to "1:All" and then press [F1](EXE) or [EXE].
   - This displays a list all the commands.

4. Input some of the letters in the command name.
   - You can input up to eight letters.
   - With each letter you input, the highlighting will move to the first command name that matches.
5. After the command you want is highlighted, press [F1](INPUT) or [EXE].

Example: **To input the command "FMax("**

[AC] [SHIFT] [4](CATALOG) [F6](CTGY)
[F1](EXE) [tan](F) [7](M) ▼



[F1](INPUT)

• Using the Command History (fx-9860GIII/fx-9750GIII only)

The calculator maintains a history of the last six commands you input.

1. Display one of the command lists.
2. Press F5 (HIST).
   - This displays the command history.

3. Use ▲ and ▼ to move the highlighting to the command you want to input and then press F1 (INPUT) or EXE.

• QR Code Function (fx-9860GIII/fx-9750GIII only)

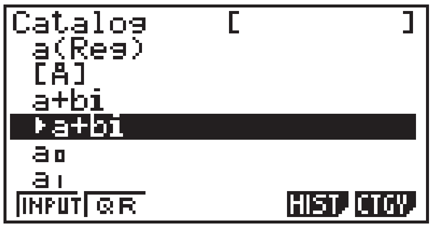
- You can use the QR Code function to access the online manual that covers commands. Note that the online manual does not include all commands. Note that the QR Code function cannot be used on the history screen.
- A QR Code* is displayed on the calculator screen. Use a smart device to read the QR Code and display the online manual.

  * QR Code is a registered trademark of DENSO WAVE INCORPORATED in Japan and in other countries.

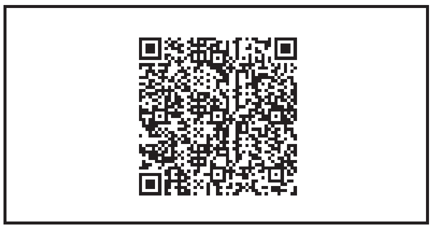
Important!

- The operations in this section assume that the smart device being used has a QR Code reader installed, and it can connect to the Internet.

1. Select a command that is included in the online manual.
   - This causes F2 (QR) to appear in the function menu.



2. Press F2 (QR).
   - This displays a QR Code.



3. Use your smart device to read the displayed QR Code.
   - This will display the online manual on your smart device.
   - For information about how to read a QR Code, refer to the user documentation of your smart device and the QR Code reader you are using.
   - If you are having trouble reading the QR Code, use ◀ and ▶ to adjust display brightness.

4. Press [EXIT] to close the QR Code screen.

- To exit the Catalog function, press [AC] or [SHIFT] [EXIT].

4. Using the Math Input/Output Mode

Important!

- The fx-7400GIII is not equipped with a Math input/output mode.

Selecting "Math" for the "Input/Output" mode setting on the Setup screen (page 1-31) turns on the Math input/output mode, which allows natural input and display of certain functions, just as they appear in your textbook.

- The operations in this section all are performed in the Math input/output mode.
  - The initial default setting is the Math input/output mode. If you have changed to the Linear input/output mode, switch back to the Math input/output mode before performing the operations in this section. See "Using the Setup Screen" (page 1-30) for information about how to switch modes.
  - Switch to the Math input/output mode before performing the operations in this section. See "Using the Setup Screen" (page 1-30) for information about how to switch modes.
- In the Math input/output mode, all input is insert mode (not overwrite mode) input. Note that the [SHIFT] [DEL](INS) operation (page 1-6) you use in the Linear input/output mode to switch to insert mode input performs a completely different function in the Math input/output mode. For more information, see "Using Values and Expressions as Arguments" (page 1-16).
- Unless specifically stated otherwise, all operations in this section are performed in the **RUN•MAT** mode.

fx-9750GIII users...

The fx-9750GIII "Input/Output" mode setting (page 1-31) has a "Mth/Mix" option that enables the same input operation as when "Math" is selected. The only way "Mth/Mix" differs from "Math" is that it outputs results of calculations including $\sqrt{\ }$ or π in decimal format.

For display examples of calculation results when "Mth/Mix" is selected, see "Example 4" (page 1-15) and "Math Input/Output Mode Input and Result Display in the **EQUA** Mode" (page 1-26).

■ Input Operations in the Math Input/Output Mode

• Math Input/Output Mode Functions and Symbols

The functions and symbols listed below can be used for natural input in the Math input/output mode. The "Bytes" column shows the number of bytes of memory that are used up by input in the Math input/output mode.

Function/Symbol	Key Operation	Bytes
Fraction (Improper)	[▭/▭]	9
Mixed Fraction*1	[SHIFT] [▭/▭] (■▭/▭)	14
Power	[^]	4
Square	[x^2]	4
Negative Power (Reciprocal)	[SHIFT] [)] (x^{-1})	5

Function/Symbol	Key Operation	Bytes
$\sqrt{\ }$	SHIFT x^2 ($\sqrt{\ }$)	6
Cube Root	SHIFT (($\sqrt[3]{\ }$)	9
Power Root	SHIFT ^ ($\sqrt[x]{\ }$)	9
e^x	SHIFT ln (e^x)	6
10^x	SHIFT log (10^x)	6
log(a,b)	(Input from MATH menu*2)	7
Abs (Absolute Value)	(Input from MATH menu*2)	6
Linear Differential*3	(Input from MATH menu*2)	7
Quadratic Differential*3	(Input from MATH menu*2)	7
Integral*3	(Input from MATH menu*2)	8
Σ Calculation*4	(Input from MATH menu*2)	11
Matrix, Vector	(Input from MATH menu*2)	14*5
Parentheses	(and)	1
Braces (Used during list input.)	SHIFT × ({) and SHIFT ÷ (})	1
Brackets (Used during matrix/vector input.)	SHIFT + ([ ) and SHIFT − ( ])	1

*1 Mixed fraction is supported in the Math input/output mode only.

*2 For information about function input from the MATH function menu, see "Using the MATH Menu" described below.

*3 Tolerance cannot be specified in the Math input/output mode. If you want to specify tolerance, use the Linear input/output mode.

*4 For Σ calculation in the Math input/output mode, the pitch is always 1. If you want to specify a different pitch, use the Linear input/output mode.

*5 This is the number of bytes for a 2 × 2 matrix.

• Using the MATH Menu

In the **RUN•MAT** mode, pressing F4 (MATH) displays the MATH menu.
You can use this menu for natural input of matrices, differentials, integrals, etc.

- {**MAT**} ... {displays the MAT submenu, for natural input of matrices/vectors}
  - {**2×2**} ... {inputs a 2 × 2 matrix}
  - {**3×3**} ... {inputs a 3 × 3 matrix}
  - {***m*×*n***} ... {inputs a matrix/vector with m lines and n columns (up to 6 × 6)}
  - {**2×1**} ... {inputs a 2 × 1 vector}
  - {**3×1**} ... {inputs a 3 × 1 vector}
  - {**1×2**} ... {inputs a 1 × 2 vector}
  - {**1×3**} ... {inputs a 1 × 3 vector}
- {**log$_a$b**} ... {starts natural input of logarithm $\log_a b$}
- {**Abs**} ... {starts natural input of absolute value |X|}
- {***d*/*dx***} ... {starts natural input of linear differential $\frac{d}{dx}f(x)_{x=a}$ }

- {d^2/dx^2} ... {starts natural input of quadratic differential $\dfrac{d^2}{dx^2}f(x)_{x=a}$}
- {$\int dx$} … {starts natural input of integral $\int_a^b f(x)dx$}
- {$\Sigma($} … {starts natural input of Σ calculation $\sum_{x=\alpha}^{\beta} f(x)$}

• Math Input/Output Mode Input Examples

This section provides a number of different examples showing how the MATH function menu and other keys can be used during Math input/output mode natural input. Be sure to pay attention to the input cursor position as you input values and data.

Example 1 **To input $2^3 + 1$**

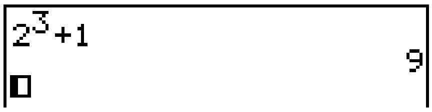
[AC] [2] [∧]

[3]

[▶]

[+] [1]

[EXE]



Example 2 **To input $\left(1+\frac{2}{5}\right)^2$**

[AC] [(] [1] [+]

[▭/▭]

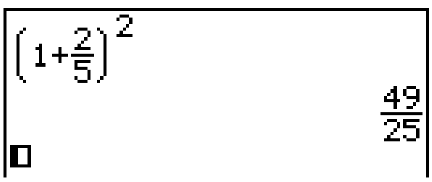
[2] [▼]

[5]

[▶]

[)] [x^2]

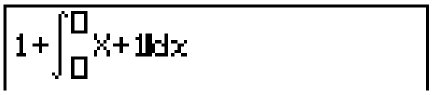
[EXE]



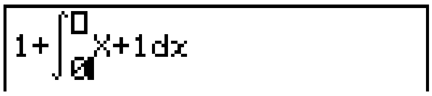
Example 3 To input $1+\int_0^1 x+1dx$

AC 1 + F4(MATH) F6(▷) F1(∫dx)

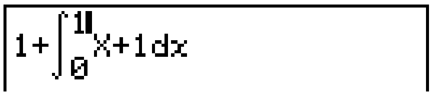
X,θ,T + 1



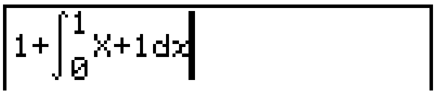
▶ 0



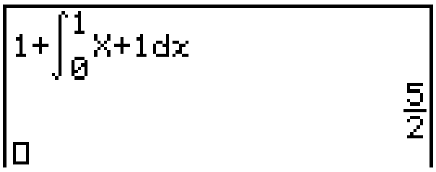
▲ 1



▶



EXE



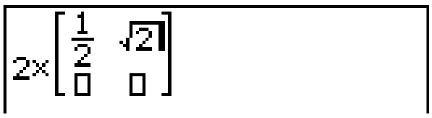
Example 4 To input $2\times\begin{bmatrix}\frac{1}{2} & \sqrt{2}\\ \sqrt{2} & \frac{1}{2}\end{bmatrix}$

AC 2 × F4(MATH) F1(MAT) F1(2×2)

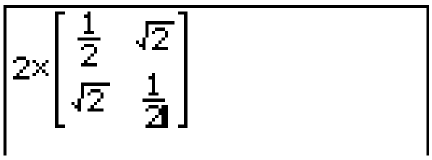
▭ 1 ▼ 2

▶ ▶

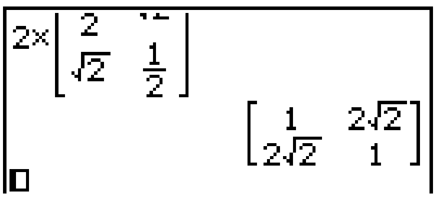
SHIFT x^2(√‾) 2 ▶



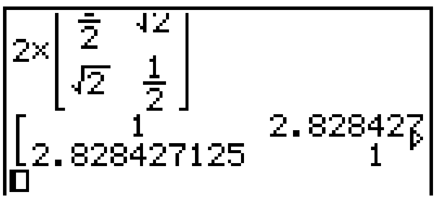
▶ SHIFT x^2(√‾) 2 ▶ ▶ ▭ 1 ▼ 2



EXE

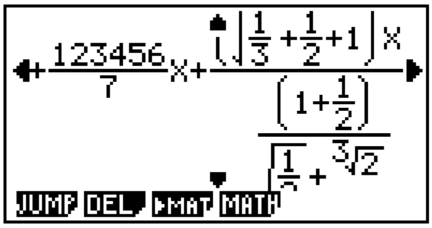


fx-9860GIII, fx-9750GIII
(Input/Output: Math)



fx-9750GIII
(Input/Output: Mth/Mix)

• When the calculation does not fit within the display window



Arrows appear at the left, right, top, or bottom edge of the display to let you know when there is more of the calculation off the screen in the corresponding direction.

When you see an arrow, you can use the cursor keys to scroll the screen contents and view the part you want.

• Math Input/Output Mode Input Restrictions

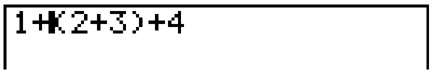
Certain types of expressions can cause the vertical width of a calculation formula to be greater than one display line. The maximum allowable vertical width of a calculation formula is about two display screens (120 dots). You cannot input any expression that exceeds this limitation.

• Using Values and Expressions as Arguments

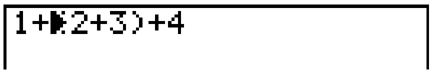
A value or an expression that you have already input can be used as the argument of a function. After you have input "(2+3)", for example, you can make it the argument of $\sqrt{\ }$, resulting in $\sqrt{(2+3)}$.

Example

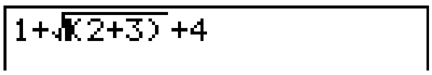
1. Move the cursor so it is located directly to the left of the part of the expression that you want to become the argument of the function you will insert.



2. Press [SHIFT] [DEL] (INS).
   - This changes the cursor to an insert cursor (▶).



3. Press [SHIFT] [x^2] ($\sqrt{\ }$) to insert the $\sqrt{\ }$ function.
   - This inserts the $\sqrt{\ }$ function and makes the parenthetical expression its argument.



As shown above, the value or expression to the right of the cursor after [SHIFT] [DEL] (INS) are pressed becomes the argument of the function that is specified next. The range encompassed as the argument is everything up to the first open parenthesis to the right, if there is one, or everything up to the first function to the right (sin(30), log2(4), etc.).

This capability can be used with the following functions.

Function	Key Operation	Original Expression	Expression After Insertion
Improper Fraction	[$\frac{\square}{\square}$]	1+(2+3)+4	$1+\frac{\square}{(2+3)}+4$
Power	[^]	1+2(2+3)+4	$1+2^{(2+3)}+4$

Function	Key Operation	Original Expression	Expression After Insertion
$\sqrt{\ }$	[SHIFT] [x^2] ($\sqrt{\ }$)	1+(2+3)+4	$1+\sqrt{(2+3)}+4$
Cube Root	[SHIFT] [(] ($\sqrt[3]{\ }$)		$1+\sqrt[3]{(2+3)}+4$
Power Root	[SHIFT] [^] ($\sqrt[x]{\ }$)		$1+\sqrt[\square]{(2+3)}+4$
e^x	[SHIFT] [ln] (e^x)		$1+e^{(2+3)}+4$
10^x	[SHIFT] [log] (10^x)		$1+10^{(2+3)}+4$
log(a,b)	[F4] (MATH) [F2] ($\log_a b$)		$1+\log_{\square}((2+3))+4$
Absolute Value	[F4] (MATH) [F3] (Abs)		$1+\lvert(2+3)\rvert+4$
Linear Differential	[F4] (MATH) [F4] (d/dx)	1+(X+3)+4	$1+\frac{d}{dx}((X+3))\Big\rvert_{x=\square}+4$
Quadratic Differential	[F4] (MATH) [F5] (d^2/dx^2)		$1+\frac{d^2}{dx^2}((X+3))\Big\rvert_{x=\square}+4$
Integral	[F4] (MATH) [F6] (▷) [F1] ($\int dx$)		$1+\int_{\square}^{\square}(X+3)dx+4$
Σ Calculation	[F4] (MATH) [F6] (▷) [F2] (Σ( )		$1+\sum_{\square=\square}^{\square}((X+3))+4$

- In the Linear input/output mode, pressing [SHIFT] [DEL] (INS) will change to the insert mode. See page 1-6 for more information.

• Editing Calculations in the Math Input/Output Mode

The procedures for editing calculations in the Math input/output mode are basically the same as those for the Linear input/output mode. For more information, see "Editing Calculations" (page 1-6).

Note however, that the following points are different between the Math input/output mode and the Linear input/output mode.

- Overwrite mode input that is available in the Linear input/output mode is not supported by the Math input/output mode. In the Math input/output mode, input is always inserted at the current cursor location.
- In the Math input/output mode, pressing the [DEL] key always performs a backspace operation.
- Note the following cursor operations you can use while inputting a calculation with Math input/output mode.

To do this:	Press this key:
Move the cursor from the end of the calculation to the beginning	▶
Move the cursor from the beginning of the calculation to the end	◀

Using Undoing and Redoing Operations

You can use the following procedures during calculation expression input in the Math input/output mode (up until you press the EXE key) to undo the last key operation and to redo the key operation you have just undone.

- To undo the last key operation, press: ALPHA DEL (UNDO).
- To redo a key operation you have just undone, press: ALPHA DEL (UNDO) again.

• You also can use UNDO to cancel an AC key operation. After pressing AC to clear an expression you have input, pressing ALPHA DEL (UNDO) will restore what was on the display before you pressed AC.

• You also can use UNDO to cancel a cursor key operation. If you press ▶ during input and then press ALPHA DEL (UNDO), the cursor will return to where it was before you pressed ▶.

• The UNDO operation is disabled while the keyboard is alpha-locked. Pressing ALPHA DEL (UNDO) while the keyboard is alpha-locked will perform the same delete operation as the DEL key alone.

Example

1 + ▭ 1 ▶

DEL

ALPHA DEL (UNDO)

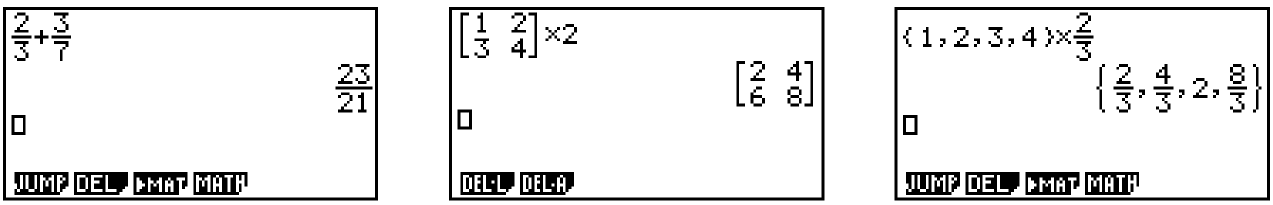
2

AC

ALPHA DEL (UNDO)

Math Input/Output Mode Calculation Result Display

Fractions, matrices, vectors, and lists produced by Math input/output mode calculations are displayed in natural format, just as they appear in your textbook.

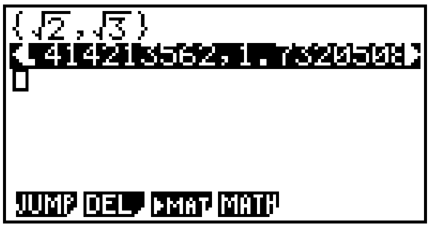


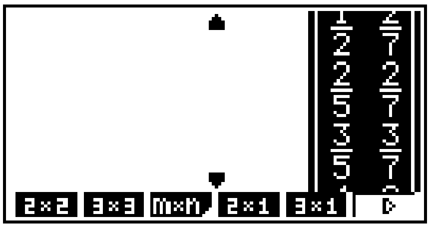
Sample Calculation Result Displays

• Fractions are displayed either as improper fractions or mixed fractions, depending on the "Frac Result" setting on the Setup screen. For details, see "Using the Setup Screen" (page 1-30).

• Matrices are displayed in natural format, up to 6 × 6. A matrix that has more than six rows or columns will be displayed on a MatAns screen, which is the same screen used in the Linear input/output mode.

- Vectors are displayed in natural format up to 1 × 6, or 6 × 1. A vector that has more than six rows or columns will be displayed on a VctAns screen, which is the same screen used in the Linear input/output mode.
- Lists are displayed in natural format for up to 20 elements. A list that has more than 20 elements will be displayed on a ListAns screen, which is the same screen used in the Linear input/output mode.
- Arrows appear at the left, right, top, or bottom edge of the display to let you know when there is more data off the screen in the corresponding direction.





You can use the cursor keys to scroll the screen and view the data you want.

- Pressing [F2](DEL)[F1](DEL•L) while a calculation result is selected will delete both the result and the calculation that produced it.
- The multiplication sign cannot be omitted immediately before an improper fraction or mixed fraction. Be sure to always input a multiplication sign in this case.

  Example: $2\times\frac{2}{5}$ [2][×][2][▭/▭][5]

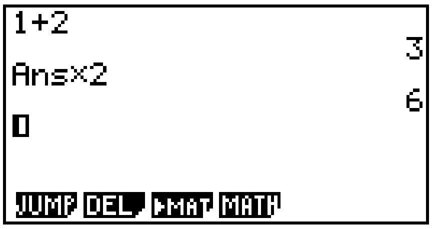
- A [∧], [x^2], or [SHIFT][)](x^{-1}) key operation cannot be followed immediately by another [∧], [x^2], or [SHIFT][)](x^{-1}) key operation. In this case, use parentheses to keep the key operations separate.

  Example: $(3^2)^{-1}$ [(][3][x^2][)][SHIFT][)](x^{-1})

■ History Function

The history function maintains a history of calculation expressions and results in the Math input/output mode. Up to 30 sets of calculation expressions and results are maintained.

[1][+][2][EXE]
[×][2][EXE]

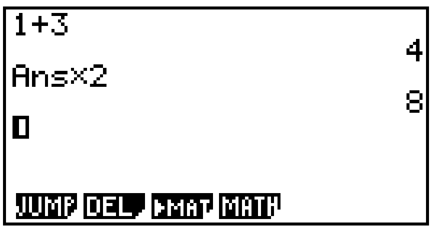


You can also edit the calculation expressions that are maintained by the history function and recalculate. This will recalculate all of the expressions starting from the edited expression.

Example **To change "1+2" to "1+3" and recalculate**

Perform the following operation following the sample shown above.

[▲][▲][▲][▲][◀][DEL][3][EXE]



- The value stored in the answer memory is always dependent on the result produced by the last calculation performed. If history contents include operations that use the answer memory, editing a calculation may affect the answer memory value used in subsequent calculations.
  - If you have a series of calculations that use the answer memory to include the result of the previous calculation in the next calculation, editing a calculation will affect the results of all the other calculations that come after it.
  - When the first calculation of the history includes the answer memory contents, the answer memory value is "0" because there is no calculation before the first one in history.

■ Using the Clipboard for Copy and Paste in the Math Input/Output Mode

You can copy a function, command, or other input to the clipboard, and then paste the clipboard contents at another location.

- In the Math input/output mode, you can specify only one line as the copy range.
- The copy operation below can be performed on an input line (calculation formula line input by you) only. If you want to copy a calculation result in history, see "Copying a Calculation Result in History" (page 1-20).
- The CUT operation is supported for the Linear input/output mode only. It is not supported for the Math input/output mode.

• To copy text

1. Use the cursor keys to move the cursor to the input line you want to copy.
2. Press [SHIFT] [8] (CLIP). The cursor will change to " ".
3. Press [F1] (CPY·L) to copy the highlighted text to the clipboard.

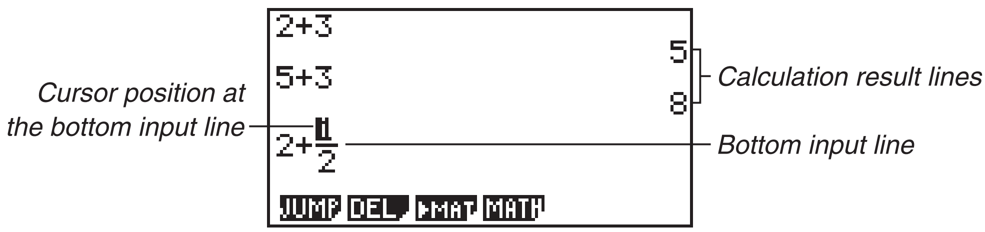
- Note the following points about clipboard contents.
  - Performing the above operation or the operation under "To copy a calculation result line in history" (page 1-21) will cause the current contents of the clipboard to be overwritten.
  - Performing the paste operation under "To paste text" below will paste the current contents of the clipboard.

• To paste text

Move the cursor to the location where you want to paste the text, and then press [SHIFT] [9] (PASTE). The contents of the clipboard are pasted at the cursor position.

■ Copying a Calculation Result in History

In the **RUN•MAT** mode and **e•ACT** mode, the contents of a calculation result line (line where a calculation result is displayed on the right side) can be copied to the final cursor position of the bottom input line.



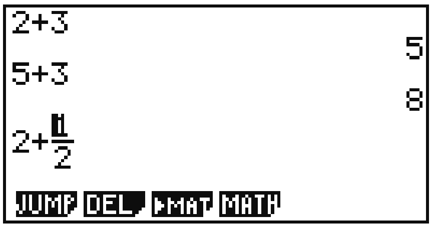
Important!

- In the **e•ACT** mode, the copy operation described here can be performed on a calculation result line of a calculation line only.
- In the **RUN•MAT** mode, this operation is possible only when Setup screen settings are configured as shown below.
  - Mode: Comp
  - Input/Output: fx-9860GIII: Math, fx-9750GIII: Math or Mth/Mix

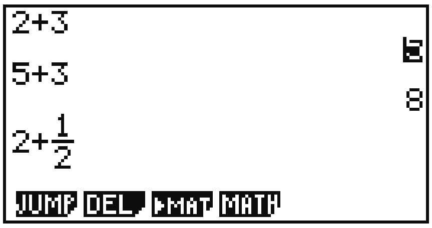
  In the **e•ACT** mode, this operation can be performed regardless of Setup screen settings.

• To copy a calculation result line in history

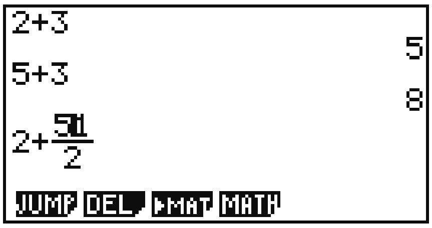
1. Move the cursor to the location in the bottom input line where you want to insert the copied content.*1



2. Press SHIFT ▲.*2
3. Use ▲ and ▼ move the highlighting to the calculation result line you want to copy.*3



4. Press EXE.*4



*1 When the bottom input line in the **e•ACT** mode is a text line, you cannot copy to the text line cursor position. In this case, completing step 3 of the above procedure will insert a new calculation line at the bottom, to which the content will be copied.

*2 Be sure to perform the SHIFT ▲ key operation in step 2 (which exits input line editing) when copying to the destinations described below.

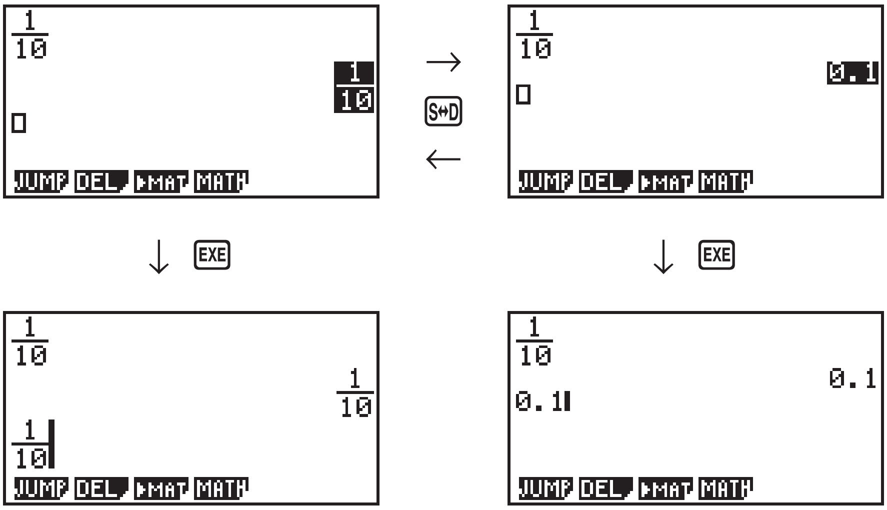
- To the gray locations of the functions below
  - Improper fraction: $\frac{\square}{\blacksquare}$
  - Mixed fraction: $\square\frac{\square}{\blacksquare}$
  - Integral: $\int_{\blacksquare}^{\square}\blacksquare\,dx$
  - Σ Calculation: $\sum_{\blacksquare=\blacksquare}^{\square}(\blacksquare)$
- To the second or subsequent line of a matrix or vector

In cases other than the above, you can skip the key operation in step 2.

*3 After highlighting the calculation result line you want to copy and before performing step 3 of the procedure, you can use the key operation below to change the calculation result display format. The display format of a copied result is the one in effect when you press [EXE] in step 3.

- Fraction, root, π format, and decimal: [S⇔D] (pages 1-23, 2-21)

Example:



- Improper fraction and mixed fraction: [S⇔D] ($a\frac{b}{c} \leftrightarrow \frac{d}{c}$) (page 2-21)
- Sexagesimal: [OPTN] [F6] (▷) [F5] (ANGL) [F5] ($\overleftarrow{\circ\ ,\ ,,}$) (page 2-14)
- ENG: [OPTN] [F6] (▷) [F6] (▷) [F1] (ESYM) [F6] (▷) [F6] (▷) [F2] (ENG) (pages 2-14, 2-21)
- $\overleftarrow{\text{ENG}}$: [OPTN] [F6] (▷) [F6] (▷) [F1] (ESYM) [F6] (▷) [F6] (▷) [F3] ($\overleftarrow{\text{ENG}}$) (pages 2-14, 2-21)

*4 In the cases below, copying is not performed when [EXE] is pressed.

(a) If the calculation result you selected in step 3 is one that cannot be copied (list, matrix, vector, or other special format calculation result)

(b) If the calculation result you selected in step 3 is a type of value or format that cannot be input to the copy destination

(c) If the copied result exceeds the number of allowable bytes of the copy destination

In the case of (b) and (c), the content will not be copied to the cursor position, but the content you selected will be copied to the clipboard.

■ Calculation Operations in the Math Input/Output Mode

This section introduces Math input/output mode calculation examples.

- For details about calculation operations, see "Chapter 2 Manual Calculations".

• Performing Function Calculations Using Math Input/Output Mode

Example	Operation
$\frac{6}{4\times5} = \frac{3}{10}$	[AC] **6** [▭] **4** [×] **5** [EXE]
$\cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$ (Angle: Rad)	[AC] [cos] [(] [SHIFT] [×10ˣ] (π) [▭] **3** [▶] [)] [EXE]
$\log_2 8 = 3$	[AC] [F4] (MATH) [F2] ($\log_a b$) **2** [▶] **8** [EXE]
$\sqrt[7]{123} = 1.988647795$	[AC] [SHIFT] [^] ($\sqrt[x]{\ }$) **7** [▶] **123** [EXE]
$2 + 3 \times \sqrt[3]{64} - 4 = 10$	[AC] **2** [+] **3** [×] [SHIFT] [^] ($\sqrt[x]{\ }$) **3** [▶] **64** [▶] [−] **4** [EXE]

$\left\lvert\log\frac{3}{4}\right\rvert = 0.1249387366$	[AC] [F4](MATH) [F3](Abs) [log] **3** [▭/▭] **4** [EXE]
$\frac{2}{5}+3\frac{1}{4}=\frac{73}{20}$	[AC] **2** [▭/▭] **5** [▶] [+] **3** [SHIFT] [▭/▭] (■▭/▭) **1** [▶] **4** [EXE]
$1.5 + 2.3\boldsymbol{i} = \frac{3}{2}+\frac{23}{10}\boldsymbol{i}$	[AC] **1.5** [+] **2.3** [SHIFT] [0] (i) [EXE] [S⇔D] ([F⇔D] on the fx-7400GIII)
$\frac{d}{dx}\left(x^3+4x^2+x-6\right)_{x=3}=52$	[AC] [F4](MATH) [F4](d/dx) [X,θ,T] [^] **3** [▶] [+] **4** [X,θ,T] [x^2] [+] [X,θ,T] [−] **6** [▶] **3** [EXE]
$\int_1^5 2x^2+3x+4dx = \frac{404}{3}$	[AC] [F4](MATH) [F6](▷) [F1]($\int dx$) **2** [X,θ,T] [x^2] [+] **3** [X,θ,T] [+] **4** [▶] **1** [▶] **5** [EXE]
$\sum_{k=2}^{6}\left(k^2-3k+5\right)=55$	[AC] [F4](MATH) [F6](▷) [F2](Σ) [ALPHA] [,] (K) [x^2] [−] **3** [ALPHA] [,] (K) [+] **5** [▶] [ALPHA] [,] (K) [▶] **2** [▶] **6** [EXE]

■ Performing Matrix/Vector Calculations Using Math Input/Output Mode

• To specify the dimensions (size) of a matrix/vector

1. In the **RUN • MAT** mode, press [SHIFT] [MENU](SET UP) [F1](Math) [EXIT].
2. Press [F4](MATH) to display the MATH menu.
3. Press [F1](MAT) to display the following menu.
   - {**2**×**2**} … {inputs a 2 × 2 matrix}
   - {**3**×**3**} … {inputs a 3 × 3 matrix}
   - {$\boldsymbol{m}$×$\boldsymbol{n}$} … {inputs an m-row × n-column matrix or vector (up to 6 × 6)}
   - {**2**×**1**} … {inputs a 2 × 1 vector}
   - {**3**×**1**} … {inputs a 3 × 1 vector}
   - {**1**×**2**} … {inputs a 1 × 2 vector}
   - {**1**×**3**} … {inputs a 1 × 3 vector}

Example **To create a 2-row × 3-column matrix**

[F3](m×n)

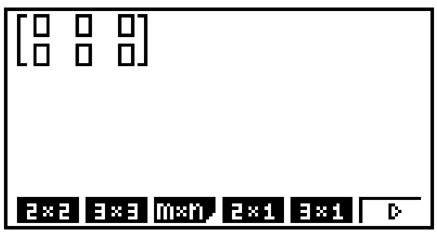
Specify the number of rows.

[2] [EXE]

Specify the number of columns.

[3] [EXE]

[EXE]



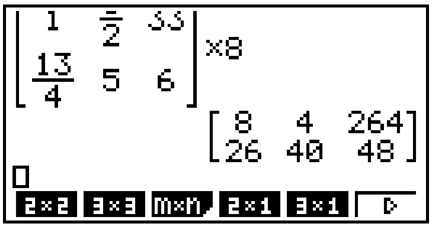
• To input cell values

Example **To perform the calculation shown below**

$$\begin{bmatrix} 1 & \frac{1}{2} & 33 \\ \frac{13}{4} & 5 & 6 \end{bmatrix} \times 8$$

The following operation is a continuation of the example calculation on the previous page.

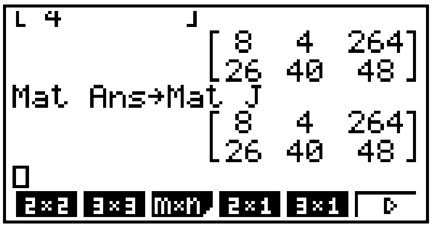
[1] [▶] [1] [fraction] [2] [▶] [▶] [3] [3] [▶]
[1] [3] [fraction] [4] [▶] [▶] [5] [▶] [6] [▶]
[×] [8] [EXE]



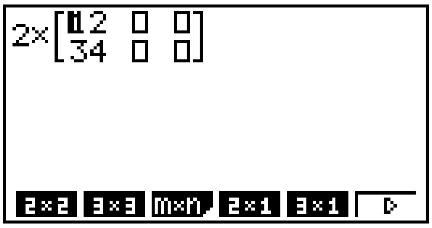
• To assign a matrix created using Math input/output mode to a MAT mode matrix

Example **To assign the calculation result to Mat J**

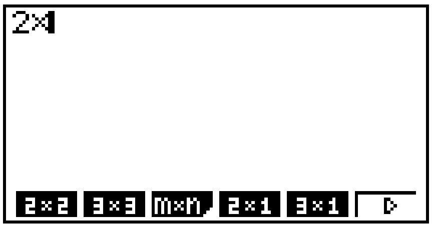
[SHIFT] [2] (Mat) [SHIFT] [(−)] (Ans) [→]
[SHIFT] [2] (Mat) [ALPHA] [)] (J) [EXE]



- Pressing the [DEL] key while the cursor is located at the top (upper left) of the matrix will delete the entire matrix.



[DEL]
⇒



■ Using Graph Modes and the EQUA Mode in the Math Input/Output Mode

Using the Math input/output mode with any of the modes below lets you input numeric expressions just as they are written in your textbook and view calculation results in natural display format.

Modes that support input of expressions as they are written in textbooks:

RUN•MAT, e•ACT, GRAPH, DYNA, TABLE, RECUR, EQUA (SOLV)

Modes that support natural display format:

RUN•MAT, e•ACT, EQUA

The following explanations show Math input/output mode operations in the **GRAPH**, **DYNA**, **TABLE**, **RECUR** and **EQUA** modes, and natural calculation result display in the **EQUA** mode.

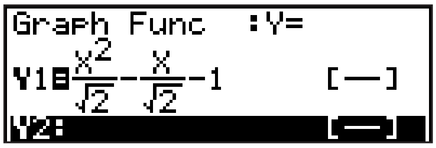
- See the sections that cover each calculation for details about its operation.
- See "Input Operations in the Math Input/Output Mode" (page 1-12) and "Calculation Operations in the Math Input/Output Mode" (page 1-22) for details about Math input/output mode input operations and calculation result displays in the **RUN•MAT** mode.
- **e•ACT** mode input operations and result displays are the same as those in the **RUN•MAT** mode. For information about **e•ACT** mode operations, see "Chapter 10 eActivity".

• Math Input/Output Mode Input in the GRAPH Mode

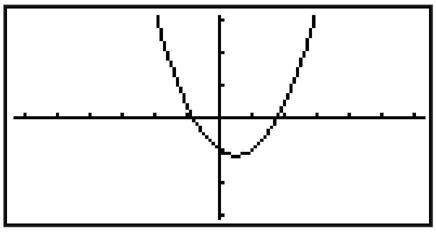
You can use the Math input/output mode for graph expression input in the **GRAPH**, **DYNA**, **TABLE**, and **RECUR** modes.

Example 1 **In the GRAPH mode, input the function $y = \frac{x^2}{\sqrt{2}} - \frac{x}{\sqrt{2}} - 1$ and then graph it.**
Make sure that initial default settings are configured on the View Window.

MENU GRAPH X,θ,T x^2 ▭ SHIFT x^2 (√‾) 2
▶ ▶ − X,θ,T ▭ SHIFT x^2 (√‾) 2 ▶ ▶
− 1 EXE

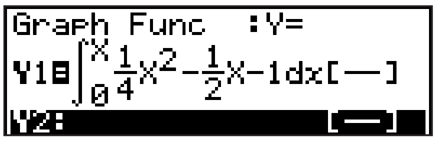


F6 (DRAW)

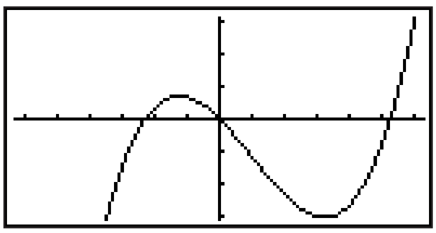


Example 2 **In the GRAPH mode, input the function $y = \int_0^x \frac{1}{4} x^2 - \frac{1}{2} x - 1 dx$ and then graph it.**
Make sure that initial default settings are configured on the View Window.

MENU GRAPH OPTN F2 (CALC) F3 (∫dx)
1 ▭ 4 ▶ X,θ,T x^2 − 1 ▭ 2 ▶
X,θ,T − 1 ▶ 0 ▶ X,θ,T EXE



F6 (DRAW)



• Math Input/Output Mode Input and Result Display in the EQUA Mode

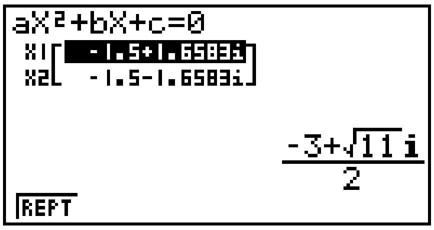
You can use the Math input/output mode in the **EQUA** mode for input and display as shown below.

- In the case of simultaneous equations ([F1](SIML)) and high-order equations ([F2](POLY)), solutions are output in natural display format (fractions, √‾, π are displayed in natural format) whenever possible.
- In the case of Solver ([F3](SOLV)), you can use Math input/output mode natural input.

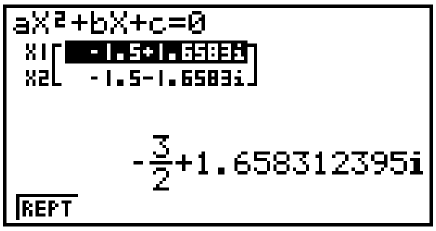
Example **To solve the quadratic equation $x^2 + 3x + 5 = 0$ in the EQUA mode**

[MENU] EQUA [SHIFT] [MENU] (SET UP) [▼] [▼] [▼] [▼] (Complex Mode)

[F2] (a+bi) [EXIT] [F2] (POLY) [F1] (2) [1] [EXE] [3] [EXE] [5] [EXE] [EXE]



fx-9860GIII, fx-9750GIII
(Input/Output: Math)



fx-9750GIII
(Input/Output: Mth/Mix)

5. Option (OPTN) Menu

The option menu gives you access to scientific functions and features that are not marked on the calculator's keyboard. The contents of the option menu differ according to the mode you are in when you press the [OPTN] key.

- The option menu does not appear if you press [OPTN] while binary, octal, decimal, or hexadecimal is set as the default number system.
- For details about the commands included on the option (OPTN) menu, see the "[OPTN] key" item in the "**PRGM** Mode Command List" (page 8-41).
- The meanings of the option menu items are described in the sections that cover each mode.

The following list shows the option menu that is displayed when the **RUN•MAT** (or **RUN**) or **PRGM** mode is selected.

Item names below that are marked with an asterisk (*) are not included on the fx-7400GIII.

- {**LIST**} ... {list function menu}
- {**MAT**}* ... {matrix/vector operation menu}
- {**CPLX**} ... {complex number calculation menu}
- {**CALC**} ... {functional analysis menu}
- {**STAT**} ... {paired-variable statistical estimated value menu} (fx-7400GIII)
  {menu for paired-variable statistical estimated value, distribution, standard deviation, variance, and test functions} (fx-9860GIII, fx-9750GIII)
- {**CONV**} ... {metric conversion menu}
- {**HYP**} ... {hyperbolic calculation menu}
- {**PROB**} ... {probability/distribution calculation menu}
- {**NUM**} ... {numeric calculation menu}

- {**ANGL**} ... {menu for angle/coordinate conversion, sexagesimal input/conversion}
- {**ESYM**} ... {engineering symbol menu}
- {**PICT**} ... {graph save/recall menu}
- {**FMEM**} ... {function memory menu}
- {**LOGIC**} ... {logic operator menu}
- {**CAPT**} ... {screen capture menu}
- {**TVM**}* ... {financial calculation menu}
- The PICT, FMEM and CAPT items are not displayed when "Math" is selected for the "Input/Output" mode setting on the Setup screen.

6. Variable Data (VARS) Menu

To recall variable data, press VARS to display the variable data menu.

{**V-WIN**}/{**FACT**}/{**STAT**}/{**GRPH**}/{**DYNA**}/{**TABL**}/{**RECR**}/{**EQUA**}/{**TVM**}/{**Str**}

- Note that the EQUA and TVM items appear for function keys (F3 and F4) only when you access the variable data menu from the **RUN•MAT** (or **RUN**) or **PRGM** mode.
- The variable data menu does not appear if you press VARS while binary, octal, decimal, or hexadecimal is set as the default number system.
- Depending on the calculator model, some menu items may not be included.
- For details about the commands included on the variable data (VARS) menu, see the "VARS key" item in the "**PRGM** Mode Command List" (page 8-41).
- Item names below that are marked with an asterisk (*) are not included on the fx-7400GIII.

• V-WIN — Recalling V-Window values

- {**X**}/{**Y**}/{**T,θ**} ... {x-axis menu}/{y-axis menu}/{T,θ menu}
- {**R-X**}/{**R-Y**}/{**R-T,θ**} ... {x-axis menu}/{y-axis menu}/{T,θ menu} for right side of Dual Graph
  - {**min**}/{**max**}/{**scal**}/{**dot**}/{**ptch**} ... {minimum value}/{maximum value}/{scale}/{dot value*1}/{pitch}

  *1 The dot value indicates the display range (Xmax value – Xmin value) divided by the screen dot pitch (126). The dot value is normally calculated automatically from the minimum and maximum values. Changing the dot value causes the maximum to be calculated automatically.

• FACT — Recalling zoom factors

- {**Xfct**}/{**Yfct**} ... {x-axis factor}/{y-axis factor}

• STAT — Recalling statistical data

- {**X**} … {single-variable, paired-variable x-data}
  - {n}/{$\bar{x}$}/{Σx}/{Σx^2}/{σx}/{sx}/{**minX**}/{**maxX**} ... {number of data}/{mean}/{sum}/{sum of squares}/{population standard deviation}/{sample standard deviation}/{minimum value}/{maximum value}

- **{Y}** ... {paired-variable y-data}
  - {$\bar{y}$}/{Σy}/{Σy^2}/{Σxy}/{σ_x}/{s_y}/{**minY**}/{**maxY**} ... {mean}/{sum}/{sum of squares}/{sum of products of x-data and y-data}/{population standard deviation}/{sample standard deviation}/{minimum value}/{maximum value}
- **{GRPH}** ... {graph data menu}
  - {a}/{b}/{c}/{d}/{e} ... {regression coefficient and polynomial coefficients}
  - {r}/{r^2} ... {correlation coefficient}/{coefficient of determination}
  - {**MSe**} ... {mean square error}
  - {Q_1}/{Q_3} ... {first quartile}/{third quartile}
  - {**Med**}/{**Mod**} ... {median}/{mode} of input data
  - {**Strt**}/{**Pitch**} ... histogram {start division}/{pitch}
- **{PTS}** ... {summary point data menu}
  - {x_1}/{y_1}/{x_2}/{y_2}/{x_3}/{y_3} ... {coordinates of summary points}
- **{INPT}*** ... {statistical calculation input values}
  - {n}/{$\bar{x}$}/{s_x}/{n_1}/{n_2}/{$\bar{x}_1$}/{$\bar{x}_2$}/{s_{x1}}/{s_{x2}}/{s_p} ... {size of sample}/{mean of sample}/{sample standard deviation}/{size of sample 1}/{size of sample 2}/{mean of sample 1}/{mean of sample 2}/{standard deviation of sample 1}/{standard deviation of sample 2}/{standard deviation of sample p}
- **{RESLT}*** ... {statistical calculation output values}
  - {**TEST**} ... {test calculation results}
    - {p}/{z}/{t}/{**Chi**}/{F}/{$\hat{p}$}/{$\hat{p}_1$}/{$\hat{p}_2$}/{df}/{s_e}/{r}/{r^2}/{**pa**}/{**Fa**}/{**Adf**}/{**SSa**}/{**MSa**}/{**pb**}/{**Fb**}/{**Bdf**}/{**SSb**}/{**MSb**}/{**pab**}/{**Fab**}/{**ABdf**}/{**SSab**}/{**MSab**}/{**Edf**}/{**SSe**}/{**MSe**}
      ... {p-value}/{z score}/{t score}/{χ^2 value}/{F value}/{estimated sample proportion}/{estimated proportion of sample 1}/{estimated proportion of sample 2}/{degrees of freedom}/{standard error}/{correlation coefficient}/{coefficient of determination}/{factor A p-value}/{factor A F value}/{factor A degrees of freedom}/{factor A sum of squares}/{factor A mean squares}/{factor B p-value}/{factor B F value}/{factor B degrees of freedom}/{factor B sum of squares}/ {factor B mean squares}/{factor AB p-value}/{factor AB F value}/{factor AB degrees of freedom}/{factor AB sum of squares}/{factor AB mean squares}/{error degrees of freedom}/{error sum of squares}/{error mean squares}
  - {**INTR**} ... {confidence interval calculation results}
    - {**Left**}/{**Right**}/{$\hat{p}$}/{$\hat{p}_1$}/{$\hat{p}_2$}/{df} ... {confidence interval lower limit (left edge)}/{confidence interval upper limit (right edge)}/{estimated sample proportion}/{estimated proportion of sample 1}/{estimated proportion of sample 2}/{degrees of freedom}
  - {**DIST**} ... {distribution calculation results}
    - {p}/{**xInv**}/{**x1Inv**}/{**x2Inv**}/{**zLow**}/{**zUp**}/{**tLow**}/{**tUp**} ... {probability distribution or cumulative distribution calculation result (p-value)}/{inverse Student-t, χ^2, F, binomial, Poisson, geometric or hypergeometric cumulative distribution calculation result}/{inverse normal cumulative distribution upper limit (right edge) or lower limit (left edge)}/{inverse normal cumulative distribution upper limit (right edge)}/{normal cumulative distribution lower limit (left edge)}/{normal cumulative distribution upper limit (right edge)}/{Student-t cumulative distribution lower limit (left edge)}/{Student-t cumulative distribution upper limit (right edge)}

• GRPH — Recalling graph functions

- {**Y**}/{r} ... {rectangular coordinate or inequality function}/{polar coordinate function}
- {**Xt**}/{**Yt**} ... parametric graph function {Xt}/{Yt}

- {**X**} ... {X=constant graph function}
- Press these keys before inputting a value to specify a memory area.

• DYNA* — Recalling dynamic graph setup data

- {**Strt**}/{**End**}/{**Pitch**} ... {coefficient range start value}/{coefficient range end value}/{coefficient value increment}

• TABL — Recalling table setup and content data

- {**Strt**}/{**End**}/{**Pitch**} ... {table range start value}/{table range end value}/{table value increment}
- {**Reslt**[*1]} ... {matrix of table contents}

[*1] The Reslt item appears only when the TABL menu is displayed in the **RUN•MAT** (or **RUN**) and **PRGM** modes.

• RECR* — Recalling recursion formula[*1], table range, and table content data

- {**FORM**} ... {recursion formula data menu}
  - {a_n}/{a_{n+1}}/{a_{n+2}}/{b_n}/{b_{n+1}}/{b_{n+2}}/{c_n}/{c_{n+1}}/{c_{n+2}} ... {a_n}/{a_{n+1}}/{a_{n+2}}/{b_n}/{b_{n+1}}/{b_{n+2}}/{c_n}/{c_{n+1}}/{c_{n+2}} expressions
- {**RANG**} ... {table range data menu}
  - {**Strt**}/{**End**} ... table range {start value}/{end value}
  - {a_0}/{a_1}/{a_2}/{b_0}/{b_1}/{b_2}/{c_0}/{c_1}/{c_2} ... {a_0}/{a_1}/{a_2}/{b_0}/{b_1}/{b_2}/{c_0}/{c_1}/{c_2} value
  - {a_n**St**}/{b_n**St**}/{c_n**St**} ... origin of {a_n}/{b_n}/{c_n} recursion formula convergence/divergence graph (WEB graph)
- {**Reslt**[*2]}* ... {matrix of table contents[*3]}

[*1] An error occurs when there is no function or recursion formula numeric table in memory.

[*2] "Reslt" is available only in the **RUN•MAT** and **PRGM** modes.

[*3] Table contents are stored automatically in Matrix Answer Memory (MatAns).

• EQUA* — Recalling equation coefficients and solutions[*1 *2]

- {**S-Rlt**}/{**S-Cof**} ... matrix of {solutions}/{coefficients} for linear equations with two through six unknowns[*3]
- {**P-Rlt**}/{**P-Cof**} ... matrix of {solution}/{coefficients} for a quadratic or cubic equation

[*1] Coefficients and solutions are stored automatically in Matrix Answer Memory (MatAns).

[*2] The following conditions cause an error.
- When there are no coefficients input for the equation
- When there are no solutions obtained for the equation

[*3] Coefficient and solution memory data for a linear equation cannot be recalled at the same time.

• TVM* — Recalling financial calculation data

- {n}/{$I\%$}/{PV}/{PMT}/{FV} ... {payment periods (installments)}/{annual interest rate}/{present value}/{payment}/{future value}
- {P/Y}/{C/Y} ... {installment periods per year}/{compounding periods per year}

• Str — Str command

- {**Str**} ... {string memory}

7. Program (PRGM) Menu

To display the program (PRGM) menu, first enter the **RUN•MAT** (or **RUN**) or **PRGM** mode from the Main Menu and then press SHIFT VARS (PRGM). The following are the selections available in the program (PRGM) menu.

- The program (PRGM) menu items are not displayed when "Math" is selected for the "Input/Output" mode setting on the Setup screen.

- {**COM**} ...... {program command menu}
- {**CTL**} .... {program control command menu}
- {**JUMP**}..... {jump command menu}
- {**?**} .... {input command}
- {**◢**} .... {output command}
- {**CLR**} .... {clear command menu}
- {**DISP**} ...... {display command menu}
- {**REL**} .... {conditional jump relational operator menu}
- {**I/O**} .... {I/O control/transfer command menu}
- {**:**} .... {multi-statement command}
- {**STR**} .... {string command}

The following function key menu appears if you press SHIFT VARS (PRGM) in the **RUN•MAT** (or **RUN**) mode or the **PRGM** mode while binary, octal, decimal, or hexadecimal is set as the default number system.

- {**Prog**}....... {program recall}
- {**JUMP**}/{**?**}/{**◢**}/{**REL**}/{**:**}

The functions assigned to the function keys are the same as those in the Comp mode.

For details on the commands that are available in the various menus you can access from the program menu, see "Chapter 8 Programming".

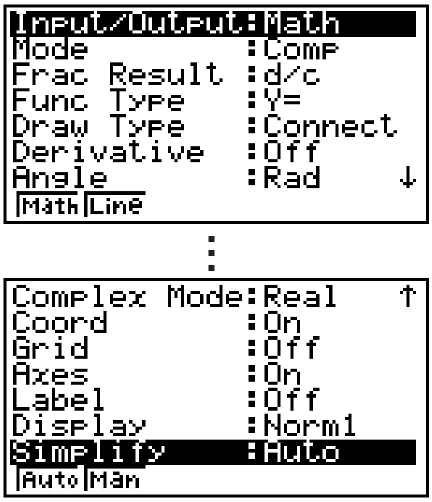
8. Using the Setup Screen

The mode's Setup screen shows the current status of mode settings and lets you make any changes you want. The following procedure shows how to change a setup.

• To change a mode setup

1. Select the icon you want and press EXE to enter a mode and display its initial screen. Here we will enter the **RUN•MAT** (or **RUN**) mode.

2. Press SHIFT MENU (SET UP) to display the mode's Setup screen.
   - This Setup screen is just one possible example. Actual Setup screen contents will differ according to the mode you are in and that mode's current settings.



3. Use the ⏶ and ⏷ cursor keys to move the highlighting to the item whose setting you want to change.
4. Press the function key (F1 to F6) that is marked with the setting you want to make.
5. After you are finished making any changes you want, press EXIT to exit the Setup screen.

■ Setup Screen Function Key Menus

This section details the settings you can make using the function keys in the Setup screen.
∿∿∿ indicates default setting.

Item names below that are marked with an asterisk (*) are not included on the fx-7400GIII.

• Input/Output* (input/output mode)

- {**Math**}/{**Line**}/{**M/M**} ... {Math}/{Linear}/{Mth/Mix}*[1] input/output mode

*[1] {Mth/Mix} is for fx-9750GIII only. In the fx-9750GIII Examination Mode, the initial default setting is {Mth/Mix}.

• Mode (calculation/binary, octal, decimal, hexadecimal mode)

- {**Comp**} ... {arithmetic calculation mode}
- {**Dec**}/{**Hex**}/{**Bin**}/{**Oct**} ... {decimal}/{hexadecimal}/{binary}/{octal}

• Frac Result (fraction result display format)

- {**d/c**}/{**ab/c**} ... {improper}/{mixed} fraction

• Func Type (graph function type)

Pressing one of the following function keys also switches the function of the X,θ,T key.

- {**Y=**}/{**r=**}/{**Parm**}/{**X=**} ... {rectangular coordinate (Y=$f(x)$ type)}/{polar coordinate}/{parametric}/{rectangular coordinate (X=$f(y)$ type)} graph
- {**Y>**}/{**Y<**}/{**Y≥**}/{**Y≤**} ... {$y>f(x)$}/{$y<f(x)$}/{$y\geq f(x)$}/{$y\leq f(x)$} inequality graph
- {**X>**}/{**X<**}/{**X≥**}/{**X≤**} ... {$x>f(y)$}/{$x<f(y)$}/{$x\geq f(y)$}/{$x\leq f(y)$} inequality graph

• Draw Type (graph drawing method)

- {**Con**}/{**Plot**} ... {connected points}/{unconnected points}

- **Derivative (derivative value display)**
  - {**On**}/{**Off**} ... {display on}/{display off} while Graph-to-Table, Table & Graph, and Trace are being used
- **Angle (default angle unit)**
  - {**Deg**}/{**Rad**}/{**Gra**} ... {degrees}/{radians}/{grads}
- **Complex Mode**
  - {**Real**} ... {calculation in real number range only}
  - {$a+bi$}/{$r\angle\theta$} ... {rectangular format}/{polar format} display of a complex calculation
- **Coord (graph pointer coordinate display)**
  - {**On**}/{**Off**} ... {display on}/{display off}
- **Grid (graph gridline display)**
  - {**On**}/{**Off**} ... {display on}/{display off}
- **Axes (graph axis display)**
  - {**On**}/{**Off**} ... {display on}/{display off}
- **Label (graph axis label display)**
  - {**On**}/{**Off**} ... {display on}/{display off}
- **Display (display format)**
  - {**Fix**}/{**Sci**}/{**Norm**}/{**Eng**} ... {fixed number of decimal places specification}/{number of significant digits specification}/{normal display setting}/{engineering mode}
- **Stat Wind (statistical graph V-Window setting method)**
  - {**Auto**}/{**Man**} ... {automatic}/{manual}
- **Resid List (residual calculation)**
  - {**None**}/{**LIST**} ... {no calculation}/{list specification for the calculated residual data}
- **List File (list file display settings)**
  - {**FILE**} ... {settings of list file on the display}
- **Sub Name (list naming)**
  - {**On**}/{**Off**} ... {display on}/{display off}
- **Graph Func (function display during graph drawing and trace)**
  - {**On**}/{**Off**} ... {display on}/{display off}
- **Dual Screen (dual screen mode status)**
  - {**G+G**}/{**GtoT**}/{**Off**} ... {graphing on both sides of dual screen}/{graph on one side and numeric table on the other side of dual screen}/{dual screen off}
- **Simul Graph (simultaneous graphing mode)**
  - {**On**}/{**Off**} ... {simultaneous graphing on (all graphs drawn simultaneously)}/{simultaneous graphing off (graphs drawn in area numeric sequence)}

- **Background (graph display background)**
  - {**None**}/{**PICT**} ... {no background}/{graph background picture specification}
- **Sketch Line (overlaid line type)**
  - {—}/{━}/{·····}/{·······} ... {normal}/{thick}/{broken}/{dotted}
- **Dynamic Type* (dynamic graph type)**
  - {**Cnt**}/{**Stop**} ... {non-stop (continuous)}/{automatic stop after 10 draws}
- **Locus* (dynamic graph locus mode)**
  - {**On**}/{**Off**} ... {locus drawn}/{locus not drawn}
- **Y=Draw Speed* (dynamic graph draw speed)**
  - {**Norm**}/{**High**} ... {normal}/{high-speed}
- **Variable (table generation and graph draw settings)**
  - {**RANG**}/{**LIST**} ... {use table range}/{use list data}
- **Σ Display* (Σ value display in recursion table)**
  - {**On**}/{**Off**} ... {display on}/{display off}
- **Slope* (display of derivative at current pointer location in conic section graph)**
  - {**On**}/{**Off**} ... {display on}/{display off}
- **Payment* (payment period setting)**
  - {**BGN**}/{**END**} ... {beginning}/{end} setting of payment period
- **Date Mode* (number of days per year setting)**
  - {**365**}/{**360**} ... interest calculations using {365}*2/{360} days per year

*2 The 365-day year must be used for date calculations in the **TVM** mode. Otherwise, an error occurs.

- **Periods/YR. * (payment interval specification)**
  - {**Annu**}/{**Semi**} ... {annual}/{semiannual}
- **Ineq Type (inequality fill specification)**
  - {**AND**}/{**OR**} ... When graphing multiple inequalities, {fill areas where all inequality conditions are satisfied}/{fill areas where each inequality condition is satisfied}
- **Simplify (calculation result auto/manual reduction specification)**
  - {**Auto**}/{**Man**} ... {auto reduce and display}/{display without reduction}
- **Q1Q3 Type (Q_1/Q_3 calculation formulas)**
  - {**Std**}/{**OnData**} ... {Divide total population on its center point between upper and lower groups, with the median of the lower group Q1 and the median of the upper group Q3}/{Make the value of element whose cumulative frequency ratio is greater than 1/4 and nearest to 1/4 Q1 and the value of element whose cumulative frequency ratio is greater than 3/4 and nearest to 3/4 Q3}

- **Imp Multi* (Changing the implicit multiplication calculation priority sequence)**
  - {**On**} ... Performs calculations the same as "Calculation Priority Sequence" on page 2-2.
  - {**Off**} ...The calculation priority sequence of implicit multiplication (⑤ and ⑦ of "Calculation Priority Sequence" on page 2-2) is the same as multiplication and division using explicit operators (⑩ of "Calculation Priority Sequence").

- **Auto Calc* (spreadsheet auto calc)**
  - {**On**}/{**Off**} ... {execute}/{not execute} the formulas automatically

- **Show Cell* (spreadsheet cell display mode)**
  - {**Form**}/{**Val**} ... {formula}*3/{value}

- **Move* (spreadsheet cell cursor direction)***4
  - {**Low**}/{**Right**} ... {move down}/{move right}

*3 Selecting "Form" (formula) causes a formula in the cell to be displayed as a formula. The "Form" does not affect any non-formula data in the cell.

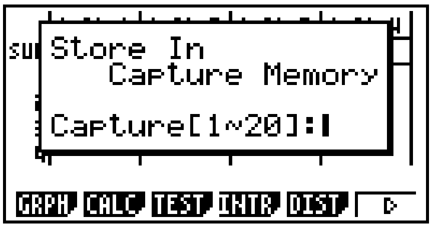
*4 Specifies the direction the cell cursor moves when you press the [EXE] key to register cell input, when the Sequence command generates a number table, and when you recall data from List memory.

9. Using Screen Capture

Any time while operating the calculator, you can capture an image of the current screen and save it in capture memory.

• To capture a screen image

1. Operate the calculator and display the screen you want to capture.
2. Press [SHIFT] [7] (CAPTURE).
   - This displays a memory area selection dialog box.



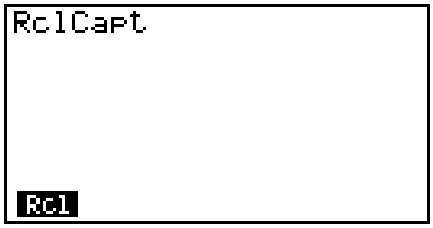
3. Input a value from 1 to 20 and then press [EXE].
   - This will capture the screen image and save it in capture memory area named "Capt n" (n = the value you input).

- You cannot capture the screen image of a message indicating that an operation or data communication is in progress.
- A memory error will occur if there is not enough room in main memory to store the screen capture.

• To recall a screen image from capture memory

This operation is possible only while the Linear input/output mode is selected.

1. In the **RUN•MAT** (or **RUN**) mode, press [OPTN] [F6](▷) [F6](▷) [F5](CAPT)([F4](CAPT) on the fx-7400GIII) [F1](RCL).



2. Enter a capture memory number in the range of 1 to 20, and then press [EXE].
   - This displays the image stored in the capture memory you specified.
3. To exit the image display and return to the screen you started from in step 1, press [EXIT].

- You can also use the RclCapt command in a program to recall a screen image from capture memory.

10. When you keep having problems…

If you keep having problems when you are trying to perform operations, try the following before assuming that there is something wrong with the calculator.

■ Getting the Calculator Back to its Original Mode Settings

1. From the Main Menu, enter the **SYSTEM** mode.
2. Press [F5](RSET).
3. Press [F1](STUP), and then press [F1](Yes).
4. Press [EXIT] [MENU] to return to the Main Menu.

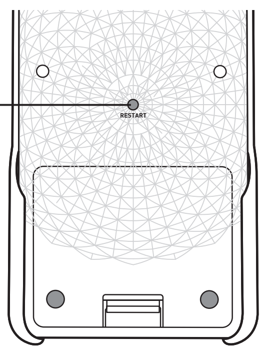
Now enter the correct mode and perform your calculation again, monitoring the results on the display.

■ Restart and Reset

• Restart

Should the calculator start to act abnormally, you can restart it by pressing the RESTART button. Note, however, that you should only use the RESTART button only as a last resort. Normally, pressing the RESTART button reboots the calculator's operating system, so programs, graph functions and other data in calculator memory is retained.

RESTART button



Important!

The calculator backs up user data (main memory) when you turn power off and loads the backed up data when you turn power back on.

When you press the RESTART button, the calculator restarts and loads backed up data.
This means that if you press the RESTART button after you edit a program, graph function, or other data, any data that has not been backed up will be lost.

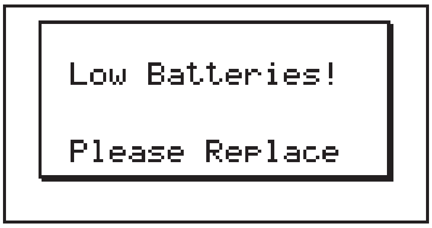
• Reset

Use reset when you want to delete all data currently in calculator memory and return all mode settings to their initial defaults.

Before performing the reset operation, first make a written copy of all important data.
For details, see “Reset” (page 12-3).

■ Low Battery Message

If the following message appears on the display, immediately turn off the calculator and replace batteries as instructed.



If you continue using the calculator without replacing batteries, power will automatically turn off to protect memory contents. Once this happens, you will not be able to turn power back on, and there is the danger that memory contents will be corrupted or lost entirely.

- You will not be able to perform data communication operations after the low battery message appears.

Chapter 2 Manual Calculations

1. Basic Calculations

2

■ Arithmetic Calculations

- Enter arithmetic calculations as they are written, from left to right.
- Use the (–) key to input the minus sign before a negative value.
- Calculations are performed internally with a 15-digit mantissa. The result is rounded to a 10-digit mantissa before it is displayed.
- For mixed arithmetic calculations, multiplication and division are given priority over addition and subtraction.

Example	Operation
$56 \times (-12) \div (-2.5) = 268.8$	**56** × (–) **12** ÷ (–) **2.5** EXE
$(2 + 3) \times 10^2 = 500$	(**2** + **3**) × **1** ×10ˣ **2** EXE
$2 + 3 \times (4 + 5) = 29$	**2** + **3** × (**4** + **5** EXE *1
$\frac{6}{4 \times 5} = 0.3$	**6** ÷ (**4** × **5**) EXE

*1 Final closed parentheses (immediately before operation of the EXE key) may be omitted, no matter how many are required.

■ Number of Decimal Places, Number of Significant Digits, Normal Display Range

[SET UP]- [Display] -[Fix]/[Sci]/[Norm]

- Even after you specify the number of decimal places or the number of significant digits, internal calculations are still performed using a 15-digit mantissa, and displayed values are stored with a 10-digit mantissa. Use Rnd of the Numeric Calculation Menu (NUM) (page 2-13) to round the displayed value off to the number of decimal place and significant digit settings.
- Number of decimal place (Fix) and significant digit (Sci) settings normally remain in effect until you change them or until you change the normal display range (Norm) setting.

Example 1 **100 ÷ 6 = 16.66666666...**

Condition	Operation	Display
	100 ÷ **6** EXE	**16.66666667**
4 decimal places	SHIFT MENU (SET UP) ▲ ▲ F1 (Fix) 4 EXE EXIT EXE	**16.6667** *1
5 significant digits	SHIFT MENU (SET UP) ▲ ▲ F2 (Sci) 5 EXE EXIT EXE	**1.6667E+01** *1
Cancels specification	SHIFT MENU (SET UP) ▲ ▲ F3 (Norm) EXIT EXE	**16.66666667**

*1 Displayed values are rounded off to the place you specify.

Example 2 **200 ÷ 7 × 14 = 400**

Condition	Operation	Display
	200 ÷ **7** × **14** EXE	**400**
3 decimal places	SHIFT MENU (SET UP) ▲ ▲ F1 (Fix) 3 EXE EXIT EXE	 **400.000**
Calculation continues using display capacity of 10 digits	**200** ÷ **7** EXE × **14** EXE	**28.571** **Ans ×** ▮ **400.000**

• If the same calculation is performed using the specified number of digits:

	200 ÷ **7** EXE	**28.571**
The value stored internally is rounded off to the number of decimal places specified on the Setup screen.	OPTN F6 (▷) F4 (NUM)* F4 (Rnd) EXE × **14** EXE	**28.571** **Ans ×** ▮ **399.994**
	200 ÷ **7** EXE	**28.571**
You can also specify the number of decimal places for rounding of internal values for a specific calculation. (Example: To specify rounding to two decimal places)	F6 (▷) F1 (RndFi) SHIFT (−) (Ans) , **2**) EXE × **14** EXE	**RndFix(Ans,2)** **28.570** **Ans ×** ▮ **399.980**

* fx-7400GIII: F3 (NUM)

■ Calculation Priority Sequence

This calculator employs true algebraic logic to calculate the parts of a formula in the following order:

① Type A functions

- Coordinate transformation Pol (x, y), Rec (r, θ)
- Functions that include parentheses (such as derivatives, integrations, Σ, etc.)
  d/dx, d^2/dx^2, $\int dx$, Σ, Solve, FMin, FMax, List→Mat, Fill, Seq, SortA, SortD, Min, Max, Median, Mean, Augment, Mat→List, DotP, CrossP, Angle, UnitV, Norm, P(, Q(, R(, t(, RndFix, $\log_a b$
- Composite functions*1, List, Mat, Vct, fn, **Y**n, **r**n, **X**tn, **Y**tn, **X**n

② Type B functions
With these functions, the value is entered and then the function key is pressed.
x^2, x^{-1}, $x!$, ° ’ ”, ENG symbols, angle unit °, ^{r}, ^{g}

③ Power/root ^(x^y), $\sqrt[x]{\ }$

④ Fractions $a\,{}^b/_c$

⑤*2 Abbreviated multiplication format in front of π, memory name, or variable name.
2π, 5A, Xmin, F Start, etc.

⑥ Type C functions
With these functions, the function key is pressed and then the value is entered.
$\sqrt{\ }$, $\sqrt[3]{\ }$, log, In, e^x, 10^x, sin, cos, tan, $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$, sinh, cosh, tanh, $\sinh^{-1}$, $\cosh^{-1}$,

tanh⁻¹, (–), d, h, b, o, Neg, Not, Det, Trn, Dim, Identity, Ref, Rref, Sum, Prod, Cuml, Percent, ⊿List, Abs, Int, Frac, Intg, Arg, Conjg, ReP, ImP

⑦*2 Abbreviated multiplication format in front of Type A functions, Type C functions, and parenthesis.
$2\sqrt{3}$, A log2, etc.

⑧ Permutation, combination $n\mathrm{P}r$, $n\mathrm{C}r$

⑨ Metric conversion commands

⑩ ×, ÷, Int÷, Rnd

⑪ +, –

⑫ Relational operators =, ≠, >, <, ≥, ≤

⑬ And (logical operator), and (bitwise operator)

⑭ Or, Xor (logical operator), or, xor, xnor (bitwise operator)

*1 You can combine the contents of multiple function memory (fn) locations or graph memory (**Y**n, **r**n, **X**tn, **Y**tn, **X**n) locations into composite functions. Specifying fn1(fn2), for example, results in the composite function fn1∘fn2 (see page 5-7). A composite function can consist of up to five functions.

*2 fx-9750GIII: Calculation priority sequence when “On” is selected for “Imp Multi” (Implicit multiplication, page 1-34) on the Setup screen. When “Off” is selected for “Imp Multi”, the calculation priority sequence of ⑤ and ⑦ is the same as ⑩. As a result, the overall calculation priority sequence becomes ❶ through ⓬ as shown below.

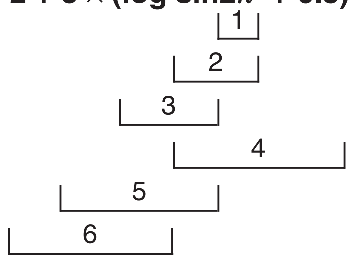
●: Calculation priority sequence when “Off” is selected for “Imp Multi”.
○: Calculation priority sequence when “On” is selected for “Imp Multi”.

●	○	
❶	①	Type A functions
❷	②	Type B functions
❸	③	Power/root
❹	④	Fractions
❺	⑥	Type C functions
❻	⑧	Permutation, combination
❼	⑨	Metric conversion commands
❽	⑤	Abbreviated multiplication format in front of π , memory name, or variable name. 2π, 5A, Xmin, F Start, etc.
	⑦	Abbreviated multiplication format in front of Type A functions, Type C functions, and parenthesis. $2\sqrt{3}$, A log2, etc.
	⑩	×, ÷, Int÷, Rnd
❾	⑪	+, –
❿	⑫	Relational operators
⓫	⑬	And (logical operator), and (bitwise operator)
⓬	⑭	Or, Xor (logical operator), or, xor, xnor (bitwise operator)

Example

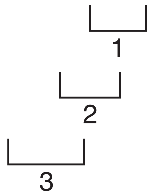
- **fx-9860GIII, fx-9750GIII, fx-7400GIII**

  2 + 3 × (log sin2π² + 6.8) = 22.07101691 (angle unit = Rad)

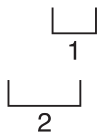


- **fx-9750GIII (Imp Multi: On)**
- **fx-9860GIII, fx-7400GIII**

  6 ÷ 2 (1 + 2) = 1

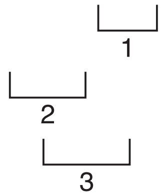


  6 ÷ 2π = 0.9549296586

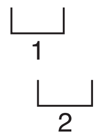


- **fx-9750GIII (Imp Multi: Off)**

  6 ÷ 2 (1 + 2) = 9



  6 ÷ 2π = 3π (Input/Output: Math)



- You cannot use a differential, quadratic differential, integration, Σ, maximum/minimum value, Solve, RndFix or $\log_a b$ calculation expression inside of a RndFix calculation term.
- When functions with the same priority are used in series, execution is performed from right to left.

  $e^x\ln\sqrt{120} \rightarrow e^x\{\ln(\sqrt{120})\}$

  Otherwise, execution is from left to right.
- Compound functions are executed from right to left.
- Anything contained within parentheses receives highest priority.

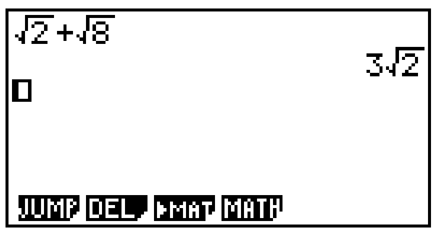
■ Calculation Result Irrational Number Display

(fx-9860GIII/fx-9750GIII only)

You can configure the calculator to display calculation results in irrational number format (including $\sqrt{\ }$ or π) by selecting "Math" for the "Input/Output" mode setting on the Setup screen.

Example $\sqrt{2} + \sqrt{8} = 3\sqrt{2}$ (Input/Output: Math)

SHIFT x^2 (√) 2 ▶ + SHIFT x^2 (√) 8 EXE



• Calculation Result Display Range with $\sqrt{}$

Display of a calculation result in $\sqrt{}$ format is supported for result with $\sqrt{}$ in up to two terms. Calculation results in $\sqrt{}$ format take one of the following forms.

$$\pm a\sqrt{b}, \pm d \pm a\sqrt{b}, \pm \frac{a\sqrt{b}}{c} \pm \frac{d\sqrt{e}}{f}$$

- The following are the ranges for each of the coefficients (a, b, c, d, e, f) can be displayed in the $\sqrt{}$ calculation result format.

  $1 \leqq a < 100$, $1 < b < 1000$, $1 \leqq c < 100$

  $0 \leqq d < 100$, $0 \leqq e < 1000$, $1 \leqq f < 100$

- In the cases shown below, a calculation result may be able to be displayed in $\sqrt{}$ format even if their coefficients (a, c, d) are outside the above ranges.

  A $\sqrt{}$ format calculation result uses a common denominator.

$$\frac{a\sqrt{b}}{c} + \frac{d\sqrt{e}}{f} \rightarrow \frac{a'\sqrt{b} + d'\sqrt{e}}{c'}$$

* c' is the least common multiple of c and f.

Since the calculation result uses a common denominator, calculation result still may be displayed using the $\sqrt{}$ format even when coefficients (a', c', d') are outside the corresponding range of coefficients (a, c, d).

Example: $\frac{\sqrt{3}}{11} + \frac{\sqrt{2}}{10} = \frac{10\sqrt{3} + 11\sqrt{2}}{110}$

Calculation Examples

This calculation:	**Produces this type of display:**
$2 \times (3 - 2\sqrt{5}) = 6 - 4\sqrt{5}$	$\sqrt{}$ format
$35\sqrt{2} \times 3 = 148.492424$ (= $\underset{\sim\sim}{105}\sqrt{2}$)*1	Decimal format
$\frac{\underset{\sim\sim}{150}\sqrt{2}}{25} = 8.485281374$*1	
$99\sqrt{999} = 3129.089165$ (= $297\sqrt{111}$)*1	
$23 \times (5 - 2\sqrt{3}) = 35.32566285$ (= $\underset{\sim\sim}{115} - 46\sqrt{3}$)*1	Decimal format
$\sqrt{2} + \sqrt{3} + \sqrt{8} = \sqrt{3} + 3\sqrt{2}$	$\sqrt{}$ format
$\underset{\sim\sim\sim\sim\sim\sim}{\sqrt{2} + \sqrt{3} + \sqrt{6}} = 5.595754113$*2	Decimal format

*1 Decimal format because values are outside of range.

*2 Decimal format because calculation result has three terms.

- The calculation result is displayed using decimal format even if an intermediate result goes greater than two terms.

  Example: $(1 + \sqrt{2} + \sqrt{3})(1 - \sqrt{2} - \sqrt{3})$ (= $-4 - 2\sqrt{6}$)

  $= -8.898979486$

- If the calculation formula has a $\sqrt{}$ term and a term that cannot be displayed as a fraction, the calculation result will be displayed in decimal format.

  Example: $\log 3 + \sqrt{2} = 1.891334817$

• Calculation Result Display Range with π

A calculation results is displayed using π format in the following cases.

- When the calculation result can be displayed in the form $n\pi$

  n is an integer up to $|10^6|$.

- When the calculation result can be displayed in the form $a\frac{b}{c}\pi$ or $\frac{b}{c}\pi$

  However, {number of a digits + number of b digits + number of c digits} must be 9 or less when the above $a\frac{b}{c}$ or $\frac{b}{c}$ is reduced.*1*2 Also, the maximum number of allowable c digits is three.*2

  *1 When $c < b$, the number of a, b, and c digits are counted when the fraction is converted from an improper fraction ($\frac{b}{c}$) to a mixed fraction ($a\frac{b}{c}$).

  *2 When "Manual" is specified for the Setup screen "Simplify" setting, the calculation result may be displayed in decimal format, even if these conditions are met.

Calculation Examples

This calculation:	**Produces this type of display:**
$78\pi \times 2 = 156\pi$	π format
$123456\pi \times 9 = 3490636.164$ (= $\underline{11111104}$ π)*3	Decimal format
$105\frac{568}{824}\pi = 105\frac{71}{103}\pi$	π format
$2\frac{258}{3238}\pi = \underline{6.533503684}$ $\left(2\frac{129}{1619}\pi\right)$ *4	Decimal format

*3 Decimal format because calculation result integer part is $|10^6|$ or greater.

*4 Decimal format because number of denominator digits is four or greater for the $a\frac{b}{c}\pi$ form.

■ Multiplication Operations without a Multiplication Sign

You can omit the multiplication sign (×) in any of the following operations.

- Before Type A functions (① on page 2-2) and Type C functions (⑥ on page 2-2), except for negative signs

Example 1 **2sin30, 10log1.2, 2√3, 2Pol(5, 12), etc.**

- Before constants, variable names, memory names

Example 2 **2π, 2AB, 3Ans, 3Y1, etc.**

- Before an open parenthesis

Example 3 **3(5 + 6), (A + 1)(B – 1), etc.**

If you execute a calculation that includes both division and multiplication operations in which a multiplication sign has been omitted, parentheses will be inserted automatically as shown in the examples below.

- When a multiplication sign is omitted immediately before an open parenthesis or after a closed parenthesis.*

Example 1 $6 \div 2(1+2) \rightarrow 6 \div (2(1+2))$

$6 \div A(1+2) \rightarrow 6 \div (A(1+2))$

$1 \div (2+3)\sin 30 \rightarrow 1 \div ((2+3)\sin 30)$

- When a multiplication sign is omitted immediately before a variable, a constant, etc.*

Example 2 $6 \div 2\pi \rightarrow 6 \div (2\pi)$

$2 \div 2\sqrt{2} \rightarrow 2 \div (2\sqrt{2})$

$4\pi \div 2\pi \rightarrow 4\pi \div (2\pi)$

* fx-9750GIII: These parentheses are not input automatically when "Off" is selected for "Imp Multi" on the Setup screen.

If you execute a calculation in which a multiplication sign has been omitted immediately before a fraction (including mixed fractions), parentheses will be inserted automatically as shown in the examples below.

Example $(2 \times \frac{1}{3})$: $2\frac{1}{3} \rightarrow 2\left(\frac{1}{3}\right)$

Example $(\sin 2 \times \frac{4}{5})$: $\sin 2\frac{4}{5} \rightarrow \sin 2\left(\frac{4}{5}\right)$

■ Overflow and Errors

Exceeding a specified input or calculation range, or attempting an illegal input causes an error message to appear on the display. Further operation of the calculator is impossible while an error message is displayed. For details, see the "Error Message Table" on page α-1.

- Most of the calculator's keys are inoperative while an error message is displayed. Press EXIT to clear the error and return to normal operation.

■ Memory Capacity

Each time you press a key, either one byte or two bytes is used. Some of the functions that require one byte are: 1, 2, 3, sin, cos, tan, log, In, √, and π.
Some of the functions that take up two bytes are d/dx(, Mat, Vct, Xmin, If, For, Return, DrawGraph, SortA(, PxIOn, Sum, and a_{n+1}.

- The required number of bytes to input functions and commands is different in the Linear input/output mode and the Math input/output mode. For details about the number of bytes required for each function in the Math input/output mode, see page 1-12.

2. Special Functions

■ Calculations Using Variables

Example	Operation	Display
	193.2 → ALPHA X,θ,T (A) EXE	**193.2**
193.2 ÷ 23 = 8.4	ALPHA X,θ,T (A) ÷ **23** EXE	**8.4**
193.2 ÷ 28 = 6.9	ALPHA X,θ,T (A) ÷ **28** EXE	**6.9**

■ Memory

• Variables (Alpha Memory)

This calculator comes with 28 variables as standard. You can use variables to store values you want to use inside of calculations. Variables are identified by single-letter names, which are made up of the 26 letters of the alphabet, plus r and θ. The maximum size of values that you can assign to variables is 15 digits for the mantissa and 2 digits for the exponent.

• Variable contents are retained even when you turn power off.

• To assign a value to a variable

[value] [→] [variable name] [EXE]

Example 1 **To assign 123 to variable A**

[AC] [1] [2] [3] [→] [ALPHA] [X,θ,T] (A) [EXE]

```
123→A
                123
```

Example 2 **To add 456 to variable A and store the result in variable B**

[AC] [ALPHA] [X,θ,T] (A) [+] [4] [5] [6] [→]
[ALPHA] [log] (B) [EXE]

```
A+456→B
                579
```

• To assign the same value to more than one variable

[value] [→] [first variable name] [ALPHA] [F3] (~) [last variable name] [EXE]

• You cannot use "r" or "θ" as a variable name.

Example **To assign a value of 10 to variables A through F**

[AC] [1] [0] [→] [ALPHA] [X,θ,T] (A)
[ALPHA] [F3] (~) [ALPHA] [tan] (F) [EXE]

```
10→A~F
                 10
```

• String Memory

You can store up to 20 strings (named Str 1 to Str 20) in string memory. Stored strings can be output to the display or used inside functions and commands that support the use of strings as arguments.

For details about string operations, see "Strings" (page 8-20).

Example **To assign string "ABC" to Str 1 and then output Str 1 to the display**

[AC] [SHIFT] [ALPHA] ([A]-LOCK) [×10^x] (") [X,θ,T] (A)
[log] (B) [ln] (C) [×10^x] (") [ALPHA] (Releases Alpha Lock.)
[→] [VARS] [F6] (▷) [F5] (Str)* [1] [EXE]

```
"ABC"→Str 1
               Done
```

[F5] (Str)* [1] [EXE]

* fx-7400GIII: [F6] (Str)

```
"ABC"→Str 1
               Done
Str 1
ABC
```

String is displayed justified left.

- Perform the above operation in the Linear input/output mode. It cannot be performed in the Math input/output mode.

• Function Memory [OPTN]-[FMEM]

Function memory is convenient for temporary storage of often-used expressions. For longer term storage, we recommend that you use the **GRAPH** mode for expressions and the **PRGM** mode for programs.

- {**STO**}/{**RCL**}/{**fn**}/{**SEE**} ... {function store}/{function recall}/{function area specification as a variable name inside an expression}/{function list}

• To store a function

Example **To store the function (A+B) (A–B) as function memory number 1**

(ALPHA X,θ,T (A) + ALPHA log (B))
(ALPHA X,θ,T (A) − ALPHA log (B))

```
(A+B)(A-B)
```

OPTN F6 (▷) F6 (▷) F3 (FMEM)*
F1 (STO) 1 EXE

```
== Function Memory ==
 f1:(A+B)(A-B)
```

* fx-7400GIII: F2 (FMEM)

EXIT EXIT EXIT

- If the function memory number to which you store a function already contains a function, the previous function is replaced with the new one.
- You can also use → to store a function in function memory in a program. In this case, you must enclose the function inside of double quotation marks.

```
"(A+B)(A-B)"→fn1
```

• To recall a function

Example **To recall the contents of function memory number 1**

AC OPTN F6 (▷) F6 (▷) F3 (FMEM)*
F2 (RCL) 1 EXE

```
(A+B)(A-B)
```

* fx-7400GIII: F2 (FMEM)

- The recalled function appears at the current location of the cursor on the display.

• To recall a function as a variable

AC 3 → ALPHA X,θ,T (A) EXE
1 → ALPHA log (B) EXE
OPTN F6 (▷) F6 (▷) F3 (FMEM)* F3 (fn)
1 + 2 EXE

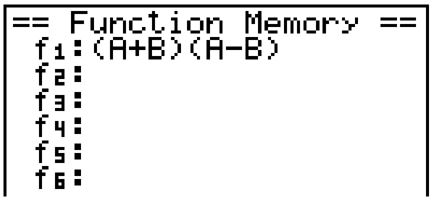
* fx-7400GIII: F2 (FMEM)

```
3→A
                    3
1→B
                    1
fn1+2
                   10
```

• To display a list of available functions

OPTN F6(▷) F6(▷) F3(FMEM)*
F4(SEE)

* fx-7400GIII: F2(FMEM)



• To delete a function

Example **To delete the contents of function memory number 1**

AC

OPTN F6(▷) F6(▷) F3(FMEM)*
F1(STO) 1 EXE

* fx-7400GIII: F2(FMEM)

- Executing the store operation while the display is blank deletes the function in the function memory you specify.

■ Answer Function

The Answer Function automatically stores the last result you calculated by pressing EXE (unless the EXE key operation results in an error). The result is stored in the answer memory.

- The largest value that the answer memory can hold is 15 digits for the mantissa and 2 digits for the exponent.
- Answer memory contents are not cleared when you press the AC key or when you switch power off.

• To use the contents of the answer memory in a calculation

Example **123 + 456 = 579**
789 – 579 = 210

AC 1 2 3 + 4 5 6 EXE
7 8 9 − SHIFT (−)(Ans) EXE

fx-7400GIII users...

- The answer memory contents are not changed by an operation that assigns values to Alpha memory (such as: 5 → ALPHA log(B) EXE).

fx-9860GIII, fx-9750GIII users...

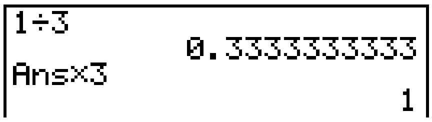
- In the Math input/output mode, the operation to recall answer memory contents is different from the operation in the Linear input/output mode. For details, see “History Function” (page 1-19).
- Performing an operation that assigns a value to an Alpha memory (such as [5] [→] [ALPHA] [log] (B) [EXE]), answer memory contents are updated in the Math input/output mode but not in the Linear input/output mode.

■ Performing Continuous Calculations

Answer memory also lets you use the result of one calculation as one of the arguments in the next calculation.

Example **1 ÷ 3 =**
1 ÷ 3 × 3 =

[AC] [1] [÷] [3] [EXE]
(Continuing) [×] [3] [EXE]



Continuous calculations can also be used with Type B functions (x^2, x^{-1}, $x!$, on page 2-2), +, –, ^(x^y), $\sqrt[x]{\ }$, ° ’ ”, etc.

3. Specifying the Angle Unit and Display Format

Before performing a calculation for the first time, you should use the Setup screen to specify the angle unit and display format.

■ Setting the Angle Unit

[SET UP]- [Angle]

1. On the Setup screen, highlight “Angle”.
2. Press the function key for the angle unit you want to specify, then press [EXIT].
   - {**Deg**}/{**Rad**}/{**Gra**} ... {degrees}/{radians}/{grads}
   - The relationship between degrees, grads, and radians is shown below.

     360° = 2π radians = 400 grads

     90° = π/2 radians = 100 grads

■ Setting the Display Format

[SET UP]- [Display]

1. On the Setup screen, highlight “Display”.
2. Press the function key for the item you want to set, then press [EXIT].
   - {**Fix**}/{**Sci**}/{**Norm**}/{**Eng**} ... {fixed number of decimal places specification}/{number of significant digits specification}/{normal display}/{Engineering mode}

• To specify the number of decimal places (Fix)

Example **To specify two decimal places**

F1 (Fix) 2 EXE

`Display :Fix2`

Press the number key that corresponds to the number of decimal places you want to specify (n = 0 to 9).

• Displayed values are rounded off to the number of decimal places you specify.

• To specify the number of significant digits (Sci)

Example **To specify three significant digits**

F2 (Sci) 3 EXE

`Display :Sci3`

Press the number key that corresponds to the number of significant digits you want to specify (n = 0 to 9). Specifying 0 makes the number of significant digits 10.

• Displayed values are rounded off to the number of significant digits you specify.

• To specify the normal display (Norm 1/Norm 2)

Press F3 (Norm) to switch between Norm 1 and Norm 2.

Norm 1: 10^{-2} (0.01) > $|x|$, $|x| \geqq 10^{10}$

Norm 2: 10^{-9} (0.000000001) > $|x|$, $|x| \geqq 10^{10}$

• To specify the engineering notation display (Eng mode)

Press F4 (Eng) to switch between engineering notation and standard notation. The indicator "/E" is on the display while engineering notation is in effect.

You can use the following symbols to convert values to engineering notation, such as 2,000 (= 2×10^3) → 2k.

E (Exa)	$\times 10^{18}$	m (milli)	$\times 10^{-3}$
P (Peta)	$\times 10^{15}$	μ (micro)	$\times 10^{-6}$
T (Tera)	$\times 10^{12}$	n (nano)	$\times 10^{-9}$
G (Giga)	$\times 10^{9}$	p (pico)	$\times 10^{-12}$
M (Mega)	$\times 10^{6}$	f (femto)	$\times 10^{-15}$
k (kilo)	$\times 10^{3}$		

• The engineering symbol that makes the mantissa a value from 1 to 1000 is automatically selected by the calculator when engineering notation is in effect.

4. Function Calculations

■ Function Menus

This calculator includes five function menus that give you access to scientific functions not printed on the key panel.

- The contents of the function menu differ according to the mode you entered from the Main Menu before you pressed the OPTN key. The following examples show function menus that appear in the **RUN • MAT** (or **RUN**) or **PRGM** mode.

• Hyperbolic Calculations (HYP) **[OPTN]-[HYP]**

- {**sinh**}/{**cosh**}/{**tanh**} ... hyperbolic {sine}/{cosine}/{tangent}
- {**sinh^{-1}**}/{**cosh^{-1}**}/{**tanh^{-1}**} ... inverse hyperbolic {sine}/{cosine}/{tangent}

• Probability/Distribution Calculations (PROB) **[OPTN]-[PROB]**

- {$x!$} ... {press after inputting a value to obtain the factorial of the value}
- {n**P**r}/{n**C**r} ... {permutation}/{combination}
- {**RAND**} ... {random number generation}
  - {**Ran#**}/{**Int**}/{**Norm**}/{**Bin**}/{**List**} ... {random number generation (0 to 1)}/{random integer generation}/{random number generation in accordance with normal distribution based on mean μ and standard deviation σ}/{random number generation in accordance with binomial distribution based on number of trials n and probability p}/{random number generation (0 to 1) and storage of result in ListAns}
- {**P(**}/{**Q(**}/{**R(**} ... normal probability {P(t)}/{Q(t)}/{R(t)}
- {t**(**} ... {value of normalized variate $t(x)$}

• Numeric Calculations (NUM) **[OPTN]-[NUM]**

- {**Abs**} ... {select this item and input a value to obtain the absolute value of the value}
- {**Int**}/{**Frac**} ... select the item and input a value to extract the {integer}/{fraction} part.
- {**Rnd**} ... {rounds off the value used for internal calculations to 10 significant digits (to match the value in the answer memory), or to the number of decimal places (Fix) and number of significant digits (Sci) specified by you}
- {**Intg**} ... {select this item and input a value to obtain the largest integer that is not greater than the value}
- {**RndFi**} ... {rounds off the value used for internal calculations to specified digits (0 to 9) (see page 2-2).}
- {**GCD**} ... {greatest common divisor for two values}
- {**LCM**} ... {least common multiple for two values}
- {**MOD**} ... {remainder of division (remainder output when n is divided by m)}
- {**MOD•E**} ... {remainder when division is performed on a power value (remainder output when n is raised to p power and then divided by m)}

• Angle Units, Coordinate Conversion, Sexagesimal Operations (ANGL)

[OPTN]-[ANGL]

- {**°**}/{**r**}/{**g**} ... {degrees}/{radians}/{grads} for a specific input value
- {° ’ ”} ... {specifies degrees (hours), minutes, seconds when inputting a degrees/minutes/ seconds value}
- {$\overleftarrow{\circ\ ,\ ,,}$} ... {converts decimal value to degrees/minutes/seconds value}
  - The {$\overleftarrow{\circ\ ,\ ,,}$} menu operation is available only when there is a calculation result on the display.
- {**Pol(**}/{**Rec(**} ... {rectangular-to-polar}/{polar-to-rectangular} coordinate conversion
- {**▶DMS**} ... {converts decimal value to sexagesimal value}

• Engineering Symbol (ESYM)

[OPTN]-[ESYM]

- {**m**}/{**μ**}/{**n**}/{**p**}/{**f**} ... {milli (10^{-3})}/{micro (10^{-6})}/{nano (10^{-9})}/{pico (10^{-12})}/{femto (10^{-15})}
- {**k**}/{**M**}/{**G**}/{**T**}/{**P**}/{**E**} ... {kilo (10^{3})}/{mega (10^{6})}/{giga (10^{9})}/{tera (10^{12})}/{peta (10^{15})}/ {exa (10^{18})}
- {**ENG**}/{**$\overleftarrow{\text{ENG}}$**} ... shifts the decimal place of the displayed value three digits to the {left}/{right} and {decreases}/{increases} the exponent by three.

  When you are using engineering notation, the engineering symbol is also changed accordingly.
  - The {ENG} and {$\overleftarrow{\text{ENG}}$} menu operations are available only when there is a calculation result on the display.

■ Angle Units

- Be sure to specify Comp for Mode in the Setup screen.

Example	Operation
To convert 4.25 rad to degrees: 243.5070629	[SHIFT] [MENU] (SET UP) [▼] [▼] [▼] [▼] [▼] [▼]* [F1] (Deg) [EXIT] **4.25** [OPTN] [F6] (▷) [F5] (ANGL)** [F2] (r) [EXE]
47.3° + 82.5rad = 4774.20181°	**47.3** [+] **82.5** [OPTN] [F6] (▷) [F5] (ANGL)** [F2] (r) [EXE]
2°20´30˝ + 39´30˝ = 3°00´00˝	**2** [OPTN] [F6] (▷) [F5] (ANGL)** [F4] (° ’ ”) **20** [F4] (° ’ ”) **30** [F4] (° ’ ”) [+] **0** [F4] (° ’ ”) **39** [F4] (° ’ ”) **30** [F4] (° ’ ”) [EXE] [F5] ($\overleftarrow{\circ\ ,\ ,,}$)
2.255° = 2°15´18˝	**2.255** [OPTN] [F6] (▷) [F5] (ANGL)** [F6] (▷) [F3] (▶DMS) [EXE]

* fx-7400GIII: [▼] [▼] [▼] [▼] [▼]   ** fx-7400GIII: [F4] (ANGL)

■ Trigonometric and Inverse Trigonometric Functions

- Be sure to set the angle unit before performing trigonometric function and inverse trigonometric function calculations.

$$(90° = \frac{\pi}{2} \text{ radians} = 100 \text{ grads})$$

- Be sure to specify Comp for Mode in the Setup screen.

Example	Operation
$\cos(\frac{\pi}{3}$ rad$) = 0.5$	SHIFT MENU (SET UP) ▼ ▼ ▼ ▼ ▼ ▼ * F2 (Rad) EXIT cos (SHIFT ×10^x (π) ÷ **3**) EXE
$2 \cdot \sin 45° \times \cos 65° = 0.5976724775$	SHIFT MENU (SET UP) ▼ ▼ ▼ ▼ ▼ ▼ * F1 (Deg) EXIT **2** × sin **45** × cos **65** EXE *1
$\sin^{-1}0.5 = 30°$ (x when $\sin x = 0.5$)	SHIFT sin ($\sin^{-1}$) **0.5** *2 EXE

*1 × can be omitted.

*2 Input of leading zero is not necessary.

* fx-7400GIII: ▼ ▼ ▼ ▼ ▼

■ Logarithmic and Exponential Functions

- Be sure to specify Comp for Mode in the Setup screen.

Example	Operation
$\log 1.23$ ($\log_{10}1.23$) $= 0.08990511144$	log **1.23** EXE
$\log_2 8 = 3$	OPTN F4 (CALC)* F6 (▷) F4 ($\log_a b$) **2** , **8**) EXE
$10^{1.23} = 16.98243652$ (To obtain the antilogarithm of common logarithm 1.23)	SHIFT log (10^x) **1.23** EXE
$e^{4.5} = 90.0171313$ (To obtain the antilogarithm of natural logarithm 4.5)	SHIFT ln (e^x) **4.5** EXE
$(-3)^4 = (-3) \times (-3) \times (-3) \times (-3) = 81$	((−) **3**) ∧ **4** EXE
$\sqrt[7]{123}$ ($= 123^{\frac{1}{7}}$) $= 1.988647795$	**7** SHIFT ∧ ($\sqrt[x]{\ }$) **123** EXE

* fx-7400GIII: F3 (CALC)

- The Linear input/output mode and Math input/output mode produce different results when two or more powers are input in series, like: 2 ∧ 3 ∧ 2.

  Linear input/output mode: 2^3^2 = 64 **Math input/output mode:** $2^{3^2} = 512$

  This is because the Math input/output mode internally treats the above input as: 2^(3^(2)).

■ Hyperbolic and Inverse Hyperbolic Functions

- Be sure to specify Comp for Mode in the Setup screen.

Example	Operation
$\sinh 3.6 = 18.28545536$	OPTN F6 (▷) F2 (HYP)* F1 (sinh) **3.6** EXE
$\cosh^{-1}\left(\frac{20}{15}\right) = 0.7953654612$	OPTN F6 (▷) F2 (HYP)* F5 ($\cosh^{-1}$) (**20** ÷ **15**) EXE

* fx-7400GIII: F1 (HYP)

■ Other Functions

- Be sure to specify Comp for Mode in the Setup screen.

Example	Operation
$\sqrt{2} + \sqrt{5} = 3.65028154$	SHIFT x^2 (√‾) 2 + SHIFT x^2 (√‾) 5 EXE *1
$(-3)^2 = (-3) \times (-3) = 9$	((–) 3) x^2 EXE
$\dfrac{1}{\frac{1}{3} - \frac{1}{4}} = 12$	(3 SHIFT) (x^{-1}) – 4 SHIFT) (x^{-1})) SHIFT) (x^{-1}) EXE
8! (= 1 × 2 × 3 × .... × 8) = 40320	8 OPTN F6 (▷) F3 (PROB)* F1 (x!) EXE
$\sqrt[3]{36 \times 42 \times 49} = 42$	SHIFT ((^{3}√‾) (36 × 42 × 49) EXE *2
What is the absolute value of the common logarithm of $\frac{3}{4}$? $\left\| \log \frac{3}{4} \right\| = 0.1249387366$	OPTN F6 (▷) F4 (NUM)** F1 (Abs) log (3 ÷ 4) EXE *3
What is the integer part of – 3.5? – 3	OPTN F6 (▷) F4 (NUM)** F2 (Int) (–) 3.5 EXE
What is the decimal part of – 3.5? – 0.5	OPTN F6 (▷) F4 (NUM)** F3 (Frac) (–) 3.5 EXE
What is the nearest integer not exceeding – 3.5? – 4	OPTN F6 (▷) F4 (NUM)** F5 (Intg) (–) 3.5 EXE

* fx-7400GIII: F2 (PROB) ** fx-7400GIII: F3 (NUM)

*1 fx-9860GIII/fx-9750GIII: Linear input/output mode operation. In the Math input/output mode, use the following operation: SHIFT x^2 (√‾) 2 ▶ + SHIFT x^2 (√‾) 5 EXE S⇔D

*2 fx-9860GIII/fx-9750GIII: Linear input/output mode operation. In the Math input/output mode, use the following operation: SHIFT ((^{3}√‾) 36 × 42 × 49 EXE

*3 fx-9860GIII/fx-9750GIII: Linear input/output mode operation. In the Math input/output mode, use the following operation: F4 (MATH) F3 (Abs) log ▭ 3 ▼ 4 EXE

■ Random Number Generation (RAND)

• Random Number Generation (0 to 1) (Ran#, RanList#)

Ran# and RanList# generate 10 digit random numbers randomly or sequentially from 0 to 1. Ran# returns a single random number, while RanList# returns multiple random numbers in list form. The following shows the syntaxes of Ran# and RanList#.

Ran# [a] $1 \leqq a \leqq 9$

RanList# (n [,a]) $1 \leqq n \leqq 999$

- n is the number of trials. RanList# generates the number of random numbers that corresponds to n and displays them on the ListAns screen. A value must be input for n.
- "a" is the randomization sequence. Random numbers are returned if nothing is input for "a". Entering an integer of 1 through 9 for a will return the corresponding sequential random number.

- Executing the function Ran# 0 initializes the sequences of both Ran# and RanList#. The sequence also is initialized when a sequential random number is generated with a different sequence of the previous execution using Ran# or RanList#, or when generating a random number.

Ran# Examples

Example	Operation
Ran# (Generates a random number.)	OPTN F6(▷) F3(PROB)* F4(RAND) F1(Ran#) EXE
(Each press of EXE generates a new random number.)	EXE EXE
Ran# 1 (Generates the first random number in sequence 1.)	OPTN F6(▷) F3(PROB)* F4(RAND) F1(Ran#)**1** EXE
(Generates the second random number in sequence 1.)	EXE
Ran# 0 (Initializes the sequence.)	F1(Ran#)**0** EXE
Ran# 1 (Generates the first random number in sequence 1.)	F1(Ran#)**1** EXE

* fx-7400GIII: F2(PROB)

RanList# Examples

Example	Operation
RanList# (4) (Generates four random numbers and displays the result on the ListAns screen.)	OPTN F6(▷) F3(PROB)* F4(RAND) F5(List) **4**) EXE
RanList# (3, 1) (Generates from the first to the third random numbers of sequence 1 and displays the result on the ListAns screen.)	EXIT OPTN F6(▷) F3(PROB)* F4(RAND) F5(List) **3** , **1**) EXE
(Next, generates from the fourth to the sixth random number of sequence 1 and displays the result on the ListAns screen.)	EXIT EXE
Ran# 0 (Initializes the sequence.)	EXIT F1(Ran#) **0** EXE
RanList# (3, 1) (Re-generates from the first to the third random numbers of sequence 1 and displays the result on the ListAns screen.)	F5(List) **3** , **1**) EXE

* fx-7400GIII: F2(PROB)

• Random Integer Generation (RanInt#)

RanInt# generates random integers that fall between two specified integers.

RanInt# (A, B [,n]) A < B |A|,|B| < 1E10 B – A < 1E10 $1 \leqq n \leqq 999$

- A is the start value and B is the end value. Omitting a value for n returns a generated random number as-is. Specifying a value for n returns the specified number of random values in list form.

Example	Operation
RanInt# (1, 5) (Generates one random integer from 1 and 5.)	OPTN F6(▷) F3(PROB)* F4(RAND) F2(Int) 1 , 5) EXE
RanInt# (1, 10, 5) (Generates five random integers from 1 to 10 and displays the result on the ListAns screen.)	OPTN F6(▷) F3(PROB)* F4(RAND) F2(Int) 1 , 10 , 5) EXE

* fx-7400GIII: F2(PROB)

• Random Number Generation in Accordance with Normal Distribution (RanNorm#)

This function generates a 10-digit random number in accordance with normal distribution based on a specified mean μ and standard deviation σ values.

RanNorm# (σ, μ [,n]) $\sigma > 0$ $1 \leqq n \leqq 999$

- Omitting a value for n returns a generated random number as-is. Specifying a value for n returns the specified number of random values in list form.

Example	Operation
RanNorm# (8, 68) (Randomly produces a body length value obtained in accordance with the normal distribution of a group of infants less than one year old with a mean body length of 68cm and standard deviation of 8.)	OPTN F6(▷) F3(PROB)* F4(RAND) F3(Norm) 8 , 68) EXE
RanNorm# (8, 68, 5) (Randomly produces the body lengths of five infants in the above example, and displays them in a list.)	OPTN F6(▷) F3(PROB)* F4(RAND) F3(Norm) 8 , 68 , 5) EXE

* fx-7400GIII: F2(PROB)

• Random Number Generation in Accordance with Binomial Distribution (RanBin#)

This function generates random integers in accordance with binomial distribution based on values specified for the number of trials n and probability p.

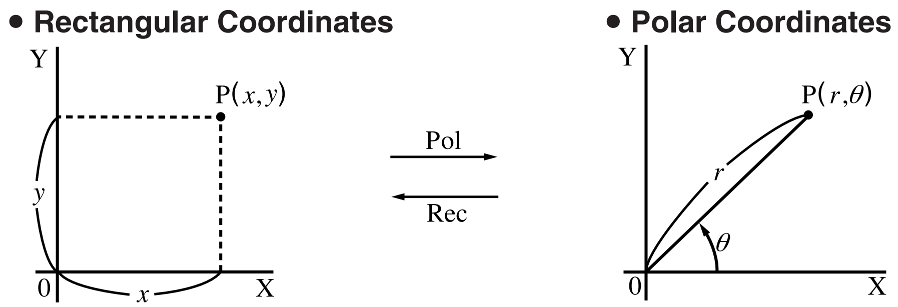
RanBin# (n, p [,m]) $1 \leqq n \leqq 100000$ $1 \leqq m \leqq 999$ $0 \leqq p \leqq 1$

- Omitting a value for m returns a generated random number as-is. Specifying a value for m returns the specified number of random values in list form.

Example	Operation
RanBin# (5, 0.5) (Randomly produces the number of heads that can be expected in accordance with binomial distribution for five coin tosses where the probability of heads is 0.5.)	OPTN F6(▷) F3(PROB)* F4(RAND) F4(Bin) **5** , **0.5**) EXE
RanBin# (5, 0.5, 3) (Performs the same coin toss sequence described above three times and displays the results in a list.)	OPTN F6(▷) F3(PROB)* F4(RAND) F4(Bin) **5** , **0.5** , **3**) EXE

* fx-7400GIII: F2(PROB)

■ Coordinate Conversion



- With polar coordinates, θ can be calculated and displayed within a range of $-180° < \theta \leqq 180°$ (radians and grads have same range).
- Be sure to specify Comp for Mode in the Setup screen.

Example	Operation
Calculate r and $\theta°$ when x = 14 and y = 20.7 1 [24.989] → 24.98979792 (r) 2 55.928 → 55.92839019 (θ)	SHIFT MENU(SET UP) ▼ ▼ ▼ ▼ ▼ ▼* F1(Deg) EXIT OPTN F6(▷) F5(ANGL)** F6(▷) F1(Pol() **14** , **20.7**) EXE EXIT
Calculate x and y when r = 25 and θ = 56° 1 [13.979] → 13.97982259 (x) 2 20.725 → 20.72593931 (y)	F2(Rec() **25** , **56**) EXE

* fx-7400GIII: ▼ ▼ ▼ ▼ ▼ ** fx-7400GIII: F4(ANGL)

Permutation and Combination

• **Permutation**

$$nPr = \frac{n!}{(n-r)!}$$

• **Combination**

$$nCr = \frac{n!}{r!\,(n-r)!}$$

• Be sure to specify Comp for Mode in the Setup screen.

Example 1 **To calculate the possible number of different arrangements using 4 items selected from among 10 items**

Formula	Operation
$_{10}P_4 = 5040$	**10** OPTN F6 (▷) F3 (PROB)* F2 ($_n P_r$) **4** EXE

* fx-7400GIII: F2 (PROB)

Example 2 **To calculate the possible number of different combinations of 4 items that can be selected from among 10 items**

Formula	Operation
$_{10}C_4 = 210$	**10** OPTN F6 (▷) F3 (PROB)* F3 ($_n C_r$) **4** EXE

* fx-7400GIII: F2 (PROB)

Greatest Common Divisor (GCD), Least Common Multiple (LCM)

Example	Operation
To determine the greatest common divisor of 28 and 35 (GCD (28, 35) = 7)	OPTN F6 (▷) F4 (NUM)* F6 (▷) F2 (GCD) **28** , **35**) EXE
To determine the least common multiple of 9 and 15 (LCM (9, 15) = 45)	OPTN F6 (▷) F4 (NUM)* F6 (▷) F3 (LCM) **9** , **15**) EXE

* fx-7400GIII: F3 (NUM)

Division Remainder (MOD), Remainder of Exponential Division (MOD Exp)

Example	Operation
To determine the remainder when 137 is divided by 7 (MOD (137, 7) = 4)	OPTN F6 (▷) F4 (NUM)* F6 (▷) F4 (MOD) **137** , **7**) EXE
To determine the remainder when 5^3 is divided by 3 (MOD • E (5, 3, 3) = 2)	OPTN F6 (▷) F4 (NUM)* F6 (▷) F5 (MOD • E) **5** , **3** , **3**) EXE

* fx-7400GIII: F3 (NUM)

■ Fractions

- In the Math input/output mode, the fraction input method is different from that described below. For fraction input operations in the Math input/output mode, see page 1-12.
- Be sure to specify Comp for Mode in the Setup screen.

Example	Operation
$\frac{2}{5} + 3\frac{1}{4} = \frac{73}{20}$	2[□/□]*5[+]3[□/□]*1[□/□]*4[EXE]
= 3.65 (Conversion to decimal)*1	[S⇔D]**
$\frac{1}{2578} + \frac{1}{4572} = 6.066202547 \times 10^{-4}$ *2	1[□/□]*2578[+]1[□/□]*4572[EXE]
$\frac{1}{2} \times 0.5 = 0.25$*3	1[□/□]*2[×].5[EXE]

* fx-7400GIII: [a b/c]   ** fx-7400GIII: [F⇔D]

*1 Fractions can be converted to decimal values and vice versa.

*2 When the total number of characters, including integer, numerator, denominator and delimiter marks in an intermediate or final calculation result exceeds 10, the fraction is automatically displayed in decimal format. (10-digit example: 1⌟1⌟123456)

*3 Calculations containing both fractions and decimals are calculated in decimal format.

- Pressing the [SHIFT][S⇔D]*($a\frac{b}{c} \leftrightarrow \frac{d}{c}$) key toggles the display fraction between mixed fraction and improper fraction format.

  * fx-7400GIII: [F⇔D]

■ Engineering Notation Calculations

Input engineering symbols using the engineering notation menu.

- Be sure to specify Comp for Mode in the Setup screen.

Example	Operation
999k (kilo) + 25k (kilo) = 1.024M (mega)	[SHIFT][MENU](SET UP)[▲][▲][F4](Eng)[EXIT]999[OPTN][F6](▷)[F6](▷) [F1](ESYM)*[F6](▷)[F1](k)[+]25[F1](k)[EXE]
9 ÷ 10 = 0.9 = 900m (milli) = 0.9	9[÷]10[EXE] [OPTN][F6](▷)[F6](▷)[F1](ESYM)*[F6](▷)[F6](▷)[F3](ENG←)*1
= 0.0009k (kilo) = 0.9 = 900m	[F3](ENG←)*1 [F2](ENG)*2 [F2](ENG)*2

* fx-7400GIII: [F5](ESYM)

*1 Converts the displayed value to the next higher engineering unit, by shifting the decimal point three places to the right.

*2 Converts the displayed value to the next lower engineering unit, by shifting the decimal point three places to the left.

■ Logical Operators (AND, OR, NOT, XOR) [OPTN]-[LOGIC]

The logical operator menu provides a selection of logical operators.

- {**And**}/{**Or**}/{**Not**}/{**Xor**} ... {logical AND}/{logical OR}/{logical NOT}/{logical XOR}
- Be sure to specify Comp for Mode in the Setup screen.

Example **What is the logical AND of A and B when A = 3 and B = 2?**
A AND B = 1

Operation	Display
3 [→] [ALPHA] [X,θ,T] (A) [EXE] **2** [→] [ALPHA] [log] (B) [EXE] [ALPHA] [X,θ,T] (A) [OPTN] [F6] (▷) [F6] (▷) [F4] (LOGIC)* [F1] (And) [ALPHA] [log] (B) [EXE]	**1**

* fx-7400GIII: [F3] (LOGIC)

• About Logical Operations

- A logical operation always produces either 0 or 1 as its result.
- The following table shows all of possible results that can be produced by AND, OR and XOR operations.

Value or Expression A	Value or Expression B	A AND B	A OR B	A XOR B
A ≠ 0	B ≠ 0	1	1	0
A ≠ 0	B = 0	0	1	1
A = 0	B ≠ 0	0	1	1
A = 0	B = 0	0	0	0

- The following table shows the results produced by the NOT operation.

Value or Expression A	NOT A
A ≠ 0	0
A = 0	1

5. Numerical Calculations

The following explains the numerical calculation operations included in the function menu displayed when [OPTN] [F4] (CALC) ([F3] (CALC) on the fx-7400GIII) is pressed. The following calculations can be performed.

- {**Int÷**}/{**Rmdr**}/{**Simp**} ... {quotient}/{remainder}/{simplification}
- {**Solve**}/{d/dx}/{d^2/dx^2}/{$\int dx$}/{**SolvN**} ... {equality solution}/{differential}/{quadratic differential}/{integration}/{$f(x)$ function solution}
- {**FMin**}/{**FMax**}/{**Σ(**}/{**log$_a$b**} ... {minimum value}/{maximum value}/{summation}/{logarithm log$_a$b}

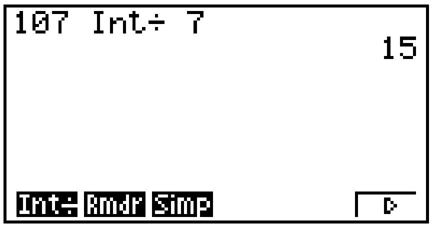
■ Quotient of Integer ÷ Integer **[OPTN]-[CALC]-[Int÷]**

The “Int÷” function can be used to determine the quotient when one integer is divided by another integer.

Example **To calculate the quotient of 107 ÷ 7**

AC 1 0 7 OPTN F4(CALC)* F6(▷)
F6(▷) F1(Int÷) 7
EXE

* fx-7400GIII: F3(CALC)



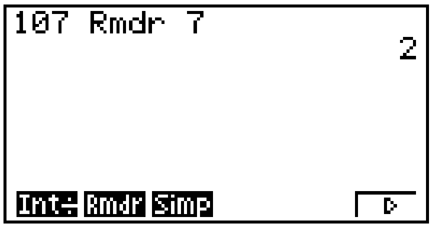
■ Remainder of Integer ÷ Integer **[OPTN]-[CALC]-[Rmdr]**

The “Rmdr” function can be used to determine the remainder when one integer is divided by another integer.

Example **To calculate the remainder of 107 ÷ 7**

AC 1 0 7 OPTN F4(CALC)* F6(▷)
F6(▷) F2(Rmdr) 7
EXE

* fx-7400GIII: F3(CALC)



■ Simplification **[OPTN]-[CALC]-[Simp]**

The “►Simp” function can be used to simplify fractions manually. The following operations can be used to perform simplification when an unsimplified calculation result is on the display.

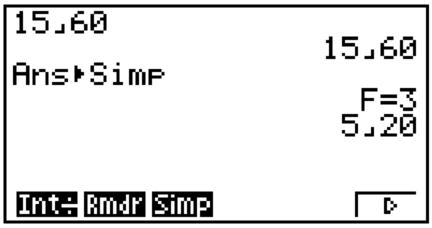
- {**Simp**} EXE ... This function automatically simplifies the displayed calculation result using the smallest prime number available. The prime number used and the simplified result are shown on the display.
- {**Simp**} n EXE ... This function performs simplification according to the specified divisor n.

Under initial default settings, this calculator automatically simplifies fraction calculation results before displaying them. Before performing the following examples, use the Setup screen to change the “Simplify” setting from “Auto” to “Manual” (page 1-33).

- When “a+bi” or “$r\angle\theta$” is specified for the Setup screen “Complex Mode” setting, fraction calculation results always are simplified before being displayed, even if the “Simplify” setting is “Manual”.
- If you want to simplify fractions manually (Simplify: Manual), make sure that the “Real” is selected for the “Complex Mode” setting.

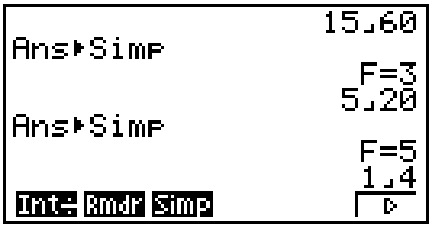
Example 1 **To simplify $\frac{15}{60}$** $\left(\frac{15}{60} = \frac{5}{20} = \frac{1}{4}\right)$

[AC] [1] [5] [▭]* [6] [0] [EXE]
[OPTN] [F4] (CALC)** [F6] (▷) [F6] (▷) [F3] (Simp) [EXE]



* fx-7400GIII: [a b/c]
** fx-7400GIII: [F3] (CALC)

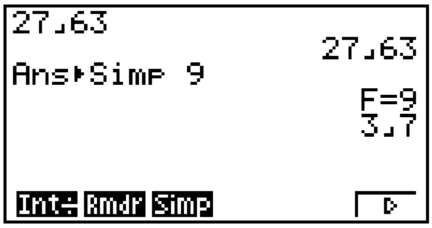
[F3] (Simp) [EXE]



The “F=” value is the divisor.

Example 2 **To simplify $\frac{27}{63}$ specifying a divisor of 9** $\left(\frac{27}{63} = \frac{3}{7}\right)$

[AC] [2] [7] [▭]* [6] [3] [EXE] [OPTN] [F4] (CALC)**
[F6] (▷) [F6] (▷) [F3] (Simp) [9] [EXE]



* fx-7400GIII: [a b/c]
** fx-7400GIII: [F3] (CALC)

- An error occurs if simplification cannot be performed using the specified divisor.
- Executing ►Simp while a value that cannot be simplified is displayed will return the original value, without displaying “F=”.

■ Solve Calculations [OPTN]-[CALC]-[Solve]

The following is the syntax for using the Solve function in a program.

Solve($f(x)$, n, a, b) (a: lower limit, b: upper limit, n: initial estimated value)

There are two different input methods that can be used for Solve calculations: direct assignment and variable table input.

With the direct assignment method (the one described here), you assign values directly to variables. This type of input is identical to that used with the Solve command used in the **PRGM** mode.

Variable table input is used with the Solve function in the **EQUA** mode. This input method is recommended for most normal Solve function input.

An error (Time Out) occurs when there is no convergence of the solution.

For information about Solve calculations, see page 4-4.

- You cannot use a quadratic differential, Σ, maximum/minimum value or Solve calculation expression inside of any of the above functions.
- Pressing [AC] during calculation of Solve (while the cursor is not shown on the display) interrupts the calculation.

■ Solving an $f(x)$ Function **[OPTN]-[CALC]-[SolvN]**

You can use SolvN to solve an $f(x)$ function using numerical analysis. The following is the input syntax.

SolveN (left side [=right side] [,variable] [, lower limit, upper limit])

- The right side, variable, lower limit and upper limit all can be omitted.
- "left side[=right side]" is the expression to be solved. Supported variables are A through Z, r, and θ. When the right side is omitted, solution is perform using right side = 0.
- The variable specifies the variable within the expression to be solved for (A through Z, r, θ). Omitting a variable specification cause X to be used as the variable.
- The lower limit and upper limit specify the range of the solution. You can input a value or an expression as the range.
- The following functions cannot be used within any of the arguments.
  Solve(, d^2/dx^2(, FMin(, FMax(, Σ(

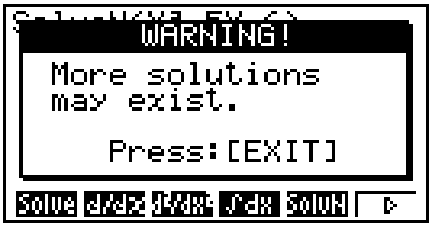
Up to 10 calculation results can be displayed simultaneously in ListAns format.

- The message "No Solution" is displayed if no solution exists.
- The message "More solutions may exist." is displayed when there may be solutions other than those displayed by SolvN.

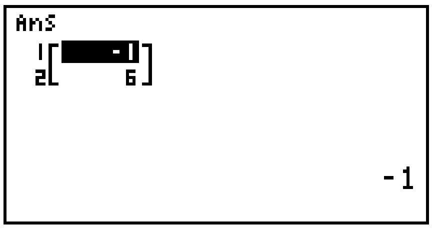
Example **To solve $x^2 - 5x - 6 = 0$**

[OPTN] [F4](CALC)* [F5](SolvN)
[X,θ,T] [x^2] [−] [5] [X,θ,T] [−] [6] [)] [EXE]

* fx-7400GIII: [F3](CALC)



[EXIT]



■ Differential Calculations **[OPTN]-[CALC]-[d/dx]**

To perform differential calculations, first display the function analysis menu, and then input the values using the syntax below.

[OPTN] [F4](CALC)* [F2](d/dx) $f(x)$ [,] a [,] tol [)] * fx-7400GIII: [F3](CALC)

(a: point for which you want to determine the derivative, tol: tolerance)

$$d/dx\ (f(x),\ a) \Rightarrow \frac{d}{dx} f(a)$$

The differentiation for this type of calculation is defined as:

$$f'(a) = \lim_{\Delta x \to 0} \frac{f(a + \Delta x) - f(a)}{\Delta x}$$

In this definition, *infinitesimal* is replaced by a *sufficiently small* Δx, with the value in the neighborhood of $f'(a)$ calculated as:

$$f'(a) \fallingdotseq \frac{f(a+\Delta x)-f(a)}{\Delta x}$$

In order to provide the best precision possible, this unit employs central difference to perform differential calculations.

Example **To determine the derivative at point x = 3 for the function $y = x^3 + 4x^2 + x - 6$, with a tolerance of "tol" = 1E – 5**

Input the function $f(x)$.

[AC] [OPTN] [F4](CALC)* [F2](d/dx) [X,θ,T] [^] [3] [+] [4] [X,θ,T] [x^2] [+] [X,θ,T] [−] [6] [,]

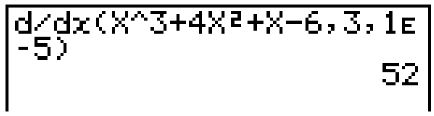
* fx-7400GIII: [F3](CALC)

Input point $x = a$ for which you want to determine the derivative.

[3] [,]

Input the tolerance value.

[1] [×10^x] [(−)] [5] [)] [EXE]



Using Differential Calculation in a Graph Function

- Omitting the tolerance (tol) value when using the differential command inside of a graph function simplifies the calculation for drawing the graph. In such a case, precision is sacrificed for the sake of faster drawing. The tolerance value is specified, the graph is drawn with the same precision obtained when you normally perform a differential calculation.
- You can also omit input of the derivative point by using the following format for the differential graph: Y2=d/dx(Y1). In this case, the value of the X variable is used as the derivative point.

Differential Calculation Precautions

- In the function $f(x)$, only X can be used as a variable in expressions. Other variables (A through Z excluding X, r, θ) are treated as constants, and the value currently assigned to that variable is applied during the calculation.
- Input of the tolerance (tol) value and the closing parenthesis can be omitted. If you omit tolerance (tol) value, the calculator automatically uses a value for tol as 1E–10.
- Specify a tolerance (tol) value of 1E–14 or greater. An error (Time Out) occurs whenever no solution that satisfies the tolerance value can be obtained.
- Pressing [AC] during calculation of a differential (while the cursor is not shown on the display) interrupts the calculation.
- Inaccurate results and errors can be caused by the following:
  - discontinuous points in x values
  - extreme changes in x values
  - inclusion of the local maximum point and local minimum point in x values
  - inclusion of the inflection point in x values
  - inclusion of undifferentiable points in x values
  - differential calculation results approaching zero
- Always use radians (Rad mode) as the angle unit when performing trigonometric differentials.

- You cannot use a differential, quadratic differential, integration, Σ, maximum/minimum value, Solve, RndFix or $\log_a b$ calculation expression inside a differential calculation term.
- In the Math input/output mode, the tolerance value is fixed at 1E–10 and cannot be changed.

■ Quadratic Differential Calculations [OPTN]-[CALC]-[d^2/dx^2]

After displaying the function analysis menu, you can input quadratic differentials using the following syntax.

[OPTN] [F4](CALC)* [F3](d^2/dx^2) $f(x)$ [,] a [,] tol [)] * fx-7400GIII: [F3](CALC)

(a: differential coefficient point, tol: tolerance)

$$\frac{d^2}{dx^2}(f(x), a) \Rightarrow \frac{d^2}{dx^2} f(a)$$

Quadratic differential calculations produce an approximate differential value using the following second order differential formula, which is based on Newton's polynomial interpretation.

$$f''(a) = \frac{2f(a+3h) - 27f(a+2h) + 270f(a+h) - 490f(a) + 270f(a-h) - 27f(a-2h) + 2f(a-3h)}{180h^2}$$

In this expression, values for "sufficiently small increments of h" are used to obtain a value that approximates $f''(a)$.

Example **To determine the quadratic differential coefficient at the point where $x = 3$ for the function $y = x^3 + 4x^2 + x - 6$**
Here we will use a tolerance tol = 1E – 5

Input the function $f(x)$.

[AC] [OPTN] [F4](CALC)* [F3](d^2/dx^2) [X,θ,T] [^] [3] [+] [4] [X,θ,T] [x^2] [+] [X,θ,T] [-] [6] [,]

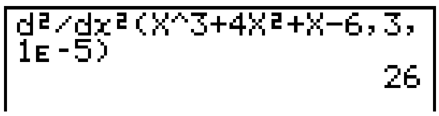
* fx-7400GIII: [F3](CALC)

Input 3 as point a, which is the differential coefficient point.

[3] [,]

Input the tolerance value.

[1] [×10^x] [(-)] [5] [)]
[EXE]



Quadratic Differential Calculation Precautions

- In the function $f(x)$, only X can be used as a variable in expressions. Other variables (A through Z excluding X, r, θ) are treated as constants, and the value currently assigned to that variable is applied during the calculation.
- Input of the tolerance (tol) value and the closing parenthesis can be omitted.
- Specify a tolerance (tol) value of 1E–14 or greater. An error (Time Out) occurs whenever no solution that satisfies the tolerance value can be obtained.
- The rules that apply for linear differential also apply when using a quadratic differential calculation for the graph formula (see page 2-25).

- Inaccurate results and errors can be caused by the following:
  - discontinuous points in x values
  - extreme changes in x values
  - inclusion of the local maximum point and local minimum point in x values
  - inclusion of the inflection point in x values
  - inclusion of undifferentiable points in x values
  - differential calculation results approaching zero
- You can interrupt an ongoing quadratic differential calculation by pressing the AC key.
- Always use radians (Rad mode) as the angle unit when performing trigonometric quadratic differentials.
- You cannot use a differential, quadratic differential, integration, Σ, maximum/minimum value, Solve, RndFix or $\log_a b$ calculation expression inside of a quadratic differential calculation term.
- With quadratic differential calculation, calculation precision is up to five digits for the mantissa.
- In the Math input/output mode, the tolerance value is fixed at 1E–10 and cannot be changed.

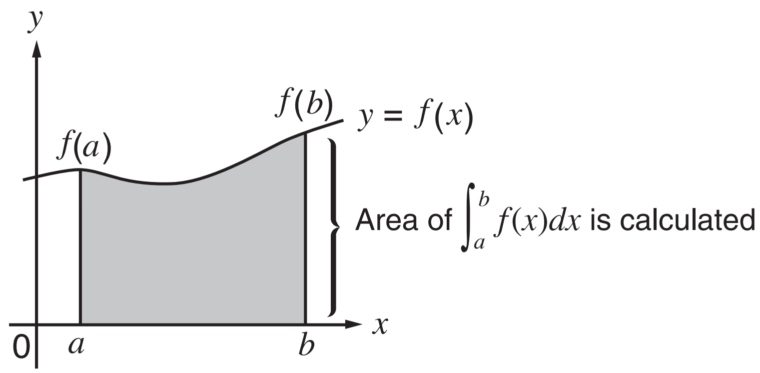
■ Integration Calculations [OPTN]-[CALC]-[$\int dx$]

To perform integration calculations, first display the function analysis menu and then input the values using the syntax below.

OPTN F4(CALC)* F4($\int dx$) $f(x)$, a , b , tol) * fx-7400GIII: F3(CALC)

(a: start point, b: end point, tol: tolerance)

$$\int(f(x), a, b, tol) \Rightarrow \int_a^b f(x)dx$$



As shown in the illustration above, integration calculations are performed by calculating integral values from a through b for the function $y = f(x)$ where $a \leqq x \leqq b$, and $f(x) \geqq 0$. This in effect calculates the surface area of the shaded area in the illustration.

Example 1 **To perform the integration calculation for the function shown below, with a tolerance of "*tol*" = 1E – 4**

$$\int_1^5 (2x^2 + 3x + 4)\, dx$$

Input the function $f(x)$.

AC OPTN F4(CALC)* F4($\int dx$) 2 X,θ,T x^2 + 3 X,θ,T + 4 ,

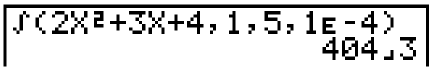
* fx-7400GIII: F3(CALC)

Input the start point and end point.

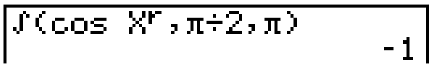
1 , 5 ,

Input the tolerance value.

1 ×10^x (−) 4) EXE



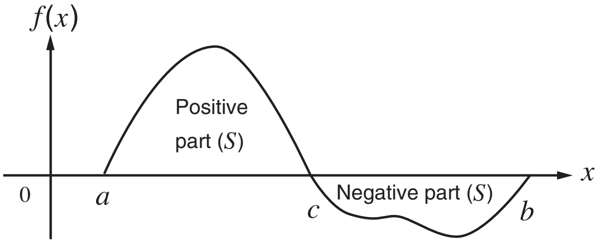
Example 2 **When the angle unit setting is degrees, trigonometric function integration calculation is performed using radians (Angle unit = Deg)**



Examples Calculation Result Display

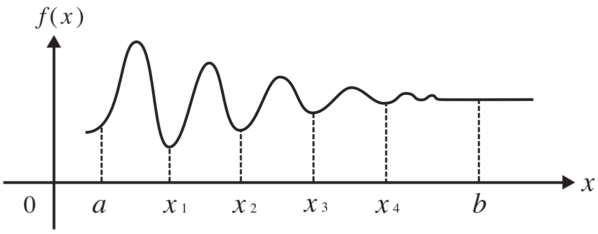
Note the following points to ensure correct integration values.

(1) When cyclical functions for integration values become positive or negative for different divisions, perform the calculation for single cycles, or divide between negative and positive, and then add the results together.



$$\underbrace{\int_a^b f(x)dx = \int_a^c f(x)dx}_{\text{Positive part }(S)} + \underbrace{\int_c^b f(x)dx}_{\text{Negative part }(S)}$$

(2) When minute fluctuations in integration divisions produce large fluctuations in integration values, calculate the integration divisions separately (divide the large fluctuation areas into smaller divisions), and then add the results together.



$$\int_a^b f(x)dx = \int_a^{x_1} f(x)dx + \int_{x_1}^{x_2} f(x)dx + \ldots.. + \int_{x_4}^{b} f(x)dx$$

- Pressing AC during calculation of an integral (while the cursor is not shown on the display) interrupts the calculation.
- Always use radians (Rad mode) as the angle unit when performing trigonometric integrations.
- An error (Time Out) occurs whenever no solution that satisfies the tolerance value can be obtained.

Integration Calculation Precautions

- Because numerical integration is used, large error may result in calculated integration values due to the content of $f(x)$, positive and negative values within the integration interval, or the interval being integrated. (Examples: When there are parts with discontinuous points or abrupt change. When the integration interval is too wide.) In such cases, dividing the integration interval into multiple parts and then performing calculations may improve calculation accuracy.

- In the function $f(x)$, only X can be used as a variable in expressions. Other variables (A through Z excluding X, r, θ) are treated as constants, and the value currently assigned to that variable is applied during the calculation.
- Input of "*tol*" and closing parenthesis can be omitted. If you omit "*tol*," the calculator automatically uses a default value of 1E–5.
- Integration calculations can take a long time to complete.
- You cannot use a differential, quadratic differential, integration, Σ, maximum/minimum value, Solve, RndFix or $\log_a b$ calculation expression inside of an integration calculation term.
- In the Math input/output mode, the tolerance value is fixed at 1E–5 and cannot be changed.

■ Σ Calculations **[OPTN]-[CALC]-[Σ(]**

To perform Σ calculations, first display the function analysis menu, and then input the values using the syntax below.

[OPTN] [F4](CALC)* [F6](▷) [F3](Σ( ) a_k [,] k [,] α [,] β [,] n [)] * fx-7400GIII: [F3](CALC)

$$\sum (a_k, k, \alpha, \beta, n) = \sum_{k=\alpha}^{\beta} a_k = a_\alpha + a_{\alpha+1} + \dots\dots + a_\beta$$

(n: distance between partitions)

Example **To calculate the following:**

$$\sum_{k=2}^{6} (k^2 - 3k + 5)$$

Use n = 1 as the distance between partitions.

[AC] [OPTN] [F4](CALC)* [F6](▷) [F3](Σ( ) [ALPHA] [,](K)
[x^2] [−] [3] [ALPHA] [,](K) [+] [5] [,]
[ALPHA] [,](K) [,] [2] [,] [6] [,] [1] [)] [EXE]

```
Σ(K²-3K+5,K,2,6,1)
                55
```

* fx-7400GIII: [F3](CALC)

Σ Calculation Precautions

- The value of the specified variable changes during a Σ calculation. Be sure to keep separate written records of the specified variable values you might need later before you perform the calculation.
- You can use only one variable in the function for input sequence a_k.
- Input integers only for the initial term (α) of sequence a_k and last term (β) of sequence a_k.
- Input of n and the closing parentheses can be omitted. If you omit n, the calculator automatically uses n = 1.
- Make sure that the value used as the final term β is greater than the value used as the initial term α. Otherwise, an error will occur.
- To interrupt an ongoing Σ calculation (indicated when the cursor is not on the display), press the [AC] key.
- You cannot use a differential, quadratic differential, integration, Σ, maximum/minimum value, Solve, RndFix or $\log_a b$ calculation expression inside of a Σ calculation term.
- In the Math input/output mode, the distance between partitions (n) is fixed at 1 and cannot be changed.

■ Maximum/Minimum Value Calculations **[OPTN]-[CALC]-[FMin]/[FMax]**

After displaying the function analysis menu, you can input maximum/minimum calculations using the formats below, and solve for the maximum and minimum of a function within interval $a \leqq x \leqq b$.

• Minimum Value

OPTN F4(CALC)* F6(▷) F1(FMin) $f(x)$, a , b , n)   * fx-7400GIII: F3(CALC)

(a: start point of interval, b: end point of interval, n: precision (n = 1 to 9))

• Maximum Value

OPTN F4(CALC)* F6(▷) F2(FMax) $f(x)$, a , b , n)   * fx-7400GIII: F3(CALC)

(a: start point of interval, b: end point of interval, n: precision (n = 1 to 9))

Example **To determine the minimum value for the interval defined by start point a = 0 and end point b = 3, with a precision of n = 6 for the function $y = x^2 - 4x + 9$**

Input $f(x)$.

AC OPTN F4(CALC)* F6(▷) F1(FMin) X,θ,T x^2 − 4 X,θ,T + 9 ,

* fx-7400GIII: F3(CALC)

Input the interval a = 0, b = 3.

0 , 3 ,

Input the precision n = 6.

6) EXE

- In the function $f(x)$, only X can be used as a variable in expressions. Other variables (A through Z excluding X, r, θ) are treated as constants, and the value currently assigned to that variable is applied during the calculation.
- Input of n and the closing parenthesis can be omitted.
- Discontinuous points or sections with drastic fluctuation can adversely affect precision or even cause an error.
- Inputting a larger value for n increases the precision of the calculation, but it also increases the amount of time required to perform the calculation.
- The value you input for the end point of the interval (b) must be greater than the value you input for the start point (a). Otherwise an error occurs.
- You can interrupt an ongoing maximum/minimum calculation by pressing the AC key.
- You can input an integer in the range of 1 to 9 for the value of n. Using any value outside this range causes an error.
- You cannot use a differential, quadratic differential, integration, Σ, maximum/minimum value, Solve, RndFix or $\log_a b$ calculation expression inside of a maximum/minimum calculation term.

6. Complex Number Calculations

You can perform addition, subtraction, multiplication, division, parentheses calculations, function calculations, and memory calculations with complex numbers just as you do with the manual calculations described on pages 2-1 to 2-16.

You can select the complex number calculation mode by changing the Complex Mode item on the Setup screen to one of the following settings.

- {**Real**} ... Calculation in the real number range only*1
- {$a+bi$} ... Performs complex number calculation and displays results in rectangular form
- {$r\angle\theta$} ... Performs complex number calculation and displays results in polar form*2

*1 When there is an imaginary number in the argument, however, complex number calculation is performed and the result is displayed using rectangular form.

Examples:

ln $2i$ = 0.6931471806 + 1.570796327i

ln $2i$ + ln (– 2) = (Non-Real ERROR)

*2 The display range of θ depends on the angle unit set for the Angle item on the Setup screen.

- Deg ... $-180 < \theta \leqq 180$
- Rad ... $-\pi < \theta \leqq \pi$
- Gra ... $-200 < \theta \leqq 200$

Press OPTN F3 (CPLX) (OPTN F2 (CPLX) on the fx-7400GIII) to display the complex calculation number menu, which contains the following items.

- {i} ... {imaginary unit i input}
- {**Abs**}/{**Arg**} ... obtains {absolute value}/{argument}
- {**Conj**} ... {obtains conjugate}
- {**ReP**}/{**ImP**} ... {real}/{imaginary} part extraction
- {►$r\angle\theta$}/{►$a+bi$} ... converts the result to {polar}/{rectangular} form

- You can also use SHIFT 0 (i) in place of OPTN F3 (CPLX) (OPTN F2 (CPLX) on the fx-7400GIII) F1 (i).
- Solutions obtained by the Real, $a+bi$ and $r\angle\theta$ modes are different for power root ($^x\sqrt{\ }$) calculations when $x < 0$ and $y = m/n$ when n is an odd number.

  Example: $3 \, ^x\sqrt{\ } \, (-8) = -2$ (Real)

  $= 1 + 1.732050808i$ ($a+bi$)

  $= 2\angle 60$ ($r\angle\theta$)

- To input the " $\angle$ " operator into the polar coordinate expression ($r\angle\theta$), press SHIFT X,θ,T ($\angle$).

■ Arithmetic Operations [OPTN]-[CPLX]-[i]

Arithmetic operations are the same as those you use for manual calculations. You can even use parentheses and memory.

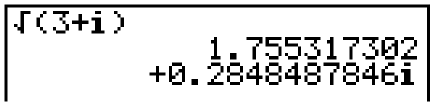
Example **(1 + 2*i*) + (2 + 3*i*)**

AC OPTN F3(CPLX)*
(1 + 2 F1(i))
+ (2 + 3 F1(i)) EXE
* fx-7400GIII: F2(CPLX)

■ Reciprocals, Square Roots, and Squares

Example $\sqrt{(3+i)}$

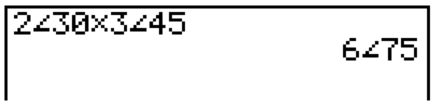
AC OPTN F3(CPLX)*
SHIFT x^2($\sqrt{\ }$) (3 + F1(i)) EXE
* fx-7400GIII: F2(CPLX)



■ Complex Number Format Using Polar Form

Example **2∠30 × 3∠45 = 6∠75**

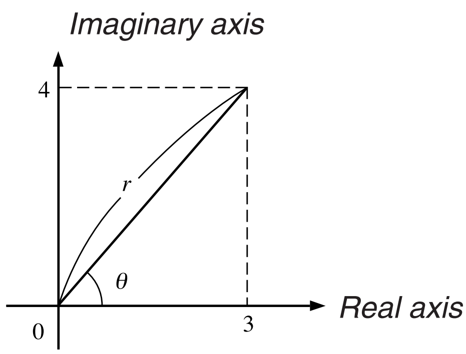
SHIFT MENU(SET UP) ▼ ▼ ▼ ▼ ▼ ▼*
F1(Deg) ▼ F3($r\angle\theta$) EXIT
AC 2 SHIFT X,θ,T(∠) 3 0 × 3
SHIFT X,θ,T(∠) 4 5 EXE
* fx-7400GIII: ▼ ▼ ▼ ▼ ▼



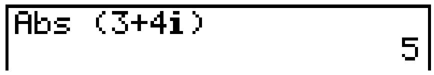
■ Absolute Value and Argument [OPTN]-[CPLX]-[Abs]/[Arg]

The unit regards a complex number in the form $a + bi$ as a coordinate on a Gaussian plane, and calculates absolute value | Z | and argument (arg).

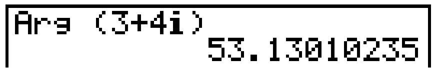
Example **To calculate absolute value (*r*) and argument (*θ*) for the complex number 3 + 4*i*, with the angle unit set for degrees**



[AC] [OPTN] [F3](CPLX)* [F2](Abs)
[(] [3] [+] [4] [F1](i) [)] [EXE]
(Calculation of absolute value)
* fx-7400GIII: [F2](CPLX)



[AC] [OPTN] [F3](CPLX)* [F3](Arg)
[(] [3] [+] [4] [F1](i) [)] [EXE]
(Calculation of argument)
* fx-7400GIII: [F2](CPLX)



- The result of the argument calculation differs in accordance with the current angle unit setting (degrees, radians, grads).

■ Conjugate Complex Numbers [OPTN]-[CPLX]-[Conj]

A complex number of the form $a + bi$ becomes a conjugate complex number of the form $a - bi$.

Example **To calculate the conjugate complex number for the complex number 2 + 4i**

[AC] [OPTN] [F3](CPLX)* [F4](Conj)
[(] [2] [+] [4] [F1](i) [)] [EXE]
* fx-7400GIII: [F2](CPLX)

■ Extraction of Real and Imaginary Parts [OPTN]-[CPLX]-[ReP]/[ImP]

Use the following procedure to extract the real part a and the imaginary part b from a complex number of the form $a + bi$.

Example **To extract the real and imaginary parts of the complex number 2 + 5i**

[AC] [OPTN] [F3](CPLX)* [F6](▷) [F1](ReP)
[(] [2] [+] [5] [F6](▷) [F1](i) [)] [EXE]
(Real part extraction)
* fx-7400GIII: [F2](CPLX)

[AC] [OPTN] [F3](CPLX)* [F6](▷) [F2](ImP)
[(] [2] [+] [5] [F6](▷) [F1](i) [)] [EXE]
(Imaginary part extraction)
* fx-7400GIII: [F2](CPLX)

■ Polar and Rectangular Form Transformation [OPTN]-[CPLX]-[►$r\angle\theta$]/[►$a+bi$]

Use the following procedure to transform a complex number displayed in rectangular form to polar form, and vice versa.

Example **To transform the rectangular form of complex number 1 + $\sqrt{3}\,i$ to its polar form**

SHIFT MENU (SET UP) ▼ ▼ ▼ ▼ ▼ ▼*

F1 (Deg) ▼ F2 (a+$b\boldsymbol{i}$) EXIT

AC 1 + (SHIFT x^2 ($\sqrt{\ }$) 3)

OPTN F3 (CPLX)** F1 ($\boldsymbol{i}$) F6 (▷) F3 (►$r\angle\theta$) EXE

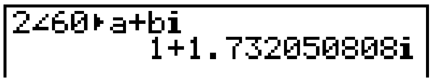
* fx-7400GIII: ▼ ▼ ▼ ▼ ▼

** fx-7400GIII: F2 (CPLX)

AC 2 SHIFT X,θ,T (∠) 6 0

OPTN F3 (CPLX)* F6 (▷) F4 (►a+$b\boldsymbol{i}$) EXE

* fx-7400GIII: F2 (CPLX)



- The input/output range of complex numbers is normally 10 digits for the mantissa and two digits for the exponent.
- When a complex number has more than 21 digits, the real part and imaginary part are displayed on separate lines.
- The following functions can be used with complex numbers.

  $\sqrt{\ }$, x^2, x^{-1}, ^(x^y), $\sqrt[3]{\ }$, $\sqrt[x]{\ }$, In, log, log$_a$b, 10^x, e^x, Int, Frac, Rnd, Intg, RndFix(, Fix, Sci, ENG, $\overleftarrow{\text{ENG}}$, ° ’ ”, $\overleftarrow{\text{° ’ ”}}$, a^b/c, d/c

7. Binary, Octal, Decimal, and Hexadecimal Calculations with Integers

You can use the **RUN • MAT** (or **RUN**) mode and binary, octal, decimal, and hexadecimal settings to perform calculations that involve binary, octal, decimal and hexadecimal values. You can also convert between number systems and perform bitwise operations.

- You cannot use scientific functions in binary, octal, decimal, and hexadecimal calculations.
- You can use only integers in binary, octal, decimal, and hexadecimal calculations, which means that fractional values are not allowed. If you input a value that includes a decimal part, the calculator automatically cuts off the decimal part.
- If you attempt to enter a value that is invalid for the number system (binary, octal, decimal, hexadecimal) you are using, the calculator displays an error message. The following shows the numerals that can be used in each number system.

  Binary: 0, 1

  Octal: 0, 1, 2, 3, 4, 5, 6, 7

  Decimal: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

  Hexadecimal: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

- Negative binary, octal, and hexadecimal values are produced using the two’s complement of the original value.
- The following are the display capacities for each of the number systems.

Number System	Binary	Octal	Decimal	Hexadecimal
Display Capacity	16 digits	11 digits	10 digits	8 digits

- The alphabetic characters used in the hexadecimal number appear differently on the display to distinguish them from text characters.

Normal Text	A	B	C	D	E	F
Hexadecimal Values	A	B	C	D	E	F
Keys	X,θ,T	log	ln	sin	cos	tan

- The following are the calculation ranges for each of the number systems.

  Binary Values

    Positive: $0 \leqq x \leqq 111111111111111$

    Negative: $1000000000000000 \leqq x \leqq 1111111111111111$

  Octal Values

    Positive: $0 \leqq x \leqq 17777777777$

    Negative: $20000000000 \leqq x \leqq 37777777777$

  Decimal Values

    Positive: $0 \leqq x \leqq 2147483647$

    Negative: $-2147483648 \leqq x \leqq -1$

  Hexadecimal Values

    Positive: $0 \leqq x \leqq$ 7FFFFFFF

    Negative: $80000000 \leqq x \leqq$ FFFFFFFF

• To perform a binary, octal, decimal, or hexadecimal calculation

[SET UP]-[Mode]-[Dec]/[Hex]/[Bin]/[Oct]

1. In the Main Menu, select **RUN • MAT** (or **RUN**).
2. Press SHIFT MENU (SET UP). Move the highlighting to "Mode", and then specify the default number system by pressing F2 (Dec), F3 (Hex), F4 (Bin), or F5 (Oct) for the Mode setting.
3. Press EXIT to change to the screen for calculation input. This causes a function menu with the following items to appear.
   - {**d~o**}/{**LOG**}/{**DISP**} ... {number system specification}/{bitwise operation}/{decimal/hexadecimal/binary/octal conversion} menu

■ Selecting a Number System

You can specify decimal, hexadecimal, binary, or octal as the default number system using the Setup screen.

• To specify a number system for an input value

You can specify a number system for each individual value you input. Press F1 (d~o) to display a menu of number system symbols. Press the function key that corresponds to the symbol you want to select and then input the value.

- {**d**}/{**h**}/{**b**}/{**o**} ... {decimal}/{hexadecimal}/{binary}/{octal}

• To input values of mixed number systems

Example **To input 123_{10}, when the default number system is hexadecimal**

[SHIFT] [MENU] (SET UP)
Move the highlighting to "Mode", and then press [F3] (Hex) [EXIT].
[AC] [F1] (d~o) [F1] (d) [1] [2] [3] [EXE]

■ Negative Values and Bitwise Operations

Press [F2] (LOG) to display a menu of negation and bitwise operators.

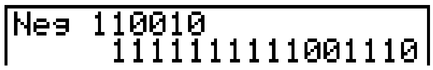
- {**Neg**} ... {negation}*1
- {**Not**}/{**and**}/{**or**}/{**xor**}/{**xnor**} ... {NOT}*2/{AND}/{OR}/{XOR}/{XNOR}*3

*1 two's complement
*2 one's complement (bitwise complement)
*3 bitwise AND, bitwise OR, bitwise XOR, bitwise XNOR

• Negative Values

Example **To determine the negative of 110010_2**

[SHIFT] [MENU] (SET UP)
Move the highlighting to "Mode", and then press [F4] (Bin) [EXIT].
[AC] [F2] (LOG) [F1] (Neg)
[1] [1] [0] [0] [1] [0] [EXE]



- Negative binary, octal, and hexadecimal values are produced by taking the binary two's complement and then returning the result to the original number base. With the decimal number base, negative values are displayed with a minus sign.

• Bitwise Operations

Example **To input and execute "120_{16} and AD_{16}"**

[SHIFT] [MENU] (SET UP)
Move the highlighting to "Mode", and then press [F3] (Hex) [EXIT].
[AC] [1] [2] [0] [F2] (LOG)
[F3] (and) [A] [D] [EXE]

■ Number System Transformation

Press [F3] (DISP) to display a menu of number system transformation functions.

- {**►Dec**}/{**►Hex**}/{**►Bin**}/{**►Oct**} ... transformation of displayed value to its {decimal}/{hexadecimal}/{binary}/{octal} equivalent

• To convert a displayed value from one number system to another

Example **To convert 22_{10} (default number system) to its binary or octal value**

AC SHIFT MENU (SET UP)

Move the highlighting to "Mode", and then press F2 (Dec) EXIT.

F1 (d~o) F1 (d) 2 2 EXE

```
d22
                    22
```

EXIT F3 (DISP) F3 (▶Bin) EXE

```
Ans▶Bin
      0000000000010110
```

F4 (▶Oct) EXE

```
Ans▶Oct
           00000000026
```

8. Matrix Calculations

Important!

- Matrix calculations cannot be performed on the fx-7400GIII.

From the Main Menu, enter the **RUN • MAT** mode, and press F1 (▶MAT) to perform Matrix calculations.

26 matrix memories (Mat A through Mat Z) plus a Matrix Answer Memory (MatAns), make it possible to perform the following matrix operations.

- Addition, subtraction, multiplication
- Scalar multiplication calculations
- Determinant calculations
- Matrix transposition
- Matrix inversion
- Matrix squaring
- Raising a matrix to a specific power
- Absolute value, integer part extraction, fractional part extraction, maximum integer calculations
- Inputting complex numbers in matrix elements and using complex number related functions
- Matrix modification using matrix commands

The maximum number of rows that can be specified for a matrix is 999, and the maximum number of columns is 999.

About Matrix Answer Memory (MatAns)

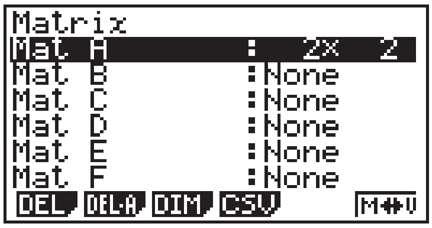
- The calculator automatically stores matrix calculation results in Matrix Answer Memory. Note the following points about Matrix Answer Memory.
- Whenever you perform a matrix calculation, the current Matrix Answer Memory contents are replaced by the new result. The previous contents are deleted and cannot be recovered.
- Inputting values into a matrix does not affect Matrix Answer Memory contents.
- When a matrix calculation result is m (rows) × 1 (column) or 1 (row) × n (columns), the calculation result is also stored in Vector Answer Memory (VctAns).

Inputting and Editing Matrices

Pressing F1(▶MAT) displays the Matrix Editor screen. Use the Matrix Editor to input and edit matrices.

$m \times n$ … m (row) × n (column) matrix

None… no matrix preset



- {**DEL**}/{**DEL•A**} ... deletes {a specific matrix}/{all matrices}
- {**DIM**} ... {specifies the matrix dimensions (number of cells)}
- {**CSV**} ... stores a matrix as a CSV file and imports the contents of CSV file into one of the matrix memories (Mat A through Mat Z, and MatAns) (page 2-43)
- {**M↔V**} ... displays the Vector Editor screen (page 2-52)

• Creating a Matrix

To create a matrix, you must first define its dimensions (size) in the Matrix Editor. Then you can input values into the matrix.

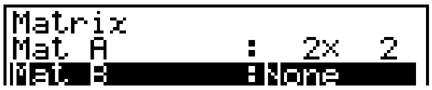
• To specify the dimensions (size) of a matrix

Example **To create a 2-row × 3-column matrix in the area named Mat B**

Highlight Mat B.

⏷

F3(DIM) (This step can be omitted.)



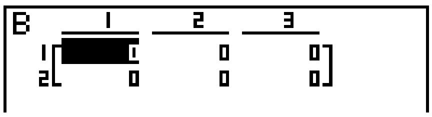
Specify the number of rows.

2 EXE

Specify the number of columns.

3 EXE

EXE



- All of the cells of a new matrix contain the value 0.
- Changing the dimensions of a matrix deletes its current contents.
- If “Memory ERROR” remains next to the matrix area name after you input the dimensions, it means there is not enough free memory to create the matrix you want.

• To input cell values

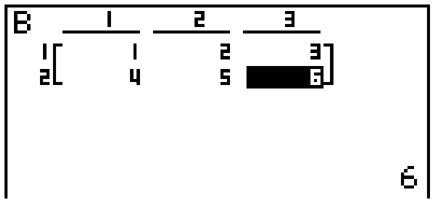
Example **To input the following data into Matrix B:**

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$$

The following operation is a continuation of the example calculation on the previous page.

[1] [EXE] [2] [EXE] [3] [EXE]
[4] [EXE] [5] [EXE] [6] [EXE]

(Data is input into the highlighted cell. Each time you press [EXE], the highlighting moves to the next cell to the right.)



- Displayed cell values show positive integers up to six digits, and negative integers up to five digits (one digit used for the negative sign). Exponential values are shown with up to two digits for the exponent. Fractional values are not displayed.

• Deleting Matrices

You can delete either a specific matrix or all matrices in memory.

• To delete a specific matrix

1. While the Matrix Editor is on the display, use [▲] and [▼] to highlight the matrix you want to delete.
2. Press [F1](DEL).
3. Press [F1](Yes) to delete the matrix or [F6](No) to abort the operation without deleting anything.

• To delete all matrices

1. While the Matrix Editor is on the display, press [F2](DEL•A).
2. Press [F1](Yes) to delete all matrices in memory or [F6](No) to abort the operation without deleting anything.

■ Matrix Cell Operations

Use the following procedure to prepare a matrix for cell operations.

1. While the Matrix Editor is on the display, use [▲] and [▼] to highlight the name of the matrix you want to use.
   You can jump to a specific matrix by inputting the letter that corresponds to the matrix name. Inputting [ALPHA] [8](N), for example, jumps to Mat N.
   Pressing [SHIFT] [(-)](Ans) jumps to the matrix current memory.
2. Press [EXE] and the function menu with the following items appears.
   - {**R•OP**} ... {row operation menu}
   - {**ROW**}
     - {**DEL**}/{**INS**}/{**ADD**} ... row {delete}/{insert}/{add}
   - {**COL**}
     - {**DEL**}/{**INS**}/{**ADD**} ... column {delete}/{insert}/{add}
   - {**EDIT**} ... {cell editing screen}

All of the following examples use Matrix A.

• Row Calculations

The following menu appears whenever you press F1(R•OP) while a recalled matrix is on the display.

- {**Swap**} ... {row swap}
- {×**Rw**} ... {product of specified row and scalar}
- {×**Rw+**} ... {addition of one row and the product of a specified row with a scalar}
- {**Rw+**} ... {addition of specified row to another row}

• To swap two rows

Example **To swap rows two and three of the following matrix:**

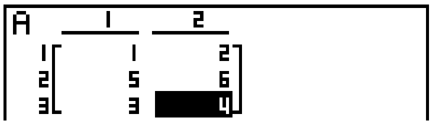
All of the operation examples are performed using the following matrix.

Matrix A = $\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$

F1(R•OP)F1(Swap)

Input the number of the rows you want to swap.

2 EXE 3 EXE EXE



• To calculate the scalar multiplication of a row

Example **To calculate the product of row 2 and the scalar 4**

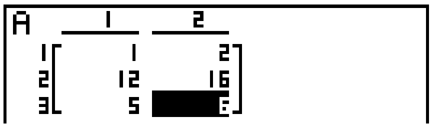
F1(R•OP)F2(×Rw)

Input multiplier value.*

4 EXE

Specify row number.

2 EXE EXE



* A complex number also can be input as multiplier value (k).

• To calculate the scalar multiplication of a row and add the result to another row

Example **To calculate the product of row 2 and the scalar 4, then add the result to row 3**

F1(R•OP)F3(×Rw+)

Input multiplier value.*

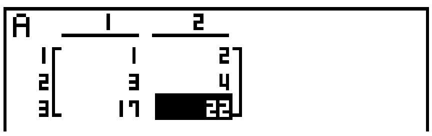
4 EXE

Specify number of row whose product should be calculated.

2 EXE

Specify number of row where result should be added.

3 EXE EXE



* A complex number also can be input as multiplier value (k).

• To add two rows together

Example **To add row 2 to row 3**

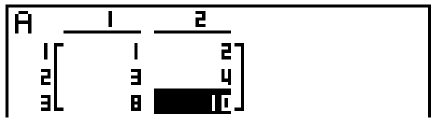
F1(R • OP) F4(Rw+)

Specify number of row to be added.

2 EXE

Specify number of row to be added to.

3 EXE EXE



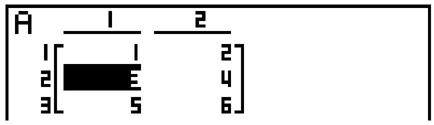
• Row Operations

- {**DEL**} ... {delete row}
- {**INS**} ... {insert row}
- {**ADD**} ... {add row}

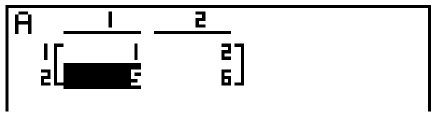
• To delete a row

Example **To delete row 2**

F2(ROW) ▼



F1(DEL)

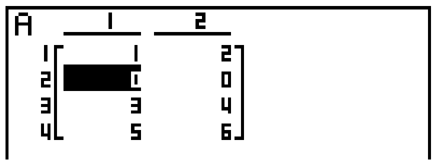


• To insert a row

Example **To insert a new row between rows one and two**

F2(ROW) ▼

F2(INS)

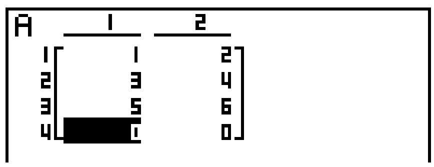


• To add a row

Example **To add a new row below row 3**

F2(ROW) ▼ ▼

F3(ADD)



• Column Operations

- {**DEL**} ... {delete column}
- {**INS**} ... {insert column}
- {**ADD**} ... {add column}

• To delete a column

Example **To delete column 2**

F3(COL)▶
F1(DEL)

■ Transferring Data between Matrices and CSV Files

You can import the contents of a CSV file stored with this calculator or transferred from a computer into one of the matrix memories (Mat A through Mat Z, and MatAns). You also can save the contents of one of the matrix memories (Mat A through Mat Z, and MatAns) as a CSV file.

• To import the contents of a CSV file to a matrix memory

1. Prepare the CSV file you want to import.
   - See “Import CSV File Requirements” (page 3-14).
2. While the Matrix Editor is on the display, use ▲ and ▼ to highlight the name of the matrix to which you want to import the CSV file contents.
   - If the matrix you select already contains data, performing the following steps will overwrite its current contents with the newly imported CSV file data.
3. Press F4(CSV)F1(LOAD).
4. On the select file dialog box that appears, use ▲ and ▼ to move the highlighting to the file you want to import and then press EXE.
   - This imports the contents of the CSV file you specified to the matrix memory.

Important!

Attempting to import the following types of CSV files will result in an error.

- A CSV file that includes data that cannot be converted. In this case, an error message will appear showing the location in the CSV file (Example: row 2, column 3) where the data that cannot be converted is located.
- A CSV file with more than 999 columns or 999 rows. In this case, an “Invalid Data Size” error will occur.

• To save matrix contents as a CSV file

1. While the Matrix Editor is on the display, use ⏶ and ⏷ to highlight the name of the matrix whose contents you want to save as a CSV file.
2. Press F4(CSV)F2(SV • AS).
   - This displays a folder selection screen.
3. Select the folder where you want to save the CSV file.
   - To store the CSV file in the root directory, highlight "ROOT".
   - To store the CSV file in a folder, use ⏶ and ⏷ to move the highlighting to the desired folder and then press F1(OPEN).
4. Press F1(SV • AS).
5. Input up to eight characters for the file name and then press EXE.

Important!

- When saving matrix data to a CSV file, some data is converted as described below.
  - Complex number data: Only the real number part is extracted.
  - Fraction data: Converted to calculation line format (Example: 2⌟3⌟4 → =2+3/4)
  - $\sqrt{\ }$ and π data: Converted to a decimal value (Example: $\sqrt{3} \rightarrow 1.732050808$)

• To specify the CSV file delimiter symbol and decimal point

While the Matrix Editor is on the display, press F4(CSV)F3(SET) to display the CSV format setting screen. Next, perform the procedure from step 3 under "Specifying the CSV File Delimiter Symbol and Decimal Point" (page 3-16).

■ Modifying Matrices Using Matrix Commands [OPTN]-[MAT]

• To display the matrix commands

1. From the Main Menu, enter the **RUN • MAT** mode.
2. Press OPTN to display the option menu.
3. Press F2(MAT) to display the matrix command menu.

The following describes only the matrix command menu items that are used for creating matrices and inputting matrix data.

- {**Mat**} ... {Mat command (matrix specification)}
- {**M→L**} ... {Mat→List command (assign contents of selected column to list file)}
- {**Aug**} ... {Augment command (link two matrices)}
- {**Iden**} ... {Identity command (identity matrix input)}
- {**Dim**} ... {Dim command (dimension check)}
- {**Fill**} ... {Fill command (identical cell values)}

- You can also use SHIFT 2(Mat) in place of OPTN F2(MAT)F1(Mat).

• Matrix Data Input Format **[OPTN]-[MAT]-[Mat]**

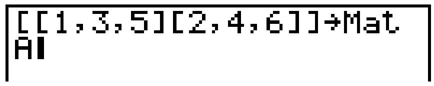
The following shows the format you should use when inputting data to create a matrix using the Mat command.

$$\begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix} = [\,[a_{11}, a_{12}, \dots, a_{1n}]\,[a_{21}, a_{22}, \dots, a_{2n}] \,\dots.\, [a_{m1}, a_{m2}, \dots, a_{mn}]\,]$$

→ Mat [letter A through Z]

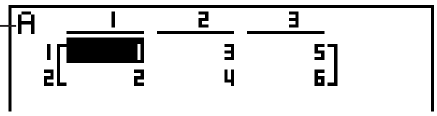
Example **To input the following data as Matrix A:** $\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$

[SHIFT] [+] ([ ) [SHIFT] [+] ([ ) [1] [,] [3] [,] [5]
[SHIFT] [−] ( ]) [SHIFT] [+] ([ ) [2] [,] [4] [,] [6]
[SHIFT] [−] ( ]) [SHIFT] [−] ( ]) [→] [OPTN] [F2] (MAT)
[F1] (Mat) [ALPHA] [X,θ,T] (A)



[EXE]

Matrix name



- The maximum value of both m and n is 999.
- An error occurs if memory becomes full as you are inputting data.
- You can also use the above format inside a program that inputs matrix data.

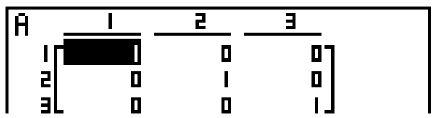
• To input an identity matrix **[OPTN]-[MAT]-[Iden]**

Use the Identity command to create an identity matrix.

Example **To create a 3 × 3 identity matrix as Matrix A**

[OPTN] [F2] (MAT) [F6] (▷) [F1] (Iden)
[3] [→] [F6] (▷) [F1] (Mat) [ALPHA] [X,θ,T] (A) [EXE]

Number of rows/columns



• To check the dimensions of a matrix **[OPTN]-[MAT]-[Dim]**

Use the Dim command to check the dimensions of an existing matrix.

Example 1 **To check the dimensions of Matrix A**

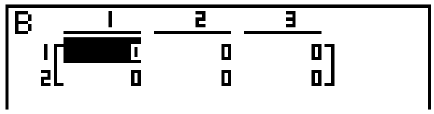
[OPTN] [F2] (MAT) [F6] (▷) [F2] (Dim)
[F6] (▷) [F1] (Mat) [ALPHA] [X,θ,T] (A) [EXE]

The display shows that Matrix A consists of two rows and three columns.
Since the result of the Dim command is list type data, it is stored in ListAns Memory.

You can also use {Dim} to specify the dimensions of the matrix.

Example 2 **To specify dimensions of 2 rows and 3 columns for Matrix B**

SHIFT × ({) 2 , 3 SHIFT ÷ (}) →
OPTN F2 (MAT) F6 (▷) F2 (Dim)
F6 (▷) F1 (Mat) ALPHA log (B) EXE



- The "Dim" command can be used to check and configure vector dimension settings.

• Modifying Matrices Using Matrix Commands

You can also use matrix commands to assign values to and recall values from an existing matrix, to fill in all cells of an existing matrix with the same value, to combine two matrices into a single matrix, and to assign the contents of a matrix column to a list file.

• To assign values to and recall values from an existing matrix

[OPTN]-[MAT]-[Mat]

Use the following format with the Mat command to specify a cell for value assignment and recall.

Mat X [m, n]

X = matrix name (A through Z, or Ans)

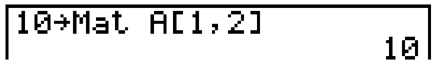
m = row number

n = column number

Example 1 **To assign 10 to the cell at row 1, column 2 of the following matrix:**

$$\textbf{Matrix A} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

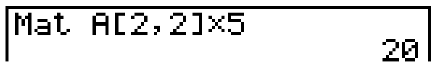
1 0 → OPTN F2 (MAT) F1 (Mat)
ALPHA X,θ,T (A) SHIFT + ([ ) 1 , 2
SHIFT − ( ]) EXE



- The "Vct" command can be used to assign values to existing vectors.

Example 2 **Multiply the value in the cell at row 2, column 2 of the above matrix by 5**

OPTN F2 (MAT) F1 (Mat)
ALPHA X,θ,T (A) SHIFT + ([ ) 2 , 2
SHIFT − ( ]) × 5 EXE



- The "Vct" command can be used to recall values from existing vectors.

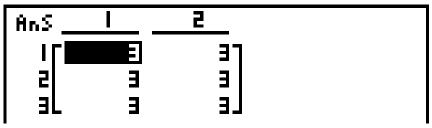
• To fill a matrix with identical values and to combine two matrices into a single matrix

[OPTN]-[MAT]-[Fill]/[Aug]

Use the Fill command to fill all the cells of an existing matrix with an identical value and the Augment command to combine two existing matrices into a single matrix.

Example 1 **To fill all of the cells of Matrix A with the value 3**

OPTN F2 (MAT) F6 (▷) F3 (Fill)
3 , F6 (▷) F1 (Mat) ALPHA X,θ,T (A) EXE
F1 (Mat) ALPHA X,θ,T (A) EXE

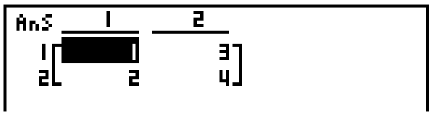


- The "Fill" command can be used to write the same value into all vector elements.

Example 2 **To combine the following two matrices:**

$$\mathbf{A} = \begin{bmatrix} 1 \\ 2 \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$$

OPTN F2 (MAT) F5 (Aug)
F1 (Mat) ALPHA X,θ,T (A) ,
F1 (Mat) ALPHA log (B) EXE



- The two matrices you combine must have the same number of rows. An error occurs if you try to combine two matrices that have different number of rows.
- You can use Matrix Answer Memory to assign the results of the above matrix input and edit operations to a matrix variable. To do so, use the following syntax.

  Fill (n, Mat α)

  Augment (Mat α, Mat β) → Mat γ

  In the above, α, β, and γ are any variable names A through Z, and n is any value.
  The above does not affect the contents of Matrix Answer Memory.
- The "Augment" command can be used to merge two vectors into a single matrix.

• To assign the contents of a matrix column to a list **[OPTN]-[MAT]-[M→L]**

Use the following format with the Mat→List command to specify a column and a list.

Mat → List (Mat X, m) → List n

X = matrix name (A through Z)

m = column number

n = list number

Example **To assign the contents of column 2 of the following matrix to list 1:**

$$\textbf{Matrix A} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

OPTN F2 (MAT) F2 (M→L)
F1 (Mat) ALPHA X,θ,T (A) , 2)
→ OPTN F1 (LIST) F1 (List) 1 EXE
F1 (List) 1 EXE

■ Matrix Calculations **[OPTN]-[MAT]**

Use the matrix command menu to perform matrix calculation operations.

• To display the matrix commands

1. From the Main Menu, enter the **RUN • MAT** mode.
2. Press [OPTN] to display the option menu.
3. Press [F2] (MAT) to display the matrix command menu.

The following describes only the matrix commands that are used for matrix arithmetic operations.

- {**Mat**} ... {Mat command (matrix specification)}
- {**Det**} ... {Det command (determinant command)}
- {**Trn**} ... {Trn command (transpose matrix command)}
- {**Iden**} ... {Identity command (identity matrix input)}
- {**Ref**} ... {Ref command (row echelon form command)}
- {**Rref**} ... {Rref command (reduced row echelon form command)}

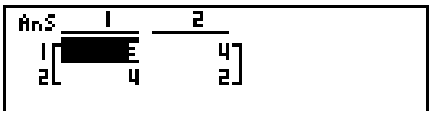
All of the following examples assume that matrix data is already stored in memory.

• Matrix Arithmetic Operations **[OPTN]-[MAT]-[Mat]/[Iden]**

Example 1 **To add the following two matrices (Matrix A + Matrix B):**

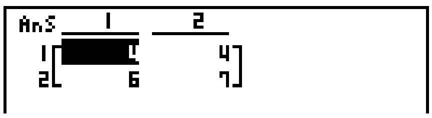
$$\mathbf{A} = \begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} 2 & 3 \\ 2 & 1 \end{bmatrix}$$

[AC] [OPTN] [F2] (MAT) [F1] (Mat) [ALPHA] [X,θ,T] (A) [+]
[F1] (Mat) [ALPHA] [log] (B) [EXE]



Example 2 **To multiply the two matrices in Example 1 (Matrix A × Matrix B)**

[AC] [OPTN] [F2] (MAT) [F1] (Mat) [ALPHA] [X,θ,T] (A) [×]
[F1] (Mat) [ALPHA] [log] (B) [EXE]



- The two matrices must have the same dimensions in order to be added or subtracted. An error occurs if you try to add or subtract matrices of different dimensions.
- For multiplication (Matrix 1 × Matrix 2), the number of columns in Matrix 1 must match the number of rows in Matrix 2. Otherwise, an error occurs.

• Determinant **[OPTN]-[MAT]-[Det]**

Example **Obtain the determinant for the following matrix:**

$$\textbf{Matrix A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ -1 & -2 & 0 \end{bmatrix}$$

OPTN F2 (MAT) F3 (Det) F1 (Mat)
ALPHA X,θ,T (A) EXE

- Determinants can be obtained only for square matrices (same number of rows and columns). Trying to obtain a determinant for a matrix that is not square produces an error.
- The determinant of a 2 × 2 matrix is calculated as shown below.

$$|A| = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} = a_{11}a_{22} - a_{12}a_{21}$$

- The determinant of a 3 × 3 matrix is calculated as shown below.

$$|A| = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} = a_{11}a_{22}a_{33} + a_{12}a_{23}a_{31} + a_{13}a_{21}a_{32} - a_{11}a_{23}a_{32} - a_{12}a_{21}a_{33} - a_{13}a_{22}a_{31}$$

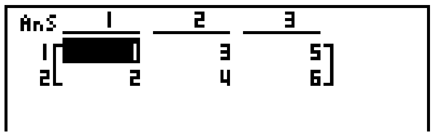
• Matrix Transposition **[OPTN]-[MAT]-[Trn]**

A matrix is transposed when its rows become columns and its columns become rows.

Example **To transpose the following matrix:**

$$\textbf{Matrix A} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

OPTN F2 (MAT) F4 (Trn) F1 (Mat)
ALPHA X,θ,T (A) EXE



- The "Trn" command can be used with a vector as well. It converts a 1-row × n-column vector to an n-row × 1-column vector, or an m-row × 1-column vector to a 1-row × m-column vector.

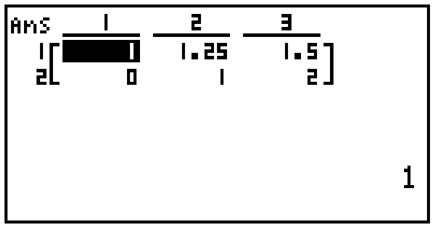
• Row Echelon Form **[OPTN]-[MAT]-[Ref]**

This command uses the Gaussian elimination algorithm to find the row echelon form of a matrix.

Example **To find the row echelon form of the following matrix:**

Matrix A = $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

OPTN F2(MAT) F6(▷) F4(Ref)
F6(▷) F1(Mat) ALPHA X,θ,T(A) EXE



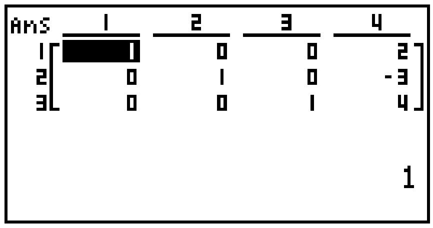
• Reduced Row Echelon Form **[OPTN]-[MAT]-[Rref]**

This command finds the reduced row echelon form of a matrix.

Example **To find the reduced row echelon form of the following matrix:**

Matrix A = $\begin{bmatrix} 2 & -1 & 3 & 19 \\ 1 & 1 & -5 & -21 \\ 0 & 4 & 3 & 0 \end{bmatrix}$

OPTN F2(MAT) F6(▷) F5(Rref)
F6(▷) F1(Mat) ALPHA X,θ,T(A) EXE



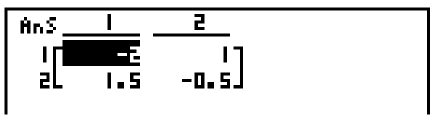
• The row echelon form and reduced row echelon form operation may not produce accurate results due to dropped digits.

• Matrix Inversion **[x^{-1}]**

Example **To invert the following matrix:**

Matrix A = $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

OPTN F2(MAT) F1(Mat)
ALPHA X,θ,T(A) SHIFT)(x^{-1}) EXE



• Only square matrices (same number of rows and columns) can be inverted. Trying to invert a matrix that is not square produces an error.

• A matrix with a determinant of zero cannot be inverted. Trying to invert a matrix with determinant of zero produces an error.

- Calculation precision is affected for matrices whose determinant is near zero.
- A matrix being inverted must satisfy the conditions shown below.

$$\mathbf{A\,A^{-1} = A^{-1}\,A = E} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

The following shows the formula used to invert Matrix A into inverse matrix A^{-1}.

$$\mathbf{A} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$\mathbf{A^{-1}} = \frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

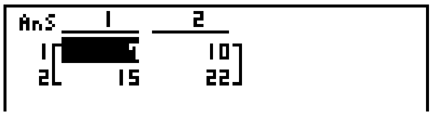
Note that $ad - bc \neq 0$.

• Squaring a Matrix [x^2]

Example **To square the following matrix:**

$$\textbf{Matrix A} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

[OPTN] [F2](MAT) [F1](Mat) [ALPHA] [X,θ,T](A) [x^2] [EXE]

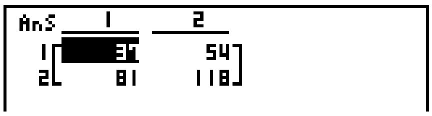


• Raising a Matrix to a Power [^]

Example **To raise the following matrix to the third power:**

$$\textbf{Matrix A} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

[OPTN] [F2](MAT) [F1](Mat) [ALPHA] [X,θ,T](A)
[^] [3] [EXE]



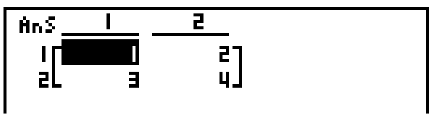
- For matrix power calculations, calculation is possible up to a power of 32766.

• Determining the Absolute Value, Integer Part, Fraction Part, and Maximum Integer of a Matrix [OPTN]-[NUM]-[Abs]/[Frac]/[Int]/[Intg]

Example **To determine the absolute value of the following matrix:**

$$\textbf{Matrix A} = \begin{bmatrix} 1 & -2 \\ -3 & 4 \end{bmatrix}$$

[OPTN] [F6](▷) [F4](NUM) [F1](Abs)
[OPTN] [F2](MAT) [F1](Mat) [ALPHA] [X,θ,T](A) [EXE]



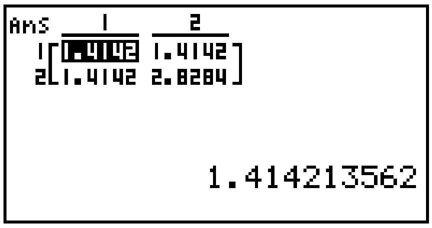
- The "Abs" command can be used to obtain the absolute value of a vector element.

• Complex Number Calculations with a Matrix

Example **To determine the absolute value of a matrix with the following complex number elements:**

$$\textbf{Matrix D} = \begin{bmatrix} -1 + i & 1 + i \\ 1 + i & -2 + 2i \end{bmatrix}$$

AC OPTN F6(▷) F4(NUM) F1(Abs)
OPTN F2(MAT) F1(Mat) ALPHA sin(D) EXE



- The following complex number functions are supported in matrices and vectors.
  i, Abs, Arg, Conjg, ReP, ImP

Matrix Calculation Precautions

- Determinants and inverse matrices are subject to error due to dropped digits.
- Matrix operations are performed individually on each cell, so calculations may require considerable time to complete.
- The calculation precision of displayed results for matrix calculations is ±1 at the least significant digit.
- If a matrix calculation result is too large to fit into Matrix Answer Memory, an error occurs.
- You can use the following operation to transfer Matrix Answer Memory contents to another matrix (or when Matrix Answer Memory contains a determinant to a variable).

  MatAns → Mat α

  In the above, α is any variable name A through Z. The above does not affect the contents of Matrix Answer Memory.

9. Vector Calculations

Important!

- Vector calculations cannot be performed on the fx-7400GIII.

To perform vector calculations, use the Main Menu to enter the **RUN • MAT** mode, and then press F1(►MAT) F6(M↔V).

A vector is defined as a matrix that is either of the two following forms: m (rows) × 1 (column) or 1 (row) × n (columns).

The maximum allowable value that can be specified for both m and n is 999.

You can use the 26 vector memories (Vct A through Vct Z) plus a Vector Answer Memory (VctAns) to perform the vector calculations listed below.

- Addition, subtraction, multiplication
- Scalar multiple calculations
- Dot product calculations
- Cross product calculations
- Determination of the vector norm (size)

- Determination of the angle formed by two vectors
- Determination of the unit vector

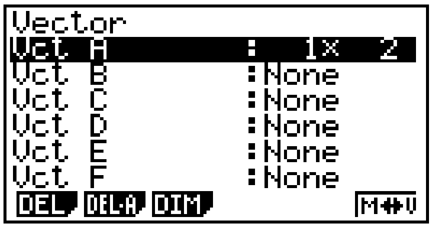
About Vector Answer Memory (VctAns)

The calculator automatically stores vector calculation results in Vector Answer Memory. Note the following precautions about Vector Answer Memory.

- Whenever you perform a vector calculation, the current Vector Answer Memory contents are replaced by the new result. The previous contents are deleted and cannot be recovered.
- Inputting values into a vector does not affect Vector Answer Memory contents.
- Vector calculation results are also stored in Matrix Answer Memory (MatAns).

■ Inputting and Editing a Vector

Pressing F1(▶MAT)F6(M↔V) displays the Vector Editor screen. Use the Vector Editor to input and edit vectors.



$m \times n$ ... m (row) $\times$ n (column) vector

None ... no vector preset

- {**DEL**}/{**DEL • A**} ... deletes {a specific vector}/{all vectors}
- {**DIM**} ... specifies the vector dimensions (m rows $\times$ 1 column or 1 row $\times$ n columns)
- {**M↔V**} ... displays the Matrix Editor screen (page 2-39)

Vector input and editing, and vector cell (element) operations are the same as matrix calculation operations. For more information, see "Inputting and Editing Matrices" (page 2-39) and "Matrix Cell Operations" (page 2-40). Note, however, that vector calculations differ from matrix calculations as described below.

- On the vector memory element input screen, there is no F1(R • OP) in the function menu.
- For vector editing, the dimension always limited to m rows $\times$ 1 column or 1 row $\times$ n columns.

■ Vector Calculations **[OPTN]-[MAT]**

Use the vector command menu to perform vector calculations.

• To display vector commands

1. From the Main Menu, enter the **RUN • MAT** mode.
2. Press OPTN to display the option menu.
3. Press F2(MAT)F6(▷)F6(▷) to display the vector command menu.
   - {**Vct**} ... {Vct command (vector specification)}
   - {**DotP**} ... {DotP command (dot product command)}
   - {**CrsP**} ... {CrossP command (cross product command)}
   - {**Angle**} ... {Angle command (calculate the angle formed by two vectors)}
   - {**UntV**} ... {UnitV command (calculate the unit vector)}
   - {**Norm**} ... {Norm command (calculate the vector norm (size))}

Vector Calculation Precautions

- When calculating a dot product, cross product, and angle formed by two vectors, the dimensions of the two vectors must be the same. Also, a cross product's dimensions must be 1 × 2, 1 × 3, 2 × 1, or 3 × 1.
- Vector calculations are performed independently for each element, so it may take some time before calculations results are displayed.
- The calculation precision of displayed results for vector calculations is ±1 at the least significant digit.
- If a vector calculation result is too large to fit into Vector Answer Memory, an error occurs.
- You can use the following operation to transfer Vector Answer Memory contents to another vector.

  VctAns → Vct α

  In the above, α is any variable name A through Z. The above does not affect the contents of Vector Answer Memory.
- Vector memory and matrix memory are compatible with each other, so vector memory contents can be assigned to matrix memory, if you want.

  Vct α → Mat β

  In the above, α and β are any variable names A through Z.

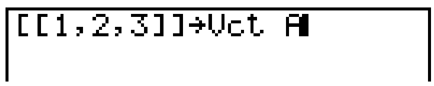
• Vector Data Input Format **[OPTN]-[MAT]-[Vct]**

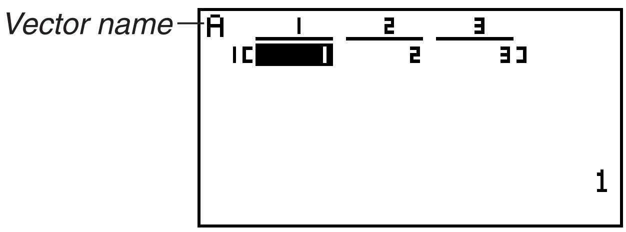
The following shows the format you should use when inputting data to create a vector using the Vct command.

$\begin{bmatrix} a_{11} \\ a_{21} \\ \vdots \\ a_{m1} \end{bmatrix} \rightarrow$ Vct [A to Z] $[a_{11} \ \ a_{12} \ \ \ldots \ \ a_{1n}] \rightarrow$ Vct [A to Z]

Example **To input the following data to Vct A: [1 2 3]**

[SHIFT] [+] ([ ) [SHIFT] [+] ([ ) [1] [,] [2] [,] [3]
[SHIFT] [−] ( ]) [SHIFT] [−] ( ]) [→]
[OPTN] [F2] (MAT) [F6] (▷) [F6] (▷) [F1] (Vct)
[ALPHA] [X,θ,T] (A) [EXE]





- The maximum value of both m and n is 999.
- An error occurs if memory becomes full as you are inputting data.
- You can also use the above format inside a program that inputs vector data.

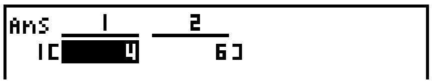
All of the following examples assume that vector data is already stored in memory.

• Vector Addition, Subtraction, and Multiplication **[OPTN]-[MAT]-[Vct]**

Example 1 **To determine the sum of the two vectors shown below (Vct A + Vct B):**

Vct A = [1 2] Vct B = [3 4]

[OPTN] [F2] (MAT) [F6] (▷) [F6] (▷) [F1] (Vct)
[ALPHA] [X,θ,T] (A) [+] [F1] (Vct) [ALPHA] [log] (B) [EXE]



Example 2 **To determine the product of the two vectors shown below (Vct A × Vct B):**

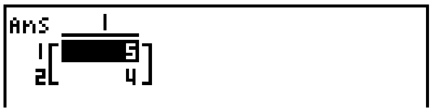
Vct A = [1 2] Vct B = $\begin{bmatrix} \mathbf{3} \\ \mathbf{4} \end{bmatrix}$

[OPTN] [F2] (MAT) [F6] (▷) [F6] (▷) [F1] (Vct)
[ALPHA] [X,θ,T] (A) [×] [F1] (Vct) [ALPHA] [log] (B) [EXE]

Example 3 **To determine the product of the matrix and vector shown below (Mat A × Vct B):**

Mat A = $\begin{bmatrix} \mathbf{1} & \mathbf{2} \\ \mathbf{2} & \mathbf{1} \end{bmatrix}$ **Vct B =** $\begin{bmatrix} \mathbf{1} \\ \mathbf{2} \end{bmatrix}$

[OPTN] [F2] (MAT) [F1] (Mat)
[ALPHA] [X,θ,T] (A) [×] [F6] (▷) [F6] (▷)
[F1] (Vct) [ALPHA] [log] (B) [EXE]



- When performing addition or subtraction of two vectors, they both must have the same dimensions.
- When multiplying Vct A ($1 \times n$) and Vct B ($m \times 1$), n and m must be the same.

• Dot Product **[OPTN]-[MAT]-[DotP]**

Example **To determine the dot product of the two vectors below**

Vct A = [1 2] Vct B = [3 4]

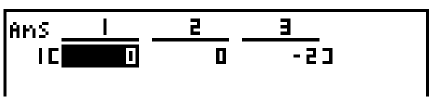
[OPTN] [F2] (MAT) [F6] (▷) [F6] (▷)
[F2] (DotP) [F1] (Vct) [ALPHA] [X,θ,T] (A) [,]
[F1] (Vct) [ALPHA] [log] (B) [)] [EXE]

• Cross Product **[OPTN]-[MAT]-[CrsP]**

Example **To determine the cross product of the two vectors below**

Vct A = [1 2] Vct B = [3 4]

[OPTN] [F2] (MAT) [F6] (▷) [F6] (▷)
[F3] (CrsP) [F1] (Vct) [ALPHA] [X,θ,T] (A) [,]
[F1] (Vct) [ALPHA] [log] (B) [)] [EXE]

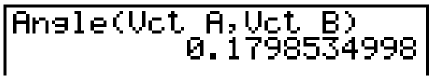


• Angle Formed by Two Vectors **[OPTN]-[MAT]-[Angle]**

Example **To determine the angle formed by two vectors**

Vct A = [1 2] Vct B = [3 4]

[OPTN] [F2](MAT) [F6](▷) [F6](▷)
[F4](Angle) [F1](Vct) [ALPHA] [X,θ,T](A) [,]
[F1](Vct) [ALPHA] [log](B) [)] [EXE]

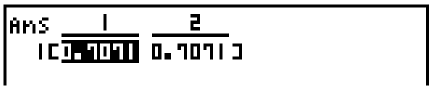


• Unit Vector **[OPTN]-[MAT]-[UntV]**

Example **Determine the unit vector of the vector below**

Vct A = [5 5]

[OPTN] [F2](MAT) [F6](▷) [F6](▷)
[F5](UntV) [F1](Vct) [ALPHA] [X,θ,T](A) [)] [EXE]

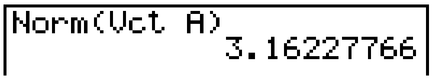


• Vector Norm (Size) **[OPTN]-[MAT]-[Norm]**

Example **To determine the vector norm (size)**

Vct A = [1 3]

[OPTN] [F2](MAT) [F6](▷) [F6](▷) [F6](▷)
[F1](Norm) [F6](▷) [F6](▷) [F6](▷)
[F1](Vct) [ALPHA] [X,θ,T](A) [)] [EXE]



• You can use the "Norm" command to calculate the norm of a matrix.

10. Metric Conversion Calculations

You can convert values from one unit of measurement to another. Measurement units are classified according to the following 11 categories. The indicators in the "Display Name" column show the text that appears in the calculator's function menu.

Display Name	Category	Display Name	Category	Display Name	Category
LENG	Length	TMPR	Temperature	PRES	Pressure
AREA	Area	VELO	Velocity	ENGY	Energy/Work
VLUM	Volume	MASS	Mass	PWR	Power
TIME	Time	FORC	Force/Weight		

You can convert from any unit in a category to any other unit in the same category.

- Attempting to convert from a unit in one category (such as "AREA") to a unit in another category (such as "TIME") results in a Conversion ERROR.
- See the "Unit Conversion Command List" (page 2-58) for information about the units included in each category.

■ Performing a Unit Conversion Calculation **[OPTN]-[CONV]**

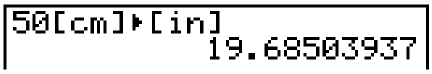
Input the value you are converting from and the conversion commands using the syntax shown below to perform a unit conversion calculation.

{value converting from}{conversion command 1} ► {conversion command 2}

- Use {conversion command 1} to specify the unit being converted from and {conversion command 2} to specify the unit being converted to.
- ► is a command that links the two conversion commands. This command is always available at [F1](►) of the Conversion menu.
- Real numbers or a list that contains real number elements only can be used as the value being converted from. When values being converted from are input into a list (or when list memory is specified), conversion calculation is performed for each element in the list and calculation results are returned in list format (ListAns screen).
- A complex number cannot be used as a value to be converted from. An error occurs if even a single element of a list being used as the value being converted from contains a complex number.

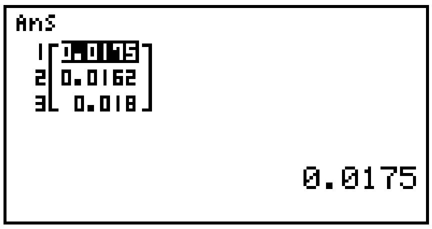
Example 1 **To convert 50cm to inches**

[AC] [5] [0] [OPTN] [F6](▷)[F1](CONV)* [F2](LENG)
[5](cm)[F1](►)[F2](LENG)[▶] [2](in)[EXE]
* fx-7400GIII: [F5](CONV)



Example 2 **To convert {175, 162, 180} square meters to hectares**

[AC] [SHIFT] [×]({) [1] [7] [5] [,] [1] [6] [2] [,]
[1] [8] [0] [SHIFT] [÷](})
[OPTN] [F6](▷)[F1](CONV)* [F3](AREA)[2](m^2)
[F1](►)[F3](AREA)[3](ha)[EXE]
* fx-7400GIII: [F5](CONV)



■ Unit Conversion Command List

Cat.	Display Name	Unit	Cat.	Display Name	Unit
Length	fm	fermi	Volume	cm^3	cubic centimeter
	Å	angstrom		mL	milliliter
	μm	micrometer		L	liter
	mm	millimeter		m^3	cubic meter
	cm	centimeter		in^3	cubic inch
	m	meter		ft^3	cubic foot
	km	kilometer		fl_oz(UK)	ounce
	AU	astronomical unit		fl_oz(US)	fluid ounce (U.S.)
	l.y.	light year		gal(US)	gallon
	pc	parsec		gal(UK)	UK gallon
	Mil	1/1000 inch		pt	pint
	in	inch		qt	quart
	ft	foot		tsp	teaspoon
	yd	yard		tbsp	tablespoon
	fath	fathom		cup	cup
	rd	rod	Time	ns	nanosecond
	mile	mile		μs	microsecond
	n mile	nautical mile		ms	millisecond
Area	cm^2	square centimeter		s	second
	m^2	square meter		min	minute
	ha	hectare		h	hour
	km^2	square kilometer		day	day
	in^2	square inch		week	week
	ft^2	square foot		yr	year
	yd^2	square yard		s-yr	sidereal year
	acre	acre		t-yr	tropical year
	$mile^2$	square mile			

Cat.	Display Name	Unit	Cat.	Display Name	Unit
Temperature	°C	degrees Celsius	Pressure	Pa	Pascal
	K	Kelvin		kPa	Kilo Pascal
	°F	degrees Fahrenheit		mmH$_2$O	millimeter of water
	°R	degrees Rankine		mmHg	millimeter of Mercury
Velocity	m/s	meter per second		atm	atmosphere
	km/h	kilometer per hour		inH$_2$O	inch of water
	knot	knot		inHg	inch of Mercury
	ft/s	foot per second		lbf/in^2	pound per square inch
	mile/h	mile per hour		bar	bar
Mass	u	atomic mass unit		kgf/cm^2	kilogram force per square centimeter
	mg	milligram	Energy/Work	eV	electron Volt
	g	gram		J	Joule
	kg	kilogram		cal$_{th}$	calorie$_{th}$
	mton	metric ton		cal$_{15}$	calorie (15°C)
	oz	avoirdupois ounce		cal$_{IT}$	calorie$_{IT}$
	lb	pound mass		kcal$_{th}$	kilocalorie$_{th}$
	slug	slug		kcal$_{15}$	kilocalorie (15°C)
	ton(short)	ton, short (2000lbm)		kcal$_{IT}$	kilocalorie$_{IT}$
	ton(long)	ton, long (2240lbm)		l-atm	liter atmosphere
Force/Weight	N	newton		kW•h	kilowatt hour
	lbf	pound of force		ft•lbf	foot-pound
	tonf	ton of force		Btu	British thermal unit
	dyne	dyne		erg	erg
	kgf	kilogram of force		kgf•m	kilogram force meter
			Power	W	watt
				cal$_{th}$/s	calorie per second
				hp	horsepower
				ft•lbf/s	foot-pound per second
				Btu/min	British thermal unit per minute

Source: NIST Special Publication 811 (2008)

Chapter 3 List Function

A list is a storage place for multiple data items.
This calculator lets you store up to 26 lists in a single file, and you can store up to six files in memory. Stored lists can be used in arithmetic and statistical calculations, and for graphing.

Element number *Display range* *Cell* *Column*

List name *Sub name* *Row*

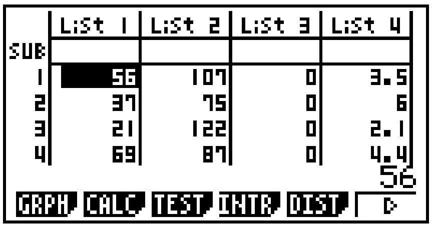
	List 1	List 2	List 3	List 4	List 5	List 26
SUB						
1	56	1	107	3.5	4	0
2	37	2	75	6	0	0
3	21	4	122	2.1	0	0
4	69	8	87	4.4	2	0
5	40	16	298	3	0	0
6	48	32	48	6.8	3	0
7	93	64	338	2	9	0
8	30	128	49	8.7	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮

1. Inputting and Editing a List

When you enter the **STAT** mode, the "List Editor" will appear first. You can use the List Editor to input data into a list and to perform a variety of other list data operations.

• To input values one-by-one

Use the cursor keys to move the highlighting to the list name, sub name or cell you want to select. Note that ⓥ does not move the highlighting to a cell that does not contain a value.



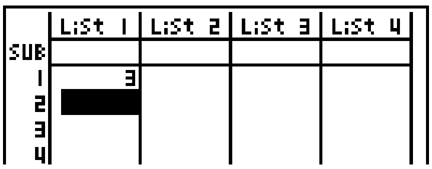
The screen automatically scrolls when the highlighting is located at either edge of the screen.

The following example is performed starting with the highlighting located at Cell 1 of List 1.

1. Input a value and press EXE to store it in the list.

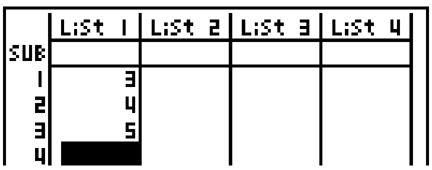
   3 EXE

   • The highlighting automatically moves down to the next cell for input.



2. Input the value 4 in the second cell, and then input the result of 2 + 3 in the next cell.

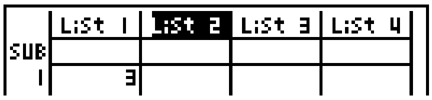
   4 EXE 2 + 3 EXE



• You can also input the result of an expression or a complex number into a cell.
• You can input values up to 999 cells in a single list.

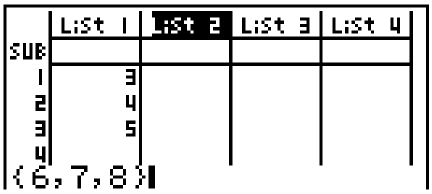
• To batch input a series of values

1. Use the cursor keys to move the highlighting to another list.



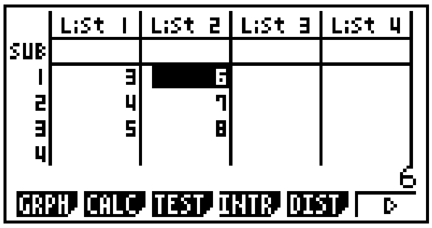
2. Press [SHIFT] [×] ({), and then input the values you want, pressing [,] between each one. Press [SHIFT] [÷] (}) after inputting the final value.

   [SHIFT] [×] ({) [6] [,] [7] [,] [8] [SHIFT] [÷] (})



3. Press [EXE] to store all of the values in your list.

   [EXE]



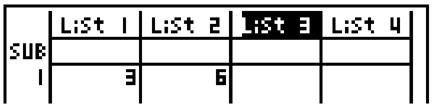
- Remember that a comma separates values, so you should not input a comma after the final value of the set you are inputting.

  Right: {34, 53, 78}

  Wrong: {34, 53, 78,}

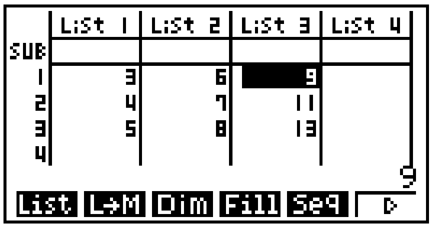
You can also use list names inside of a mathematical expression to input values into another cell. The following example shows how to add the values in each row in List 1 and List 2, and input the result into List 3.

1. Use the cursor keys to move the highlighting to the name of the list where you want the calculation results to be input.



2. Press [OPTN] and input the expression.

   [OPTN] [F1](LIST) [F1](List) [1] [+]
   [OPTN] [F1](LIST) [F1](List) [2] [EXE]



- You can also use [SHIFT] [1](List) in place of [OPTN] [F1](LIST) [F1](List).

■ Editing List Values

• To change a cell value

Use the cursor keys to move the highlighting to the cell whose value you want to change. Input the new value and press [EXE] to replace the old data with the new one.

• To edit the contents of a cell

1. Use the cursor keys to move the highlighting to the cell whose contents you want to edit.
2. Press [F6](▷) [F2](EXE).
3. Make any changes in the data you want.

• To delete a cell

1. Use the cursor keys to move the highlighting to the cell you want to delete.
2. Press F6(▷)F3(DEL) to delete the selected cell and cause everything below it to be shifted up.

• The cell delete operation does not affect cells in other lists. If the data in the list whose cell you delete is somehow related to the data in neighboring lists, deleting a cell can cause related values to become misaligned.

• To delete all cells in a list

Use the following procedure to delete all the data in a list.

1. Use the cursor key to move the highlighting to any cell of the list whose data you want to delete.
2. Pressing F6(▷)F4(DEL • A) causes a confirmation message to appear.
3. Press F1(Yes) to delete all the cells in the selected list or F6(No) to abort the delete operation without deleting anything.

• To insert a new cell

1. Use the cursor keys to move the highlighting to the location where you want to insert the new cell.
2. Press F6(▷)F5(INS) to insert a new cell, which contains a value of 0, causing everything below it to be shifted down.

• The cell insert operation does not affect cells in other lists. If the data in the list where you insert a cell is somehow related to the data in neighboring lists, inserting a cell can cause related values to become misaligned.

■ Naming a List

You can assign List 1 through List 26 “sub names” of up to eight bytes each.

• To name a list

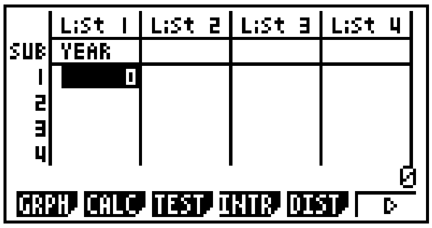
1. On the Setup screen, highlight “Sub Name” and then press F1(On)EXIT.
2. Use the cursor keys to move the highlighting to the SUB cell of the list you want to name.

3. Type in the name and then press [EXE].

- To type in a name using alpha characters, press [SHIFT] [ALPHA] to enter the ALPHA-LOCK mode.

Example: YEAR

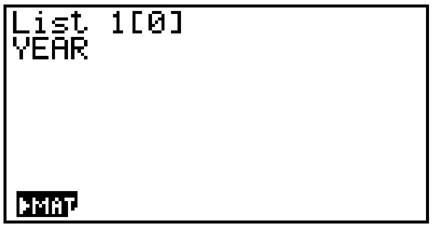
[–] (Y) [cos] (E) [X,θ,T] (A) [6] (R) [EXE]



- The following operation displays a sub name in the **RUN • MAT** (or **RUN**) mode.

[SHIFT] [1] (List) n [SHIFT] [+] ([ ) [0] [SHIFT] [–] ( ]) [EXE]

(n = list number from 1 to 26)



- Though you can input up to 8 bytes for the sub name, only the characters that can fit within the List Editor cell will be displayed.
- The List Editor SUB cell is not displayed when “Off” is selected for “Sub Name” on the Setup screen.

■ Sorting List Values

You can sort lists into either ascending or descending order. The highlighting can be located in any cell of the list.

• To sort a single list

Ascending order

1. While the lists are on the screen, press [F6] (▷) [F1] (TOOL) [F1] (SRT • A).
2. The prompt “How Many Lists?:” appears to ask how many lists you want to sort. Here we will input 1 to indicate we want to sort only one list.

   [1] [EXE]

3. In response to the “Select List List No:” prompt, input the number of the list you want to sort.

   [1] [EXE]

Descending order

Use the same procedure as that for the ascending order sort. The only difference is that you should press [F2] (SRT • D) in place of [F1] (SRT • A).

• To sort multiple lists

You can link multiple lists together for a sort so that all of their cells are rearranged in accordance with the sorting of a base list. The base list is sorted into either ascending order or descending order, while the cells of the linked lists are arranged so that the relative relationship of all the rows is maintained.

Ascending order

1. While the lists are on the screen, press F6(▷)F1(TOOL)F1(SRT • A).
2. The prompt "How Many Lists?:" appears to ask how many lists you want to sort. Here we will sort one base list linked to one other list, so we should input 2.

   2 EXE

3. In response to the "Select Base List List No:" prompt, input the number of the list you want to sort into ascending order. Here we will specify List 1.

   1 EXE

4. In response to the "Select Second List List No:" prompt, input the number of the list you want to link to the base list. Here we will specify List 2.

   2 EXE

Descending order

Use the same procedure as that for the ascending order sort. The only difference is that you should press F2(SRT • D) in place of F1(SRT • A).

- You can specify a value from 1 to 6 as the number of lists for sorting.
- If you specify a list more than once for a single sort operation, an error occurs.

  An error also occurs if lists specified for sorting do not have the same number of values (rows).

2. Manipulating List Data

List data can be used in arithmetic and function calculations. In addition, various list data manipulation functions make manipulation of list data quick and easy.

You can use list data manipulation functions in the **RUN • MAT** (or **RUN**), **STAT**, **TABLE**, **EQUA** and **PRGM** modes.

■ Accessing the List Data Manipulation Function Menu

All of the following examples are performed after entering the **RUN • MAT** (or **RUN**) mode.

Press OPTN and then F1(LIST) to display the list data manipulation menu, which contains the following items.

- {**List**}/{**L→M**}/{**Dim**}/{**Fill**}/{**Seq**}/{**Min**}/{**Max**}/{**Mean**}/{**Med**}/{**Aug**}/{**Sum**}/{**Prod**}/{**Cuml**}/{**%**}/{**⊿**}

Note that all closing parentheses at the end of the following operations can be omitted.

• To transfer list contents to Matrix Answer Memory **[OPTN]-[LIST]-[L→M]**

(Not included on the fx-7400GIII)

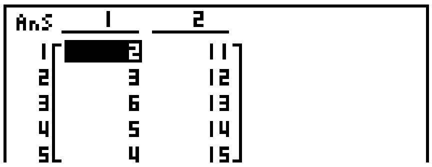
OPTN F1(LIST)F2(L→M)F1(List) <list number 1-26> , F1(List) <list number 1-26> ...
, F1(List) <list number 1-26>) EXE

- You can skip input F1(List) in the part of the above operation.
- All the lists must contain the same number of data items. If they don't, an error occurs.

  Example: List → Mat (1, 2) EXE

Example **To transfer the contents of List 1 (2, 3, 6, 5, 4) to column 1, and the contents of List 2 (11, 12, 13, 14, 15) to column 2 of Matrix Answer Memory**

AC OPTN F1(LIST) F2(L→M)
F1(List) 1 , F1(List) 2) EXE



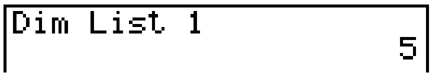
• To count the number of data items in a list [OPTN]-[LIST]-[Dim]

OPTN F1(LIST) F3(Dim) F1(List) <list number 1 - 26> EXE

• The number of cells a list contains is its "dimension."

Example **To count the number of values in List 1 (36, 16, 58, 46, 56)**

AC OPTN F1(LIST) F3(Dim)
F1(List) 1 EXE



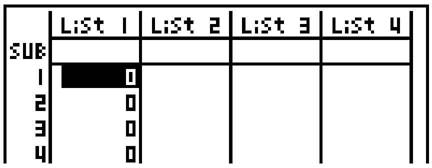
• To create a list by specifying the number of data items [OPTN]-[LIST]-[Dim]

Use the following procedure to specify the number of data in the assignment statement and create a list.

<number of data n> → OPTN F1(LIST) F3(Dim) F1(List) <list number 1 - 26> EXE (n = 1 - 999)

Example **To create five data items (each of which contains 0) in List 1**

AC 5 → OPTN F1(LIST) F3(Dim)
F1(List) 1 EXE



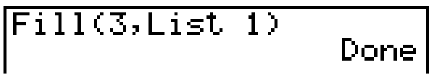
You can view the newly created list by entering the **STAT** mode.

• To replace all data items with the same value [OPTN]-[LIST]-[Fill]

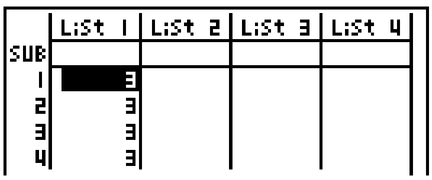
OPTN F1(LIST) F4(Fill) <value> , F1(List) <list number 1 - 26>) EXE

Example **To replace all data items in List 1 with the number 3**

AC OPTN F1(LIST) F4(Fill)
3 , F1(List) 1) EXE



The following shows the new contents of List 1.



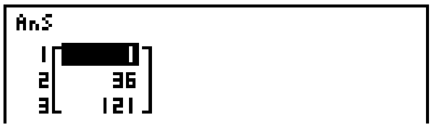
• To generate a sequence of numbers [OPTN]-[LIST]-[Seq]

[OPTN] [F1](LIST) [F5](Seq) <expression> [,] <variable name> [,] <start value> [,] <end value> [,] <increment> [)] [EXE]

• The result of this operation is stored in ListAns Memory.

Example **To input the number sequence 1^2, 6^2, 11^2, into a list, using the function $f(x) = X^2$. Use a starting value of 1, an ending value of 11, and an increment of 5.**

[AC] [OPTN] [F1](LIST) [F5](Seq) [X,θ,T] [x^2] [,]
[X,θ,T] [,] [1] [,] [1] [1] [,] [5] [)] [EXE]



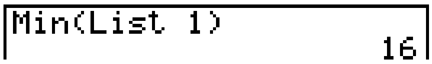
Specifying an ending value of 12, 13, 14, or 15 produces the same result as shown above since they are less than the value produced by the next increment (16).

• To find the minimum value in a list [OPTN]-[LIST]-[Min]

[OPTN] [F1](LIST) [F6](▷) [F1](Min) [F6](▷) [F6](▷) [F1](List) <list number 1 - 26> [)] [EXE]

Example **To find the minimum value in List 1 (36, 16, 58, 46, 56)**

[AC] [OPTN] [F1](LIST) [F6](▷) [F1](Min)
[F6](▷) [F6](▷) [F1](List) [1] [)] [EXE]



• To find which of two lists contains the greatest value [OPTN]-[LIST]-[Max]

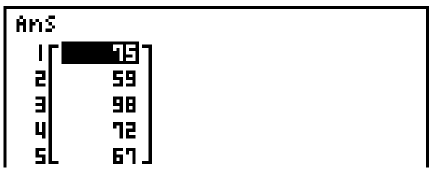
[OPTN] [F1](LIST) [F6](▷) [F2](Max) [F6](▷) [F6](▷) [F1](List) <list number 1 - 26> [,] [F1](List) <list number 1 - 26> [)] [EXE]

• The two lists must contain the same number of data items. If they don't, an error occurs.

• The result of this operation is stored in ListAns Memory.

Example **To find whether List 1 (75, 16, 98, 46, 56) or List 2 (35, 59, 58, 72, 67) contains the greatest value**

[OPTN] [F1](LIST) [F6](▷) [F2](Max)
[F6](▷) [F6](▷) [F1](List) [1] [,]
[F1](List) [2] [)] [EXE]

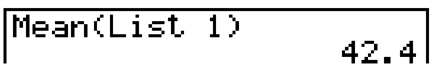


• To calculate the mean of data items [OPTN]-[LIST]-[Mean]

[OPTN] [F1](LIST) [F6](▷) [F3](Mean) [F6](▷) [F6](▷) [F1](List) <list number 1 - 26> [)] [EXE]

Example **To calculate the mean of data items in List 1 (36, 16, 58, 46, 56)**

[AC] [OPTN] [F1](LIST) [F6](▷) [F3](Mean)
[F6](▷) [F6](▷) [F1](List) [1] [)] [EXE]



• To calculate the median of data items of specified frequency

[OPTN]-[LIST]-[Med]

This procedure uses two lists: one that contains values and one that indicates the frequency (number of occurrences) of each value. The frequency of the data in Cell 1 of the first list is indicated by the value in Cell 1 of the second list, etc.

• The two lists must contain the same number of data items. If they don't, an error occurs.

[OPTN] [F1](LIST) [F6](▷) [F4](Med) [F6](▷) [F6](▷) [F1](List) <list number 1 - 26 (data)> [,] [F1](List) <list number 1 - 26 (frequency)> [)] [EXE]

Example **To calculate the median of values in List 1 (36, 16, 58, 46, 56), whose frequency is indicated by List 2 (75, 89, 98, 72, 67)**

[AC] [OPTN] [F1](LIST) [F6](▷) [F4](Med)
[F6](▷) [F6](▷) [F1](List) [1] [,]
[F1](List) [2] [)] [EXE]

• To combine lists

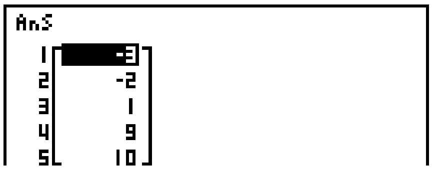
[OPTN]-[LIST]-[Aug]

• You can combine two different lists into a single list. The result of a list combination operation is stored in ListAns memory.

[OPTN] [F1](LIST) [F6](▷) [F5](Aug) [F6](▷) [F6](▷) [F1](List) <list number 1 - 26> [,] [F1](List) <list number 1 - 26> [)] [EXE]

Example **To combine the List 1 (–3, –2) and List 2 (1, 9, 10)**

[AC] [OPTN] [F1](LIST) [F6](▷) [F5](Aug)
[F6](▷) [F6](▷) [F1](List) [1] [,]
[F1](List) [2] [)] [EXE]



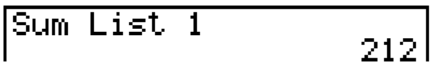
• To calculate the sum of data items in a list

[OPTN]-[LIST]-[Sum]

[OPTN] [F1](LIST) [F6](▷) [F6](▷) [F1](Sum) [F6](▷) [F1](List) <list number 1 - 26> [EXE]

Example **To calculate the sum of data items in List 1 (36, 16, 58, 46, 56)**

[AC] [OPTN] [F1](LIST) [F6](▷) [F6](▷) [F1](Sum)
[F6](▷) [F1](List) [1] [EXE]



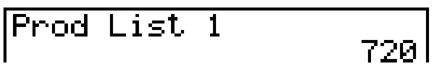
• To calculate the product of values in a list

[OPTN]-[LIST]-[Prod]

[OPTN] [F1](LIST) [F6](▷) [F6](▷) [F2](Prod) [F6](▷) [F1](List) <list number 1 - 26> [EXE]

Example **To calculate the product of values in List 1 (2, 3, 6, 5, 4)**

[AC] [OPTN] [F1](LIST) [F6](▷) [F6](▷) [F2](Prod)
[F6](▷) [F1](List) [1] [EXE]



• To calculate the cumulative frequency of each data item [OPTN]-[LIST]-[Cuml]

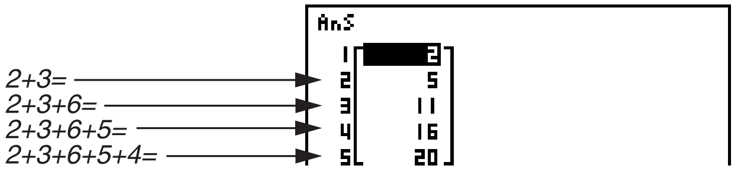
OPTN F1(LIST) F6(▷) F6(▷) F3(Cuml) F6(▷) F1(List) <list number 1 - 26> EXE

- The result of this operation is stored in ListAns Memory.

Example **To calculate the cumulative frequency of each data item in List 1 (2, 3, 6, 5, 4)**

AC OPTN F1(LIST) F6(▷) F6(▷) F3(Cuml)

F6(▷) F1(List) 1 EXE



• To calculate the percentage represented by each data item [OPTN]-[LIST]-[%]

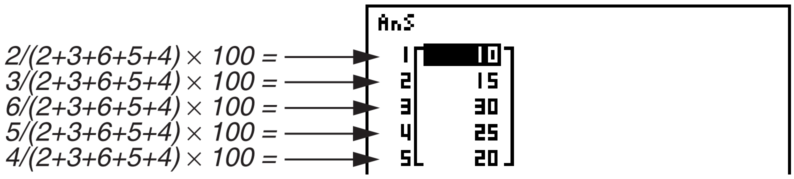
OPTN F1(LIST) F6(▷) F6(▷) F4(%) F6(▷) F1(List) <list number 1 - 26> EXE

- The above operation calculates what percentage of the list total is represented by each data item.
- The result of this operation is stored in ListAns Memory.

Example **To calculate the percentage represented by each data item in List 1 (2, 3, 6, 5, 4)**

AC OPTN F1(LIST) F6(▷) F6(▷) F4(%)

F6(▷) F1(List) 1 EXE



• To calculate the differences between neighboring data inside a list [OPTN]-[LIST]-[⊿]

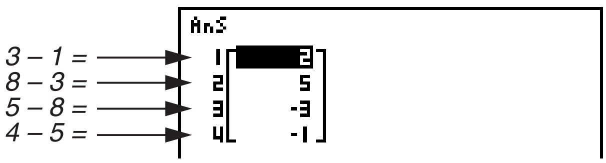
OPTN F1(LIST) F6(▷) F6(▷) F5(⊿) <list number 1 - 26> EXE

- The result of this operation is stored in ListAns Memory.

Example **To calculate the difference between the data items in List 1 (1, 3, 8, 5, 4)**

AC OPTN F1(LIST) F6(▷) F6(▷) F5(⊿)

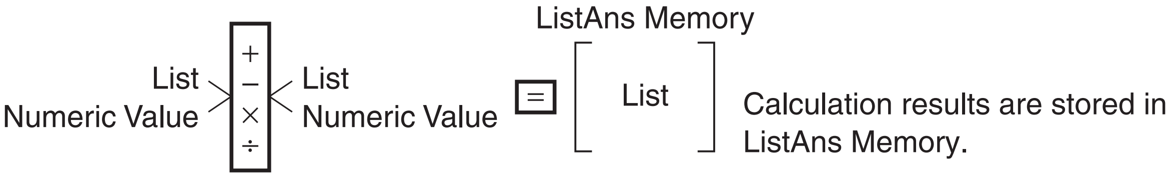
1 EXE



- You can specify the storage location in list memory for a calculation result produced by a list calculation whose result is stored in ListAns memory. For example, specifying "⊿List 1 → List 2" will store the result of ⊿List 1 in List 2.
- The number of cells in the new ⊿List is one less than the number of cells in the original list.
- An error occurs if you execute ⊿List for a list that has no data or only one data item.

3. Arithmetic Calculations Using Lists

You can perform arithmetic calculations using two lists or one list and a numeric value.



■ Error Messages

- A calculation involving two lists performs the operation between corresponding cells. Because of this, an error occurs if the two lists do not have the same number of values (which means they have different "dimensions").
- An error occurs whenever an operation involving any two cells generates a mathematical error.

■ Inputting a List into a Calculation

There are three methods you can use to input a list into a calculation.

- Specification of the list number of a list created with List Editor.
- Specification of the sub name of a list created with List Editor.
- Direct input of a list of values.

● To specify the list number of a list created with List Editor

1. In the **RUN • MAT** (or **RUN**) mode, perform the following key operation.

   AC OPTN F1(LIST) F1(List)

   - Enter the "List" command.

2. Enter the list number (integer from 1 to 26) you want to specify.

● To specify the sub name of a list created with List Editor

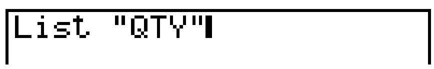
1. In the **RUN • MAT** (or **RUN**) mode, perform the following key operation.

   AC OPTN F1(LIST) F1(List)

   - Enter the "List" command.

2. Enter the sub name of the list you want to specify, enclosed in double quotes (" ").

   Example: "QTY"



• To directly input a list of values

You can also directly input a list of values using {, }, and ,.

Example **To input the list: 56, 82, 64**

SHIFT × ({) 5 6 , 8 2 ,
6 4 SHIFT ÷ (})

```
{56,82,64}
```

• To assign the contents of one list to another list

Use → to assign the contents of one list to another list.

Example **To assign the contents of List 3 (41, 65, 22) to List 1**

OPTN F1 (LIST) F1 (List) 3 → F1 (List) 1 EXE

In place of F1 (LIST) F1 (List) 3 operation in the above procedure, you could input SHIFT × ({) 4 1 , 6 5 , 2 2 SHIFT ÷ (}).

• To recall the value in a specific list cell

You can recall the value in a specific list cell and use it in a calculation. Specify the cell number by enclosing it inside square brackets.

Example **To calculate the sine of the value stored in Cell 3 of List 2**

sin OPTN F1 (LIST) F1 (List) 2 SHIFT + ([ ) 3 SHIFT − ( ]) EXE

• To input a value into a specific list cell

You can input a value into a specific list cell inside a list. When you do, the value that was previously stored in the cell is replaced with the new value you input.

Example **To input the value 25 into Cell 2 of List 3**

2 5 → OPTN F1 (LIST) F1 (List) 3 SHIFT + ([ ) 2 SHIFT − ( ]) EXE

■ Recalling List Contents

Example **To recall the contents of List 1**

OPTN F1 (LIST) F1 (List) 1 EXE

- The above operation displays the contents of the list you specify and also stores them in ListAns Memory. You can then use the ListAns Memory contents in a calculation.

• To use list contents in ListAns Memory in a calculation

Example **To multiply the list contents in ListAns Memory by 36**

OPTN F1(LIST) F1(List) SHIFT (–)(Ans) × 3 6 EXE

- The operation OPTN F1(LIST) F1(List) SHIFT (–)(Ans) recalls ListAns Memory contents.
- This operation replaces current ListAns Memory contents with the result of the above calculation.

■ Graphing a Function Using a List

When using the graphing functions of this calculator, you can input a function such as Y1 = List 1X. If List 1 contains the values 1, 2, 3, this function will produces three graphs: Y = X, Y = 2X, Y = 3X.

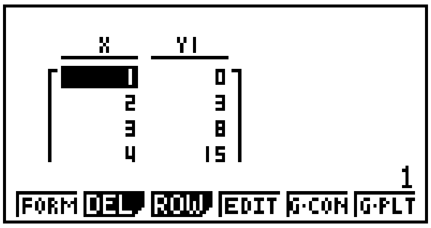
There are certain limitations on using lists with graphing functions.

■ Inputting Scientific Calculations into a List

You can use the numeric table generation functions in the **TABLE** mode to input values that result from certain scientific function calculations into a list. To do this, first generate a table and then use the list copy function to copy the values from the table to the list.

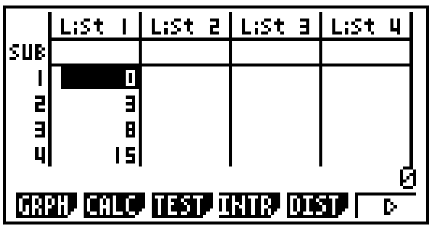
Example **To use the TABLE mode to create a number table for the formula (Y1 = x^2 –1), and then copy the table to List 1 in the STAT mode**

1. In the **TABLE** mode, input the formula Y1 = x^2 –1.
2. Create the number table.



3. Use ▶ to move the highlighting to the Y1 column.
4. Press OPTN F1(LMEM).

5. Press 1 EXE.
6. Enter the **STAT** mode to confirm that **TABLE** mode column Y1 has been copied to List 1.



■ Performing Scientific Function Calculations Using a List

Lists can be used just as numeric values are in scientific function calculations. When the calculation produces a list as a result, the list is stored in ListAns Memory.

Example **To use List 3** $\begin{bmatrix} 41 \\ 65 \\ 22 \end{bmatrix}$ **to perform sin (List 3)**

Use radians as the angle unit.

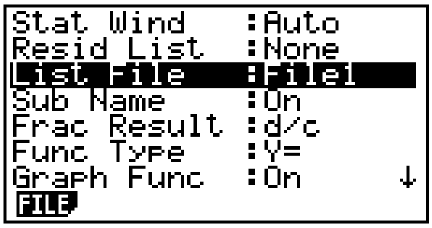
[sin] [OPTN] [F1](LIST) [F1](List) [3] [EXE]

4. Switching Between List Files

You can store up to 26 lists (List 1 to List 26) in each file (File 1 to File 6). A simple operation lets you switch between list files.

• To switch between list files

1. From the Main Menu, enter the **STAT** mode.
   Press [SHIFT] [MENU](SET UP) to display the **STAT** mode Setup screen.



2. Use [▼] to highlight "List File".
3. Press [F1](FILE) and then input the number of the list file you want to use.

Example **To select File 3**

[F1](FILE) [3]

[EXE]

All subsequent list operations are applied to the lists contained in the file you select (List File 3 in the above example).

5. Using CSV Files

You can import the contents of a CSV file stored with this calculator or transferred from a computer into the List Editor. You also can save the contents of all the list data in the List Editor as a CSV file. These operations are performed using the CSV function menu, which appears when you press F6(▷)F6(▷)F1(CSV) while the List Editor is on the display.

LOAD SV·AS SET

■ Import CSV File Requirements

A CSV file that has been output from the List Editor, Matrix Editor (page 2-39), or Spreadsheet (page 9-3), or a CSV file transferred from a computer to storage memory can be used for import. The following types of CSV files are supported for import.

- A CSV file that uses the comma (,) or semi-colon (;) as its delimiter, and the period (.) or comma (,) as its decimal point. A CSV file that uses the tab as its delimiter is not supported.
- CR, LF and CRLF are supported for the line break code.
- When importing a CSV file to the calculator, if the data in Line 1 of each column of the file (or Line 1 of Column 1 of the file) contains double quotation marks (") or a single quotation mark ('), Line 1 of all of the columns of the CSV file will be ignored, and data will be input starting from Line 2.

For information about transferring files from a computer to the calculator, see “Chapter 13 Data Communication”.

■ Transferring Data between Lists and CSV Files

• To import the contents of a CSV file to the List Editor

1. Prepare the CSV file you want to import.
   - See “Import CSV File Requirements” described above.
2. While the List Editor is on the display, press F6(▷)F6(▷)F1(CSV) to display the CSV function menu.
3. What you should do next depends on the type of CSV file import operation you want to perform.

To start import from a specific row:	To overwrite the entire contents of the List Editor:
Use the cursor keys to move the highlighting to the row from which you want to start importing data and then press F1(LOAD)F1(LIST).	Press F1(LOAD)F2(FILE).

4. On the select file dialog box that appears, use ⓐ and ⓥ to move the highlighting to the file you want to import and then press [EXE].
   - This imports the contents of the CSV file you specified to the List Editor.
   - If you pressed [F1](LOAD)[F1](LIST) in step 3, import starts from the row where the highlighted cell is located, overwriting List Editor rows only with the same number of rows contained in the CSV file.

Examples

List Editor Original Content

List 1	List 2	List 3	List 4	List 5
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4

Highlighting

Import CSV File Data

20	20	20
30	30	30
40	40	40

List Editor Content following Import

List 1	List 2	List 3	List 4	List 5
1	20	20	20	1
2	30	30	30	2
3	40	40	40	3
4				4

Important!

Attempting to import the following types of CSV files will result in an error.

- A CSV file that includes data that cannot be converted. In this case, an error message will appear showing the location in the CSV file (Example: row 2, column 3) where the data that cannot be converted is located.
- A CSV file with more than 26 columns or 999 rows. In this case, an "Invalid Data Size" error will occur.

• To save the contents of all the list data in the List Editor as a single CSV file

1. While the List Editor is on the display, press F6(▷)F6(▷)F1(CSV) to display the CSV function menu.
2. Press F2(SV•AS).
   - This displays a folder selection screen.
3. Select the folder where you want to save the CSV file.
   - To store the CSV file in the root directory, highlight “ROOT”.
   - To store the CSV file in a folder, use ⏶ and ⏷ to move the highlighting to the desired folder and then press F1(OPEN).
4. Press F1(SV•AS).
5. Input up to eight characters for the file name and then press EXE.

Important!

- The sub name line of the List Editor is not saved in the CSV file.
- When saving list data to a CSV file, some data is converted as described below.
  - Complex number data: Only the real number part is extracted.
  - Fraction data: Converted to calculation line format (Example: 2⌟3⌟4 → =2+3/4)
  - $\sqrt{\ }$ and π data: Converted to a decimal value (Example: $\sqrt{3}$ → 1.732050808)

■ Specifying the CSV File Delimiter Symbol and Decimal Point

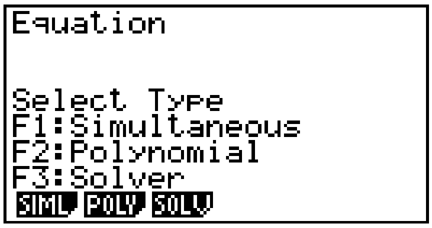
When importing a CSV file that has been transferred from a computer to the calculator, specify the delimiter symbol and decimal point in accordance with the settings you specified on the application when outputting the CSV file. The comma (,) or semi-colon (;) can be specified for the delimiter, while the period (.) or comma (,) can be specified as the decimal point.

• To specify the CSV file delimiter symbol and decimal point

1. While the List Editor is on the display, press F6(▷)F6(▷)F1(CSV) to display the CSV function menu.
2. Press F3(SET).
   - This displays the CSV format setting screen.
3. Use the ⏶ and ⏷ keys to move the highlighting to “CSV Separator” and then press F1(,) or F2(;).
4. Use the ⏶ and ⏷ keys to move the highlighting to “CSV Decimal Symbol” and then press F1(.) or F2(,).
   - If you specified F1(,) in step 3, you will not be able to specify F2(,) here.
5. After the setting is the way you want, press EXIT.

Chapter 4 Equation Calculations

From the Main Menu, enter the **EQUA** mode.



- {**SIML**} ... {linear equation with 2 to 6 unknowns}
- {**POLY**} ... {degree 2 to 6 equation}
- {**SOLV**} ... {solve calculation}

1. Simultaneous Linear Equations

You can solve simultaneous linear equations with two to six unknowns.

- Simultaneous Linear Equation with Two Unknowns:

$$a_1x + b_1y = c_1$$
$$a_2x + b_2y = c_2$$

- Simultaneous Linear Equation with Three Unknowns:

$$a_1x + b_1y + c_1z = d_1$$
$$a_2x + b_2y + c_2z = d_2$$
$$a_3x + b_3y + c_3z = d_3$$
$$\vdots$$

1. From the Main Menu, enter the **EQUA** mode.
2. Select the SIML (Simultaneous) mode, and specify the number of unknowns (variables). You can specify from 2 to 6 unknowns.
3. Sequentially input the coefficients.
   - The cell that is currently selected for input is highlighted. Each time you input a coefficient, the highlighting shifts in the sequence:

     $a_1 \rightarrow b_1 \rightarrow c_1 \rightarrow \dots\ a_n \rightarrow b_n \rightarrow c_n \rightarrow$ (n = 2 to 6)
   - You can also input fractions and values assigned to variables as coefficients.
   - You can cancel the value you are inputting for the current coefficient by pressing EXIT at any time before you press EXE to store the coefficient value. This returns to the coefficient to what it was before you input anything. You can then input another value if you want.
   - To change the value of a coefficient that you already stored by pressing EXE, move the cursor to the coefficient you want to edit. Next, input the value you want to change to.
   - Pressing F3 (CLR) clears all coefficients to zero.
4. Solve the equations.

Example **To solve the following simultaneous linear equations for x, y, and z**

$$\begin{aligned} 4x + y - 2z &= -1 \\ x + 6y + 3z &= 1 \\ -5x + 4y + z &= -7 \end{aligned}$$

① MENU EQUA

② F1(SIML)

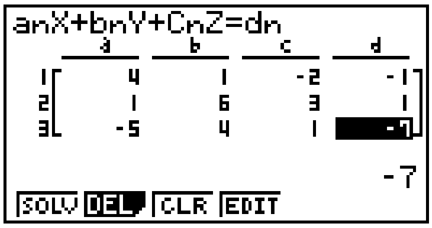
F2(3)

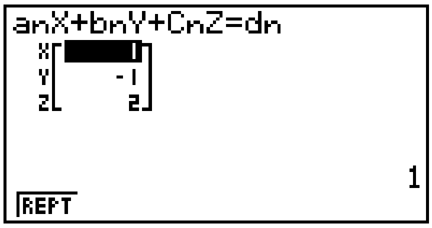
③ 4 EXE 1 EXE (−) 2 EXE (−) 1 EXE

1 EXE 6 EXE 3 EXE 1 EXE

(−) 5 EXE 4 EXE 1 EXE (−) 7 EXE

④ F1(SOLV)





- Internal calculations are performed using a 15-digit mantissa, but results are displayed using a 10-digit mantissa and a 2-digit exponent.
- Simultaneous linear equations are solved by inverting the matrix containing the coefficients of the equations. For example, the following shows the solution (x, y, z) of a simultaneous linear equation with three unknowns.

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix}^{-1} \begin{bmatrix} d_1 \\ d_2 \\ d_3 \end{bmatrix}$$

  Because of this, precision is reduced as the value of the determinant approaches zero. Also, simultaneous equations with three or more unknowns may take a very long time to solve.
- An error occurs if the calculator is unable to find a solution.
- After calculation is complete, you can press F1(REPT), change coefficient values, and then re-calculate.

2. High-order Equations from 2nd to 6th Degree

Your calculator can be used to solve high-order equations from 2nd to 6th degree.

- Quadratic Equation: $ax^2 + bx + c = 0$ ($a \neq 0$)
- Cubic Equation: $ax^3 + bx^2 + cx + d = 0$ ($a \neq 0$)
- Quartic Equation: $ax^4 + bx^3 + cx^2 + dx + e = 0$ ($a \neq 0$)

⋮

1. From the Main Menu, enter the **EQUA** mode.
2. Select the POLY (Polynomial) mode, and specify the degree of the equation.

   You can specify a degree 2 to 6.
3. Sequentially input the coefficients.
   - The cell that is currently selected for input is highlighted. Each time you input a coefficient, the highlighting shifts in the sequence:

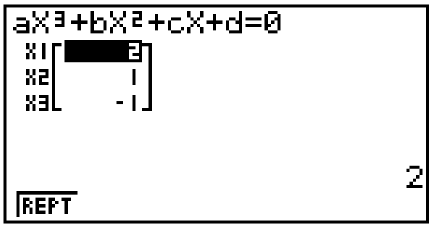
     $a \rightarrow b \rightarrow c \rightarrow \dots$
   - You can also input fractions and values assigned to variables as coefficients.
   - You can cancel the value you are inputting for the current coefficient by pressing EXIT at any time before you press EXE to store the coefficient value. This returns to the coefficient to what it was before you input anything. You can then input another value if you want.

- To change the value of a coefficient that you already stored by pressing [EXE], move the cursor to the coefficient you want to edit. Next, input the value you want to change to.
- Pressing [F3](CLR) clears all coefficients to zero.

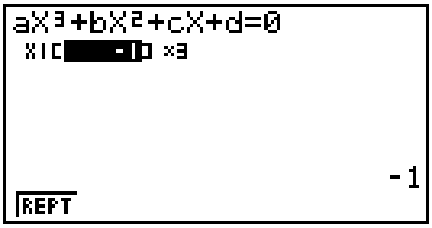
4. Solve the equations.

Example **To solve the cubic equation (Angle unit = Rad)**
$\boldsymbol{x^3 - 2x^2 - x + 2 = 0}$

① [MENU] EQUA
② [F2](POLY)
[F2](3)
③ [1] [EXE] [(−)] [2] [EXE] [(−)] [1] [EXE] [2] [EXE]
④ [F1](SOLV)

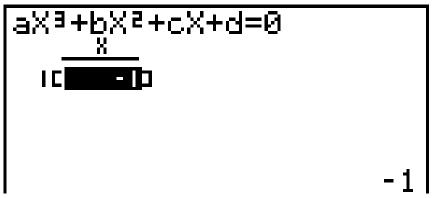


Multiple Solutions (Example: $x^3 + 3x^2 + 3x + 1 = 0$)

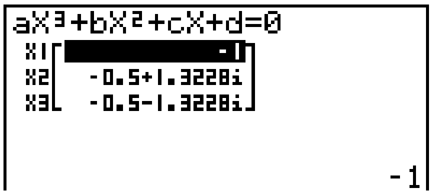


Complex Number Solution (Example: $x^3 + 2x^2 + 3x + 2 = 0$)

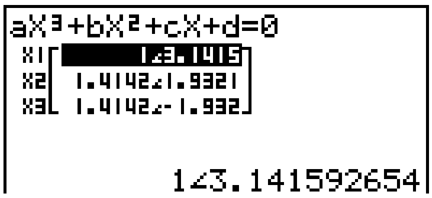
Complex Mode: Real (page 1-32)



Complex Mode: $a+b\boldsymbol{i}$



Complex Mode: $r\angle\theta$



- Internal calculations are performed using a 15-digit mantissa, but results are displayed using a 10-digit mantissa and a 2-digit exponent.
- It may take considerable time for the calculation result of a high-order equation of 3rd degree or higher to appear on the display.
- An error occurs if the calculator is unable to find a solution.
- High-order equation calculations may not produce accurate results when the equation has multiple solutions.
- After calculation is complete, you can press [F1](REPT), change coefficient values, and then re-calculate.

3. Solve Calculations

The Solve Calculation mode lets you determine the value of any variable in a formula without having to solve the equation.

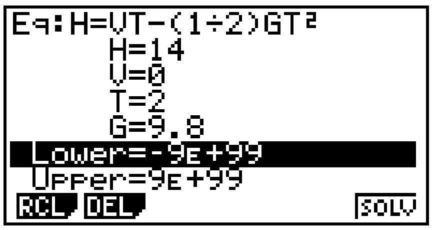
1. From the Main Menu, enter the **EQUA** mode.
2. Select the SOLV (Solver) mode, and input the equation as it is written.
   - If you do not input an equals sign, the calculator assumes that the expression is to the left of the equals sign, and there is a zero to the right.
   - An error occurs if you input more than one equals sign.
3. In the table of variables that appears on the display, input values for each variable.
   - You can also specify values for Upper and Lower to define the upper and lower limits of the range of solutions.
   - An error occurs if the solution falls outside the range you specify.
4. Select the variable for which you want to solve to obtain the solution.
   "Lft" and "Rgt" indicate the left and right sides that are calculated using the solution.*1

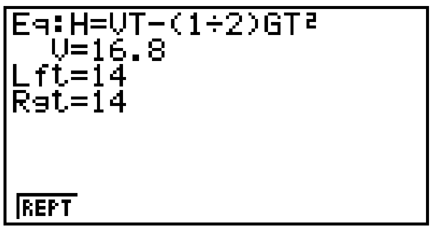
*1 Solutions are approximated using Newton's method. Lft and Rgt values are displayed for confirmation, because Newton's method may produce results that are the real solution. The closer the difference between the Lft and Rgt values is to zero, the lower degree of error in the result.

Example **An object thrown into the air at initial velocity V takes time T to reach height H. Use the following formula to solve for initial velocity V when H = 14 (meters), T = 2 (seconds) and gravitational acceleration is G = 9.8 (m/s^2).**
$H = VT - 1/2\ GT^2$

① [MENU] EQUA
② [F3](SOLV)
[ALPHA] [S↔D]*(H) [SHIFT] [.] (=) [ALPHA] [2] (V) [ALPHA] [÷] (T) [−]
[(] [1] [÷] [2] [)] [ALPHA] [▭]**(G) [ALPHA] [÷] (T) [x^2] [EXE]
③ [1] [4] [EXE] (H = 14)
[0] [EXE] (V = 0)
[2] [EXE] (T = 2)
[9] [.] [8] [EXE] (G = 9.8)
④ Press [▲] [▲] [▲] to highlight V = 0, and then press [F6](SOLV).

* fx-7400GIII: [F↔D]
** fx-7400GIII: [a b/c]





- The message "Retry" appears on the display when the calculator judges that convergence is not sufficient for the displayed results.
- A Solve operation will produce a single solution. Use POLY when you want to obtain multiple solutions for a high-order equation (such as $ax^2 + bx + c = 0$).

Chapter 5 Graphing

Select the icon in the Main Menu that suits the type of graph you want to draw or the type of table you want to generate.

- **GRAPH** … General function graphing
- **RUN•MAT** (or **RUN**) … Manual graphing (pages 5-12 to 5-16)
- **TABLE** … Number table generation (pages 5-16 to 5-20)
- **DYNA*** … Dynamic graphing (pages 5-21 to 5-23)
- **RECUR*** … Recursion graphing or number table generation (pages 5-23 to 5-27)
- **CONICS*** … Conic section graphing (page 5-28)

* Not included on the fx-7400GIII.

1. Sample Graphs

■ How to draw a simple graph (1)

To draw a graph, simply input the applicable function.

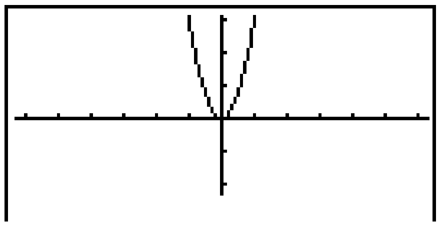
1. From the Main Menu, enter the **GRAPH** mode.
2. Input the function you want to graph.
   Here you would use the V-Window to specify the range and other parameters of the graph. See page 5-3.
3. Draw the graph.

Example **To graph $y = 3x^2$**

① MENU GRAPH

② 3 X,θ,T x^2 EXE

③ F6(DRAW) (or EXE)



- Press AC to return to the screen in step 2 (Graph relation list). After drawing a graph, you can toggle between the Graph relation list and graph screen by pressing SHIFT F6(G↔T).

■ How to draw a simple graph (2)

You can store up to 20 functions in memory and then select the one you want for graphing.

1. From the Main Menu, enter the **GRAPH** mode.
2. Specify the function type and input the function whose graph you want to draw.
   You can use the **GRAPH** mode to draw a graph for the following types of expressions: rectangular coordinate expression (Y=$f(x)$), polar coordinate expression, parametric function, rectangular coordinate expression (X=$f(y)$), inequality.

F3(TYPE) F1(Y=) ... rectangular coordinates (Y=$f(x)$ type)
F2(r=) ... polar coordinates
F3(Parm) ... parametric function
F4(X=) ... rectangular coordinates (X=$f(y)$ type)

F5(CONV)F1(►Y=) to F5(►Y≤)

F6(▷)F1(►X=) to F5(►X≤) ... changes the function type

F6(▷)F1(Y>) to F4(Y≤) .... Y inequality on left side

F6(▷)F6(▷)F1(X>) to F4(X≤) .... X inequality on left side

Repeat this step as many times as required to input all of the functions you want.

Next you should specify which of the functions among those that are stored in memory you want to graph (see page 5-6). If you do not select specific functions here, the graph operation will draw graphs of all the functions currently stored in memory.

3. Draw the graph.

- You can use the function menu that appears when you press F4(STYL) in step 2 of the above procedure to select one of the following line styles for each graph.

  F1(—) ... Normal (initial default)

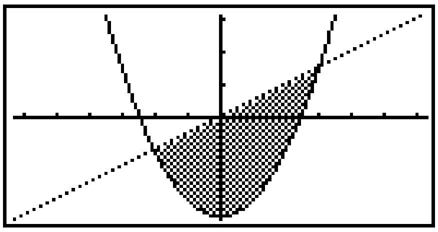
  F2(━) … Thick (twice the thickness of Normal)

  F3(······) … Broken (thick broken)

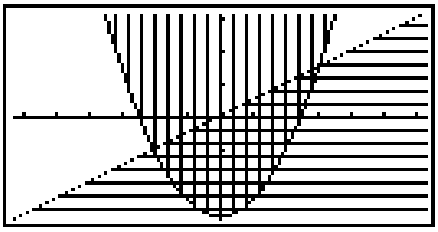
  F4(·······) … Dot (dotted)

- When simultaneously graphing multiple inequalities, you can use the "Ineq Type" setting on the Setup screen (SHIFT MENU(SETUP)) to specify either of two fill ranges.

  F1(AND) ... Fills areas only where the conditions of all of the graphed inequalities are satisfied. This is the initial default.



  F2(OR) ..... Fills all areas where the conditions of the graphed inequalities are satisfied.



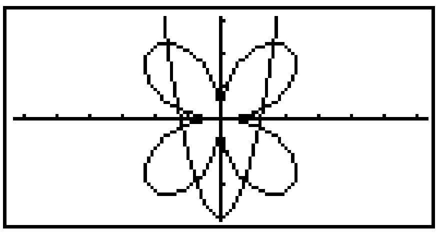
Example 1 **Input the functions shown below and draw their graphs.**
Y1 = 2x^2 – 3, r2 = 3sin2θ

① MENU GRAPH

② F3(TYPE)F1(Y=) 2 X,θ,T x^2 − 3 EXE

F3(TYPE)F2(r=) 3 sin 2 X,θ,T EXE

③ F6(DRAW)

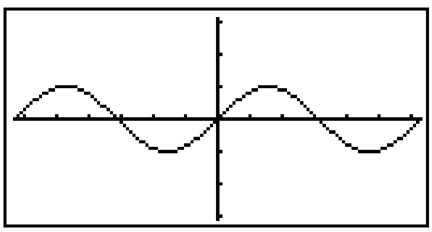


Example 2 **To graph a trigonometric function using radians when the angle unit setting is degrees (Angle unit = Deg)**
Y1=sin x^r

① MENU GRAPH

② sin X,θ,T OPTN F6(▷) F5(ANGL) F2(r) EXE

③ F6(DRAW)



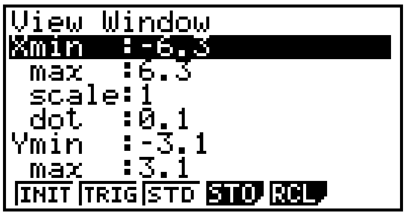
2. Controlling What Appears on a Graph Screen

■ V-Window (View Window) Settings

Use the View Window to specify the range of the x- and y-axes, and to set the spacing between the increments on each axis. You should always set the V-Window parameters you want to use before graphing.

• To make V-Window settings

1. From the Main Menu, enter the **GRAPH** mode.
2. Press [SHIFT] [F3] (V-WIN) to display the V-Window setting screen.



Rectangular coordinate parameter

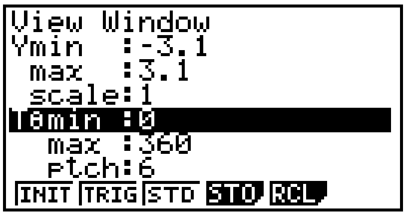
Xmin/Xmax … Minimum/maximum x-axis value

Xscale … Spacing of x-axis increments

Xdot … Value that corresponds to one x-axis dot

Ymin/Ymax … Minimum/maximum y-axis value

Yscale … Spacing of y-axis increments



Polar coordinate parameter

Tθ min/Tθ max ... Minimum/maximum T, θ values

Tθ ptch ... T, θ pitch

3. Press [▼] to move the highlighting and input an appropriate value for each parameter, pressing [EXE] after each.
   - {**INIT**}/{**TRIG**}/{**STD**} … V-Window {initial settings}/{initial settings using specified angle unit}/{standardized settings}
   - {**STO**}/{**RCL**} … V-Window setting {store}/{recall}

After settings are the way you want them, press [EXIT] or [SHIFT] [EXIT] (QUIT) to exit the V-Window setting screen.

• V-Window Setting Precautions

- Inputting zero for Tθ ptch causes an error.
- Any illegal input (out of range value, negative sign without a value, etc.) causes an error.
- When Tθ max is less than Tθ min, Tθ ptch becomes negative.
- You can input expressions (such as 2π) as V-Window parameters.
- When the V-Window setting produces an axis that does not fit on the display, the scale of the axis is indicated on the edge of the display closest to the origin.
- Changing the V-Window settings clears the graph currently on the display and replaces it with the new axes only.
- Changing the Xmin or Xmax value causes the Xdot value to be adjusted automatically. Changing the Xdot value causes the Xmax value to be adjusted automatically.
- A polar coordinate (r =) or parametric graph will appear coarse if the settings you make in the V-Window cause the Tθ ptch value to be too large, relative to the differential between the Tθ min and Tθ max settings. If the settings you make cause the Tθ ptch value to be too small relative to the differential between the Tθ min and Tθ max settings, on the other hand, the graph will take a very long time to draw.

• The following is the input range for V-Window parameters.
–9.999999999E 97 to 9.999999999E 97

■ V-Window Memory

You can store up to six sets of V-Window settings in V-Window memory for recall when you need them.

• To store V-Window settings

1. From the Main Menu, enter the **GRAPH** mode.
2. Press SHIFT F3 (V-WIN) to display the V-Window setting screen, and input the values you want.
3. Press F4 (STO) to display the pop-up window.
4. Press a number key to specify the V-Window memory where you want to save the settings, and then press EXE. Pressing 1 EXE stores the settings in V-Window Memory 1 (V-Win1).

• To recall V-Window memory settings

1. From the Main Menu, enter the **GRAPH** mode.
2. Press SHIFT F3 (V-WIN) to display the V-Window setting screen.
3. Press F5 (RCL) to display the pop-up window.
4. Press a number key to specify the V-Window memory number for the settings you want to recall, and then press EXE. Pressing 1 EXE recalls the settings in V-Window Memory 1 (V-Win1).

■ Specifying the Graph Range

You can define a range (start point, end point) for a function before graphing it.

1. From the Main Menu, enter the **GRAPH** mode.
2. Make V-Window settings.
3. Specify the function type and input the function. The following is the syntax for function input.
   Function , SHIFT + ([ ) Start Point , End Point SHIFT − ( ])
4. Draw the graph.

Example **Graph $y = x^2 + 3x - 2$ within the range $-2 \leqq x \leqq 4$.**

Use the following V-Window settings.

Xmin = –3, Xmax = 5, Xscale = 1

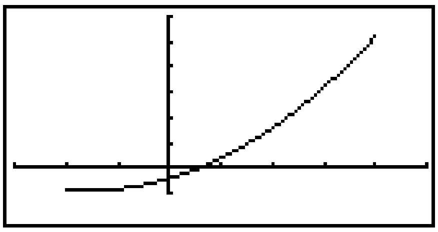
Ymin = –10, Ymax = 30, Yscale = 5

① MENU GRAPH

② SHIFT F3 (V-WIN) (−) 3 EXE 5 EXE 1 EXE ▼
(−) 1 0 EXE 3 0 EXE 5 EXE EXIT

③ F3 (TYPE) F1 (Y=) X,θ,T x^2 + 3 X,θ,T − 2 ,
SHIFT + ([ ) (−) 2 , 4 SHIFT − ( ]) EXE

④ F6 (DRAW)



• You can specify a range when graphing rectangular expressions, polar expressions, parametric functions, and inequalities.

■ Zoom

This function lets you enlarge and reduce the graph on the screen.

1. Draw the graph.
2. Specify the zoom type.

SHIFT F2 (ZOOM) F1 (BOX) ... Box zoom

Draw a box around a display area, and that area is enlarged to fill the entire screen.

F2 (FACT)

Specifies the x-axis and y-axis zoom factors for factor zoom.

F3 (IN)/F4 (OUT) ... Factor zoom

The graph is enlarged or reduced in accordance with the factor you specify, centered on the current pointer location.

F5 (AUTO) ... Auto zoom

V-Window y-axis settings are automatically adjusted so the graph fills the screen along the y-axis.

F6 (▷) F1 (ORIG) ... Original size

Returns the graph to its original size following a zoom operation.

F6 (▷) F2 (SQR) ... Graph correction

V-Window x-axis values are corrected so they are identical to the y-axis values.

F6 (▷) F3 (RND) ... Coordinate rounding

Rounds the coordinate values at the current pointer location.

F6 (▷) F4 (INTG) ... Integer

Each dot is given a width of 1, which makes coordinate values integers.

F6 (▷) F5 (PRE) ... Previous

V-Window parameters are returned to what they were prior to the last zoom operation.

Box zoom range specification

3. Use the cursor keys to move the pointer (✜) in the center of the screen to the location where you want one corner of the box to be, and then press EXE.
4. Use the cursor keys to move the pointer. This causes a box to appear on the screen. Move the cursor until the area you want to enlarge is enclosed in the box, and then press EXE to enlarge it.

Example **Graph $y = (x + 5)(x + 4)(x + 3)$, and then perform a box zoom.**

Use the following V-Window settings.

Xmin = –8, Xmax = 8, Xscale = 2

Ymin = –4, Ymax = 2, Yscale = 1

① MENU GRAPH

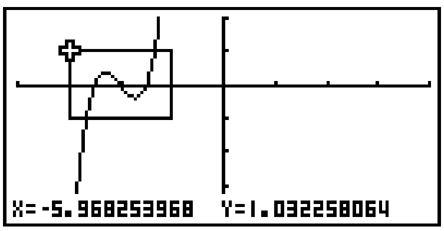
SHIFT F3 (V-WIN) (−) 8 EXE 8 EXE 2 EXE ▼

(−) 4 EXE 2 EXE 1 EXE EXIT

F3 (TYPE) F1 (Y=) (X,θ,T + 5) (X,θ,T + 4)

(X,θ,T + 3) EXE

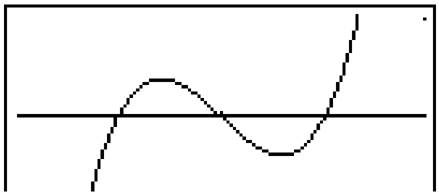
F6 (DRAW)



② SHIFT F2 (ZOOM) F1 (BOX)

③ ◀ ~ ◀ EXE

④ ◀ ~ ◀ , ▲ ~ ▲ EXE



- You must specify two different points for box zoom, and the two points cannot be on a straight line vertically or horizontally from each other.

3. Drawing a Graph

You can store up to 20 functions in memory. Functions in memory can be edited, recalled, and graphed.

■ Specifying the Graph Type

Before you can store a graph function in memory, you must first specify its graph type.

1. While the Graph relation list is on the display, press F3 (TYPE) to display the graph type menu, which contains the following items.
   - {**Y=**}/{**r=**}/{**Parm**}/{**X=**} ... {rectangular coordinate (Y=$f(x)$ type)}/{polar coordinate}/{parametric}/{rectangular coordinate (X=$f(y)$ type)} graph
   - {**Y>**}/{**Y<**}/{**Y≥**}/{**Y≤**} ... {Y>$f(x)$}/{Y<$f(x)$}/{Y≥$f(x)$}/{Y≤$f(x)$} inequality graph
   - {**X>**}/{**X<**}/{**X≥**}/{**X≤**} ... {X>$f(y)$}/{X<$f(y)$}/{X≥$f(y)$}/{X≤$f(y)$} inequality graph
   - {**CONV**}
     - {**▶Y=**}/{**▶Y>**}/{**▶Y<**}/{**▶Y≥**}/{**▶Y≤**}/{**▶X=**}/{**▶X>**}/{**▶X<**}/{**▶X≥**}/{**▶X≤**} ... {changes the function type of the selected expression}
2. Press the function key that corresponds to the graph type you want to specify.

■ Storing Graph Functions

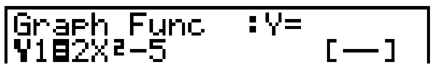
• To store a rectangular coordinate function (Y=)

Example **To store the following expression in memory area Y1: $y = 2x^2 - 5$**

F3 (TYPE) F1 (Y=) (Specifies rectangular coordinate expression.)

2 X,θ,T x^2 − 5 (Inputs expression.)

EXE (Stores expression.)



- A function cannot be stored into a memory area that already contains a function of a different type from the one you are trying to store. Select a memory area that contains a function that is the same type as the one you are storing, or delete the function in the memory area to which you are trying to store.

• To store a parametric function

Example **To store the following expressions in memory areas Xt3 and Yt3:**

x = 3 sinT

y = 3 cosT

F3(TYPE) F3(Parm) (Specifies parametric expression.)

3 sin X,θ,T EXE (Inputs and stores x expression.)

3 cos X,θ,T EXE (Inputs and stores y expression.)

• To create a composite function

Example **To use relations in Y1 and Y2 to create composite functions for Y3 and Y4**

Y1 = $\sqrt{(X + 1)}$, Y2 = X² + 3

Assign Y1∘Y2 to Y3, and Y2∘Y1 to Y4.

(Y1∘Y2 = $\sqrt{((x^2 + 3) +1)}$ = $\sqrt{(x^2 + 4)}$ Y2∘Y1 = ($\sqrt{(X + 1)}$)² + 3 = X + 4 (X ≧ –1))

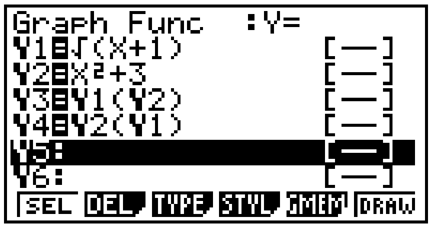
Input relations into Y3 and Y4.

F3(TYPE) F1(Y=) VARS F4(GRPH)

F1(Y) 1 (F1(Y) 2) EXE

VARS F4(GRPH) F1(Y) 2

(F1(Y) 1) EXE



• A composite function can consist of up to five functions.

• To assign values to the coefficients and variables of a graph function

Example **To assign the values –1, 0, and 1 to variable A in Y = AX²–1, and draw a graph for each value**

F3(TYPE) F1(Y=)

ALPHA X,θ,T (A) X,θ,T x² – 1 EXE

VARS F4(GRPH) F1(Y) 1 (ALPHA X,θ,T (A)

SHIFT • (=) (–) 1) EXE

VARS F4(GRPH) F1(Y) 1 (ALPHA X,θ,T (A)

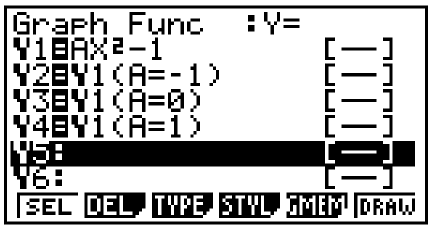
SHIFT • (=) 0) EXE

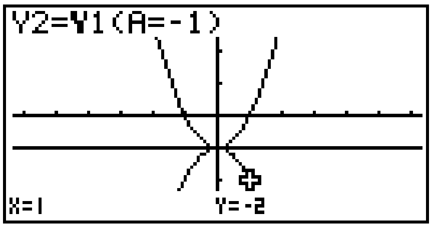
VARS F4(GRPH) F1(Y) 1 (ALPHA X,θ,T (A)

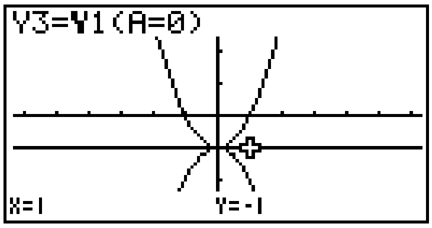
SHIFT • (=) 1) EXE

▲ ▲ ▲ ▲ F1(SEL)

F6(DRAW)







The above three screens are produced using the Trace function.
See “Function Analysis” (page 5-30) for more information.

■ Editing and Deleting Functions

• To edit a function in memory

Example **To change the expression in memory area Y1 from $y = 2x^2 - 5$ to $y = 2x^2 - 3$**

[▶] (Displays cursor.)

[▶][▶][▶][▶][▶][DEL][3] (Changes contents.)

[EXE] (Stores new graph function.)

• To change the line style of a graph function

1. On the Graph relation list screen, use [▲] and [▼] to highlight the relation whose line style you want to change.
2. Press [F4] (STYL).
3. Select the line style.

Example **To change the line style of $y = 2x^2 - 3$, which is stored in area Y1, to “Broken”**

[F4] (STYL) [F3] (•••••) (Selects “Broken”.)

• To change the type of a function *1

1. While the Graph relation list is on the display, press [▲] or [▼] to move the highlighting to the area that contains the function whose type you want to change.
2. Press [F3] (TYPE) [F5] (CONV).
3. Select the function type you want to change to.

Example **To change the function in memory area Y1 from $y = 2x^2 - 3$ to $y < 2x^2 - 3$**

[F3] (TYPE) [F5] (CONV) [F3] (►Y<) (Changes the function type to “Y<”.)

*1 The function type can be changed for rectangular coordinate functions and inequalities only.

• To delete a function

1. While the Graph relation list is on the display, press [▲] or [▼] to move the highlighting to the area that contains the function you want to delete.
2. Press [F2] (DEL) or [DEL].

3. Press [F1](Yes) to delete the function or [F6](No) to abort the procedure without deleting anything.
   - Using the above procedure to delete one line of a parametric function (such as Xt2) also will delete the applicable paired line (Yt2, in the case of Xt2).

■ Selecting Functions for Graphing

• To specify the draw/non-draw status of a graph

1. On the Graph relation list, use ▲ and ▼ to highlight the relation you do not want to graph.
2. Press [F1](SEL).
   - Each press of [F1](SEL) toggles graphing on and off.
3. Press [F6](DRAW).

Example **To select the following functions for drawing:**
Y1 = 2x^2 – 5, r2 = 5 sin3θ

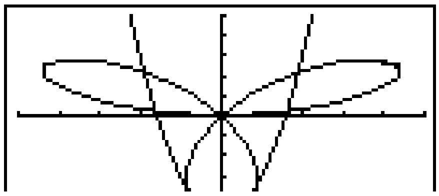
Use the following V-Window settings.

Xmin = –5,	**Xmax = 5,**	**Xscale = 1**
Ymin = –5,	**Ymax = 5,**	**Yscale = 1**
Tθ min = 0,	**Tθ max = π,**	**Tθ ptch = 2π / 60**

▼ ▲ (Select a memory area that contains a function for which you want to specify non-draw.)

[F1](SEL) (Specifies non-draw.)

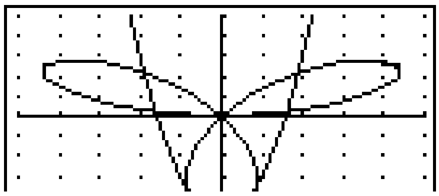
[F6](DRAW) or [EXE] (Draws the graphs.)



- You can use the Setup screen settings to alter the appearance of the graph screen as shown below.

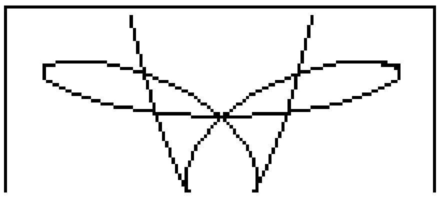
  - Grid: On (Axes: On Label: Off)

    This setting causes dots to appear at the grid intersects on the display.



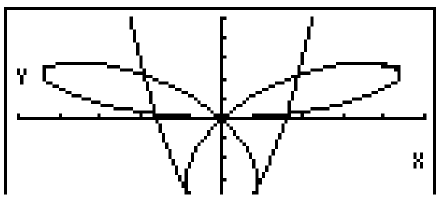
  - Axes: Off (Label: Off Grid: Off)

    This setting clears the axis lines from the display.



  - Label: On (Axes: On Grid: Off)

    This setting displays labels for the x- and y-axes.



■ Graph Memory

Graph memory lets you store up to 20 sets of graph function data and recall it later when you need it.

A single save operation saves the following data in graph memory.

- All graph functions in the currently displayed Graph relation list (up to 20)
- Graph types
- Function graph line information
- Draw/non-draw status
- V-Window settings (1 set)

• To store graph functions in graph memory

1. Press [F5](GMEM)[F1](STO) to display the pop-up window.
2. Press a number key to specify the Graph memory where you want to save the graph function, and then press [EXE]. Pressing [1] [EXE] stores the graph function to Graph Memory 1 (G-Mem1).
   - There are 20 graph memories numbered G-Mem1 to G-Mem20.
   - Storing a function in a memory area that already contains a function replaces the existing function with the new one.
   - If the data exceeds the calculator's remaining memory capacity, an error occurs.

• To recall a graph function

1. Press [F5](GMEM)[F2](RCL) to display the pop-up window.
2. Press a number key to specify the Graph memory for the function you want to recall, and then press [EXE]. Pressing [1] [EXE] recalls the graph function in Graph Memory 1 (G-Mem1).
   - Recalling data from graph memory causes any data currently on the Graph relation list to be deleted.

4. Storing a Graph in Picture Memory

You can save up to 20 graphic images in picture memory for later recall. You can overdraw the graph on the screen with another graph stored in picture memory.

• To store a graph in picture memory

1. After graphing in **GRAPH** mode, press [OPTN] [F1](PICT)[F1](STO) to display the pop-up window.
2. Press a number key to specify the Picture memory where you want to save the picture, and then press [EXE]. Pressing [1] [EXE] stores the picture function to Picture Memory 1 (Pict 1).
   - There are 20 picture memories numbered Pict 1 to Pict 20.
   - Storing a graphic image in a memory area that already contains a graphic image replaces the existing graphic image with the new one.
   - A dual graph screen or any other type of graph that uses a split screen cannot be saved in picture memory.

• To recall a stored graph

1. After graphing in **GRAPH** mode, press [OPTN] [F1](PICT) [F2](RCL) to display the pop-up window.
2. Press a number key to specify the Picture memory for the picture you want to recall, and then press [EXE]. Pressing [1] [EXE] recalls the picture function in Picture Memory 1 (Pict 1).
   - Recalling picture memory contents causes the currently displayed graph to be overwritten.
   - Use the sketch Cls function (page 5-29) to clear a graph that was recalled from picture memory.

5. Drawing Two Graphs on the Same Screen

■ Copying the Graph to the Sub-screen

Dual Graph lets you split the screen into two parts. Then you can graph two different functions in each for comparison, or draw a normal size graph on one side and its enlarged version on the other side. This makes Dual Graph a powerful graph analysis tool.

With Dual Graph, the left side of the screen is called the “main screen”, while the right side is called the “sub-screen”.

• Main Screen
The graph in the main screen is actually drawn from a function.

• Sub-screen
The graph on the sub-screen is produced by copying or zooming the main screen graph. You can even make different V-Window settings for the sub-screen and main screen.

• To copy the graph to the sub-screen

1. From the Main Menu, enter the **GRAPH** mode.
2. On the Setup screen, select “G+G” for Dual Screen.
3. Make V-Window settings for the main screen.

   Press [F6](RIGHT) to display the sub-graph settings screen. Pressing [F6](LEFT) returns to the main screen setting screen.
4. Store the function, and draw the graph in the main screen.
5. Perform the Dual Graph operation you want.

   [OPTN] [F1](COPY) ... Duplicates the main screen graph in the sub-screen

   [OPTN] [F2](SWAP) ... Swaps the main screen contents and sub-screen contents

- Indicators appear to the right of the formulas in the Graph relation list to tell where graphs are drawn with Dual Graph.

Indicates sub-screen graph (on right side of display)

Indicates graph drawn on both sides of display

Performing a draw operation with the function marked “ R ” in the above example screen causes the graph to be drawn on the right side on the display. The function marked “ B ” is drawn on both sides of the graph.

Pressing F1(SEL) while one of the function's is highlighted would causes its " R " or " B " indicator to be cleared. A function without an indicator is drawn as the main screen graph (on the left side of the display).

Example **Graph $y = x(x + 1)(x – 1)$ in the main screen and sub-screen.**

Use the following V-Window settings.

(Main Screen)	**Xmin = –2,**	**Xmax = 2,**	**Xscale = 0.5**
	Ymin = –2,	**Ymax = 2,**	**Yscale = 1**
(Sub-screen)	**Xmin = –4,**	**Xmax = 4,**	**Xscale = 1**
	Ymin = –3,	**Ymax = 3,**	**Yscale = 1**

① MENU GRAPH

② SHIFT MENU(SET UP) ▼ ▼ ▼ ▼* F1(G+G) EXIT

*fx-7400GIII: ▼ ▼ ▼

③ SHIFT F3(V-WIN) (–) 2 EXE 2 EXE 0 . 5 EXE ▼

(–) 2 EXE 2 EXE 1 EXE

F6(RIGHT) (–) 4 EXE 4 EXE 1 EXE ▼

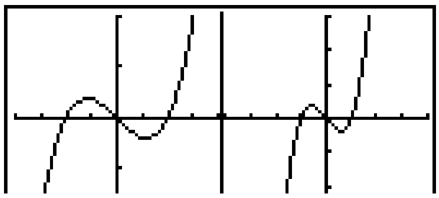
(–) 3 EXE 3 EXE 1 EXE EXIT

④ F3(TYPE) F1(Y=) X,θ,T (X,θ,T + 1) (

X,θ,T – 1) EXE

F6(DRAW)

⑤ OPTN F1(COPY)



• Pressing AC while a graph is on the display will return to the screen in step 4.

6. Manual Graphing

■ Graphing in the Run-Matrix Mode

While the Linear input/output mode is selected, commands can be input directly in the **RUN•MAT** (or **RUN**) mode to draw a graph.

You can select a function type for graphing by pressing SHIFT F4(SKTCH) F5(GRPH) and then selecting one of the function types shown below.

- **{Y=}/{r=}/{Param}/{X=}/{G·$\int dx$}** ... {rectangular coordinate}/{polar coordinate}/{parametric function}/{X=$f(y)$ rectangular coordinate}/{integration} graphing
- **{Y>}/{Y<}/{Y≥}/{Y≤}** ... Inequality {Y>$f(x)$}/{Y<$f(x)$}/{Y≥$f(x)$}/{Y≤$f(x)$} graphing
- **{X>}/{X<}/{X≥}/{X≤}** ... Inequality {X>$f(y)$}/{X<$f(y)$}/{X≥$f(y)$}/{X≤$f(y)$} graphing

• Graphing with Rectangular Coordinates

1. From the Main Menu, enter the **RUN•MAT** (or **RUN**) mode.
2. fx-9860GIII, fx-9750GIII: On the Setup screen, change the "Input/Output" setting to "Linear".

3. Make V-Window settings.
4. Input the commands for drawing the rectangular coordinate graph.
5. Input the function.

Example **Graph $y = 2x^2 + 3x - 4$.**

Use the following V-Window settings.

Xmin = –5, Xmax = 5, Xscale = 2

Ymin = –10, Ymax = 10, Yscale = 5

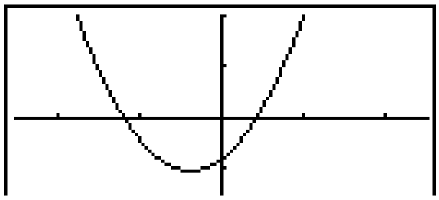
① MENU RUN•MAT (or RUN)

② fx-9860GIII, fx-9750GIII: SHIFT MENU (SET UP) F2 (Line) EXIT

③ SHIFT F3 (V-WIN) (–) 5 EXE 5 EXE 2 EXE ▼
(–) 1 0 EXE 1 0 EXE 5 EXE EXIT

④ SHIFT F4 (SKTCH) F1 (Cls) EXE
F5 (GRPH) F1 (Y=)

⑤ 2 X,θ,T x^2 + 3 X,θ,T – 4 EXE



- Certain functions can be graphed easily using built-in function graphs.
- You can draw graphs of the following built-in scientific functions.

Rectangular Coordinate Graph

• sin x	• cos x	• tan x	• $\sin^{-1} x$
• $\cos^{-1} x$	• $\tan^{-1} x$	• sinh x	• cosh x
• tanh x	• $\sinh^{-1} x$	• $\cosh^{-1} x$	• $\tanh^{-1} x$
• $\sqrt{x}$	• x^2	• log x	• ln$x$
• 10^x	• e^x	• x^{-1}	• $\sqrt[3]{x}$
• $\frac{d}{dx}(x)$	• $\frac{d^2}{dx^2}(x)$	• $\int(x)dx$	

Polar Coordinate Graph

• sin θ	• cos θ	• tan θ	• $\sin^{-1} \theta$
• $\cos^{-1} \theta$	• $\tan^{-1} \theta$	• sinh θ	• cosh θ
• tanh θ	• $\sinh^{-1} \theta$	• $\cosh^{-1} \theta$	• $\tanh^{-1} \theta$
• $\sqrt{\theta}$	• θ^2	• log θ	• lnθ
• 10^θ	• e^θ	• θ^{-1}	• $\sqrt[3]{\theta}$

- Input for x and θ variables is not required for a built-in function.
- When inputting a built-in function, other operators or values cannot be input.

• Graphing a Parametric Function

Your calculator can graph a parametric function represented by (X, Y) = (f(T), g(T)).

Example **To graph using the function parameters below**

x = 7cosT – 2cos3.5T **y = 7sinT – 2sin3.5T**

Use the following V-Window settings.

Xmin = –20, Xmax = 20, Xscale = 5

Ymin = –12, Ymax = 12, Yscale = 5

Tθmin = 0, Tθmax = 4π, Tθptch = π ÷ 36

On the Setup screen, select “Param” for “Func Type”, and “Rad” for “Angle”.

① MENU RUN•MAT (or RUN)

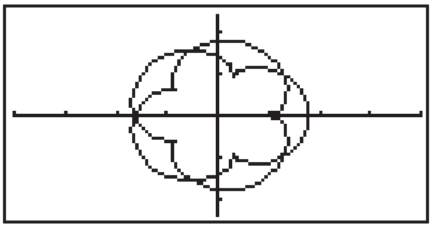
② SHIFT MENU (SET UP) F2 (Line) ▼ ▼ ▼* F3 (Param) ▼ ▼ ▼ F2 (Rad) EXIT

* fx-7400GIII: ▼ ▼

③ SHIFT F3 (V-WIN) (−) 2 0 EXE 2 0 EXE 5 EXE ▼
(−) 1 2 EXE 1 2 EXE 5 EXE
0 EXE 4 SHIFT ×10^x (π) EXE SHIFT ×10^x (π) ÷ 3 6 EXE EXIT

④ SHIFT F4 (SKTCH) F1 (Cls) EXE
F5 (GRPH) F3 (Param)

⑤ 7 cos X,θ,T − 2 cos 3 . 5 X,θ,T ,
7 sin X,θ,T − 2 sin 3 . 5 X,θ,T EXE



• Graphing an Integration

Your calculator can graph a function that performs integration calculation.

Calculation results are displayed in the lower left corner of the screen, with the integration area filled in.

Example **To graph the integration formula** $\int_{-2}^{1}(x + 2)(x - 1)(x - 3)\,dx$

Use the following V-Window settings.

Xmin = –4, Xmax = 4, Xscale = 1

Ymin = –8, Ymax = 12, Yscale = 5

On the Setup screen, select “Y=” for “Func Type”.

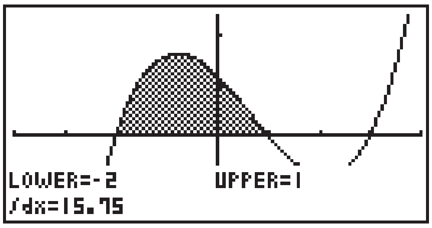
① MENU RUN•MAT (or RUN)

② SHIFT MENU (SET UP) F2 (Line) ▼ ▼ ▼ * F1 (Y=) EXIT
* fx-7400GIII: ▼ ▼

③ SHIFT F3 (V-WIN) (−) 4 EXE 4 EXE 1 EXE ▼
(−) 8 EXE 1 2 EXE 5 EXE EXIT

④ SHIFT F4 (SKTCH) F1 (Cls) EXE
F5 (GRPH) F5 (G·∫dx)

⑤ (X,θ,T + 2) (X,θ,T − 1)
(X,θ,T − 3) , (−) 2 , 1 EXE



■ Drawing Multiple Graphs on the Same Screen

Use the following procedure to assign various values to a variable contained in an expression and overwrite the resulting graphs on the screen.

1. From the Main Menu, enter the **GRAPH** mode.
2. On the Setup screen, change the “Dual Screen” setting to “Off”.
3. Make V-Window settings.
4. Specify the function type and input the function. The following is the syntax for function input.

   Expression containing one variable , SHIFT + ([ ) variable SHIFT . (=)

   value , value , ... , value SHIFT − ( ])
5. Draw the graph.

Example **To graph y = Ax^2 – 3 as the value of A changes in the sequence 3, 1, –1**

Use the following V-Window settings.

Xmin = –5, Xmax = 5, Xscale = 1

Ymin = –10, Ymax = 10, Yscale = 2

① MENU GRAPH

② SHIFT MENU (SET UP) ▼ ▼ ▼ ▼* F3 (Off) EXIT

*fx-7400GIII: ▼ ▼ ▼

③ SHIFT F3 (V-WIN) (–) 5 EXE 5 EXE 1 EXE ▼

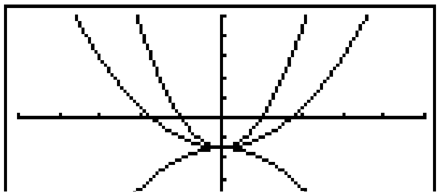
(–) 1 0 EXE 1 0 EXE 2 EXE EXIT

④ F3 (TYPE) F1 (Y=) ALPHA X,θ,T (A) X,θ,T x^2 – 3 ,

SHIFT + ([ ) ALPHA X,θ,T (A) SHIFT . (=) 3 , 1 , (–) 1

SHIFT – ( ]) EXE

⑤ F6 (DRAW)



- The value of only one of the variables in the expression can change.
- Any of the following cannot be used for the variable name: X, Y, r, θ, T.
- You cannot assign a variable to the variable inside the function.
- When Simul Graph is turned on, all of the graphs for the specified variable values are drawn simultaneously.
- Overwrite can be used when graphing rectangular expressions, polar expressions, parametric functions, and inequalities.

■ Using Copy and Paste to Graph a Function

You can graph a function by copying it to the clipboard, and then pasting it into the graph screen.

There are two types of functions you can paste into the graph screen.

Type 1 (Y= expression)

A function with the Y variable to the left of the equal sign is graphed as Y= expression.

Example: To paste Y=X and graph it

- Any spaces to the left of Y are ignored.

Type 2 (expression)

Pasting this type of expression graphs Y= expression.

Example: To paste X and graph Y=X

- Any spaces to the left of the expression are ignored.

• To graph a function using copy and paste

1. Copy the function you want to graph to the clipboard.
2. From the Main Menu, enter the **GRAPH** mode.
3. On the Setup screen, change the “Dual Screen” setting to “Off”.

4. Make V-Window settings.
5. Draw the graph.
6. Paste the expression.

Example **While the graph of $y = 2x^2 + 3x - 4$ is currently displayed, to paste the previously copied function Y=X from the clipboard**

Use the following V-Window settings.

Xmin = –5, Xmax = 5, Xscale = 2

Ymin = –10, Ymax = 10, Yscale = 5

① [MENU] RUN•MAT (or RUN)
[ALPHA] [–] (Y) [SHIFT] [•] (=) [X,θ,T]
[SHIFT] [8] (CLIP) [◀] [◀] [◀] [F1] (COPY)

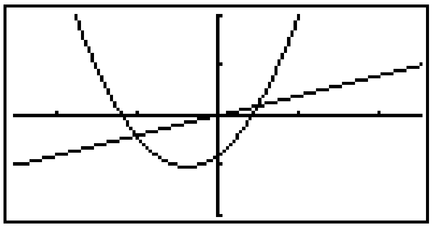
② [MENU] GRAPH

③ [SHIFT] [MENU] (SET UP) [▼] [▼] [▼] [▼]* [F3] (Off) [EXIT]
*fx-7400GIII: [▼] [▼] [▼]

④ [SHIFT] [F3] (V-WIN) [(–)] [5] [EXE] [5] [EXE] [2] [EXE] [▼]
[(–)] [1] [0] [EXE] [1] [0] [EXE] [5] [EXE] [EXIT]

⑤ [F3] (TYPE) [F1] (Y=) [2] [X,θ,T] [x^2] [+] [3] [X,θ,T] [–] [4] [EXE]
[F6] (DRAW)

⑥ [SHIFT] [9] (PASTE)



- Paste is supported only when “Off” is selected for the “Dual Screen” setting on the Setup screen.
- Though there is no limit on the number of graphs you can draw by pasting a function, the total number of graphs supported by trace and other functions is 30 (number of graphs drawn using expression number 1 to 20, plus graphs drawn using pasted functions).
- For the graph of a pasted function, the graph expression that appears when using trace or other functions is displayed in the format: Y= expression.
- Re-executing a draw without clearing graph screen memory will redraw all the graphs, including those produced by pasting functions.

7. Using Tables

To enter the **TABLE** mode, select the **TABLE** icon on the Main Menu.

■ Storing a Function and Generating a Number Table

• To store a function

Example **To store the function $y = 3x^2 - 2$ in memory area Y1**

Use [▲] and [▼] to move the highlighting in the Table relation list to the memory area where you want to store the function. Next, input the function and press [EXE] to store it.

• Variable Specifications

There are two methods you can use to specify value for the variable *x* when generating a numeric table.

- **Table range method**

  With this method, you specify the conditions for the change in value of the variable.

- **List**

  With this method, the data in the list you specify is substituted for the *x*-variable to generate a number table.

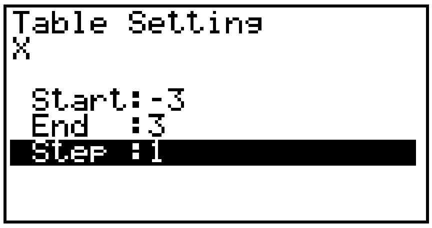
• To generate a table using a table range

Example **To generate a table as the value of variable *x* changes from –3 to 3, in increments of 1**

[MENU] TABLE

[F5](SET)

[(–)] [3] [EXE] [3] [EXE] [1] [EXE]



The numeric table range defines the conditions under which the value of variable *x* changes during function calculation.

Start .... Variable *x* start value

End .... Variable *x* end value

Step .... Variable *x* value change (interval)

After specifying the table range, press [EXIT] to return to the Table relation list.

• To generate a table using a list

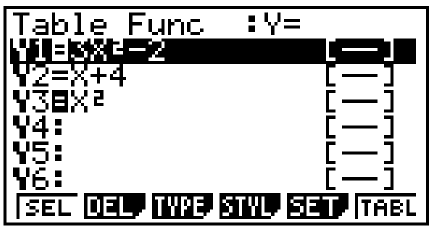
1. While the Table relation list is on the screen, display the Setup screen.
2. Highlight Variable and then press [F2](LIST) to display the pop-up window.
3. Select the list whose values you want to assign for the *x*-variable.
   - To select List 6, for example, press [6] [EXE]. This causes the setting of the Variable item of the Setup screen to change to List 6.
4. After specifying the list you want to use, press [EXIT] to return to the previous screen.

• Generating a Table

Example **To generate a table of values for the functions stored in memory areas Y1 and Y3 of the Table relation list**

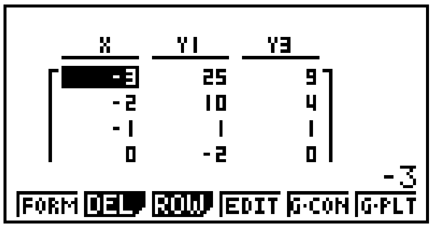
Use [▲] and [▼] to move the highlighting to the function you want to select for table generation and press [F1](SEL) to select it.

The "=" sign of selected functions is highlighted on the screen. To deselect a function, move the cursor to it and press [F1](SEL) again.



Press [F6](TABL) to generate a number table using the functions you selected. The value of variable x changes according to the range or the contents of the list you specified.

The example screen shown here shows the results based on the contents of List 6 (–3, –2, –1, 0, 1, 2, 3).

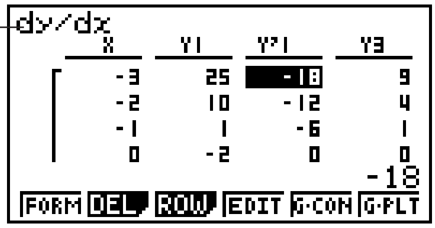


Each cell can contain up to six digits, including negative sign.

• To generate a differential number table

Changing the setting of Setup screen’s Derivative item to On causes a number table that includes the derivative to be displayed whenever you generate a number table.

Locating the cursor at a differential coefficient displays “dy/dx” in the top line, which indicates differential.



- An error occurs if a graph for which a range is specified or an overwrite graph is included among the graph expressions.

• Specifying the Function Type

You can specify a function as being one of three types.

- Rectangular coordinate (Y=)
- Polar coordinate (r=)
- Parametric (Parm)

1. Press [F3](TYPE) while the relation list is on the screen.
2. Press the number key that corresponds to the function type you want to specify.

- The number table is generated only for the function type specified on the relation list (Table Func). You cannot generate a number table for a mixture of different function types.

■ Editing Tables

You can use the table menu to perform any of the following operations once you generate a table.

- Change the values of variable x
- Edit (delete, insert, and append) rows
- Delete a table
- Draw a connect type graph
- Draw a plot type graph

- {**FORM**} ... {return to Table relation list}
- {**DEL**} ... {delete table}
- {**ROW**}
    - {**DEL**}/{**INS**}/{**ADD**} ... {delete}/{insert}/{add} row
- {**G • CON**}/{**G • PLT**} ... {connected type}/{draw plot type} graph draw

- If you try to replace a value with an illegal operation (such as division by zero), an error occurs and the original value remains unchanged.
- You cannot directly change any values in the other (non-x) columns of the table.

■ Copying a Table Column to a List

A simple operation lets you copy the contents of a numeric table column into a list.

Use ◀ and ▶ to move the cursor to the column you want to copy. The cursor can be in any row.

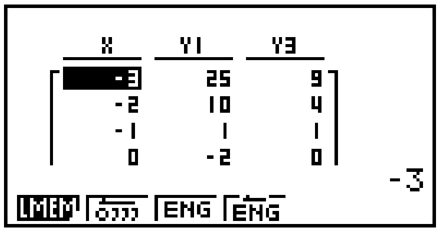
• To copy a table to a list

Example **To copy the contents of Column x into List 1**

OPTN F1 (LMEM)

Input the number of the list you want to copy and then press EXE.

1 EXE



■ Drawing a Graph from a Number Table

Use the following procedure to generate a number table and then draw a graph based on the values in the table.

1. From the Main Menu, enter the **TABLE** mode.
2. Make V-Window settings.
3. Store the functions.
4. Specify the table range.
5. Generate the table.
6. Select the graph type and draw it.
   F5 (G • CON) ... line graph
   F6 (G • PLT) ... plot type graph

- After drawing the graph, pressing SHIFT F6 (G ↔ T) or AC returns to the number table screen.

Example **Store the two functions below, generate a number table, and then draw a line graph. Specify a range of –3 to 3, and an increment of 1.**

Y1 = $3x^2 - 2$, Y2 = x^2

Use the following V-Window settings.

Xmin = 0, Xmax = 6, Xscale = 1

Ymin = –2, Ymax = 10, Yscale = 2

① MENU TABLE

② SHIFT F3(V-WIN) 0 EXE 6 EXE 1 EXE ▼

(–) 2 EXE 1 0 EXE 2 EXE EXIT

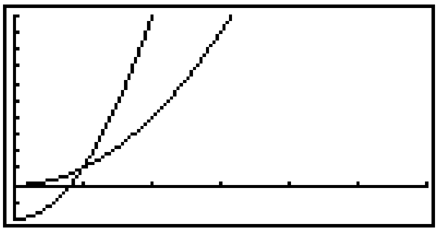
③ F3(TYPE) F1(Y=) 3 X,θ,T x^2 – 2 EXE

X,θ,T x^2 EXE

④ F5(SET) (–) 3 EXE 3 EXE 1 EXE EXIT

⑤ F6(TABL)

⑥ F5(G • CON)



• You can use Trace, Zoom, or Sketch after drawing a graph.

■ Simultaneously Displaying a Number Table and Graph

Specifying T+G for Dual Screen on the Setup screen makes it possible to display a number table and graph at the same time.

1. From the Main Menu, enter the **TABLE** mode.
2. Make V-Window settings.
3. On the Setup screen, select T+G for Dual Screen.
4. Input the function.
5. Specify the table range.
6. The number table is displayed in the sub-screen on the right.
7. Specify the graph type and draw the graph.

F5(G • CON) ... line graph

F6(G • PLT) ... plot type graph

Example **Store the function Y1 = 3x^2 – 2 and simultaneously display its number table and line graph. Use a table range of –3 to 3 with an increment of 1.**

Use the following V-Window settings.

Xmin = 0, Xmax = 6, Xscale = 1

Ymin = –2, Ymax = 10, Yscale = 2

① MENU TABLE

② SHIFT F3(V-WIN) 0 EXE 6 EXE 1 EXE ▼

(–) 2 EXE 1 0 EXE 2 EXE EXIT

③ SHIFT MENU(SET UP) ▼ ▼ ▼* F1(T+G) EXIT

*fx-7400GIII: ▼ ▼

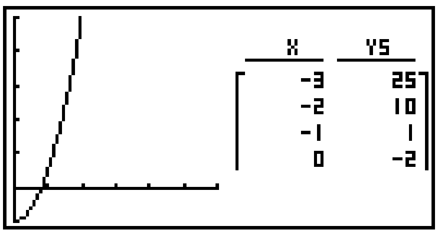
④ F3(TYPE) F1(Y=) 3 X,θ,T x^2 – 2 EXE

⑤ F5(SET)

(–) 3 EXE 3 EXE 1 EXE EXIT

⑥ F6(TABL)

⑦ F5(G • CON)



• The Setup screen's "Dual Screen" setting is applied in the **TABLE** mode and the **RECUR** mode.

• You can make the number table active by pressing OPTN F1(CHNG) or AC.

8. Dynamic Graphing

Important!

- The fx-7400GIII is not equipped with the **DYNA** mode.

■ Using Dynamic Graph

Dynamic Graph lets you define a range of values for the coefficients in a function, and then observe how a graph is affected by changes in the value of a coefficient. It helps to see how the coefficients and terms that make up a function influence the shape and position of a graph.

1. From the Main Menu, enter the **DYNA** mode.
2. Make V-Window settings.
3. On the Setup screen, specify the Dynamic Type.
   F1(Cnt) ... Continuous
   F2(Stop) ... Automatic stop after 10 draws
4. Use the cursor keys to select the function type on the built-in function type list.*1
5. Input values for coefficients, and specify which coefficient will be the dynamic variable.*2
6. Specify the start value, end value, and increment.
7. Specify the drawing speed.
   F3(SPEED) F1(▮▮▷).... Pause after each draw (Stop&Go)
   F2(▷) ...... Half normal speed (Slow)
   F3(▶) ...... Normal speed (Normal)
   F4(▷▷)..... Twice normal speed (Fast)
8. Draw the Dynamic Graph.

*1 The following are the seven built-in function types.

- Y=AX+B
- Y=A(X+B)^2+C
- Y=AX^2+BX+C
- Y=AX^3+BX^2+CX+D
- Y=Asin(BX+C)
- Y=Acos(BX+C)
- Y=Atan(BX+C)

After you press F3(TYPE) and select the function type you want, you can then input the actual function.

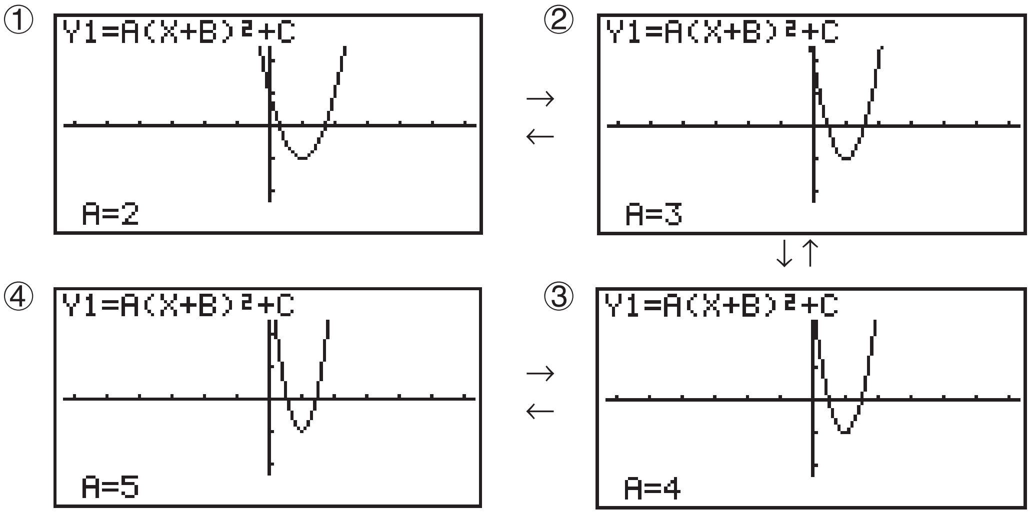
*2 You could also press EXE here and display the parameter setting menu.

- The message "Too Many Functions" appears when more than one function is selected for Dynamic Graphing.

Example **Use Dynamic Graph to graph y = A (x – 1)^2 – 1, in which the value of coefficient A changes from 2 through 5 in increments of 1. The graph is drawn 10 times.**

① MENU DYNA
② SHIFT F3(V-WIN) F1(INIT) EXIT
③ SHIFT MENU(SET UP) ▼ F2(Stop) EXIT
④ F5(B-IN) ▼ F1(SEL)
⑤ F4(VAR) 2 EXE (–) 1 EXE (–) 1 EXE
⑥ F2(SET) 2 EXE 5 EXE 1 EXE EXIT
⑦ F3(SPEED) F3(▶) EXIT
⑧ F6(DYNA)

Repeats from ① through ④.



■ Drawing a Dynamic Graph Locus

Turning on the Dynamic Graph locus setting on the Setup screen lets you overlay a graph drawn by changing the coefficient values.

1. From the Main Menu, enter the **DYNA** mode.
2. Make V-Window settings.
3. On the Setup screen, select “On” for “Locus”.
4. Use the cursor keys to select the function type on the built-in function type list.
5. Input values for coefficients, and specify which coefficient will be the dynamic variable.
6. Specify the start value, end value, and increment.
7. Specify Normal for the draw speed.
8. Draw the Dynamic Graph.

Example **Use Dynamic Graph to graph y = Ax, in which the value of coefficient A changes from 1 through 4 in increments of 1. The Graph is drawn 10 times.**

① [MENU] DYNA

② [SHIFT] [F3] (V-WIN) [F1] (INIT) [EXIT]

③ [SHIFT] [MENU] (SET UP) [▼] [▼] [F1] (On) [EXIT]

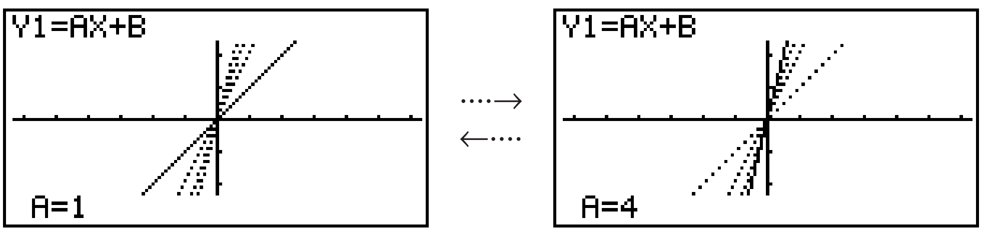
④ [F5] (B-IN) [F1] (SEL)

⑤ [F4] (VAR) [1] [EXE] [0] [EXE]

⑥ [F2] (SET) [1] [EXE] [4] [EXE] [1] [EXE] [EXIT]

⑦ [F3] (SPEED) [F3] (▶) [EXIT]

⑧ [F6] (DYNA)



■ Graph Calculation DOT Switching Function

Use this function to specify drawing of all the dots on the Dynamic Graph X-axis, or every other dot. This setting is value for Dynamic Func Y= graphic only.

1. Press SHIFT MENU (SET UP) to display the Setup screen.
2. Press ▼ ▼ ▼ to select Y=Draw Speed.
3. Select the graphing method.
   F1 (Norm) … Draws all X-axis dots. (initial default)
   F2 (High) … Draws every other X-axis dot. (faster drawing than Normal)
4. Press EXIT.

■ Using Dynamic Graph Memory

You can store Dynamic Graph conditions and screen data in Dynamic Graph memory for later recall when you need it. This lets you save time, because you can recall the data and immediately begin a Dynamic Graph draw operation. Note that you can store one set of data in memory at any one time.

• To save data in Dynamic Graph memory

1. While a Dynamic Graph draw operation is being performed, press AC to change to the speed adjustment menu.
2. Press F5 (STO). In response to the confirmation dialog that appears, press F1 (Yes) to save the data.

• To recall data from Dynamic Graph memory

1. Display the Dynamic Graph relation list.
2. Pressing F6 (RCL) recalls Dynamic Graph memory contents and draws the graph.

9. Graphing a Recursion Formula

Important!

- The fx-7400GIII is not equipped with the **RECUR** mode.

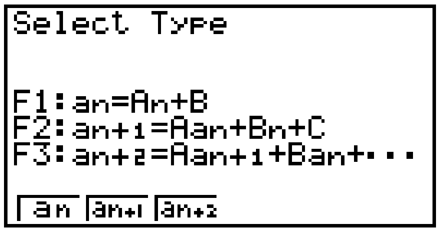
■ Generating a Number Table from a Recursion Formula

You can input up to three of the following types of recursion formulas and generate a number table.

- General term of sequence $\{a_n\}$, composed of a_n, n
- Linear two-term recursion composed of a_{n+1}, a_n, n
- Linear three-term recursion composed of a_{n+2}, a_{n+1}, a_n, n

1. From the Main Menu, enter the **RECUR** mode.

2. Specify the recursion type.

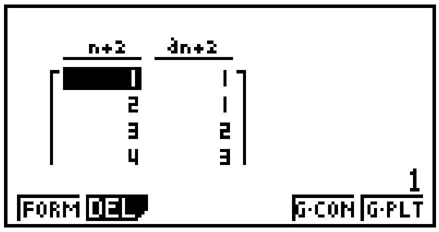


[F3](TYPE)[F1](a_n) ... {general term of sequence a_n}
[F2](a_{n+1}) ... {linear two-term recursion}
[F3](a_{n+2}) ... {linear three-term recursion}

3. Input the recursion formula.
4. Specify the table range. Specify a start point and end point for n. If necessary, specify a value for the initial term, and a pointer start point value if you plan to graph the formula.
5. Display the recursion formula number table.

Example **Generate a number table from recursion between three terms as expressed by $a_{n+2} = a_{n+1} + a_n$, with initial terms of a_1 = 1, a_2 = 1 (Fibonacci sequence), as n changes in value from 1 to 6.**

① [MENU] RECUR
② [F3](TYPE)[F3](a_{n+2})
③ [F4]($n.a_n$ ··)[F3](a_{n+1})[+][F2](a_n)[EXE]
④ [F5](SET)[F2](a_1)[1][EXE][6][EXE][1][EXE][1][EXE][EXIT]
⑤ [F6](TABL)



* The first two values correspond to a_1 = 1 and a_2 = 1.

- Pressing [F1](FORM) will return to the screen for storing recursion formulas.
- Specifying "On" for the "ΣDisplay" of the Setup screen causes the sum of each term to be included in the table.

■ Graphing a Recursion Formula

After generating a number table from a recursion formula, you can graph the values on a line graph or plot type graph.

1. From the Main Menu, enter the **RECUR** mode.
2. Make V-Window settings.
3. Specify the recursion formula type and input the formula.
4. Specify the table range, and start and ending values for n. If necessary, specify the initial term value and pointer start point.
5. Select the line style for the graph.
6. Display the recursion formula number table.
7. Specify the graph type and draw the graph.

[F5](G•CON) ... line graph

[F6](G•PLT) ... plot type graph

Example **Generate a number table from recursion between two terms as expressed by $a_{n+1} = 2a_n + 1$, with an initial term of a_1 = 1, as n changes in value from 1 to 6. Use the table values to draw a line graph.**

Use the following V-Window settings.

Xmin = 0, Xmax = 6, Xscale = 1

Ymin = –15, Ymax = 65, Yscale = 5

① MENU RECUR

② SHIFT F3 (V-WIN) 0 EXE 6 EXE 1 EXE ▼

(−) 1 5 EXE 6 5 EXE 5 EXE EXIT

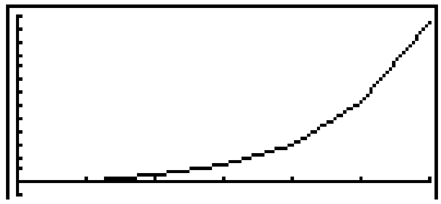
③ F3 (TYPE) F2 (a_{n+1}) 2 F2 (a_n) + 1 EXE

④ F5 (SET) F2 (a_1) 1 EXE 6 EXE 1 EXE EXIT

⑤ F1 (SEL+S) ▲ F2 (—) EXIT

⑥ F6 (TABL)

⑦ F5 (G • CON)



- After drawing a graph, you can use Trace, Zoom, and Sketch.
- Press AC to return to the number table screen. After drawing a graph, you can toggle between the number table screen and graph screen by pressing SHIFT F6 (G↔T).

■ Graphing a Phase Plot from Two Numeric Sequences

You can draw the phase plot for numeric sequences generated by two expressions input in the **RECUR** mode with one value on the horizontal axis and the other value on the vertical axis. For a_n (a_{n+1}, a_{n+2}), b_n (b_{n+1}, b_{n+2}), c_n (c_{n+1}, c_{n+2}), the numeric sequence of the alphabetically first expression is on the horizontal axis while the following numeric sequence is on the vertical axis.

1. From the Main Menu, enter the **RECUR** mode.
2. Configure V-Window settings.
3. Enter two recursion formulas and select both of them for table generation.
4. Configure table generation settings.

   Specify the start and end values for variable n and the initial term for each recursion formula.
5. Display the recursion formula number table.
6. Draw the phase plot.

Example **To input the two sequence formulas for regression between two terms $a_{n+1} = 0.9a_n$ and $b_{n+1} = b_n + 0.1_n - 0.2$, and specify initial terms $a_1 = 1$ and $b_1 = 1$ for each. Generate a number table as the value of the n variable goes from 1 to 10 and use it to draw a phase plot.**

Use the following V-Window settings.

Xmin = 0, **Xmax = 2,** **Xscale = 1**

Ymin = 0, **Ymax = 4,** **Yscale = 1**

① MENU RECUR

② SHIFT F3 (V-WIN) 0 EXE 2 EXE 1 EXE ▼

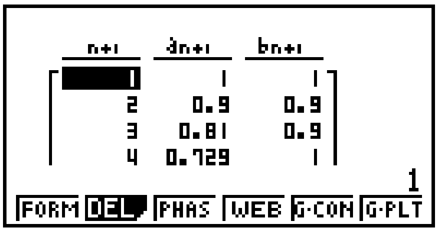
0 EXE 4 EXE 1 EXE EXIT

③ F3 (TYPE) F2 (a_{n+1}) 0 . 9 F2 (a_n) EXE

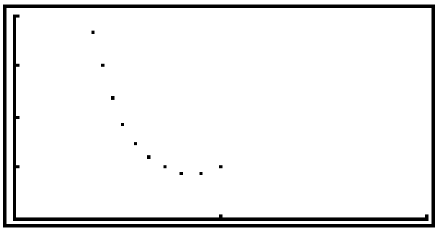
F4 ($n.a_n$ ··) F3 (b_n) + 0 . 1 F1 (n) − 0 . 2 EXE

④ F5 (SET) F2 (a_1) 1 EXE 1 0 EXE 1 EXE 1 EXE EXIT

⑤ F6(TABL)

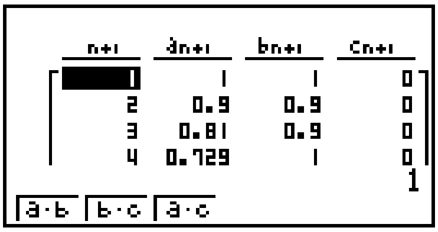


⑥ F3(PHAS)



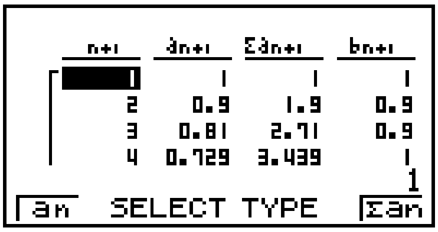
- If you enter three expressions on the **RECUR** mode screen and select all of them for table creation, you will need to specify which two of the three expressions you want to use to draw the phase plot. To do so, use the function menu that appears when you press F3(PHAS) on the table screen.

F1($a \bullet b$)..........Graph using a_n (a_{n+1}, a_{n+2}) and b_n (b_{n+1}, b_{n+2}).
F2($b \bullet c$)..........Graph using b_n (b_{n+1}, b_{n+2}) and c_n (c_{n+1}, c_{n+2}).
F3($a \bullet c$)..........Graph using a_n (a_{n+1}, a_{n+2}) and c_n (c_{n+1}, c_{n+2}).



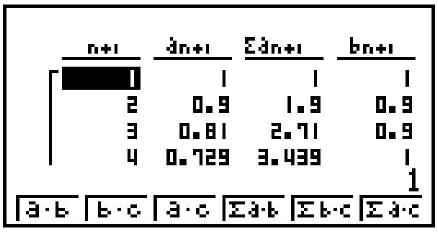
- Specifying “On” for the “ΣDisplay” of the Setup screen causes the sum of each term to be included in the table. At this time you can select use of the two numeric sequences as-is to draw the plot graph, or use of the sums of each of the two numeric sequences. To do so, use the function menu that appears when you press F3(PHAS) on the table screen.

F1(a_n) ....Use numeric sequence for graphing.
F6(Σa_n)..........Use numeric sequence sums for graphing.



- When “On” is selected “ΣDisplay” on the Setup screen and all three of the expressions you input in the **RECUR** mode are selected for table creation, use the function menu that appears when you press F3(PHAS) on the table screen to specify which two of the expressions you want to use, and to specify whether you want to use numeric sequence data or numeric sequence sum data.

F1($a \bullet b$)..........Graph using number sequences a_n (a_{n+1}, a_{n+2}) and b_n (b_{n+1}, b_{n+2})
F2($b \bullet c$)..........Graph using number sequences b_n (b_{n+1}, b_{n+2}) and c_n (c_{n+1}, c_{n+2})
F3($a \bullet c$)..........Graph using number sequences a_n (a_{n+1}, a_{n+2}) and c_n (c_{n+1}, c_{n+2})
F4($\Sigma a \bullet b$) ....Graph using the sums of number sequences a_n (a_{n+1}, a_{n+2}) and b_n (b_{n+1}, b_{n+2})
F5($\Sigma b \bullet c$) ....Graph using the sums of number sequences b_n (b_{n+1}, b_{n+2}) and c_n (c_{n+1}, c_{n+2})
F6($\Sigma a \bullet c$) ....Graph using the sums of number sequences a_n (a_{n+1}, a_{n+2}) and c_n (c_{n+1}, c_{n+2})



■ WEB Graph (Convergence, Divergence)

$y = f(x)$ is graphed by presuming $a_{n+1} = y$, $a_n = x$ for linear two-term regression $a_{n+1} = f(a_n)$ composed of a_{n+1}, a_n. Next, it can be determined whether the function is convergent or divergent.

1. From the Main Menu, enter the **RECUR** mode.
2. Make V-Window settings.
3. Select 2-term recursion as the recursion formula type, and input the formula.
4. Specify the table range, n start and end points, initial term value, and pointer start point.
5. Display the recursion formula number table.
6. Draw the graph.
7. Press [EXE], and the pointer appears at the start point you specified.
   Press [EXE] several times.

   If convergence exists, lines that resemble a spider web are drawn on the display. Failure of the web lines to appear indicates either divergence or that the graph is outside the boundaries of the display screen. When this happens, change to larger V-Window values and try again.

   You can use [▲] [▼] to select the graph.

Example **To draw the WEB graph for the recursion formula $a_{n+1} = -3(a_n)^2 + 3a_n$, $b_{n+1} = 3b_n + 0.2$, and check for divergence or convergence. Use the following table range: Start = 0, End = 6, a_0 = 0.01, a_nStr = 0.01, b_0 = 0.11, b_nStr = 0.11**

① [MENU] RECUR

② [SHIFT] [F3] (V-WIN) [0] [EXE] [1] [EXE] [1] [EXE] [▼]
[0] [EXE] [1] [EXE] [1] [EXE] [EXIT]

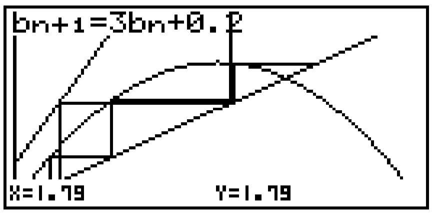
③ [F3] (TYPE) [F2] (a_{n+1}) [(–)] [3] [F2] (a_n) [x^2] [+] [3] [F2] (a_n) [EXE]
[3] [F3] (b_n) [+] [0] [•] [2] [EXE]

④ [F5] (SET) [F1] (a_0)
[0] [EXE] [6] [EXE] [0] [•] [0] [1] [EXE] [0] [•] [1] [1] [EXE] [▼]
[0] [•] [0] [1] [EXE] [0] [•] [1] [1] [EXE] [EXIT]

⑤ [F6] (TABL)

⑥ [F4] (WEB)

⑦ [EXE] ~ [EXE] (a_n is convergence)
[▼] [EXE] ~ [EXE] (b_n is divergence)



- To change the graph line style, press [F1] (SEL+S) after step 4.
- With WEB Graph, you can specify the line type for a $y = f(x)$ graph. The line type setting is valid only when "Connect" is selected for "Draw Type" on the Setup screen.

10. Graphing a Conic Section

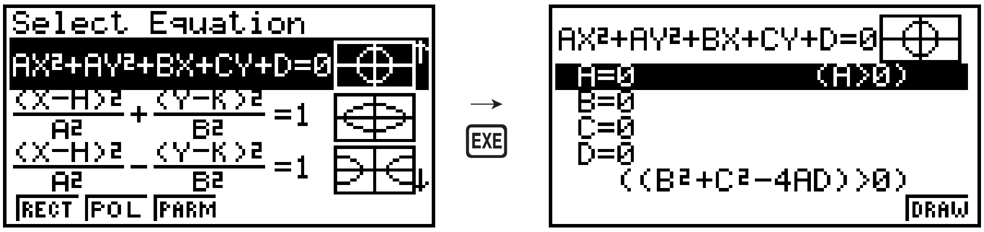
Important!

- The fx-7400GIII is not equipped with the **CONICS** mode.

■ Graphing a Conic Section

You can use the **CONICS** mode to graph parabolas, circles, ellipses, and hyperbolas. You can input a rectangular coordinate function, polar coordinate function, or parametric function for graphing.

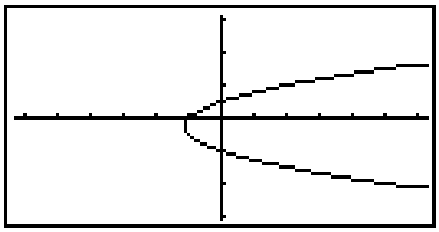
1. From the Main Menu, enter the **CONICS** mode.
2. Select the function type.
   F1 (RECT).... {rectangular coordinate}
   F2 (POL).... {polar coordinate}
   F3 (PARM).... {parametric}
3. Select the pattern of the function in accordance with the type of graph you want to draw.



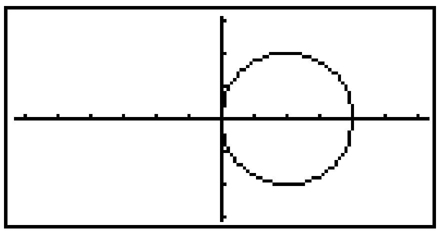
4. Enter the coefficients of the function and draw the graph.

Example **To input the rectangular coordinate function $x = 2y^2 + y - 1$ and graph a parabola open on the right, and then input the polar coordinate function $r = 4\cos\theta$ and draw a circle graph.**

① MENU CONICS
② F1 (RECT) ▼ (X=AY²+BY+C) EXE
③ 2 EXE 1 EXE (−) 1 EXE F6 (DRAW)



④ EXIT EXIT
⑤ F2 (POL) ▼ ▼ ▼ ▼ (R=2Acosθ) EXE
⑥ 2 EXE F6 (DRAW)



11. Changing the Appearance of a Graph

■ Drawing a Line

The sketch function lets you draw points and lines inside of graphs.
You can select one of four different line styles for drawing with the sketch function.

1. From the Main Menu, enter the **GRAPH** mode.
2. Make V-Window settings.
3. On the Setup screen, use the "Sketch Line" setting to specify the line style you want.
   F1(—) … Normal (initial default)
   F2(━) … Thick (twice the thickness of Normal)
   F3(▪▪▪▪▪) … Broken (thick broken)
   F4(·······) … Dot (dotted)
4. Input the function of the graph.
5. Draw the graph.
6. Select the sketch function you want to use.*[1]

SHIFT F4(SKTCH) F1(Cls) ... Screen clear
F2(Tang) ... Tangent line
F3(Norm) ... Line normal to a curve
F4(Inv) ... Inverse function*[2]
F6(▷) F1(PLOT)
{Plot}/{Pl•On}/{Pl•Off}/{Pl•Chg} ... Point {Plot}/{On}/{Off}/{Change}
F6(▷) F2(LINE)
{Line}/{F•Line} ... {connects 2 points plotted by F6(▷) F1(PLOT) with a line}/{for drawing a line between any 2 points}
F6(▷) F3(Crcl) ... Circle
F6(▷) F4(Vert) ... Vertical line
F6(▷) F5(Hztl) ... Horizontal line
F6(▷) F6(▷) F1(PEN) ... Freehand
F6(▷) F6(▷) F2(Text) ... Text input

7. Use the cursor keys to move the pointer (✣) to the location where you want to draw, and press EXE.*[3]

*[1] The above shows the function menu that appears in the **GRAPH** mode. Menu items may differ somewhat in other modes.

*[2] In the case of an inverse function graph, drawing starts immediately after you select this option.

*[3] Some sketch functions require specification of two points. After you press EXE to specify the first point, use the cursor keys to move the pointer to the location of the second point and press EXE.

- You can specify line type for the following sketch functions: Tangent, Normal, Inverse, Line, F•Line, Circle, Vertical, Horizontal, Pen

Example **Draw a line that is tangent to point (2, 0) on the graph for $y = x(x + 2)(x - 2)$.**

① MENU GRAPH

② SHIFT F3(V-WIN) F1(INIT) EXIT

③ SHIFT MENU(SET UP)▼▼▼▼▼▼▼▼* F1(—) EXIT

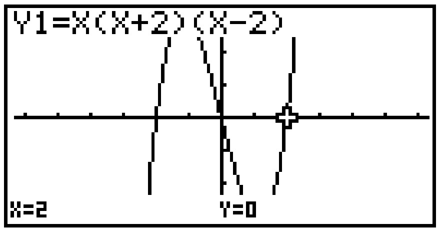
*fx-7400GIII: ▼▼▼▼▼▼▼

④ [F3](TYPE) [F1](Y=) [X,θ,T] [(] [X,θ,T] [+] [2] [)] [(] [X,θ,T] [−] [2] [)] [EXE]

⑤ [F6](DRAW)

⑥ [SHIFT] [F4](SKTCH) [F2](Tang)

⑦ [▶] ~ [▶] [EXE] *1



*1 You can draw a tangent line in succession by moving the "✥" pointer and pressing [EXE].

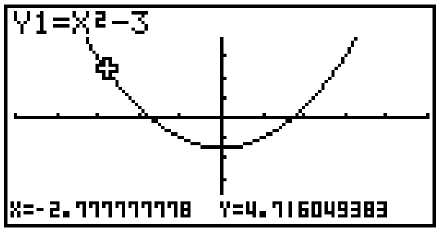
12. Function Analysis

■ Reading Coordinates on a Graph Line

Trace lets you move a pointer along a graph and read out coordinates on the display.

1. From the Main Menu, enter the **GRAPH** mode.
2. Draw the graph.
3. Press [SHIFT] [F1](TRCE), and a pointer appears in the center of the graph.*1
4. Use [◀] and [▶] to move the pointer along the graph to the point at which you want to display the derivative.

   When there are multiple graphs on the display, press [▲] and [▼] to move between them along the x-axis of the current pointer location.



5. You can also move the pointer by pressing [X,θ,T] to display the pop-up window, and then inputting coordinates.

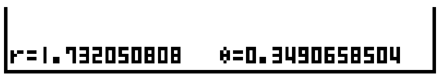
   The pop-up window appears even when you input coordinates directly.

To exit a trace operation, press [SHIFT] [F1](TRCE).

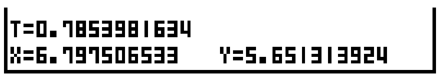
*1 The pointer is not visible on the graph when it is located at a point outside the graph display area or when an error of no value occurs.

- You can turn off display of the coordinates at the pointer location by specifying "Off" for the "Coord" item on the Setup screen.
- The following shows how coordinates are displayed for each function type.

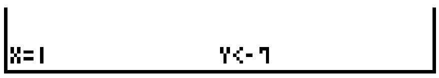
Polar Coordinate Graph



Parametric Graph



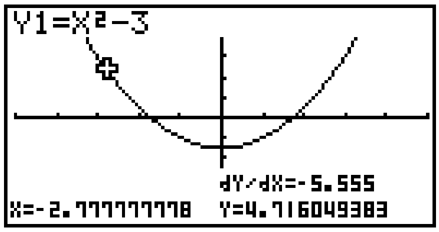
Inequality Graph



■ Displaying the Derivative

In addition to using Trace to display coordinates, you can also display the derivative at the current pointer location.

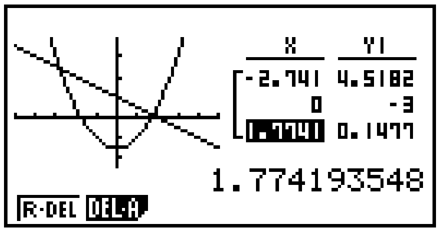
1. From the Main Menu, enter the **GRAPH** mode.
2. On the Setup screen, specify On for Derivative.
3. Draw the graph.
4. Press [SHIFT] [F1](TRCE), and the pointer appears at the center of the graph. The current coordinates and the derivative also appear on the display at this time.



■ Graph to Table

You can use trace to read the coordinates of a graph and store them in a number table. You can also use Dual Graph to simultaneously store the graph and number table, making this an important graph analysis tool.

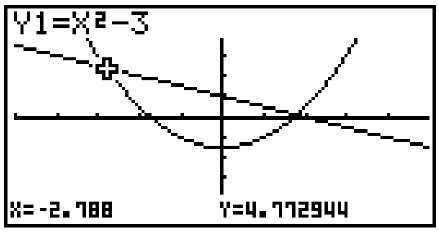
1. From the Main Menu, enter the **GRAPH** mode.
2. On the Setup screen, specify GtoT for Dual Screen.
3. Make V-Window settings.
4. Save the function and draw the graph on the main (left) screen.
5. Activate Trace. When there are multiple graphs on the display, press ▲ and ▼ to select the graph you want.
6. Use ◀ and ▶ to move the pointer and press [EXE] to store coordinates into the number table. Repeat this step to store as many values as you want.
7. Press [OPTN] [F1](CHNG) to make the number table active.



■ Coordinate Rounding

This function rounds off coordinate values displayed by Trace.

1. From the Main Menu, enter the **GRAPH** mode.
2. Draw the graph.
3. Press [SHIFT] [F2](ZOOM) [F6](▷) [F3](RND). This causes the V-Window settings to be changed automatically in accordance with the Rnd value.
4. Press [SHIFT] [F1](TRCE), and then use the cursor keys to move the pointer along the graph. The coordinates that now appear are rounded.



■ Calculating the Root

This feature provides a number of different methods for analyzing graphs.

1. From the Main Menu, enter the **GRAPH** mode.
2. Draw the graphs.
3. Select the analysis function.

[SHIFT] [F5](G-SLV) [F1](ROOT) ... Calculation of root
[F2](MAX) ... Local maximum value
[F3](MIN) ... Local minimum value

[F4](Y-ICPT) ... y-intercept

[F5](ISCT) ... Intersection of two graphs

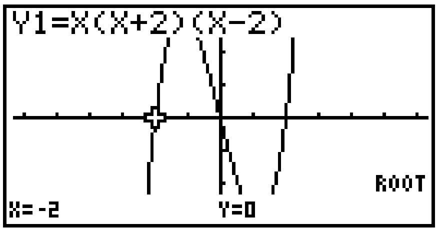
[F6](▷)[F1](Y-CAL) ... y-coordinate for given x-coordinate

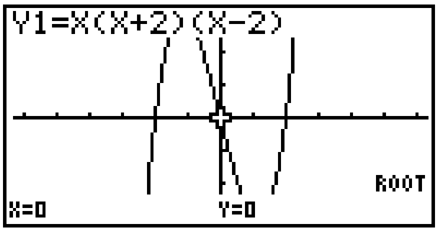
[F6](▷)[F2](X-CAL) ... x-coordinate for given y-coordinate

[F6](▷)[F3]($\int dx$) ... Integral value for a given range

4. When there are multiple graphs on the screen, the selection cursor (■) is located at the lowest numbered graph. Press [▲] and [▼] to move the cursor to the graph you want to select.
5. Press [EXE] to select the graph where the cursor is located and display the value produced by the analysis.

   When an analysis produces multiple values, press [▶] to calculate the next value. Pressing [◀] returns to the previous value.





- Either of the following can cause poor accuracy or even make it impossible to obtain solutions.
  - When the graph of the solution obtained is a point of tangency with the x-axis
  - When a solution is an inflection point

■ Calculating the Point of Intersection of Two Graphs

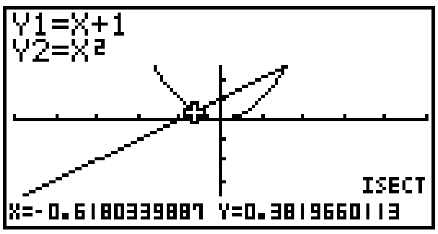
Use the following procedure to calculate the point of intersection of two graphs.

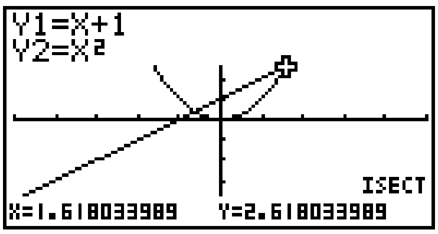
1. Draw the graphs.
2. Press [SHIFT][F5](G-SLV)[F5](ISCT). When there are three or more graphs, the selection cursor (■) appears at the lowest numbered graph.
3. Press [▲] and [▼] to move the cursor to the graph you want to select.
4. Press [EXE] to select the first graph, which changes the shape of the cursor from ■ to ◆.
5. Press [▲] and [▼] to move the cursor to the second graph.
6. Press [EXE] to calculate the point of intersection for the two graphs.

   When an analysis produces multiple values, press [▶] to calculate the next value. Pressing [◀] returns to the previous value.

Example **Graph the two functions shown below, and determine the point of intersection between Y1 and Y2.**

Y1 = x + 1, Y2 = x^2





- You can calculate the point of intersection for rectangular coordinate graphs (Y=$f(x)$ type) and inequality graphs (Y>$f(x)$, Y<$f(x)$, Y≥$f(x)$ or Y≤$f(x)$) only.
- Either of the following can cause poor accuracy or even make it impossible to obtain solutions.
  - When a solution is a point of tangency between two graphs
  - When a solution is an inflection point

■ Determining the Coordinates for Given Points

The following procedure describes how to determine the y-coordinate for a given x, and the x-coordinate for a given y.

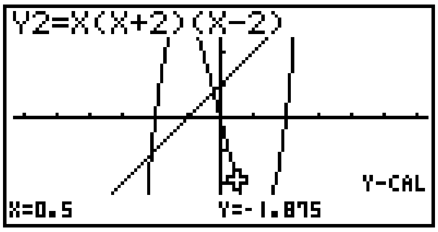
1. Draw the graph.
2. Select the function you want to perform. When there are multiple graphs, the selection cursor (■) appears at the lowest numbered graph.

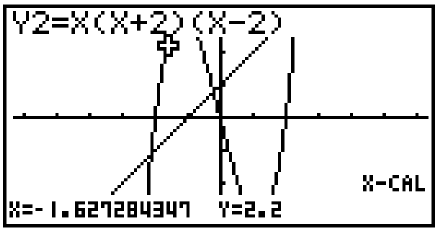
   SHIFT F5(G-SLV) F6(▷) F1(Y-CAL) ... y-coordinate for given x
   F6(▷) F2(X-CAL) ... x-coordinate for given y

3. Use ▲▼ to move the cursor (■) to the graph you want, and then press EXE to select it.
4. Input the given x-coordinate value or y-coordinate value.
   Press EXE to calculate the corresponding y-coordinate value or x-coordinate value.

Example **Graph the two functions shown below and then determine the y-coordinate for x = 0.5 and the x-coordinate for y = 2.2 on graph Y2.**

Y1 = x + 1, Y2 = x(x + 2)(x – 2)





- When there are multiple results for the above procedure, press ▶ to calculate the next value. Pressing ◀ returns to the previous value.
- The X-CAL value cannot be obtained for a parametric function graph.

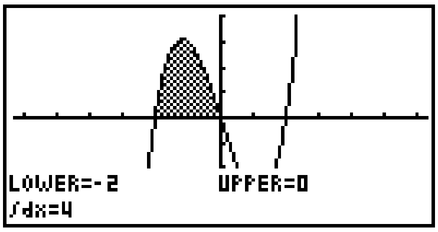
■ Calculating the Integral Value for a Given Range

Use the following procedure to obtain integration values for a given range.

1. Draw the graph.
2. Press SHIFT F5(G-SLV) F6(▷) F3(∫dx). When there are multiple graphs, this causes the selection cursor (■) to appear at the lowest numbered graph.
3. Use ▲▼ to move the cursor (■) to the graph you want, and then press EXE to select it.
4. Use ◀▶ to move the lower limit pointer to the location you want, and then press EXE.
5. Use ▶ to move the upper limit pointer to the location you want.
6. Press EXE to calculate the integral value.

Example **Graph the function shown below, and then determine the integral value at (–2, 0).**

Y1 = $x(x + 2)(x - 2)$



- You can also specify the lower limit and upper limit by inputting them on the 10-key pad.
- When setting the range, make sure that the lower limit is less than the upper limit.
- Integral values can be calculated for rectangular coordinate graphs only.

■ Conic Section Graph Analysis

Important!

- The fx-7400GIII is not equipped with the **CONICS** mode.

You can determine approximations of the following analytical results using conic section graphs.

1. From the Main Menu, enter the **CONICS** mode.
2. Select the function type.
   F1(RECT).... {rectangular coordinate}
   F2(POL).... {polar coordinate}
   F3(PARM).... {parametric}
3. Use ▲ and ▼ to select the conic section you want to analyze.
4. Input the conic section constants.
5. Draw the Graph.

After graphing a conic section, press SHIFT F5(G-SLV) to display the following graph analysis menus.

• Parabolic Graph Analysis

- {**FOCS**}/{**VTX**}/{**LEN**}/{**e**} ... {focus}/{vertex}/{length of latus rectum}/{eccentricity}
- {**DIR**}/{**SYM**} ... {directrix}/{axis of symmetry}
- {**X-IN**}/{**Y-IN**} ... {x-intercept}/{y-intercept}

• Circular Graph Analysis

- {**CNTR**}/{**RADS**} ... {center}/{radius}
- {**X-IN**}/{**Y-IN**} ... {x-intercept}/{y-intercept}

• Elliptical Graph Analysis

- {**FOCS**}/{**VTX**}/{**CNTR**}/{**e**} ... {focus}/{vertex}/{center}/{eccentricity}
- {**X-IN**}/{**Y-IN**} ... {x-intercept}/{y-intercept}

• Hyperbolic Graph Analysis

- {**FOCS**}/{**VTX**}/{**CNTR**}/{**e**} ... {focus}/{vertex}/{center}/{eccentricity}
- {**ASYM**} ... {asymptote}
- {**X-IN**}/{**Y-IN**} ... {x-intercept}/{y-intercept}

• To calculate the focus and length of latus rectum [G-SLV]-[FOCS]/[LEN]

Example **To determine the focus and length of latus rectum for the parabola X = $(Y - 2)^2 + 3$**

Use the following V-Window settings.

Xmin = –1, Xmax = 10, Xscale = 1

Ymin = –5, Ymax = 5, Yscale = 1

MENU CONICS

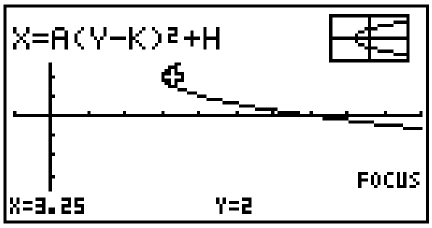
EXE

1 EXE 2 EXE 3 EXE F6 (DRAW)

SHIFT F5 (G-SLV)

F1 (FOCS)

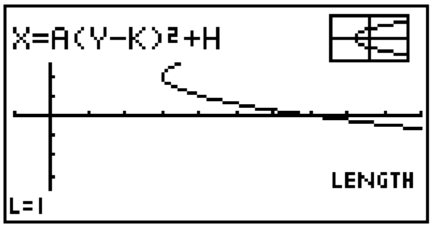
(Calculates the focus.)



SHIFT F5 (G-SLV)

F5 (LEN)

(Calculates the length of latus rectum.)



- When calculating two foci for an ellipse or hyperbolic graph, press ▶ to calculate the second focus. Pressing ◀ returns to the first focus.
- When calculating two vertexes for a hyperbolic graph, press ▶ to calculate the second vertex. Pressing ◀ returns to the first vertex.
- Pressing ▶ when calculating the vertices of an ellipse will calculate the next value. Pressing ◀ will scroll back through previous values. An ellipse has four vertices.

• To calculate the center [G-SLV]-[CNTR]

Example **To determine the center for the circle**

$(X + 2)^2 + (Y + 1)^2 = 2^2$

MENU CONICS

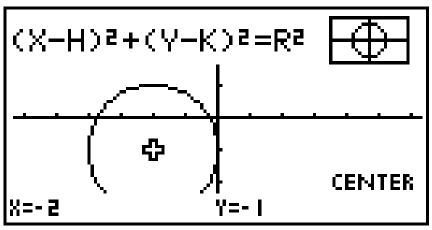
▼ ▼ ▼ ▼ EXE

(–) 2 EXE (–) 1 EXE 2 EXE F6 (DRAW)

SHIFT F5 (G-SLV)

F1 (CNTR)

(Calculates the center.)



Chapter 6 Statistical Graphs and Calculations

Important!

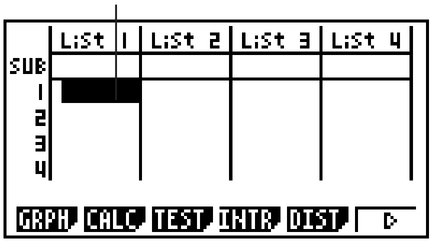
This chapter contains a number of graph screen shots. In each case, new data values were input in order to highlight the particular characteristics of the graph being drawn. Note that when you try to draw a similar graph, the unit uses data values that you have input using the List function. Because of this, the graphs that appear on the screen when you perform a graphing operation will probably differ somewhat from those shown in this manual.

1. Before Performing Statistical Calculations

Entering the **STAT** mode from the Main Menu displays the List Editor screen.

You can use the List Editor screen to input statistical data and perform statistical calculations.

Use ▲, ▼, ◀ and ▶ to move the highlighting around the lists.



Once you input data, you can use it to produce a graph and check for tendencies. You can also use a variety of different regression calculations to analyze the data.

- For information about using the statistical data lists, see "Chapter 3 List Function".

■ Changing Graph Parameters

Use the following procedures to specify the graph draw/non-draw status, the graph type, and other general settings for each of the graphs in the graph menu (GPH1, GPH2, GPH3).

While the statistical data list is on the display, press F1(GRPH) to display the graph menu, which contains the following items.

- {**GPH1**}/{**GPH2**}/{**GPH3**} ... graph {1}/{2}/{3} drawing*1
- {**SEL**} ... {simultaneous graph (GPH1, GPH2, GPH3) selection}
  You can specify the multiple graphs.
- {**SET**} ... {graph settings (graph type, list assignments)}

*1 The initial default graph type setting for all the graphs (Graph 1 through Graph 3) is scatter diagram, but you can change to one of a number of other graph types.

1. General graph settings **[GRPH]-[SET]**

This section describes how to use the general graph settings screen to make the following settings for each graph (GPH1, GPH2, GPH3).

- **Graph Type**

The initial default graph type setting for all the graphs is scatter graph. You can select one of a variety of other statistical graph types for each graph.

• **List**

The initial default statistical data is List 1 for single-variable data, and List 1 and List 2 for paired-variable data. You can specify which statistical data list you want to use for x-data and y-data.

• **Frequency**

This setting specifies a list that contains frequency data.
In statistics, "frequency" means the number of times a data item (or set of data items) occurs. Frequencies are used in "frequency distribution tables," which list each unique data item in one column, with the frequency (number of occurrences) in the column to the right. With this calculator, the data column and frequency column are separate lists. This setting specifies the list (List 1, List 2, etc.) to be used for the frequency column when drawing a statistical graph.

• For a Med-Med graph (page 6-12), input positive integers only for frequency data. Inputting any other type of value (fractional value, etc.) will cause an error.

Important!

• The values contained in a frequency list should be 0 or positive values only. Even a single negative value will cause an error.

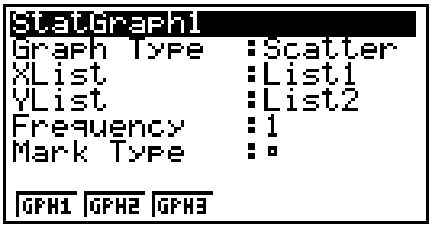
• Statistical data with a frequency of 0 is not used for calculation of minimum and maximum values.

• **Mark Type**

This setting lets you specify the shape of the plot points on the graph.

• To display the general graph settings screen **[GRPH]-[SET]**

Pressing F1(GRPH)F6(SET) displays the general graph settings screen.



• **StatGraph (statistical graph specification)**
  • {**GPH1**}/{**GPH2**}/{**GPH3**} ... graph {1}/{2}/{3}

• **Graph Type (graph type specification)**
  • {**Scat**}/{***xy***}/{**NPP**}/{**Pie**} ... {scatter diagram}/{xy line graph}/{normal probability plot}/{pie graph}
  • {**Hist**}/{**Box**}/{**Bar**}/{**N·Dis**}/{**Brkn**} ... {histogram}/{med-box graph}/{bar graph}/{normal distribution curve}/{broken line graph}
  • {**X**}/{**Med**}/{**X^2**}/{**X^3**}/{**X^4**} ... {linear regression graph}/{Med-Med graph}/{quadratic regression graph}/{cubic regression graph}/{quartic regression graph}
  • {**Log**}/{**Exp**}/{**Pwr**}/{**Sin**}/{**Lgst**} ... {logarithmic regression graph}/{exponential regression graph}/{power regression graph}/{sinusoidal regression graph}/{logistic regression graph}

• **XList (x-axis data list)/YList (y-axis data list)**
  • {**List**} ... {List 1 to 26}

• **Frequency (number of times a value occurs)**
  • {**1**} ... {1-to-1 plot}
  • {**List**} ... {List 1 to 26}

• **Mark Type (plot mark type)**
  • {□}/{×}/{•} ... scatter diagram plot points

When "Pie" (pie graph) is selected as the Graph Type:

- **Data (Specifies the list to be used as graph data.)**
  - {**LIST**} ... {List 1 to List 26}
- **Display (pie graph value display setting)**
  - {**%**}/{**Data**} ... For each data element {display as percentage}/{display as value}
- **% Sto Mem (Specifies storage of percentage values to a list.)**
  - {**None**}/{**List**} ... For percentage values: {Do not store to list}/{Specify List 1 to 26 and store}

When "Box" (med-box graph) is selected as the Graph Type:

- **Outliers (outliers specification)**
  - {**On**}/{**Off**} ... {display}/{do not display} Med-Box outliers

When "Bar" (bar graph) is selected as the Graph Type:

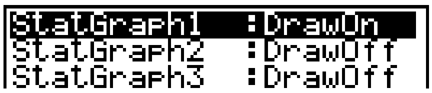
- **Data1 (first stick data list)**
  - {**LIST**} ... {List 1 to 26}
- **Data2 (second stick data list)/Data3 (third stick data list)**
  - {**None**}/{**LIST**} ... {none}/{List 1 to 26}
- **Stick Style (stick style specification)**
  - {**Leng**}/{**HZtl**} ... {length}/{horizontal}

2. Graph draw/non-draw status **[GRPH]-[SEL]**

The following procedure can be used to specify the draw (On)/non-draw (Off) status of each of the graphs in the graph menu.

• To specify the draw/non-draw status of a graph

1. Pressing F1(GRPH)F4(SEL) displays the graph On/Off screen.



   - Note that the StatGraph1 setting is for Graph 1 (GPH1 of the graph menu), StatGraph2 is for Graph 2, and StatGraph3 is for Graph 3.
2. Use the cursor keys to move the highlighting to the graph whose status you want to change, and press the applicable function key to change the status.
   - {**On**}/{**Off**} ... {On (draw)}/{Off (non-draw)}
   - {**DRAW**} ... {draws all On graphs}
3. To return to the graph menu, press EXIT.

- V-Window parameters are normally set automatically for statistical graphing. If you want to set V-Window parameters manually, you must change the Stat Wind item to "Manual".

  While the statistical data list is on the display, perform the following procedure.

  SHIFT MENU(SET UP) F2(Man)

  EXIT(Returns to previous menu.)

  Note that V-Window parameters are set automatically for the following types of graphs regardless of whether or not the Stat Wind item is set to "Manual".

Pie, 1-Sample Z Test, 2-Sample Z Test, 1-Prop Z Test, 2-Prop Z Test, 1-Sample t Test, 2-Sample t Test, χ^2 GOF Test, χ^2 2-way Test, 2-Sample F Test (x-axis only disregarded).

- The default setting automatically uses List 1 data as x-axis (horizontal) values and List 2 data as y-axis (vertical) values. Each set of x/y data is a point on the scatter diagram.

2. Calculating and Graphing Single-Variable Statistical Data

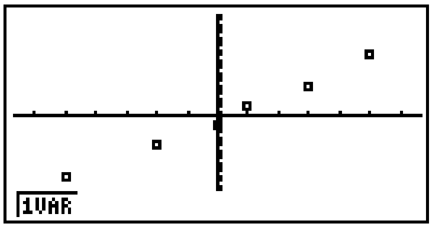
Single-variable data is data with only a single variable. If you are calculating the average height of the members of a class for example, there is only one variable (height).

Single-variable statistics include distribution and sum. The following types of graphs are available for single-variable statistics.

You can also use the procedures under "Changing Graph Parameters" on page 6-1 to make the settings you want before drawing each graph.

■ Normal Probability Plot

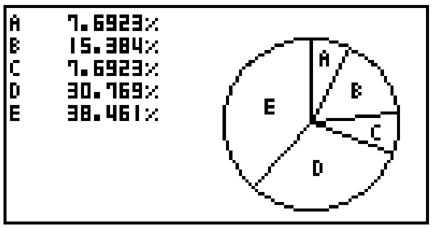
This plot compares the data accumulated ratio with a normal distribution accumulated ratio. XList specifies the list where data is input, and Mark Type is used to select from among the marks {□ / × / • } you want to plot.



Press [AC], [EXIT] or [SHIFT] [EXIT](QUIT) to return to the statistical data list.

■ Pie Graph

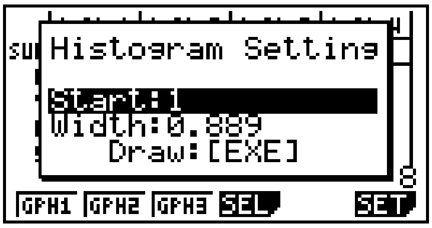
You can draw a pie graph based on the data in a specific list. The maximum number of graph data items (list lines) is 20. The graph is labeled A, B, C, and so on, corresponding to lines 1, 2, 3, and so on of the list used for the graph data.



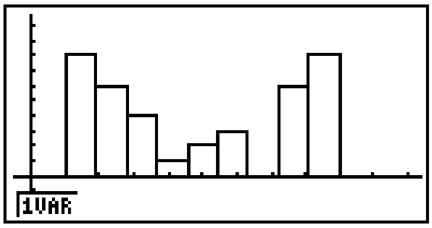
When "%" is selected for the "Display" setting on the general graph settings screen (page 6-3), a value showing the percentage is displayed for each of the alphabetic label letters.

■ Histogram

XList specifies the list where the data is input, while Freq specifies the list where the data frequency is input. 1 is specified for Freq when frequency is not specified.



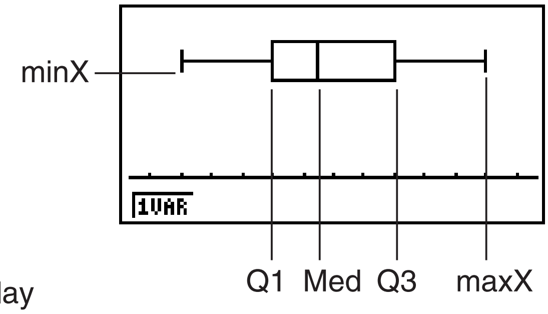
⇒
[EXE](DRAW)



The display screen appears as shown above before the graph is drawn. At this point, you can change the Start and Width values.

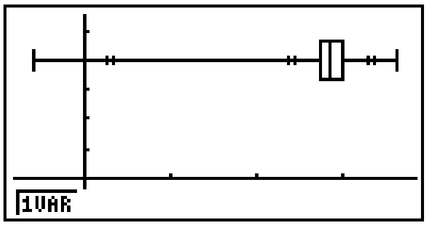
■ Med-box Graph

This type of graph lets you see how a large number of data items are grouped within specific ranges. A box encloses all the data in an area from the first quartile (Q1) to the third quartile (Q3), with a line drawn at the median (Med). Lines (called whiskers) extend from either end of the box up to the minimum (minX) and maximum (maxX) of the data.



From the statistical data list, press [F1](GRPH) to display the graph menu, press [F6](SET), and then change the graph type of the graph you want to use (GPH1, GPH2, GPH3) to med-box graph.

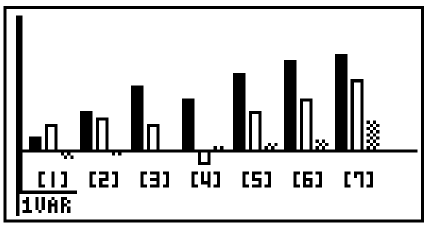
To plot the data that falls outside the box, first specify "MedBox" as the Graph Type. Then, on the same screen you use to specify the graph type, turn the Outliers item "On", and draw the graph.



- Changing the "Q1Q3 Type" setting on the Setup screen can cause the Q1 and Q3 positions to change, even when a Med-box graph is drawn based on a single list.

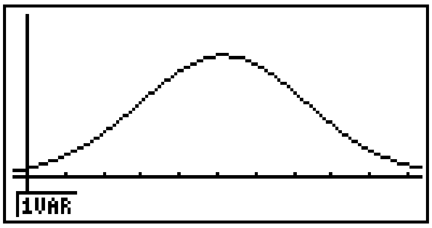
■ Bar Graph

You can specify up to three lists for drawing a bar graph. The graph is labeled [1], [2], [3], and so on, corresponding to lines 1, 2, 3, and so on of the list used for the graph data.



- Any of the following causes an error and cancels bar graph drawing.
  - A Condition ERROR occurs when drawing of multiple graphs is specified using the graph On/Off screen (page 6-3), and bar graph is specified for one of the graphs and a different graph type is specified for another graph.
  - A Dimension ERROR occurs when you draw a graph with two or three lists specified and the specified lists have a different number of list elements.
  - A Condition ERROR occurs when lists are assigned for Data1 and Data3, while "None" is specified for Data2.

■ Normal Distribution Curve



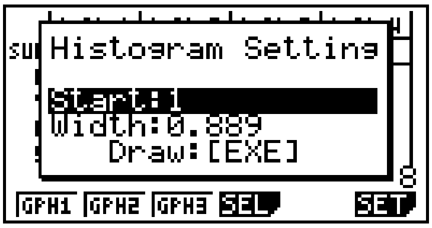
The normal distribution curve is graphed using the normal distribution function.

XList specifies the list where the data is input, while Freq specifies the list where the data frequency is input. 1 is specified for Freq when frequency is not specified.

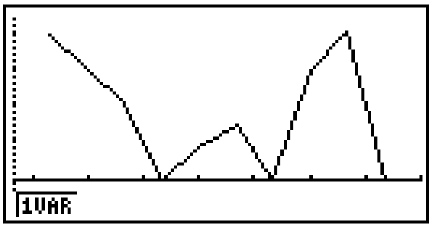
■ Broken Line Graph

Lines connect center points of a histogram bar.

XList specifies the list where the data is input, while Freq specifies the list where the data frequency is input. 1 is specified for Freq when frequency is not specified.



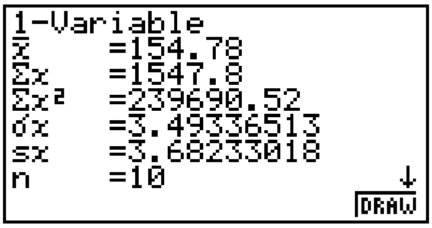
⇒ [EXE](DRAW)



The display screen appears as shown above before the graph is drawn. At this point, you can change the Start and Width values.

■ Displaying the Calculation Results of a Drawn Single-Variable Graph

Single-variable statistics can be expressed as both graphs and parameter values. When these graphs are displayed, the single-variable calculation results appear as shown to the right when you press [F1](1VAR).



- Use [▼] to scroll the list so you can view the items that run off the bottom of the screen.

The following describes the meaning of each of the parameters.

$\bar{x}$ .... mean
Σx .... sum
Σx^2 .... sum of squares
σ_x .... population standard deviation
s_x .... sample standard deviation
n .... number of data items
minX............ minimum

Q1 .... first quartile
Med .... median
Q3 .... third quartile
maxX........... maximum
Mod .... mode
Mod:n .... number of data mode items
Mod:F .... data mode frequency

$$\sigma_x = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n}} = \sqrt{\frac{\Sigma x^2 - (\Sigma x)^2/n}{n}}$$

$$s_x = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}} = \sqrt{\frac{\Sigma x^2 - (\Sigma x)^2/n}{n-1}}$$

- Press F6(DRAW) to return to the original single-variable statistical graph.
- When Mod has multiple solutions, they are all displayed.
- You can use the Setup screen's "Q1Q3 Type" setting to select either "Std" (standard calculation) or "OnData" (French calculation) for the Q1 and Q3 calculation mode.

  For details about calculation methods while "Std" or "OnData" is selected, see "Calculation Methods for the Std and OnData Settings" below.

■ Calculation Methods for the Std and OnData Settings

Q1, Q3 and Med can be calculated in accordance with the Setup screen's "Q1Q3 Type" setting as described below.

• Std

With this calculation method, processing depends on whether the number of elements n in the population is an even number or odd number.

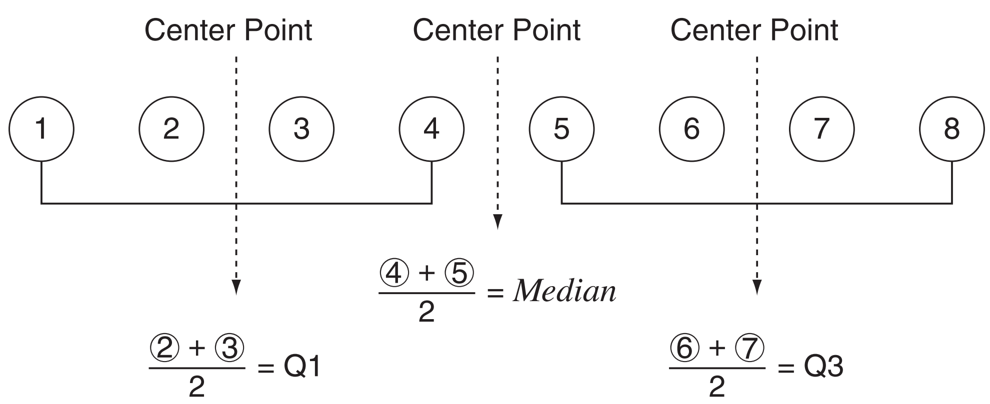
When the number of elements n is an even number:

Using the center point of the total population as the reference, the population elements are divided into two groups: a lower half group and an upper half group. Q1, Q3 and Med then become the values described below.

Q1 = {median of the group of $\frac{n}{2}$ items from the bottom of the population}

Q3 = {median of the group of $\frac{n}{2}$ items from the top of the population}

Med = {$\frac{n}{2}$-th and $\frac{n}{2}$ +1-th element average value}



When the number of elements n is an odd number:

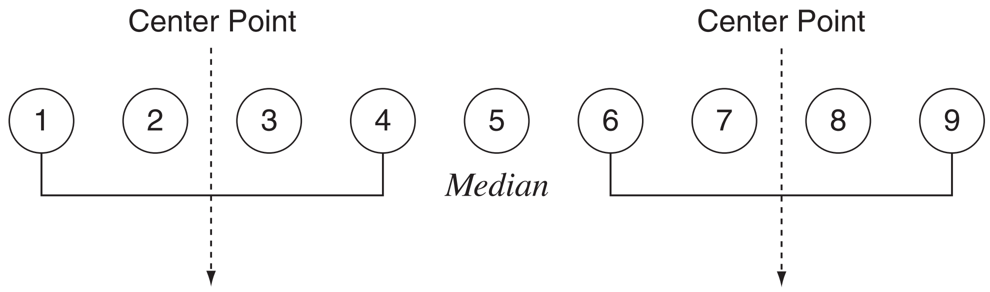
Using the median of the total population as the reference, the population elements are divided into two groups: a lower half group (values less than the median) and an upper half group (values greater than the median). The median value is excluded. Q1, Q3 and Med then become the values described below.

Q1 = {median of the group of $\frac{n-1}{2}$ items from the bottom of the population}

Q3 = {median of the group of $\frac{n-1}{2}$ items from the top of the population}

Med = {$\frac{n+1}{2}$-th element}

- When n = 1, Q1 = Q3 = Med = population center point.



$$\frac{②+③}{2} = \mathrm{Q1} \qquad \frac{⑦+⑧}{2} = \mathrm{Q3}$$

- When Frequency includes decimal fraction values

The Q1, Q3 and Med values for this calculation method are described below.

Q1 = {value of element whose cumulative frequency ratio is greater than 0.25 and nearest to 0.25}

When the cumulative frequency ratio for some data value is exactly 0.25, Q1 is the average of that data value and the next data value.

Q3 = {value of element whose cumulative frequency ratio is greater than 0.75 and nearest to 0.75}

When the cumulative frequency ratio for some data value is exactly 0.75, Q3 is the average of that data value and the next data value.

Med = {value of element whose cumulative frequency ratio is greater than 0.5 and nearest to 0.5}

When the cumulative frequency ratio for some data value is exactly 0.5, Med is the average of that data value and the next data value.

The following shows an actual example of the above.

Data Value	Frequency	Cumulative Frequency	Cumulative Frequency Ratio
1	0.1	0.1	0.1/1.0 = 0.1
2	0.1	0.2	0.2/1.0 = 0.2
3	**0.2**	**0.4**	**0.4/1.0 = 0.4**
4	0.3	0.7	0.7/1.0 = 0.7
5	**0.1**	**0.8**	**0.8/1.0 = 0.8**
6	0.1	0.9	0.9/1.0 = 0.9
7	0.1	1.0	1.0/1.0 = 1.0

- 3 is the value whose cumulative frequency ratio is greater than 0.25 and nearest to 0.25, so Q1 = 3.
- 5 is the value whose cumulative frequency ratio is greater than 0.75 and nearest to 0.75, so Q3 = 5.
- 4 is the value whose cumulative frequency ratio is greater than 0.5 and nearest to 0.5, so Med = 4.

• OnData

The Q1, Q3 and Med values for this calculation method are described below.

Q1 = {value of element whose cumulative frequency ratio is greater than 0.25 and nearest to 0.25}

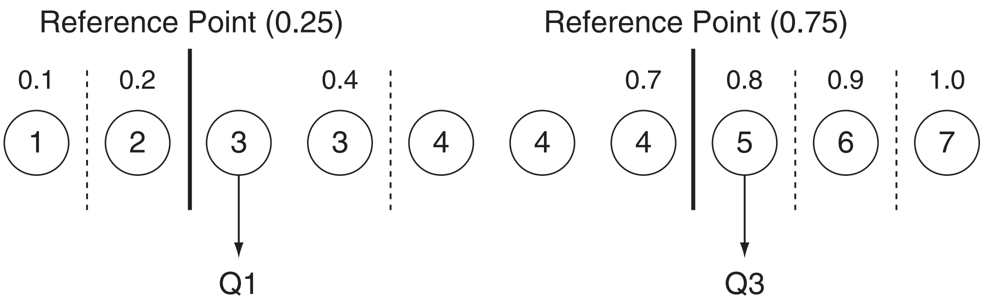
Q3 = {value of element whose cumulative frequency ratio is greater than 0.75 and nearest to 0.75}

The following shows an actual example of the above.

(Number of Elements: 10)

Data Value	Frequency	Cumulative Frequency	Cumulative Frequency Ratio
1	1	1	1/10 = 0.1
2	1	2	2/10 = 0.2
3	**2**	**4**	**4/10 = 0.4**
4	3	7	7/10 = 0.7
5	**1**	**8**	**8/10 = 0.8**
6	1	9	9/10 = 0.9
7	1	10	10/10 = 1.0

- 3 is the value of whose cumulative frequency ratio is greater than or equal to 0.25 and nearest to 0.25, so Q1 = 3.
- 5 is the value of whose cumulative frequency ratio is greater than or equal to 0.75 and nearest to 0.75, so Q3 = 5.



- Med is calculated using the same method as that used when the “Std” is selected for the “Q1Q3 Type” setting.
- It makes no different whether frequency values are all integers or include decimal fraction values when “OnData” is selected for the “Q1Q3 Type” setting.

3. Calculating and Graphing Paired-Variable Statistical Data

■ Drawing a Scatter Diagram and *xy* Line Graph

The following procedure plots a scatter diagram and connects the dots to produce an *xy* line graph.

1. From the Main Menu, enter the **STAT** mode.
2. Input the data into a list.
3. Specify Scat (scatter diagram) or *xy* (*xy* line graph) as the graph type, and then execute the graph operation.

Press [AC], [EXIT] or [SHIFT] [EXIT] (QUIT) to return to the statistical data list.

Example **Input the two sets of data shown below. Next, plot the data on a scatter diagram and connect the dots to produce an *xy* line graph.**

0.5, 1.2, 2.4, 4.0, 5.2 (*x*List)

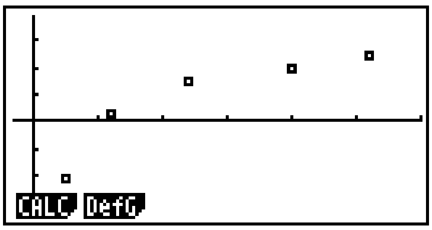
–2.1, 0.3, 1.5, 2.0, 2.4 (*y*List)

① [MENU] STAT

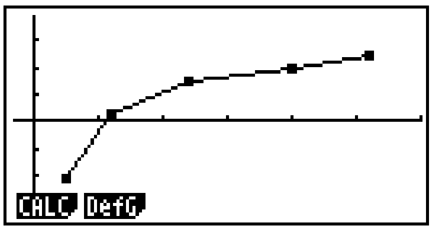
② [0] [•] [5] [EXE] [1] [•] [2] [EXE] [2] [•] [4] [EXE] [4] [EXE] [5] [•] [2] [EXE] [▶]
[(–)] [2] [•] [1] [EXE] [0] [•] [3] [EXE] [1] [•] [5] [EXE] [2] [EXE] [2] [•] [4] [EXE]

③ (Scatter diagram) [F1] (GRPH) [F6] (SET) [▼] [F1] (Scat) [EXIT] [F1] (GPH1)

③ (*xy* line graph) [F1] (GRPH) [F6] (SET) [▼] [F2] (*xy*) [EXIT] [F1] (GPH1)



(Scatter diagram)



(*xy* line graph)

■ Drawing a Regression Graph

Use the following procedure to input paired-variable statistical data, perform a regression calculation using the data, and then graph the results.

1. From the Main Menu, enter the **STAT** mode.
2. Input the data into a list, and plot the scatter diagram.
3. Select the regression type, execute the calculation, and display the regression parameters.
4. Draw the regression graph.

Example **Input the two sets of data shown below and plot the data on a scatter diagram. Next, perform logarithmic regression on the data to display the regression parameters, and then draw the corresponding regression graph.**

0.5, 1.2, 2.4, 4.0, 5.2 (xList)

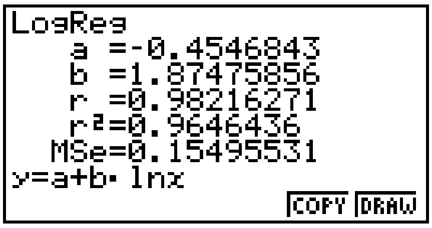
–2.1, 0.3, 1.5, 2.0, 2.4 (yList)

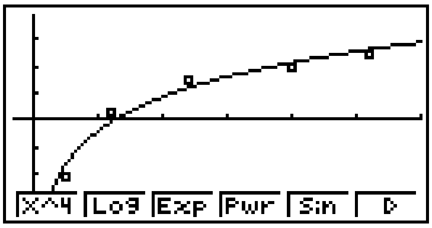
① MENU STAT

② 0 • 5 EXE 1 • 2 EXE 2 • 4 EXE 4 EXE 5 • 2 EXE ▶
(–) 2 • 1 EXE 0 • 3 EXE 1 • 5 EXE 2 EXE 2 • 4 EXE
F1(GRPH) F6(SET) ▼ F1(Scat) EXIT F1(GPH1)

③ F1(CALC) F6(▷) F2(Log)

④ F6(DRAW)





- You can perform trace on a regression graph. You cannot perform trace scroll.
- Input a positive integer for frequency data. Other types of values (decimals, etc.) cause an error.

■ Selecting the Regression Type

After you graph paired-variable statistical data, you can use the function menu at the bottom of the display to select from a variety of different types of regression.

- {***ax*+*b***}/{***a*+*bx***}/{**Med**}/{**X^2**}/{**X^3**}/{**X^4**}/{**Log**}/{***ae*^*bx***}/{***ab*^*x***}/{**Pwr**}/{**Sin**}/{**Lgst**} ...
{linear regression ($ax+b$ form)}/{linear regression ($a+bx$ form)}/{Med-Med}/{quadratic regression}/{cubic regression}/{quartic regression}/{logarithmic regression}/{exponential regression (ae^{bx} form)}/{exponential regression (ab^x form)}/{power regression}/{sinusoidal regression}/{logistic regression} calculation and graphing
- {**2VAR**}... {paired-variable statistical results}

■ Displaying Regression Calculation Results

Whenever you perform a regression calculation, the regression formula parameter (such as a and b in the linear regression $y = ax + b$) calculation results appear on the display. You can use these to obtain statistical calculation results.

Regression parameters are calculated as soon as you press a function key to select a regression type, while a graph is on the display.

The following parameters are used by linear regression, logarithmic regression, exponential regression, and power regression.

r ....correlation coefficient

r^2 ....coefficient of determination

MSe.........mean square error

■ Graphing Statistical Calculation Results

While the parameter calculation result is on the display, you can graph the displayed regression formula by pressing F6(DRAW).

■ Linear Regression Graph

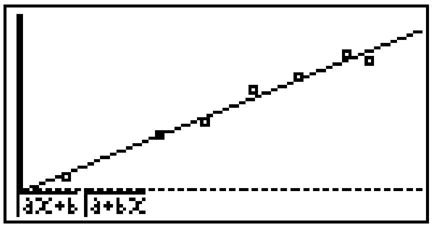
Linear regression uses the method of least squares to plot a straight line that passes close to as many data points as possible, and returns values for the slope and y-intercept (y-coordinate when x = 0) of the line.

The graphic representation of this relationship is a linear regression graph.

F1(CALC)F2(X)

F1($ax+b$) or F2($a+bx$)

F6(DRAW)



The following is the linear regression model formula.

$y = ax + b$

a .... regression coefficient (slope)

b .... regression constant term (y-intercept)

$y = a + bx$

a .... regression constant term (y-intercept)

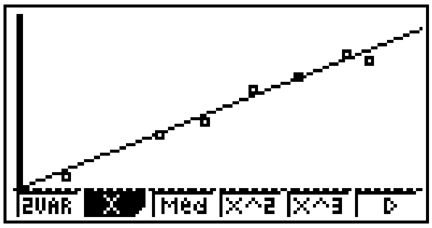
b .... regression coefficient (slope)

■ Med-Med Graph

When it is suspected that there are a number of extreme values, a Med-Med graph can be used in place of the least squares method. This is similar to linear regression, but it minimizes the effects of extreme values.

F1(CALC)F3(Med)

F6(DRAW)



The following is the Med-Med graph model formula.

$y = ax + b$

a............. Med-Med graph slope

b............. Med-Med graph y-intercept

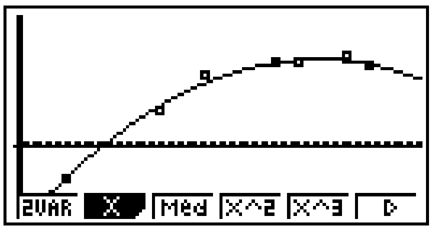
■ Quadratic/Cubic/Quartic Regression Graph

A quadratic/cubic/quartic regression graph represents connection of the data points of a scatter diagram. It uses the method of least squares to draw a curve that passes close to as many data points as possible. The formula that represents this is quadratic/cubic/quartic regression.

Ex. Quadratic regression

F1(CALC)F4(X^2)

F6(DRAW)



Quadratic regression

Model formula....... $y = ax^2 + bx + c$

a.......... regression second coefficient

b.......... regression first coefficient

c.......... regression constant term (y-intercept)

Cubic regression

Model formula....... $y = ax^3 + bx^2 + cx + d$

a.......... regression third coefficient

b.......... regression second coefficient

c.......... regression first coefficient

d.......... regression constant term (y-intercept)

Quartic regression

Model formula....... $y = ax^4 + bx^3 + cx^2 + dx + e$

a.......... regression fourth coefficient

b.......... regression third coefficient

c.......... regression second coefficient

d.......... regression first coefficient

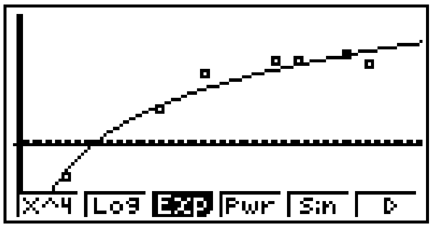
e.......... regression constant term (y-intercept)

■ Logarithmic Regression Graph

Logarithmic regression expresses y as a logarithmic function of x. The standard logarithmic regression formula is $y = a + b \times \ln x$, so if we say that $X = \ln x$, the formula corresponds to linear regression formula $y = a + bX$.

F1(CALC) F6(▷) F2(Log)

F6(DRAW)



The following is the logarithmic regression model formula.

$y = a + b \cdot \ln x$

a............. regression constant term

b............. regression coefficient

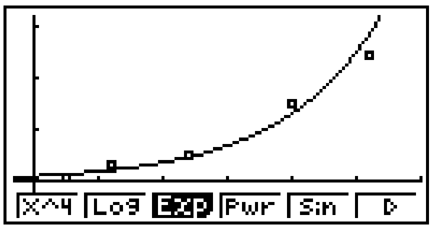
■ Exponential Regression Graph

Exponential regression expresses y as a proportion of the exponential function of x. The standard exponential regression formula is $y = a \times e^{bx}$, so if we take the logarithms of both sides we get $\ln y = \ln a + bx$. Next, if we say $Y = \ln y$, and $A = \ln a$, the formula corresponds to linear regression formula $Y = A + bx$.

F1(CALC) F6(▷) F3(Exp)

F1(ae^bx) or F2(ab^x)

F6(DRAW)



The following is the exponential regression model formula.

$y = a \cdot e^{bx}$

a............. regression coefficient

b............. regression constant term

$y = a \cdot b^x$

a............. regression constant term

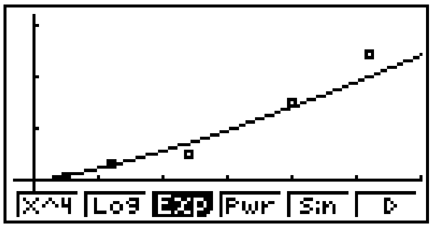
b............. regression coefficient

Power Regression Graph

Power regression expresses y as a proportion of the power of x. The standard power regression formula is $y = a \times x^b$, so if we take the logarithm of both sides we get In y = In $a + b \times$ In x. Next, if we say X = In x, Y = In y, and A = In a, the formula corresponds to linear regression formula Y = A + bX.

F1(CALC) F6(▷) F4(Pwr)

F6(DRAW)



The following is the power regression model formula.

$y = a \cdot x^b$

a.............regression coefficient

b.............regression power

Sinusoidal Regression Graph

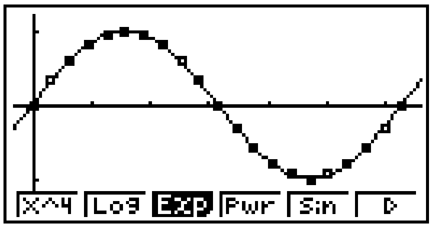
Sinusoidal regression is best applied for cyclical data.

The following is the sinusoidal regression model formula.

$y = a \cdot \sin(bx + c) + d$

F1(CALC) F6(▷) F5(Sin)

F6(DRAW)



Drawing a sine regression graph causes the angle unit setting of the calculator to automatically change to Rad (radians). The angle unit does not change when you perform a sine regression calculation without drawing a graph.

- Certain types of data may take a long time to calculate. This does not indicate malfunction.

Logistic Regression Graph

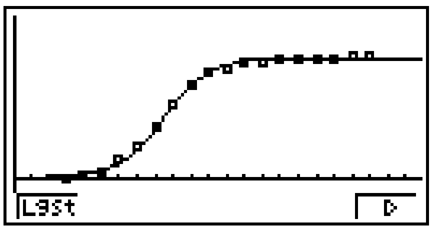
Logistic regression is best applied for time-based phenomena in which there is a continual increase until a saturation point is reached.

The following is the logistic regression model formula.

$$y = \frac{c}{1 + ae^{-bx}}$$

F1(CALC) F6(▷) F6(▷) F1(Lgst)

F6(DRAW)



- Certain types of data may take a long time to calculate. This does not indicate malfunction.

Residual Calculation

Actual plot points (y-coordinates) and regression model distance can be calculated during regression calculations.

While the statistical data list is on the display, recall the Setup screen to specify a LIST ("List 1" through "List 26") for "Resid List". Calculated residual data is stored in the specified list.

The vertical distance from the plots to the regression model will be stored in the list.

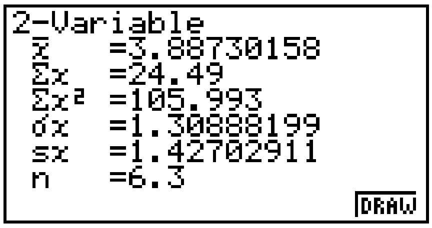
Plots that are higher than the regression model are positive, while those that are lower are negative.

Residual calculation can be performed and saved for all regression models.

Any data already existing in the selected list is cleared. The residual of each plot is stored in the same precedence as the data used as the model.

■ Displaying the Calculation Results of a Drawn Paired-Variable Graph

Paired-variable statistics can be expressed as both graphs and parameter values. When these graphs are displayed, the paired-variable calculation results appear as shown below when you press F1(CALC)F1(2VAR).



- Use ▼ to scroll the list so you can view the items that run off the bottom of the screen.

$\bar{x}$ .... mean of data stored in xList

Σx .... sum of data stored in xList

Σx^2 .... sum of squares of data stored in xList

σ_x .... population standard deviation of data stored in xList

s_x .... sample standard deviation of data stored in xList

n .... number of data

$\bar{y}$ .... mean of data stored in yList

Σy .... sum of data stored in yList

Σy^2 .... sum of squares of data stored in yList

σ_y .... population standard deviation of data stored in yList

s_y .... sample standard deviation of data stored in yList

Σxy .... sum of the product of data stored in xList and yList

minX...... minimum of data stored in xList

maxX..... maximum of data stored in xList

minY...... minimum of data stored in yList

maxY..... maximum of data stored in yList

■ Copying a Regression Graph Formula to the GRAPH Mode

You can copy regression formula calculation results to the **GRAPH** mode Graph relation list, and store and compare.

1. While a regression calculation result is on the display (see "Displaying Regression Calculation Results" on page 6-11), press F5(COPY).
   - This will display the **GRAPH** mode Graph relation list.*1
2. Use ▲ and ▼ to highlight the area to which you want to copy the regression formula of the displayed result.
3. Press EXE to save the copied graph formula and return to the previous regression calculation result display.

*1 You cannot edit regression formulas for graph formulas in the **GRAPH** mode.

4. Performing Statistical Calculations

All of the statistical calculations up to this point were performed after displaying a graph. The following procedures can be used to perform statistical calculations alone.

• To specify statistical calculation data lists

You have to input the statistical data for the calculation you want to perform and specify where it is located before you start a calculation. Display the statistical data and then press F2(CALC)F6(SET).

The following is the meaning for each item.

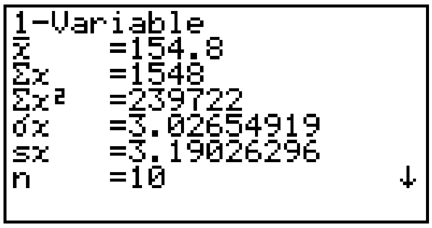
1Var XList....... location of single-variable statistic x values (XList)
1Var Freq .... location of single-variable frequency values (Frequency)
2Var XList....... location of paired-variable statistic x values (XList)
2Var YList....... location of paired-variable statistic y values (YList)
2Var Freq .... location of paired-variable frequency values (Frequency)

• Calculations in this section are performed based on the above specifications.

■ Single-Variable Statistical Calculations

In the previous example under "Displaying the Calculation Results of a Drawn Single-Variable Graph", statistical calculation results were displayed after the graph was drawn. These were numeric expressions of the characteristics of variables used in the graphic display.

These values can also be directly obtained by displaying the statistical data list and pressing F2(CALC)F1(1VAR).



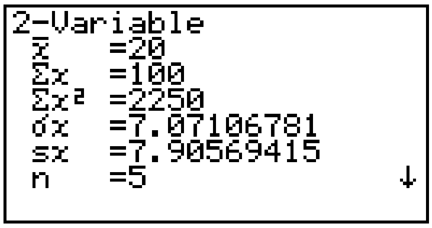
After this, pressing ▲ or ▼ scrolls the statistical calculation result display so you can view variable characteristics.

For details on the meanings of these statistical values, see "Displaying the Calculation Results of a Drawn Single-Variable Graph" (page 6-6).

■ Paired-Variable Statistical Calculations

In the previous example under "Displaying the Calculation Results of a Drawn Paired-Variable Graph", statistical calculation results were displayed after the graph was drawn. These were numeric expressions of the characteristics of variables used in the graphic display.

These values can also be directly obtained by displaying the statistical data list and pressing F2(CALC)F2(2VAR).



After this, pressing ▲ or ▼ scrolls the statistical calculation result display so you can view variable characteristics.

For details on the meanings of these statistical values, see “Displaying the Calculation Results of a Drawn Paired-Variable Graph” (page 6-15).

■ Regression Calculation

In the explanations from “Linear Regression Graph” to “Logistic Regression Graph”, regression calculation results were displayed after the graph was drawn. Here, each coefficient value of the regression line or regression curve is expressed as a number.

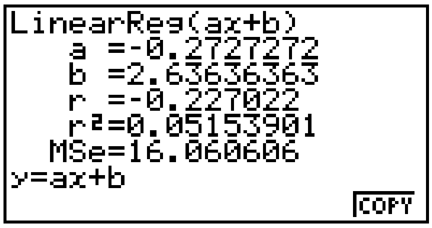
You can directly determine the same expression from the data input screen.

Pressing F2(CALC)F3(REG) displays a function menu, which contains the following items.

- {***ax+b***}/{***a+bx***}/{**Med**}/{**X^2**}/{**X^3**}/{**X^4**}/{**Log**}/{***ae^bx***}/{***ab^x***}/{**Pwr**}/{**Sin**}/{**Lgst**} ...
  {linear regression (*ax+b* form)}/{linear regression (*a+bx* form)}/{Med-Med}/{quadratic regression}/{cubic regression}/{quartic regression}/{logarithmic regression}/{exponential regression (ae^{bx} form)}/{exponential regression (ab^x form)}/{power regression}/{sinusoidal regression}/{logistic regression} parameters

Example **To display single-variable regression parameters**

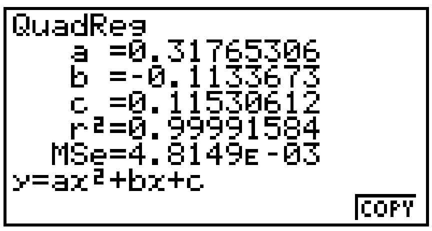
F2(CALC)F3(REG)F1(X)F1(*ax+b*)



The meanings of the parameters that appear on this screen are the same as those for “Linear Regression Graph” to “Logistic Regression Graph”.

• Calculation of the Coefficient of Determination (r^2) and MSe

You can use the **STAT** mode to calculate the coefficient of determination (r^2) for quadratic regression, cubic regression, and quartic regression. The following types of MSe calculations are also available for each type of regression.



• Linear Regression $(ax + b)$............ $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(y_i - (ax_i + b))^2$

$(a + bx)$............ $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(y_i - (a + bx_i))^2$

• Quadratic Regression.................... $MSe = \dfrac{1}{n-3}\sum_{i=1}^{n}(y_i - (ax_i^2 + bx_i + c))^2$

• Cubic Regression.......................... $MSe = \dfrac{1}{n-4}\sum_{i=1}^{n}(y_i - (ax_i^3 + bx_i^2 + cx_i + d))^2$

• Quartic Regression........................ $MSe = \dfrac{1}{n-5}\sum_{i=1}^{n}(y_i - (ax_i^4 + bx_i^3 + cx_i^2 + dx_i + e))^2$

• Logarithmic Regression................. $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(y_i - (a + b\ln x_i))^2$

• Exponential Repression $(a{\cdot}e^{bx})$....... $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(\ln y_i - (\ln a + bx_i))^2$

$(a{\cdot}b^x)$........ $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(\ln y_i - (\ln a + (\ln b)\cdot x_i))^2$

• Power Regression.......................... $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(\ln y_i - (\ln a + b\ln x_i))^2$

• Sin Regression.............................. $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(y_i - (a\sin(bx_i + c) + d))^2$

• Logistic Regression....................... $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}\left(y_i - \dfrac{C}{1 + ae^{-bx_i}}\right)^2$

• Estimated Value Calculation for Regression Graphs

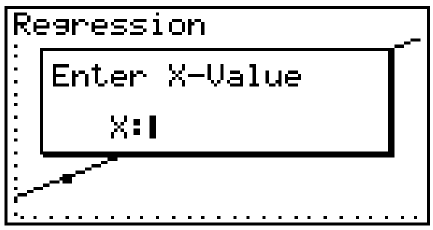
The **STAT** mode also includes a Y-CAL function that uses regression to calculate the estimated y-value for a particular x-value after graphing a paired-variable statistical regression.

The following is the general procedure for using the Y-CAL function.

1. After drawing a regression graph, press SHIFT F5 (G-SLV) F1 (Y-CAL) to enter the graph selection mode, and then press EXE.

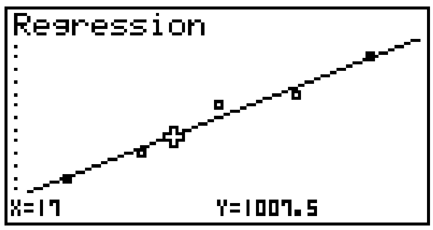
   If there are multiple graphs on the display, use ▲ and ▼ to select the graph you want, and then press EXE.

   • This causes an x-value input dialog box to appear.



2. Input the value you want for x and then press EXE.

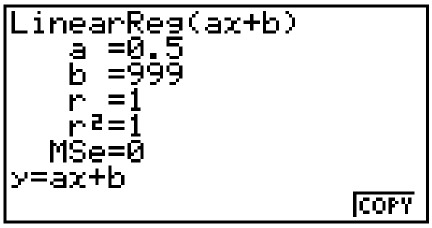
   • This causes the coordinates for x and y to appear at the bottom of the display, and moves the pointer to the corresponding point on the graph.



3. Pressing [X,θ,T] or a number key at this time causes the x-value input dialog box to reappear so you can perform another estimated value calculation if you want.
   - The pointer does not appear if the calculated coordinates are not within the display range.
   - The coordinates do not appear if "Off" is specified for the "Coord" item of the Setup screen.
   - The Y-CAL function can also be used with a graph drawn by using DefG feature.

• Regression Formula Copy Function from a Regression Calculation Result Screen

In addition to the normal regression formula copy function that lets you copy the regression calculation result screen after drawing a statistical graph (such as Scatter Plot), the **STAT** mode also has a function that lets you copy the regression formula obtained as the result of a regression calculation. To copy a resulting regression formula, press [F6](COPY).



■ Estimated Value Calculation ($\hat{x}$, $\hat{y}$)

After drawing a regression graph with the **STAT** mode, you can use the **RUN • MAT** (or **RUN**) mode to calculate estimated values for the regression graph's x and y parameters.

Example **To perform a linear regression using the nearby data and estimate the values of $\hat{y}$ and $\hat{x}$ when xi = 20 and yi = 1000**

xi	10	15	20	25	30
yi	1003	1005	1010	1011	1014

1. From the Main Menu, enter the **STAT** mode.
2. Input data into the list and draw the linear regression graph.
3. From the Main Menu, enter the **RUN • MAT** (or **RUN**) mode.
4. Press the keys as follows.

[2] [0] (value of xi)
[OPTN] [F5](STAT)* [F2]($\hat{y}$) [EXE]
* fx-7400GIII: [F4](STAT)

The estimated value $\hat{y}$ is displayed for xi = 20.

[1] [0] [0] [0] (value of yi)
[F1]($\hat{x}$) [EXE]

The estimated value $\hat{x}$ is displayed for yi = 1000.

- You cannot obtain estimated values for a Med-Med, quadratic regression, cubic regression, quartic regression, sinusoidal regression, or logistic regression graph.

■ Normal Probability Distribution Calculation

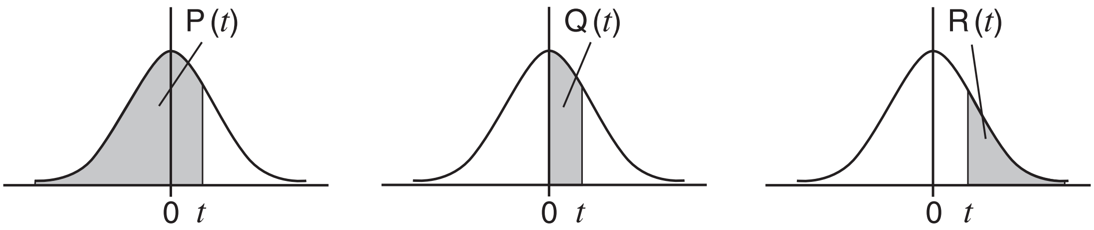
You can calculate normal probability distributions for single-variable statistics with the **RUN • MAT** (or **RUN**) mode.

Press OPTN F6(▷) F3(PROB) (F2(PROB) on the fx-7400GIII) F6(▷) to display a function menu, which contains the following items.

- {**P(**}/{**Q(**}/{**R(**} ... obtains normal probability {P(t)}/{Q(t)}/{R(t)} value
- {***t*(**} ... {obtains normalized variate $t(x)$ value}

- Normal probability P(t), Q(t), and R(t), and normalized variate $t(x)$ are calculated using the following formulas.

Standard Normal Distribution



$$\frac{1}{\sqrt{2\pi}}\int_{-\infty}^{t} e^{-\frac{u^2}{2}}du \qquad \frac{1}{\sqrt{2\pi}}\int_{0}^{t} e^{-\frac{u^2}{2}}du \qquad \frac{1}{\sqrt{2\pi}}\int_{t}^{+\infty} e^{-\frac{u^2}{2}}du$$

$$t(x) = \frac{x-\bar{x}}{\sigma x}$$

Example **The following table shows the results of measurements of the height of 20 college students. Determine what percentage of the students fall in the range 160.5 cm to 175.5 cm. Also, in what percentile does the 175.5 cm tall student fall?**

Class no.	Height (cm)	Frequency
1	158.5	1
2	160.5	1
3	163.3	2
4	167.5	2
5	170.2	3

Class no.	Height (cm)	Frequency
6	173.3	4
7	175.5	2
8	178.6	2
9	180.4	2
10	186.7	1

1. From the Main Menu, enter the **STAT** mode.
2. Input the height data into List 1 and the frequency data into List 2.
3. Perform the single-variable statistical calculations.

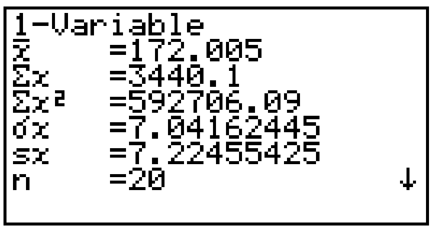
   You can obtain the normalized variate immediately after performing single-variable statistical calculations only.

   F2(CALC) F6(SET)

   F1(LIST) 1 EXE

   ▼ F2(LIST) 2 EXE SHIFT EXIT(QUIT)

   F2(CALC) F1(1VAR)



4. Press [MENU], select the **RUN • MAT** (or **RUN**) mode, press [OPTN] [F6](▷) [F3](PROB) ([F2](PROB) on the fx-7400GIII) to recall the probability calculation (PROB) menu.

[F3](PROB)* [F6](▷) [F4](t() [1] [6] [0] [•] [5] [)] [EXE]
* fx-7400GIII: [F2](PROB)

(Normalized variate t for 160.5 cm) Result: –1.633855948 (≒ –1.634)

[F4](t() [1] [7] [5] [•] [5] [)] [EXE]

(Normalized variate t for 175.5 cm) Result: 0.4963343361 (≒ 0.496)

[F1](P() [0] [•] [4] [9] [6] [)] [–]
[F1](P() [(–)] [1] [•] [6] [3] [4] [)] [EXE]

(Percentage of total) Result: 0.638921 (63.9% of total)

[F3](R() [0] [•] [4] [9] [6] [)] [EXE]

(Percentile) Result: 0.30995 (31.0 percentile)

■ Drawing a Normal Probability Distribution Graph

You can draw a normal probability distribution graph using manual graphing with the **RUN • MAT** (or **RUN**) mode.

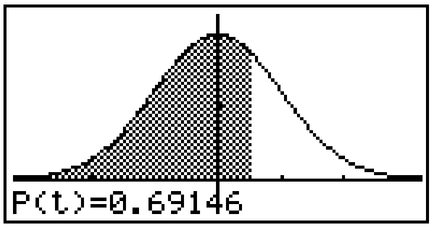
1. From the Main Menu, enter the **RUN • MAT** (or **RUN**) mode.
2. Input the commands to draw a rectangular coordinate graph.
3. Input the probability value.

Example **To draw a normal probability P (0.5) graph.**

① [MENU] RUN • MAT (or RUN)

② [SHIFT] [F4](SKTCH) [F1](Cls) [EXE]
[F5](GRPH) [F1](Y=)

③ [OPTN] [F6](▷) [F3](PROB)* [F6](▷) [F1](P() [0] [•] [5] [)] [EXE]
* fx-7400GIII: [F2](PROB)



■ Calculations Using the Distribution Function

Important!

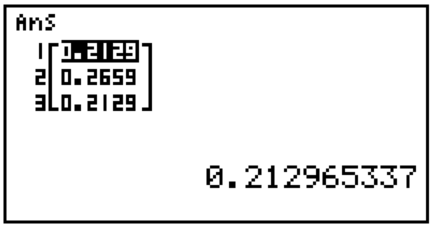
- The following operations cannot be performed on the fx-7400GIII.

You can use special functions in the **RUN • MAT** mode or **PRGM** mode to perform calculations that are the same as the **STAT** mode distribution function calculation (page 6-40).

Example **To calculate normal probability distribution in the RUN • MAT mode for the data {1, 2, 3}, when the population standard deviation is σ = 1.5 and the population mean is μ = 2.**

1. From the Main Menu, enter the **RUN • MAT** mode.
2. Press the keys as follows.

[OPTN] [F5](STAT) [F3](DIST) [F1](NORM)
[F1](NPd) [SHIFT] [×]({) [1] [,] [2] [,] [3]
[SHIFT] [÷](}) [,] [1] [.] [5] [,] [2] [)] [EXE]



• For details about what you can do with the distribution function and its syntax, see “Performing Distribution Calculations in a Program” (page 8-32).

■ Determining Standard Deviation and Variance from List Data

You can use functions to determine standard deviation and variance for specified list data. This calculation is performed in the **RUN • MAT** (or **RUN**) mode. You can perform calculations using data you saved to a list (List 1 to List 26) with the **STAT** mode List Editor or list data you input directly on the **RUN • MAT** (or **RUN**) mode screen.

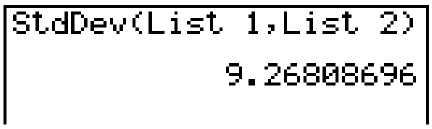
Syntax StdDev(List *n* [,List *m*])
Variance(List *n* [,List *m*])
List *n*........Sample data
List *m*.......Frequency data

Example **To store the *x*-data below in List 1, the frequency values in List 2, and determine the standard deviation and variance**

x	60	70	80	90
Frequency	3	5	4	1

1. From the Main Menu, enter the **STAT** mode.
2. Use the List Editor to store the above data.
3. From the Main Menu, enter the **RUN • MAT** (or **RUN**) mode.
4. Press the keys as follows.

[OPTN] [F5](STAT) [F4](S • Dev)* [EXIT]
[F1](LIST) [F1](List) [1] [,] [F1](List) [2] [)] [EXE]
* fx-7400GIII: [F4](STAT) [F3](S • Dev)



[EXIT] [F5](STAT) [F5](Var)* [EXIT]
[F1](LIST) [F1](List) [1] [,] [F1](List) [2] [)] [EXE]
* fx-7400GIII: [F4](STAT) [F4](Var)

■ Calculations Using the TEST Command

Important!

- The following operations cannot be performed on the fx-7400GIII.

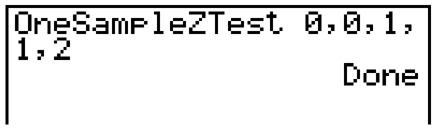
You can use special functions in the **RUN • MAT** mode or **PRGM** mode to perform calculations that are the same as the **STAT** mode Z Test, t Test, and other test calculations (page 6-23).

Example **To determine the z score and p-value when a one-sample Z test is performed under the conditions below:**
test condition (μ condition) $\neq \mu_0$*, assumed population mean $\mu_0 = 0$, population standard deviation $\sigma = 1$, sample mean $\bar{x} = 1$, number of samples $n = 2$

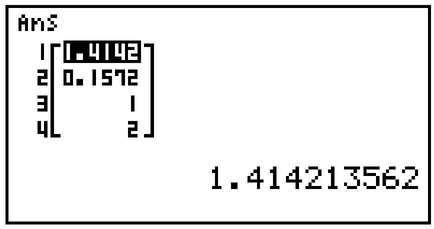
* "μ condition $\neq \mu_0$" can be specified by entering 0 as the initial argument of the one-sample Z test command "OneSampleZTest".

1. From the Main Menu, enter the **RUN • MAT** mode.
2. Perform the following key operation.

[OPTN] [F5](STAT) [F6](▷) [F1](TEST) [F1](Z)
[F1](1-S) [0] [,] [0] [,] [1] [,] [1] [,] [2]
[EXE]



[EXIT] [EXIT] [EXIT]
[F1](LIST) [F1](List) [SHIFT] [(-)](Ans) [EXE]



The following calculation results are displayed as ListAns elements 1 through 4.

1: z score
2: p-value
3: $\bar{x}$
4: n

- For details about the function of the supported TEST command and their syntax, see "Using the TEST Command to Execute a Command in a Program" (page 8-36).

5. Tests

Important!

- Test calculations cannot be performed on the fx-7400GIII.

The ***Z*** **Test** provides a variety of different standardization-based tests. They make it possible to test whether or not a sample accurately represents the population when the standard deviation of a population (such as the entire population of a country) is known from previous tests. Z testing is used for market research and public opinion research, that need to be performed repeatedly.

1-Sample Z Test tests for the unknown population mean when the population standard deviation is known.

2-Sample Z Test tests the equality of the means of two populations based on independent samples when both population standard deviations are known.

1-Prop Z Test tests for an unknown proportion of successes.

2-Prop Z Test tests to compare the proportion of successes from two populations.

The ***t* Test** tests the hypothesis when the population standard deviation is unknown. The hypothesis that is the opposite of the hypothesis being proven is called the *null hypothesis*, while the hypothesis being proved is called the *alternative hypothesis*. The t Test is normally applied to test the null hypothesis. Then a determination is made whether the null hypothesis or alternative hypothesis will be adopted.

1-Sample *t* Test tests the hypothesis for a single unknown population mean when the population standard deviation is unknown.

2-Sample *t* Test compares the population means when the population standard deviations are unknown.

LinearReg *t* Test calculates the strength of the linear association of paired data.

With the **χ^2 test**, a number of independent groups are provided and a hypothesis is tested relative to the probability of samples being included in each group.

The **χ^2 GOF test** (χ^2 one-way Test) tests whether the observed count of sample data fits a certain distribution. For example, it can be used to determine conformance with normal distribution or binomial distribution.

The **χ^2 two-way test** creates a cross-tabulation table that structures mainly two qualitative variables (such as "Yes" and "No"), and evaluates the independence of the variables.

2-Sample F Test tests the hypothesis for the ratio of sample variances. It could be used, for example, to test the carcinogenic effects of multiple suspected factors such as tobacco use, alcohol, vitamin deficiency, high coffee intake, inactivity, poor living habits, etc.

ANOVA tests the hypothesis that the population means of the samples are equal when there are multiple samples. It could be used, for example, to test whether or not different combinations of materials have an effect on the quality and life of a final product.

One-Way ANOVA is used when there is one independent variable and one dependent variable.

Two-Way ANOVA is used when there are two independent variables and one dependent variable.

The following pages explain various statistical calculation methods based on the principles described above. Details concerning statistical principles and terminology can be found in any standard statistics textbook.

On the initial **STAT** mode screen, press F3(TEST) to display the test menu, which contains the following items.

- F3(TEST)F1(Z) ... Z Tests (page 6-25)
  F2(t) ... t Tests (page 6-27)
  F3(CHI) ... χ^2 Test (page 6-30)
  F4(F) ... 2-Sample F Test (page 6-31)
  F5(ANOV) ... ANOVA (page 6-32)

After setting all the parameters, use ▼ to move the highlighting to "Execute" and then press one of the function keys shown below to perform the calculation or draw the graph.

- F1(CALC) ... Performs the calculation.
- F6(DRAW) ... Draws the graph.

• V-Window settings are automatically optimized for drawing the graph.

■ *Z* Tests

• *Z* Test Common Functions

You can use the following graph analysis functions after drawing a *Z* Test result output graph.

- F1(Z) ... Displays z score.

Pressing F1(Z) displays the z score at the bottom of the display, and displays the pointer at the corresponding location in the graph (unless the location is off the graph screen).

Two points are displayed in the case of a two-tail test. Use ◀ and ▶ to move the pointer.

- F2(P) ... Displays p-value.

Pressing F2(P) displays the p-value at the bottom of the display without displaying the pointer.

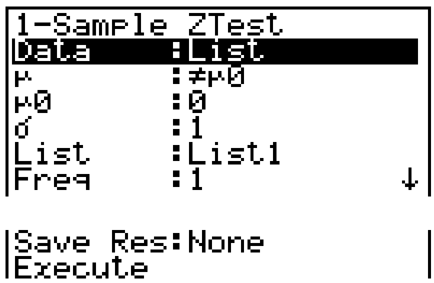
• Executing an analysis function automatically stores the z and p values in alpha variables Z and P, respectively.

• 1-Sample *Z* Test

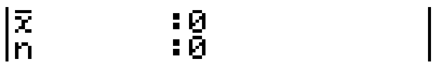
This test is used when the population standard deviation is known to test the hypothesis. The **1-Sample *Z* Test** is applied to the normal distribution.

Perform the following key operations from the statistical data list.

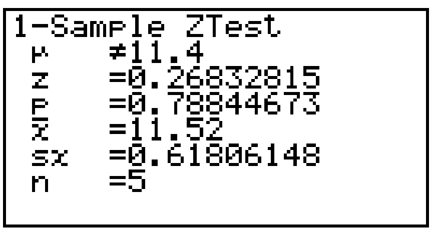
F3(TEST)
F1(Z)
F1(1-S)

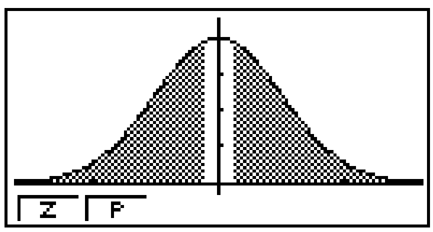


The following shows the parameter data specification items that are different from list data specification.



Calculation Result Output Example





$\mu \neq 11.4$ .... direction of test

s_x .... Displayed only for Data: List setting.

• [Save Res] does not save the μ condition in line 2.

• 2-Sample Z Test

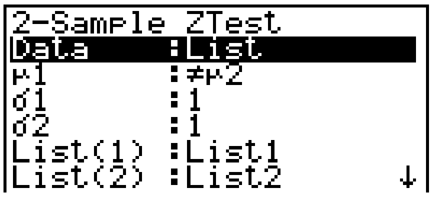
This test is used when the standard deviations for two populations are known to test the hypothesis. The **2-Sample Z Test** is applied to the normal distribution.

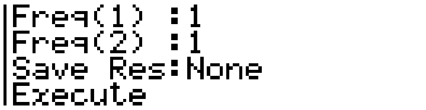
Perform the following key operations from the statistical data list.

F3 (TEST)

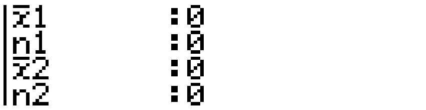
F1 (Z)

F2 (2-S)

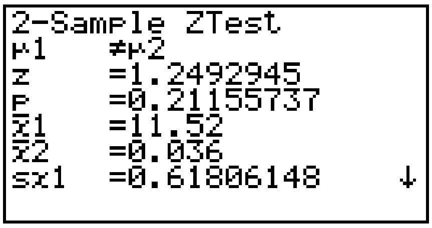


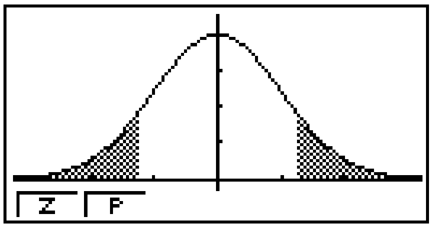


The following shows the parameter data specification items that are different from list data specification.



Calculation Result Output Example





$\mu_1 \neq \mu_2$ .... direction of test

s_{x1} .... Displayed only for Data: List setting.

s_{x2} .... Displayed only for Data: List setting.

• [Save Res] does not save the μ_1 condition in line 2.

• 1-Prop Z Test

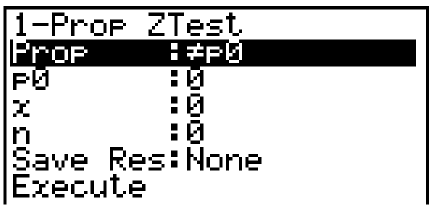
This test is used to test for an unknown proportion of successes. The **1-Prop Z Test** is applied to the normal distribution.

Perform the following key operations from the statistical data list.

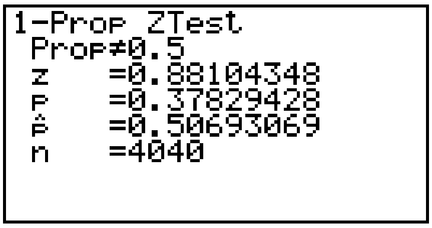
F3 (TEST)

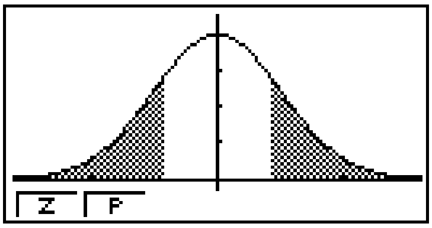
F1 (Z)

F3 (1-P)



Calculation Result Output Example





Prop≠0.5 .... direction of test

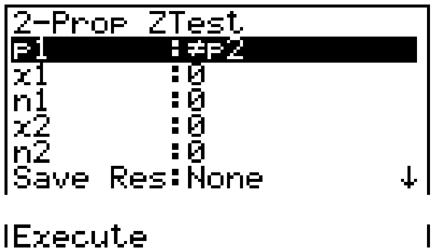
- [Save Res] does not save the Prop condition in line 2.

• 2-Prop Z Test

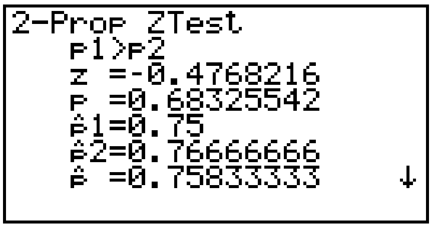
This test is used to compare the proportion of successes. The **2-Prop Z Test** is applied to the normal distribution.

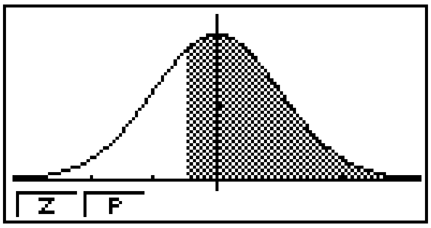
Perform the following key operation from the statistical data list.

F3 (TEST)
F1 (Z)
F4 (2-P)



Calculation Result Output Example





$p_1 > p_2$ .... direction of test

- [Save Res] does not save the p_1 condition in line 2.

■ t Tests

• t Test Common Functions

You can use the following graph analysis functions after drawing a t Test result output graph.

- F1 (T) ... Displays t score.

Pressing F1 (T) displays the t score at the bottom of the display, and displays the pointer at the corresponding location in the graph (unless the location is off the graph screen).

Two points are displayed in the case of a two-tail test. Use ◀ and ▶ to move the pointer.

- F2 (P) ... Displays p-value.

Pressing F2 (P) displays the p-value at the bottom of the display without displaying the pointer.

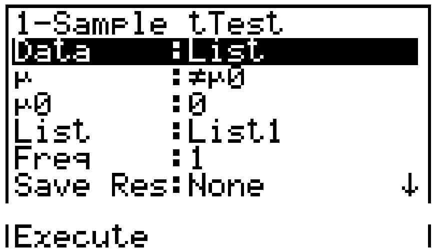
- Executing an analysis function automatically stores the t and p values in alpha variables T and P, respectively.

• 1-Sample *t* Test

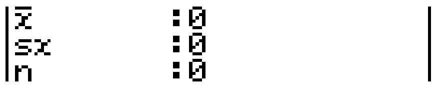
This test uses the hypothesis test for a single unknown population mean when the population standard deviation is unknown. The **1-Sample *t* Test** is applied to t distribution.

Perform the following key operations from the statistical data list.

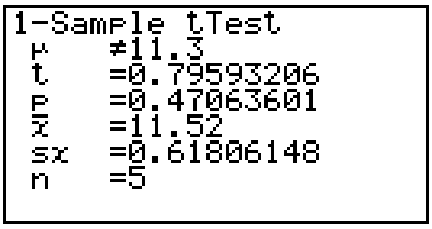
F3 (TEST)
F2 (t)
F1 (1-S)

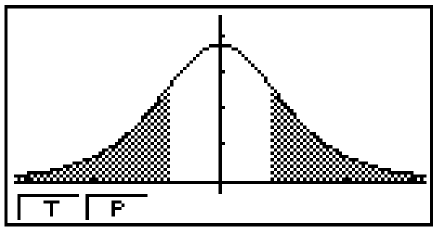


The following shows the parameter data specification items that are different from list data specification.



Calculation Result Output Example





$\mu \neq 11.3$ .... direction of test

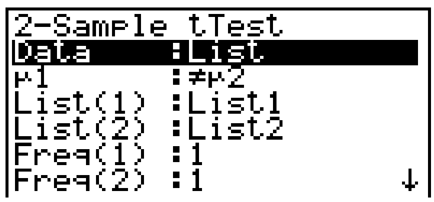
- [Save Res] does not save the μ condition in line 2.

• 2-Sample *t* Test

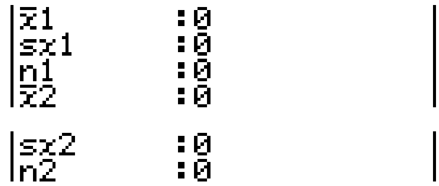
2-Sample *t* Test compares the population means when the population standard deviations are unknown. The **2-Sample *t* Test** is applied to t distribution.

Perform the following key operations from the statistical data list.

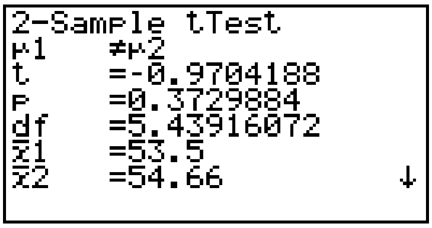
F3 (TEST)
F2 (t)
F2 (2-S)

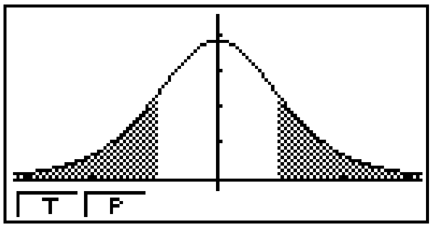


The following shows the parameter data specification items that are different from list data specification.



Calculation Result Output Example





$\mu_1 \neq \mu_2$ .... direction of test

s_p .... Displayed only when Pooled: On setting.

- [Save Res] does not save the μ_1 condition in line 2.

• LinearReg t Test

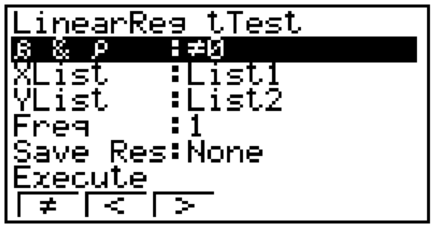
LinearReg t Test treats paired-variable data sets as (x, y) pairs, and uses the method of least squares to determine the most appropriate a, b coefficients of the data for the regression formula $y = a + bx$. It also determines the correlation coefficient and t score, and calculates the extent of the relationship between x and y.

Perform the following key operations from the statistical data list.

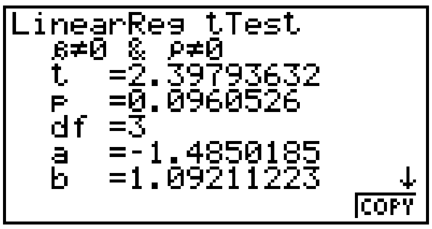
F3(TEST)

F2(t)

F3(REG)

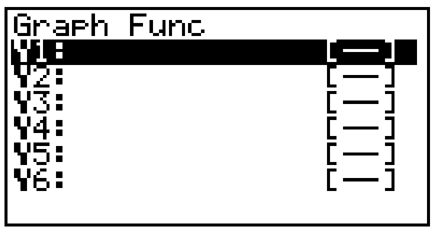


Calculation Result Output Example



$\beta \neq 0$ & $\rho \neq 0$ .... direction of test

Pressing F6(COPY) while a calculation result is on the display copies the regression formula to the Graph relation list.



When there is a list specified for the [Resid List] item on the Setup screen, regression formula residual data is automatically saved to the specified list after the calculation is finished.

- You cannot draw a graph for LinearReg t Test.
- [Save Res] does not save the β & ρ conditions in line 2.
- When the list specified by [Save Res] is the same list specified by the [Resid List] item on the Setup screen, only [Resid List] data is saved in the list.

■ χ^2 Test

• χ^2 Test Common Functions

You can use the following graph analysis functions after drawing a graph.

- F1(CHI) ... Displays χ^2 value.

Pressing F1(CHI) displays the χ^2 value at the bottom of the display, and displays the pointer at the corresponding location in the graph (unless the location is off the graph screen).

- F2(P) ... Displays p-value.

Pressing F2(P) displays the p-value at the bottom of the display without displaying the pointer.

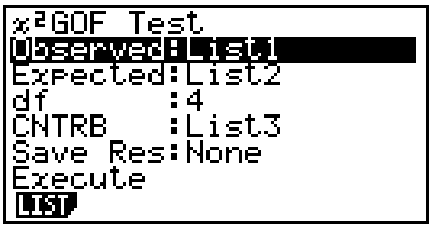
- Executing an analysis function automatically stores the χ^2 and p values in alpha variables C and P, respectively.

• χ^2 GOF Test (χ^2 one-way Test)

The χ^2 **GOF Test** (χ^2 one-way test) tests whether the frequency of sample data fits a certain distribution. For example, it can be used to determine conformance with normal distribution or binomial distribution.

Perform the following key operations from the statistical data list.

F3(TEST)
F3(CHI)
F1(GOF)



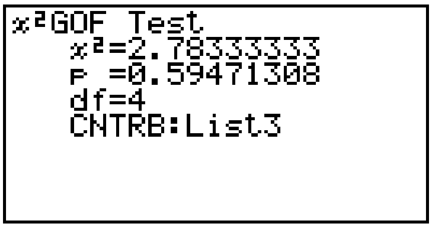
Next, specify the lists that contain the data. The following shows the meaning of the above items.

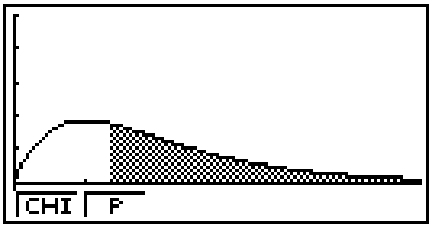
Observed ...... name of List (1 to 26) that contains observed counts (all cells positive integers)

Expected....... name of List (1 to 26) that is for saving expected frequency

CNTRB .... Specifies a list (List 1 to List 26) as the storage location of the contribution of each observed count obtained as calculation results.

Calculation Result Output Examples





CNTRB .... list for output of contribution values

• χ^2 two-way Test

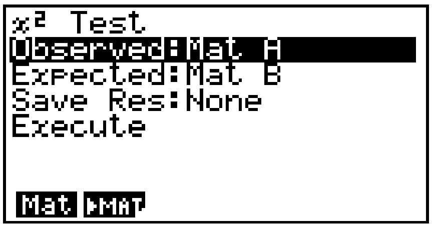
χ^2 two-way Test sets up a number of independent groups and tests hypothesis related to the proportion of the sample included in each group. The χ^2 Test is applied to dichotomous variables (variable with two possible values, such as yes/no).

Perform the following key operations from the statistical data list.

F3 (TEST)

F3 (CHI)

F2 (2WAY)

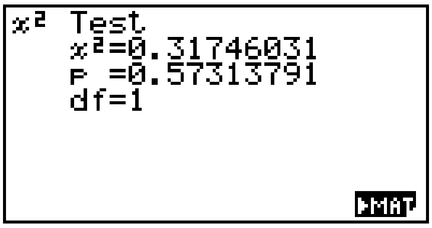


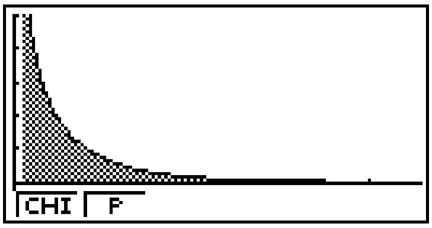
Next, specify the matrix that contains the data. The following shows the meaning of the above items.

Observed ... name of matrix (A to Z) that contains observed counts (all cells positive integers)

Expected .... name of matrix (A to Z) that is for saving expected frequency

Calculation Result Output Example





- The matrix must be at least two lines by two columns. An error occurs if the matrix has only one line or one column.
- Pressing F1 (Mat) while the "Observed" and "Expected" parameter settings are highlighted will display the Matrix (A to Z) setting screen.
- Pressing F2 (▶MAT) while setting parameters enters the Matrix Editor, which you can use to edit and view the contents of matrices.
- Pressing F6 (▶MAT) while a calculation result is displayed enters the Matrix Editor, which you can use to edit and view the contents of matrices.
- Switching from the Matrix Editor to the Vector Editor is not supported.

■ 2-Sample F Test

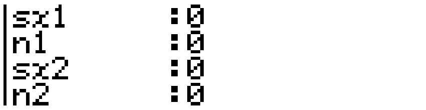
2-Sample F Test tests the hypothesis for the ratio of sample variances. The F Test is applied to the F distribution.

Perform the following key operations from the statistical data list.

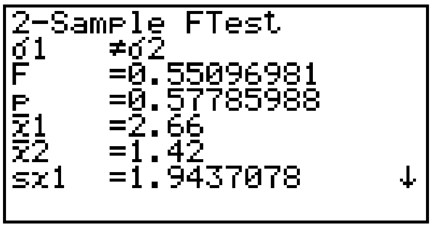
F3(TEST)

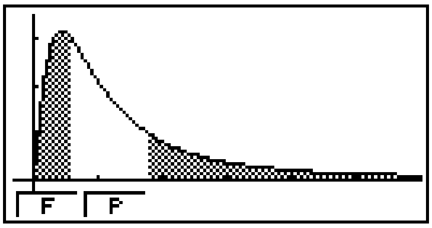
F4(F)

The following shows the parameter data specification items that are different from list data specification.



Calculation Result Output Example





$\sigma_1 \neq \sigma_2$ .... direction of test

$\bar{x}_1$ .... Displayed only for Data: List setting.

$\bar{x}_2$ .... Displayed only for Data: List setting.

You can use the following graph analysis functions after drawing a graph.

- F1(F) ... Displays F value.

Pressing F1(F) displays the F value at the bottom of the display, and displays the pointer at the corresponding location in the graph (unless the location is off the graph screen).

Two points are displayed in the case of a two-tail test. Use ◀ and ▶ to move the pointer.

- F2(P) ... Displays p-value.

Pressing F2(P) displays the p-value at the bottom of the display without displaying the pointer.

- Executing an analysis function automatically stores the F and p values in alpha variables F and P, respectively.
- [Save Res] does not save the σ_1 condition in line 2.

■ ANOVA

ANOVA tests the hypothesis that the population means of the samples are equal when there are multiple samples.

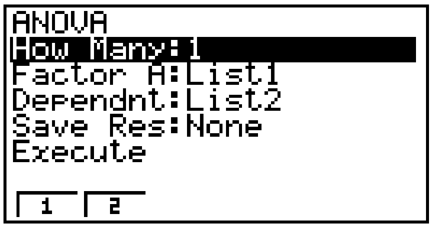
One-Way ANOVA is used when there is one independent variable and one dependent variable.

Two-Way ANOVA is used when there are two independent variables and one dependent variable.

Perform the following key operations from the statistical data list.

F3(TEST)

F5(ANOV)



The following is the meaning of each item in the case of list data specification.

How Many..... selects One-Way ANOVA or Two-Way ANOVA (number of levels)

Factor A........ category list (List 1 to 26)

Dependnt...... list to be used for sample data (List 1 to 26)

Save Res...... first list for storage of calculation results (None or List 1 to 22)*[1]

Execute......... executes a calculation or draws a graph (Two-Way ANOVA only)

*[1] [Save Res] saves each vertical column of the table into its own list. The leftmost column is saved in the specified list, and each subsequent column to the right is saved in the next sequentially numbered list. Up to five lists can be used for storing columns. You can specify an first list number in the range of 1 to 22.

The following item appears in the case of Two-Way ANOVA only.

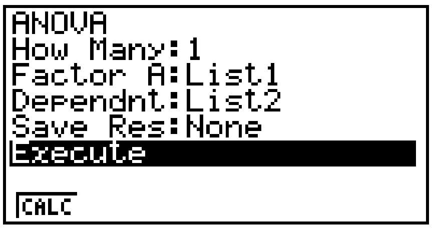
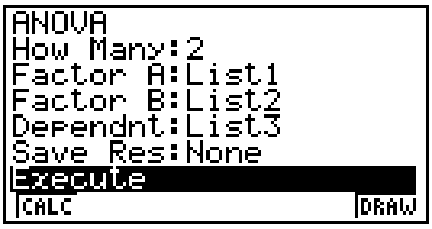
Factor B........ category list (List 1 to 26)

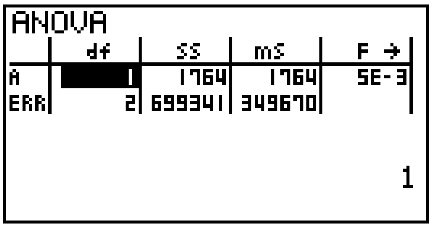
After setting all the parameters, use ▼ to move the highlighting to "Execute" and then press one of the function keys shown below to perform the calculation or draw the graph.

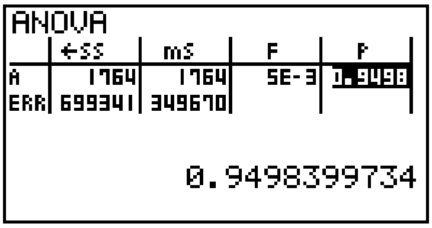
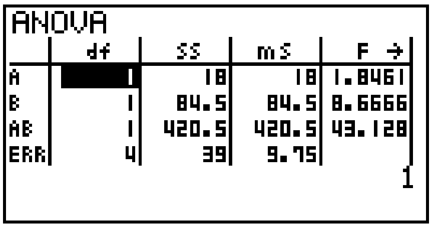
- F1(CALC) ... Performs the calculation.
- F6(DRAW) ... Draws the graph (Two-Way ANOVA only).

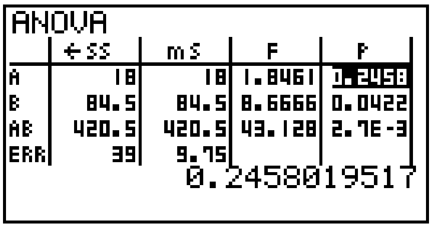
Calculation results are displayed in table form, just as they appear in science books.

Data and Calculation Result Example

	One-Way ANOVA	Two-Way ANOVA
Data	List1={1,1,2,2} List2={124,913,120,1001}	List1={1,1,1,1,2,2,2,2} List2={1,1,2,2,1,1,2,2} List3={113,116,139,132,133,131,126,122}
Setup Screen		

<table>
<tr><th></th><th>One-Way ANOVA</th><th>Two-Way ANOVA</th></tr>
<tr><td>Calculation Result</td><td>


</td><td>


</td></tr>
</table>

One-Way ANOVA

Line 1 (A) .... Factor A *df* value, *SS* value, *MS* value, *F* value, *p*-value

Line 2 (ERR)..... Error *df* value, *SS* value, *MS* value

Two-Way ANOVA

Line 1 (A) .... Factor A *df* value, *SS* value, *MS* value, *F* value, *p*-value

Line 2 (B) .... Factor B *df* value, *SS* value, *MS* value, *F* value, *p*-value

Line 3 (AB)........ Factor A × Factor B *df* value, *SS* value, *MS* value, *F* value, *p*-value

* Line 3 does not appear when there is only one observation in each cell.

Line 4 (ERR)..... Error *df* value, *SS* value, *MS* value

F .... *F* value

p .... *p*-value

df .... degrees of freedom

SS .... sum of squares

MS .... mean squares

With Two-Way ANOVA, you can draw Interaction Plot graphs. The number of graphs depends on Factor B, while the number of X-axis data depends on the Factor A. The Y-axis is the average value of each category.

You can use the following graph analysis function after drawing a graph.

- F1(Trace) or SHIFT F1(TRCE) ... Trace function

Pressing ◀ or ▶ moves the pointer on the graph in the corresponding direction. When there are multiple graphs, you can move between graphs by pressing ▲ and ▼.

- Graphing is available with Two-Way ANOVA only. V-Window settings are performed automatically, regardless of Setup screen settings.
- Using the Trace function automatically stores the number of conditions to alpha variable A and the mean value to variable M, respectively.

ANOVA (Two-Way)

• Description

The nearby table shows measurement results for a metal product produced by a heat treatment process based on two treatment levels: time (A) and temperature (B). The experiments were repeated twice each under identical conditions.

B (Heat Treatment Temperature) A (Time)	B1	B2
A1	113 , 116	139 , 132
A2	133 , 131	126 , 122

Perform analysis of variance on the following null hypothesis, using a significance level of 5%.

H_0 : No change in strength due to time

H_0 : No change in strength due to heat treatment temperature

H_0 : No change in strength due to interaction of time and heat treatment temperature

• Solution

Use Two-Way ANOVA to test the above hypothesis.
Input the above data as shown below.

List1={1,1,1,1,2,2,2,2}

List2={1,1,2,2,1,1,2,2}

List3={113,116,139,132,133,131,126,122}

Define List 3 (the data for each group) as Dependent. Define List 1 and List 2 (the factor numbers for each data item in List 3) as Factor A and Factor B respectively.
Executing the test produces the following results.

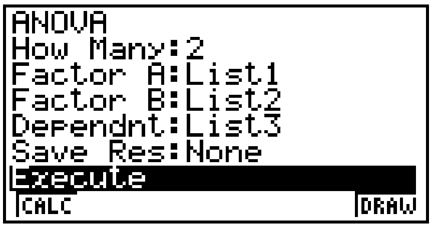
- Time differential (A) level of significance P = 0.2458019517
  The level of significance (p = 0.2458019517) is greater than the significance level (0.05), so the hypothesis is not rejected.

- Temperature differential (B) level of significance P = 0.04222398836
  The level of significance (p = 0.04222398836) is less than the significance level (0.05), so the hypothesis is rejected.

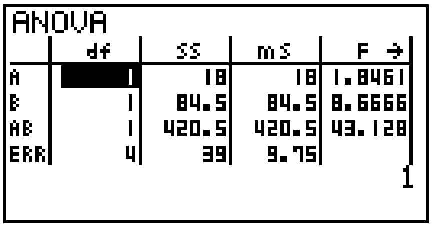
- Interaction (A × B) level of significance P = 2.78169946e-3
  The level of significance (p = 2.78169946e-3) is less than the significance level (0.05), so the hypothesis is rejected.

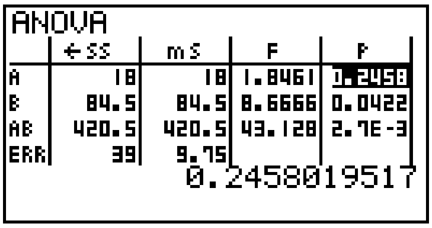
The above test indicates that the time differential is not significant, the temperature differential is significant, and interaction is highly significant.

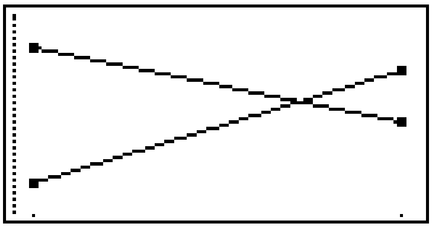
• Input Example



• Results







6. Confidence Interval

Important!

• Confidence interval calculations cannot be performed on the fx-7400GIII.

A confidence interval is a range (interval) that includes a statistical value, usually the population mean.

A confidence interval that is too broad makes it difficult to get an idea of where the population value (true value) is located. A narrow confidence interval, on the other hand, limits the population value and makes it difficult to obtain reliable results. The most commonly used confidence levels are 95% and 99%. Raising the confidence level broadens the confidence interval, while lowering the confidence level narrows the confidence level, but it also increases the chance of accidently overlooking the population value. With a 95% confidence interval, for example, the population value is not included within the resulting intervals 5% of the time.

When you plan to conduct a survey and then t test and Z test the data, you must also consider the sample size, confidence interval width, and confidence level. The confidence level changes in accordance with the application.

1-Sample Z Interval calculates the confidence interval for an unknown population mean when the population standard deviation is known.

2-Sample Z Interval calculates the confidence interval for the difference between two population means when the population standard deviations of two samples are known.

1-Prop Z Interval calculates the confidence interval for an unknown proportion of successes.

2-Prop Z Interval calculates the confidence interval for the difference between the proportion of successes in two populations.

1-Sample t Interval calculates the confidence interval for an unknown population mean when the population standard deviation is unknown.

2-Sample t Interval calculates the confidence interval for the difference between two population means when both population standard deviations are unknown.

On the initial **STAT** mode screen, press F4(INTR) to display the confidence interval menu, which contains the following items.

- F4(INTR)F1(Z) ... Z intervals (page 6-38)
  F2(t) ... t intervals (page 6-39)

After setting all the parameters, use ▼ to move the highlighting to “Execute” and then press the function key shown below to perform the calculation.

- F1(CALC) ... Performs the calculation.

• There is no graphing for confidence interval functions.

• General Confidence Interval Precaution

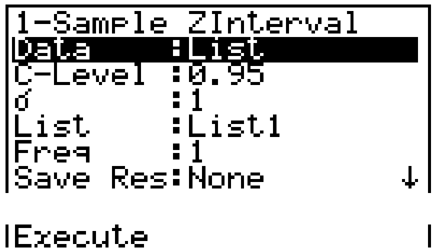
Inputting a value in the range of 0 ≦ C-Level < 1 for the C-Level setting sets a value you input. Inputting a value in the range of 1 ≦ C-Level < 100 sets a value equivalent to your input divided by 100.

■ Z Interval

• 1-Sample Z Interval

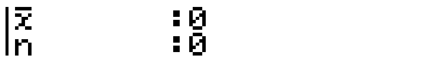
1-Sample Z Interval calculates the confidence interval for an unknown population mean when the population standard deviation is known.

Perform the following key operations from the statistical data list.

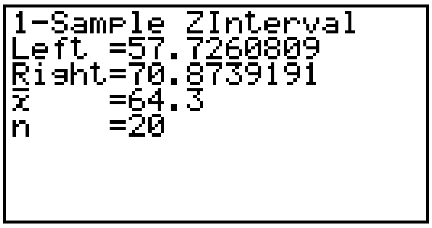


[F4](INTR)
[F1](Z)
[F1](1-S)

The following shows the parameter data specification items that are different from list data specification.



Calculation Result Output Example



• 2-Sample Z Interval

2-Sample Z Interval calculates the confidence interval for the difference between two population means when the population standard deviations of two samples are known.

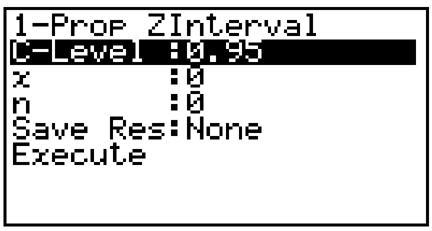
Perform the following key operations from the statistical data list.

[F4](INTR)
[F1](Z)
[F2](2-S)

• 1-Prop Z Interval

1-Prop Z Interval uses the number of data to calculate the confidence interval for an unknown proportion of successes.

Perform the following key operations from the statistical data list.



[F4](INTR)
[F1](Z)
[F3](1-P)

Data is specified using parameter specification.

Calculation Result Output Example

```
1-Prop ZInterval
Left =0.71056582
Right=0.78943417
p̂    =0.75
n    =800
```

• 2-Prop *Z* Interval

2-Prop *Z* Interval uses the number of data items to calculate the confidence interval for the defference between the proportion of successes in two populations.

Perform the following key operations from the statistical data list.

[F4](INTR)
[F1](Z)
[F4](2-P)

■ *t* Interval

• 1-Sample *t* Interval

1-Sample *t* Interval calculates the confidence interval for an unknown population mean when the population standard deviation is unknown.

Perform the following key operations from the statistical data list.

[F4](INTR)
[F2](t)
[F1](1-S)

```
1-Sample tInterval
Data     :List
C-Level  :0.95
List     :List1
Freq     :List1
Save Res:None
Execute
LIST VAR
```

The following shows the parameter data specification items that are different from list data specification.

```
x̄        :0
sx       :0
n        :0
```

Calculation Result Output Example

```
1-Sample tInterval
Left =60.9628946
Right=71.6371054
x̄    =66.3
sx   =8.4
n    =12
```

- **2-Sample t Interval**

2-Sample t Interval calculates the confidence interval for the difference between two population means when both population standard deviations are unknown. The t interval is applied to t distribution.

Perform the following key operations from the statistical data list.

F4 (INTR)

F2 (t)

F2 (2-S)

7. Distribution

Important!

- Distribution calculations cannot be performed on the fx-7400GIII.

There is a variety of different types of distribution, but the most well-known is "normal distribution", which is essential for performing statistical calculations. Normal distribution is a symmetrical distribution centered on the greatest occurrences of mean data (highest frequency), with the frequency decreasing as you move away from the center. Poisson distribution, geometric distribution, and various other distribution shapes are also used, depending on the data type.

Certain trends can be determined once the distribution shape is determined. You can calculate the probability of data taken from a distribution being less than a specific value.

For example, distribution can be used to calculate the yield rate when manufacturing some product. Once a value is established as the criteria, you can calculate normal probability when estimating what percent of the products meet the criteria. Conversely, a success rate target (80% for example) is set up as the hypothesis, and normal distribution is used to estimate the proportion of the products will reach this value.

Normal probability density calculates the probability density of normal distribution from a specified x value.

Normal cumulative distribution calculates the probability of normal distribution data falling between two specific values.

Inverse normal cumulative distribution calculates a value that represents the location within a normal distribution for a specific cumulative probability.

Student-t probability density calculates t probability density from a specified x value.

Student-t cumulative distribution calculates the probability of t distribution data falling between two specific values.

Inverse Student-t cumulative distribution calculates the lower bound value of a Student-t cumulative probability density for a specified percentage.

Like t distribution, probability density (or probability), cumulative distribution and inverse cumulative distribution can also be calculated for χ^2, F, **Binomial**, **Poisson**, **Geometric** and **Hypergeometric** distributions.

On the initial **STAT** mode screen, press F5 (DIST) to display the distribution menu, which contains the following items.

- F5(DIST) F1(NORM) ... Normal distribution (page 6-41)
  F2(t) ... Student-t distribution (page 6-43)
  F3(CHI) ... χ^2 distribution (page 6-44)
  F4(F) ... F distribution (page 6-45)
  F5(BINM) ... Binomial distribution (page 6-46)
  F6(▷) F1(POISN) ... Poisson distribution (page 6-48)
  F6(▷) F2(GEO) ... Geometric distribution (page 6-49)
  F6(▷) F3(H.GEO) ... Hypergeometric distribution (page 6-51)

After setting all the parameters, use ▼ to move the highlighting to "Execute" and then press one of the function keys shown below to perform the calculation or draw the graph.

- F1(CALC) ... Performs the calculation.
- F6(DRAW) ... Draws the graph.

■ Common Distribution Functions

- V-Window settings for graph drawing are set automatically when the Setup screen's "Stat Wind" setting is "Auto". Current V-Window settings are used for graph drawing when the "Stat Wind" setting is "Manual".
- After drawing a graph, you can use the P-CAL function to calculate an estimated p-value for a particular x value. The P-CAL function can be used only after a Normal Probability Density, Student-t Probability Density, χ^2 Probability Density, or F Probability Density graph is drawn.

The following is the general procedure for using the P-CAL function.

1. After drawing a distribution graph, press SHIFT F5(G-SLV) F1(P-CAL) to display the x value input dialog box.
2. Input the value you want for x and then press EXE.
   - This causes the x and p values to appear at the bottom of the display, and moves the pointer to the corresponding point on the graph.
3. Pressing X,θ,T or a number key at this time causes the x value input dialog box to reappear so you can perform another estimated value calculation if you want.
4. After you are finished, press EXIT to clear the coordinate values and the pointer from the display.

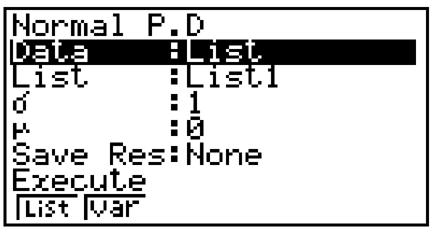
- Executing an analysis function automatically stores the x and p values in alpha variables X and P, respectively.

■ Normal Distribution

• Normal Probability Density

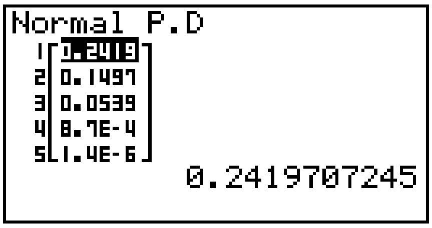
F5(DIST) F1(NORM) F1(NPd)

Normal Probability Density calculates the probability density (p) for a specified single x-value or a list. When a list is specified, calculation results for each list element are displayed in list form.

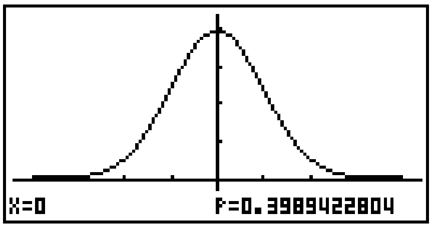


- Normal probability density is applied to standard normal distribution.
- Specifying $\sigma = 1$ and $\mu = 0$ specifies standard normal distribution.

Calculation Result Output Examples



When a list is specified



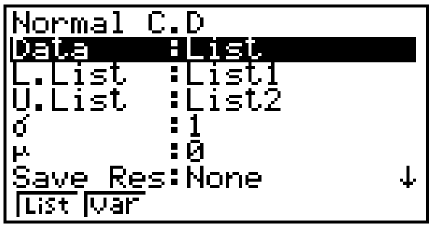
Graph when an x-value is specified

- Graphing is supported only when a variable is specified and a single x-value is entered as data.

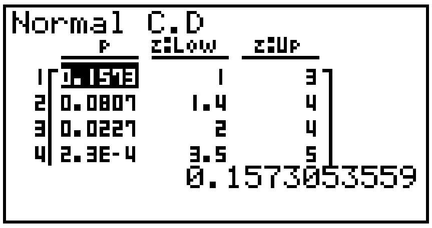
• Normal Cumulative Distribution

F5 (DIST) F1 (NORM) F2 (NCd)

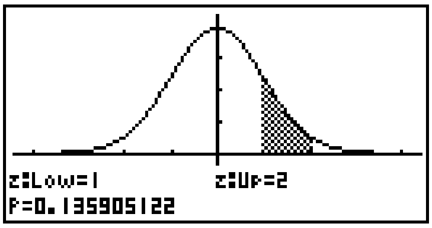
Normal Cumulative Distribution calculates the normal cumulative probability of a normal distribution between a lower bound and an upper bound.



Calculation Result Output Examples



When a list is specified



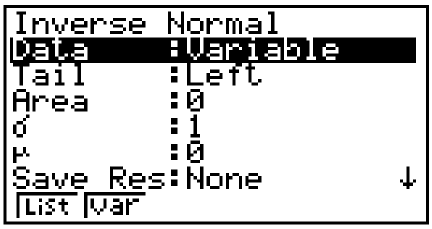
Graph when an x-value is specified

- Graphing is supported only when a variable is specified and a single x-value is entered as data.

• Inverse Normal Cumulative Distribution

F5 (DIST) F1 (NORM) F3 (InvN)

Inverse Normal Cumulative Distribution calculates the boundary value(s) of a normal cumulative distribution probability for specified values.



Area: probability value
(0 ≦ Area ≦ 1)

Inverse cumulative normal distribution calculates a value that represents the location within a normal distribution for a specific cumulative probability.

$$\int_{-\infty}^{Upper} f(x)dx = p$$

Tail: Left
upper boundary
of integration
interval

$$\int_{Lower}^{+\infty} f(x)dx = p$$

Tail: Right
lower boundary
of integration
interval

$$\int_{Lower}^{Upper} f(x)dx = p$$

Tail: Central
upper and lower
boundaries of
integration interval

Specify the probability and use this formula to obtain the integration interval.

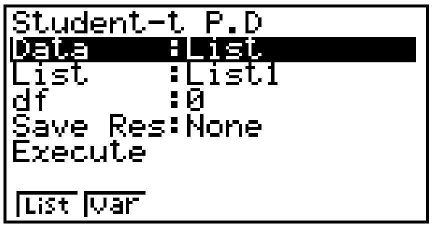
- This calculator performs the above calculation using the following: ∞ = 1E99, –∞ = –1E99
- There is no graphing for Inverse Normal Cumulative Distribution.

Student-t Distribution

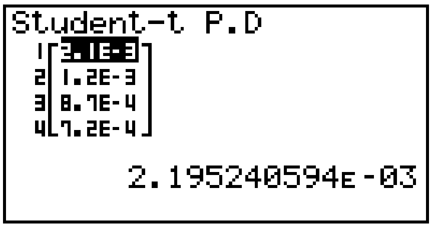
• Student-t Probability Density

F5 (DIST) F2 (t) F1 (tPd)

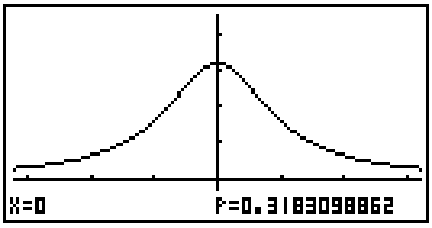
Student-t Probability Density calculates the probability density (p) for a specified single x-value or a list. When a list is specified, calculation results for each list element are displayed in list form.



Calculation Result Output Examples



When a list is specified



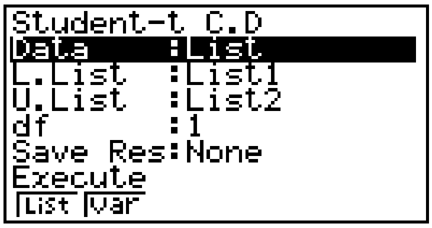
Graph when variable (x) is specified

- Graphing is supported only when a variable is specified and a single x-value is entered as data.

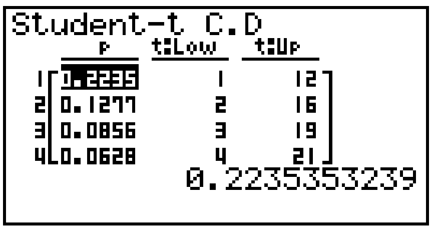
• Student-t Cumulative Distribution

F5 (DIST) F2 (t) F2 (tCd)

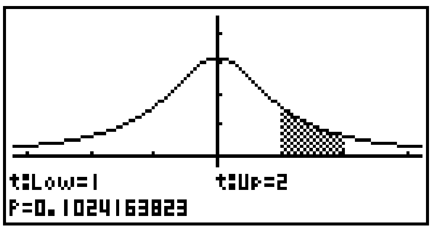
Student-t Cumulative Distribution calculates the Student-t cumulative probability of a Student-t distribution between a lower bound and an upper bound.



Calculation Result Output Examples



When a list is specified



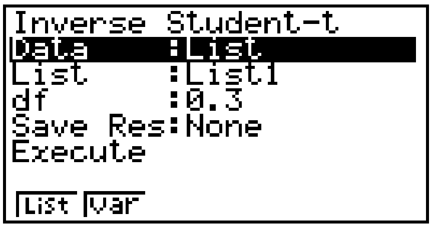
Graph when variable (x) is specified

• Graphing is supported only when a variable is specified and a single x-value is entered as data.

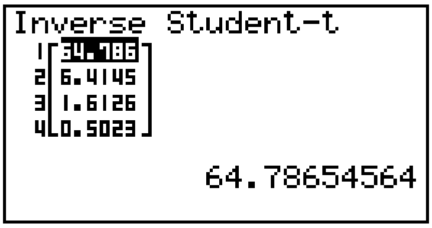
• Inverse Student-*t* Cumulative Distribution

F5 (DIST) F2 (t) F3 (InvN)

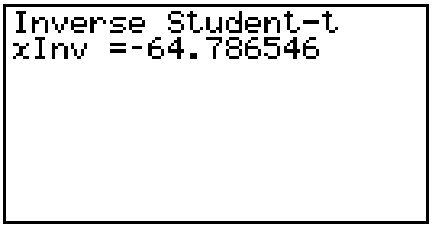
Inverse Student-*t* Cumulative Distribution calculates the lower bound value of a Student-*t* cumulative distribution for a specified *df* (degrees of freedom) value.



Calculation Result Output Examples



When a list is specified



When variable (x) is specified

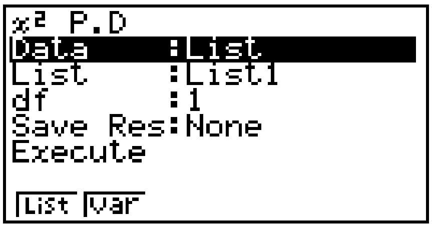
• There is no graphing for Inverse Student-*t* Cumulative Distribution.

■ χ^2 Distribution

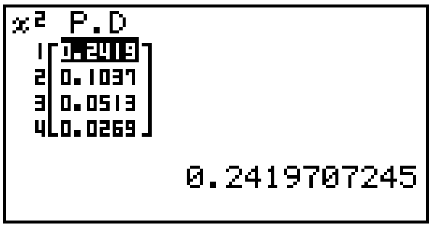
• χ^2 Probability Density

F5 (DIST) F3 (CHI) F1 (CPd)

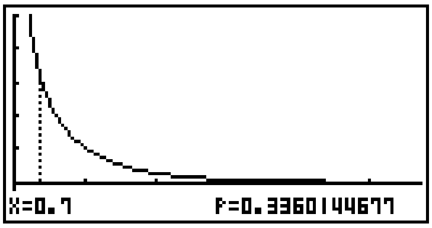
χ^2 Probability Density calculates the χ^2 probability density (p) for a specified single x-value or a list. When a list is specified, calculation results for each list element are displayed in list form.



Calculation Result Output Examples



When a list is specified



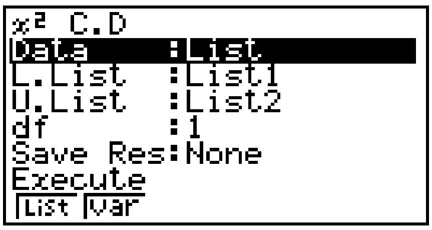
Graph when variable (x) is specified

• Graphing is supported only when a variable is specified and a single x-value is entered as data.

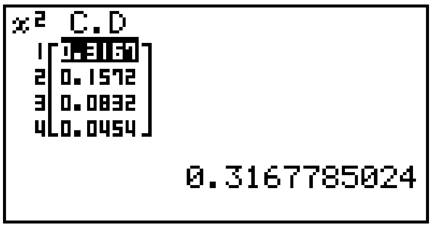
• χ^2 Cumulative Distribution

F5 (DIST) F3 (CHI) F2 (CCd)

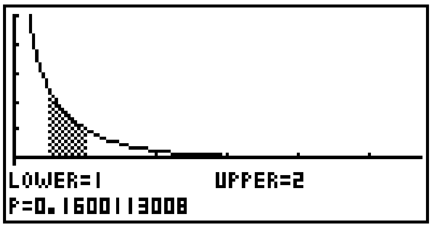
χ^2 Cumulative Distribution calculates the cumulative probability of a χ^2 distribution between a lower bound and an upper bound.



Calculation Result Output Examples



When a list is specified



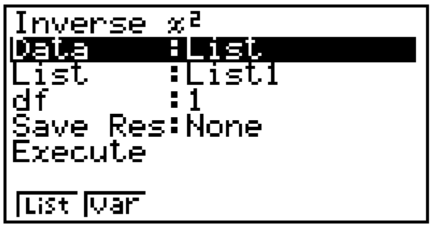
Graph when variable (x) is specified

- Graphing is supported only when a variable is specified and a single x-value is entered as data.

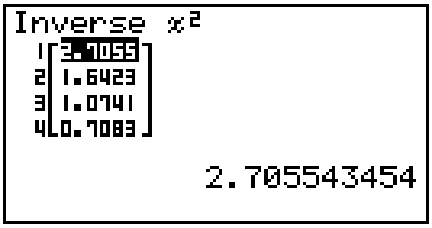
• Inverse χ^2 Cumulative Distribution

F5(DIST) F3(CHI) F3(InvC)

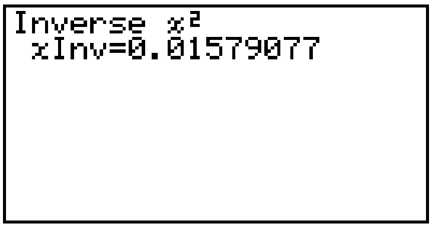
Inverse χ^2 Cumulative Distribution calculates the lower bound value of a χ^2 cumulative distribution probability for a specified df (degrees of freedom) value.



Calculation Result Output Examples



When a list is specified



When variable (x) is specified

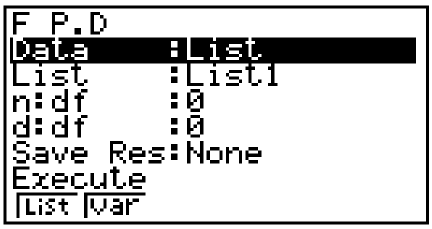
- There is no graphing for Inverse χ^2 Cumulative Distribution.

■ *F* Distribution

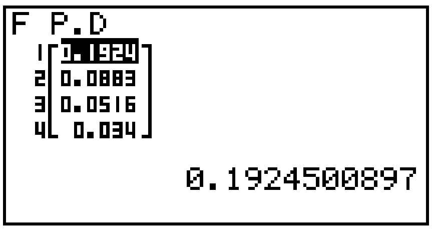
• *F* Probability Density

F5(DIST) F4(F) F1(FPd)

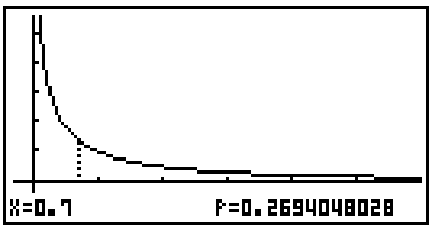
F Probability Density calculates the *F* probability density (p) for a specified single x-value or a list. When a list is specified, calculation results for each list element are displayed in list form.



Calculation Result Output Examples



When a list is specified



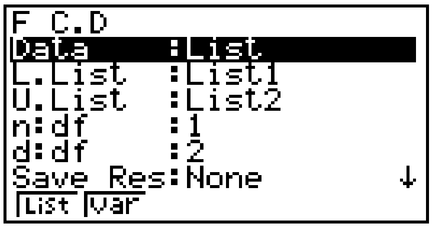
Graph when variable (x) is specified

- Graphing is supported only when a variable is specified and a single x-value is entered as data.

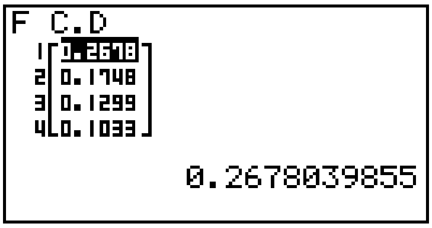
• *F* Cumulative Distribution

[F5](DIST)[F4](F)[F2](FCd)

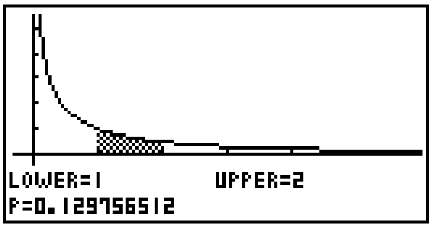
F Cumulative Distribution calculates the cumulative probability of an *F* distribution between a lower bound and an upper bound.



Calculation Result Output Examples



When a list is specified



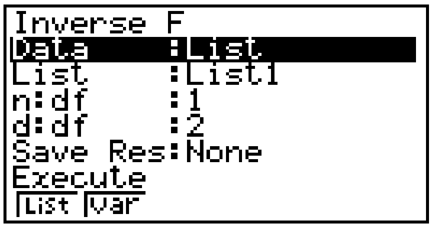
Graph when variable (x) is specified

- Graphing is supported only when a variable is specified and a single x-value is entered as data.

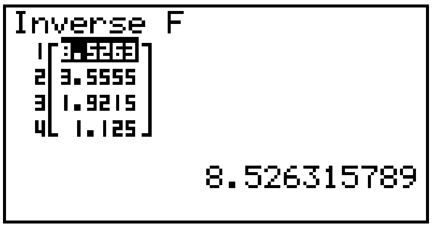
• Inverse *F* Cumulative Distribution

[F5](DIST)[F4](F)[F3](InvF)

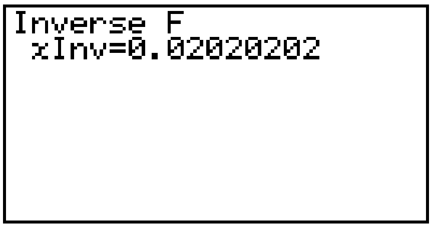
Inverse *F* Cumulative Distribution calculates the lower bound value of an *F* cumulative distribution probability for specified n:df and d:df (degrees of freedom of numerator and denominator) values.



Calculation Result Output Examples



When a list is specified



When variable (x) is specified

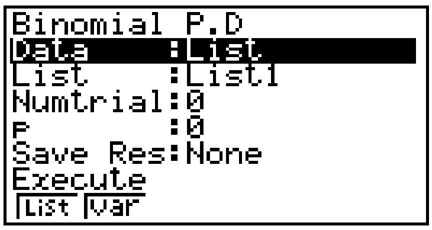
- There is no graphing for Inverse *F* Cumulative Distribution.

■ Binomial Distribution

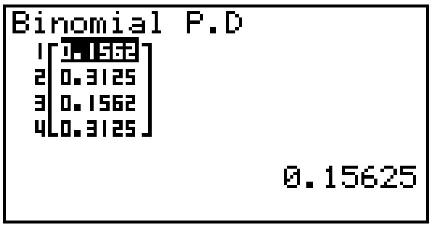
• Binomial Probability

[F5](DIST)[F5](BINM)[F1](BPd)

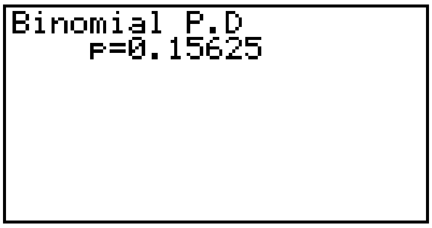
Binomial Probability calculates a probability at a specific single x-value or each list element for the discrete binomial distribution with the specified number of trials and probability of success on each trial. When a list is specified, calculation results for each list element are displayed in list form.



Calculation Result Output Examples



When a list is specified



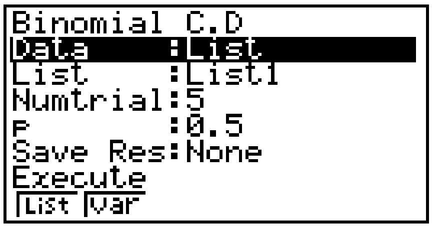
When variable (x) is specified

- There is no graphing for Binomial Probability.

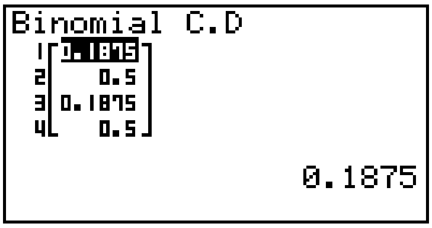
• Binomial Cumulative Distribution

F5 (DIST) F5 (BINM) F2 (BCd)

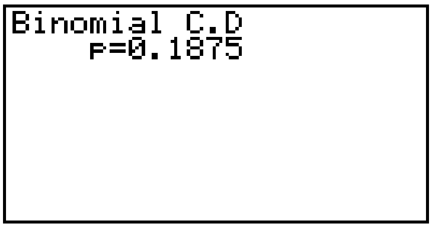
Binomial Cumulative Distribution calculates the cumulative probability in a binomial distribution that the success will occur on or before a specified trial.



Calculation Result Output Examples



When a list is specified



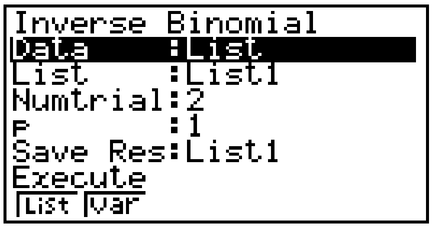
When variable (x) is specified

- There is no graphing for Binomial Cumulative Distribution.

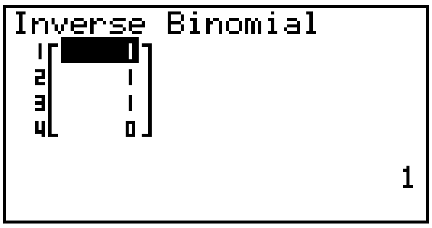
• Inverse Binomial Cumulative Distribution

F5 (DIST) F5 (BINM) F3 (InvB)

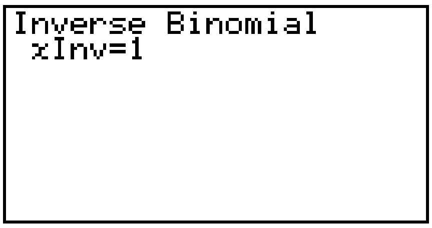
Inverse Binomial Cumulative Distribution calculates the minimum number of trials of a binomial cumulative distribution for specified values.



Calculation Result Output Examples



When a list is specified



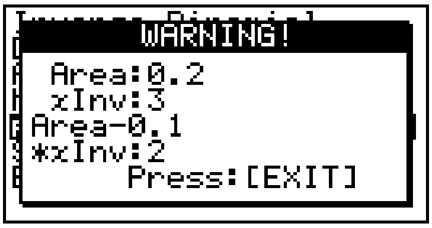
When variable (x) is specified

- There is no graphing for Inverse Binomial Cumulative Distribution.

Important!

When executing the Inverse Binomial Cumulative Distribution calculation, the calculator uses the specified Area value and the value that is one less than the Area value minimum number of significant digits (∗Area value) to calculate minimum number of trials values.

The results are assigned to system variables xInv (calculation result using Area) and ∗xInv (calculation result using ∗Area). The calculator always displays the xInv value only. However, when the xInv and ∗xInv values are different, the message shown below will appear with both values.



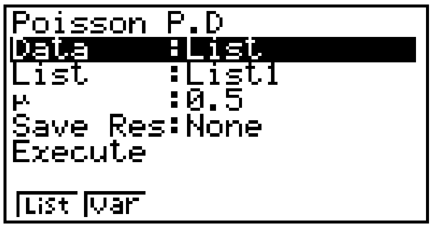
The calculation results of Inverse Binomial Cumulative Distribution are integers. Accuracy may be reduced when the first argument has 10 or more digits. Note that even a slight difference in calculation accuracy affects calculation results. If a warning message appears, check the displayed values.

■ Poisson Distribution

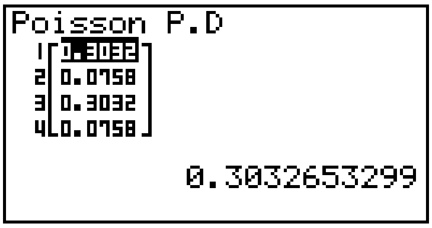
• Poisson Probability

F5(DIST) F6(▷) F1(POISN) F1(PPd)

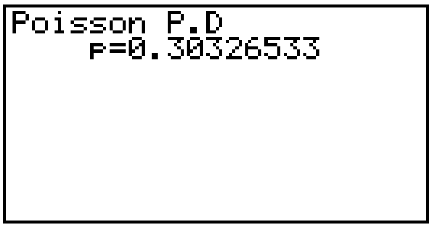
Poisson Probability calculates a probability at a specific single x-value or each list element for the discrete Poisson distribution with the specified mean.



Calculation Result Output Examples



When a list is specified



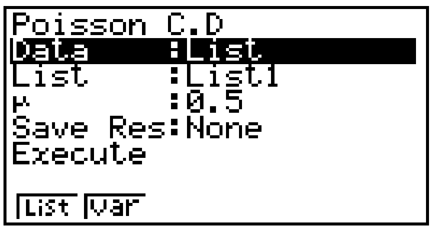
When variable (x) is specified

- There is no graphing for Poisson Probability.

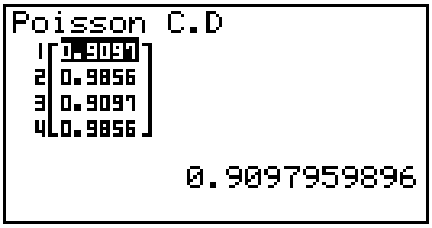
• Poisson Cumulative Distribution

F5(DIST) F6(▷) F1(POISN) F2(PCd)

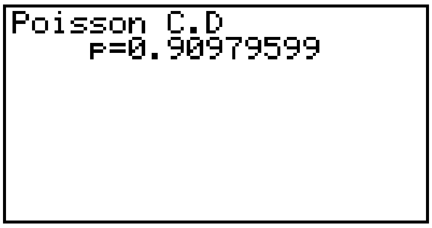
Poisson Cumulative Distribution calculates the cumulative probability in a Poisson distribution that the success will occur on or before a specified trial.



Calculation Result Output Examples



When a list is specified



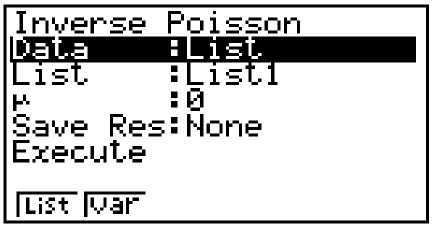
When variable (x) is specified

- There is no graphing for Poisson Cumulative Distribution.

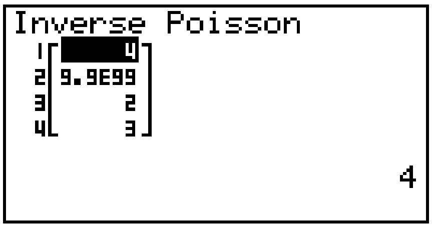
• Inverse Poisson Cumulative Distribution

F5(DIST) F6(▷) F1(POISN) F3(InvP)

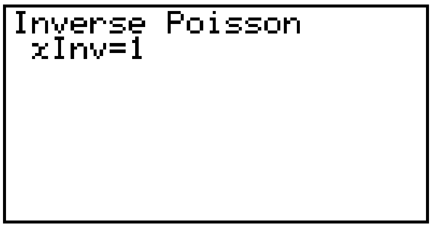
Inverse Poisson Cumulative Distribution calculates the minimum number of trials of a Poisson cumulative probability distribution for specified values.



Calculation Result Output Examples



When a list is specified



When variable (x) is specified

- There is no graphing for Inverse Poisson Cumulative Distribution.

Important!

When executing the Inverse Poisson Cumulative Distribution calculation, the calculator uses the specified Area value and the value that is one less than the Area value minimum number of significant digits (∗Area value) to calculate minimum number of trials values.

The results are assigned to system variables xInv (calculation result using Area) and ∗xInv (calculation result using ∗Area). The calculator always displays the xInv value only. However, when the xInv and ∗xInv values are different, the message will appear with both values.

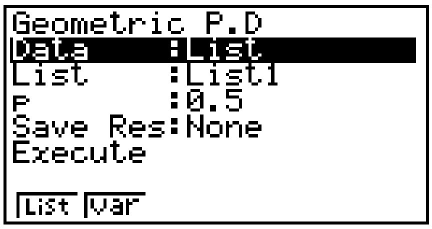
The calculation results of Inverse Poisson Cumulative Distribution are integers. Accuracy may be reduced when the first argument has 10 or more digits. Note that even a slight difference in calculation accuracy affects calculation results. If a warning message appears, check the displayed values.

■ Geometric Distribution

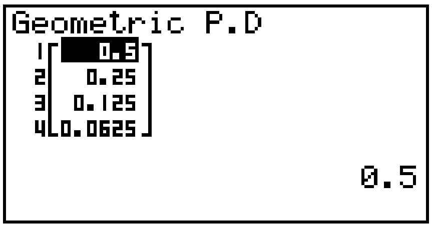
• Geometric Probability

F5(DIST) F6(▷) F2(GEO) F1(GPd)

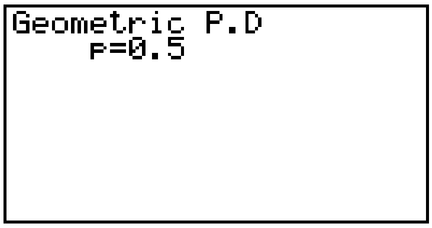
Geometric Probability calculates the probability at a specific single x-value or each list element, and the number of the trial on which the first success occurs, for the geometric distribution with a specified probability of success.



Calculation Result Output Examples



When a list is specified



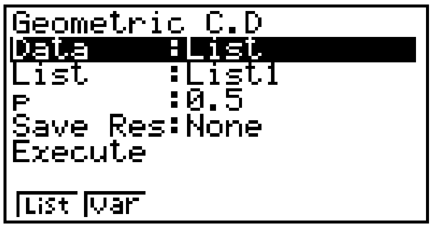
When variable (x) is specified

• There is no graphing for Geometric Probability.

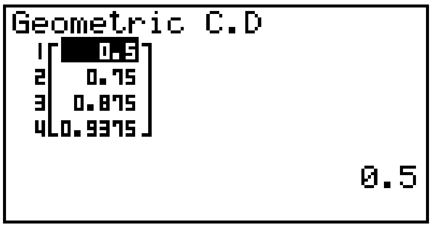
• Geometric Cumulative Distribution

F5 (DIST) F6 (▷) F2 (GEO) F2 (GCd)

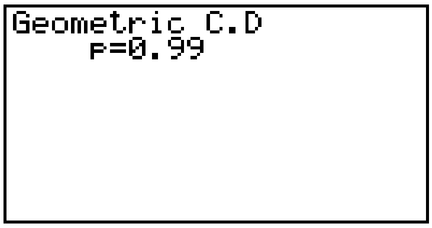
Geometric Cumulative Distribution calculates the cumulative probability in a geometric distribution that the success will occur on or before a specified trial.



Calculation Result Output Examples



When a list is specified



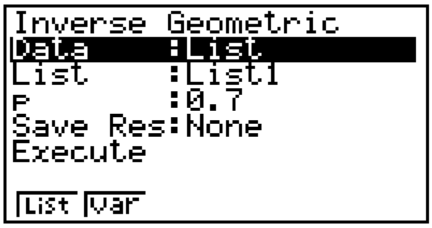
When variable (x) is specified

• There is no graphing for Geometric Cumulative Distribution.

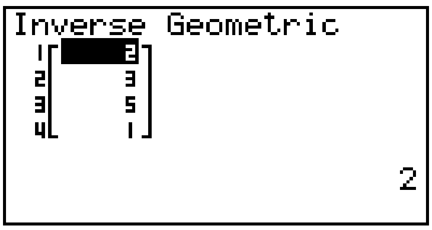
• Inverse Geometric Cumulative Distribution

F5 (DIST) F6 (▷) F2 (GEO) F3 (InvG)

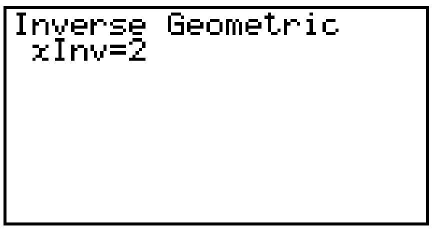
Inverse Geometric Cumulative Distribution calculates the minimum number of trials of a geometric cumulative probability distribution for specified values.



Calculation Result Output Examples



When a list is specified



When variable (x) is specified

• There is no graphing for Inverse Geometric Cumulative Distribution.

Important!

When executing the Inverse Geometric Cumulative Distribution calculation, the calculator uses the specified Area value and the value that is one less than the Area value minimum number of significant digits (∗Area value) to calculate minimum number of trials values.

The results are assigned to system variables xInv (calculation result using Area) and ∗xInv (calculation result using ∗Area). The calculator always displays the xInv value only. However, when the xInv and ∗xInv values are different, the message will appear with both values.

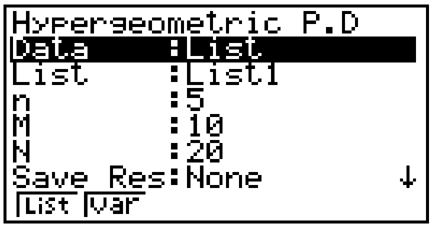
The calculation results of Inverse Geometric Cumulative Distribution are integers. Accuracy may be reduced when the first argument has 10 or more digits. Note that even a slight difference in calculation accuracy affects calculation results. If a warning message appears, check the displayed values.

■ Hypergeometric Distribution

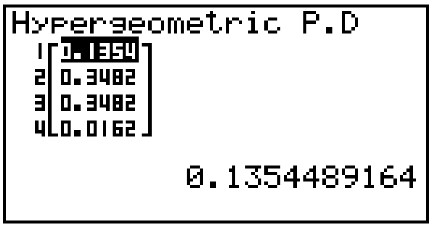
• Hypergeometric Probability

F5(DIST) F6(▷) F3(H.GEO) F1(HPd)

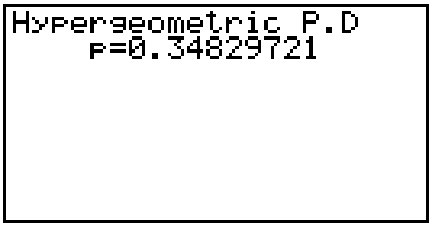
Hypergeometric Probability calculates the probability at a specific single x-value or each list element, and the number of the trial on which the first success occurs, for the hypergeometric distribution with a specified probability of success.



Calculation Result Output Examples



When a list is specified



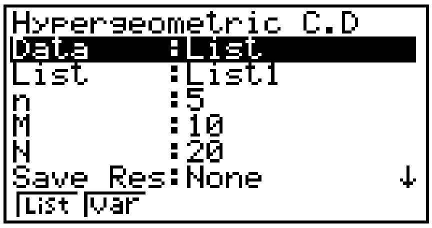
When variable (x) is specified

• There is no graphing for Hypergeometric Probability.

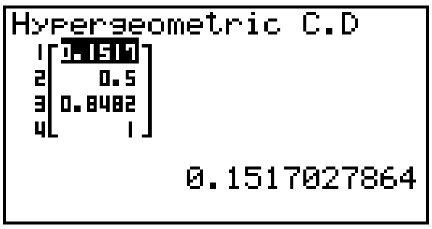
• Hypergeometric Cumulative Distribution

F5(DIST) F6(▷) F3(H.GEO) F2(HCd)

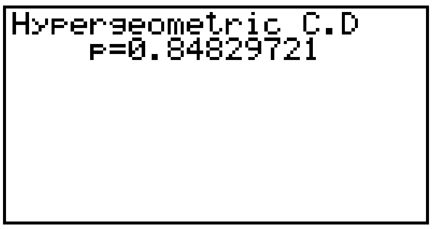
Hypergeometric Cumulative Distribution calculates the cumulative probability in a hypergeometric distribution that the success will occur on or before a specified trial.



Calculation Result Output Examples



When a list is specified



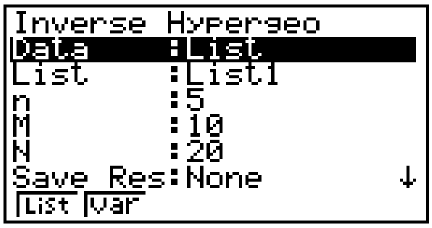
When variable (x) is specified

• There is no graphing for Hypergeometric Cumulative Distribution.

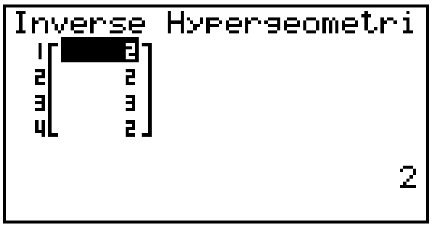
- **Inverse Hypergeometric Cumulative Distribution**

F5 (DIST) F6 (▷) F3 (H.GEO) F3 (InvH)

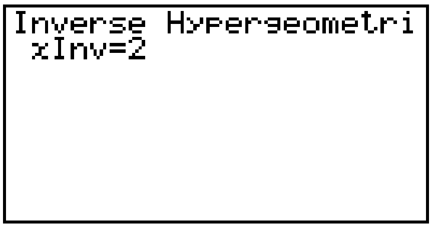
Inverse Hypergeometric Cumulative Distribution calculates the minimum number of trials of a hypergeometric cumulative probability distribution for specified values.



Calculation Result Output Examples



When a list is specified



When variable (x) is specified

- There is no graphing for Inverse Hypergeometric Cumulative Distribution.

Important!

When executing the Inverse Hypergeometric Cumulative Distribution calculation, the calculator uses the specified Area value and the value that is one less than the Area value minimum number of significant digits (∗Area value) to calculate minimum number of trials values.

The results are assigned to system variables xInv (calculation result using Area) and ∗xInv (calculation result using ∗Area). The calculator always displays the xInv value only. However, when the xInv and ∗xInv values are different, the message will appear with both values.

The calculation results of Inverse Hypergeometric Cumulative Distribution are integers. Accuracy may be reduced when the first argument has 10 or more digits. Note that even a slight difference in calculation accuracy affects calculation results. If a warning message appears, check the displayed values.

8. Input and Output Terms of Tests, Confidence Interval, and Distribution (fx-9860GIII/fx-9750GIII only)

The following explains the input and output terms that are used by tests, confidence interval, and distribution.

■ Input Terms

Data ....data type

μ (1-Sample Z Test)...........population mean value test conditions ("$\neq \mu_0$" specifies two-tail test, "$< \mu_0$" specifies lower one-tail test, "$> \mu_0$" specifies upper one-tail test.)

μ_1 (2-Sample Z Test) ....population mean value test conditions ("$\neq \mu_2$" specifies two-tail test, "$< \mu_2$" specifies one-tail test where sample 1 is smaller than sample 2, "$> \mu_2$" specifies one-tail test where sample 1 is greater than sample 2.)

Prop (1-Prop Z Test)..........sample proportion test conditions ("$\neq p_0$" specifies two-tail test, "$< p_0$" specifies lower one-tail test, "$> p_0$" specifies upper one-tail test.)

p_1 (2-Prop Z Test) ....sample proportion test conditions ("$\neq p_2$" specifies two-tail test, "$< p_2$" specifies one-tail test where sample 1 is smaller than sample 2, "$> p_2$" specifies one-tail test where sample 1 is greater than sample 2.)

μ (1-Sample t Test)...........population mean value test conditions ("$\neq \mu_0$" specifies two-tail test, "$< \mu_0$" specifies lower one-tail test, "$> \mu_0$" specifies upper one-tail test.)

μ_1 (2-Sample t Test) ....sample mean value test conditions ("$\neq \mu_2$" specifies two-tail test, "$< \mu_2$" specifies one-tail test where sample 1 is smaller than sample 2, "$> \mu_2$" specifies one-tail test where sample 1 is greater than sample 2.)

β & ρ (LinearReg t Test) ....ρ-value test conditions ("$\neq 0$" specifies two-tail test, "< 0" specifies lower one-tail test, "> 0" specifies upper one-tail test.)

σ_1 (2-Sample F Test) ....population standard deviation test conditions ("$\neq \sigma_2$" specifies two-tail test, "$< \sigma_2$" specifies one-tail test where sample 1 is smaller than sample 2, "$> \sigma_2$" specifies one-tail test where sample 1 is greater than sample 2.)

μ_0 ....assumed population mean

σ..population standard deviation ($\sigma > 0$)

σ_1 ....population standard deviation of sample 1 ($\sigma_1 > 0$)

σ_2 ....population standard deviation of sample 2 ($\sigma_2 > 0$)

List ....list whose contents you want to use as data (List 1 to 26)

List1 ....list whose contents you want to use as sample 1 data (List 1 to 26)

List2..................................list whose contents you want to use as sample 2 data (List 1 to 26)

Freq...................................frequency (1 or List 1 to 26)

Freq1.................................frequency of sample 1 (1 or List 1 to 26)

Freq2.................................frequency of sample 2 (1 or List 1 to 26)

Execute.............................executes a calculation or draws a graph

$\bar{x}$..mean of sample

$\bar{x}_1$ ....mean of sample 1

$\bar{x}_2$......................................mean of sample 2

n..size of sample (positive integer)

n_1......................................size of sample 1 (positive integer)

n_2......................................size of sample 2 (positive integer)

p_0......................................expected sample proportion ($0 < p_0 < 1$)

p_1......................................sample proportion test conditions

x (1-Prop Z Test)...............sample value ($x \geqq 0$ integer)

x (1-Prop Z Interval)..........data (0 or positive integer)

x_1......................................data value of sample 1 ($x_1 \geqq 0$ integer)

x_2......................................data value of sample 2 ($x_2 \geqq 0$ integer)

s_x......................................sample standard deviation ($s_x > 0$)

s_{x1}.....................................standard deviation of sample 1 ($s_{x1} > 0$)

s_{x2}.....................................standard deviation of sample 2 ($s_{x2} > 0$)

XList..................................list for x-axis data (List 1 to 6)
YList..................................list for y-axis data (List 1 to 6)
C-Level..............................confidence level ($0 \leqq$ C-Level < 1)
Pooled...............................pooling On (in effect) or Off (not in effect)
x (Distribution)....................data
σ (Distribution) ....standard deviation ($\sigma > 0$)
μ (Distribution) ....mean
Lower (Distribution)............lower boundary
Upper (Distribution)............upper boundary
df (Distribution) ....degrees of freedom ($df > 0$)
n:df (Distribution) ....numerator degrees of freedom (positive integer)
d:df (Distribution) ....denominator degrees of freedom (positive integer)
Numtrial (Distribution) ....number of trials
p (Distribution) ....success probability ($0 \leqq p \leqq 1$)

■ Output Terms

z ....z score
p ....p-value
t...t score
χ^2.......................................χ^2 value
F ....F value
$\hat{p}$..estimated sample proportion
$\hat{p}_1$.......................................estimated proportion of sample 1
$\hat{p}_2$.......................................estimated proportion of sample 2
$\bar{x}$ ....mean of sample
$\bar{x}_1$.......................................mean of sample 1
$\bar{x}_2$.......................................mean of sample 2
s_x.......................................sample standard deviation
s_{x1}.....................................standard deviation of sample 1
s_{x2}.....................................standard deviation of sample 2
s_p.......................................pooled sample standard deviation
n ....size of sample
n_1.......................................size of sample 1
n_2.......................................size of sample 2
df.......................................degrees of freedom
a ....constant term
b ....coefficient
s_e.......................................standard error
r ....correlation coefficient
r^2 ....coefficient of determination
Left....................................confidence interval lower limit (left edge)
Right..................................confidence interval upper limit (right edge)

9. Statistic Formula

■ Test

Test	
1-Sample Z Test	$z = (\bar{x} - \mu_0)/(\sigma/\sqrt{n})$
2-Sample Z Test	$z = (\bar{x}_1 - \bar{x}_2)/\sqrt{(\sigma_1^2/n_1) + (\sigma_2^2/n_2)}$
1-Prop Z Test	$z = (x/n - p_0)/\sqrt{p_0(1 - p_0)/n}$
2-Prop Z Test	$z = (x_1/n_1 - x_2/n_2)/\sqrt{\hat{p}(1 - \hat{p})(1/n_1 + 1/n_2)}$
1-Sample t Test	$t = (\bar{x} - \mu_0)/(s_x/\sqrt{n})$
2-Sample t Test (pooled)	$t = (\bar{x}_1 - \bar{x}_2)/\sqrt{s_p^2(1/n_1 + 1/n_2)}$ $s_p = \sqrt{((n_1 - 1)s_{x1}^2 + (n_2 - 1)s_{x2}^2)/(n_1 + n_2 - 2)}$ $df = n_1 + n_2 - 2$
2-Sample t Test (not pooled)	$t = (\bar{x}_1 - \bar{x}_2)/\sqrt{s_{x1}^2/n_1 + s_{x2}^2/n_2}$ $df = 1/(C^2/(n_1 - 1) + (1 - C)^2/(n_2 - 1))$ $C = (s_{x1}^2/n_1)/(s_{x1}^2/n_1 + s_{x2}^2/n_2)$
LinearReg t Test	$b = \sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})/\sum_{i=1}^{n}(x_i - \bar{x})^2 \qquad a = \bar{y} - b\bar{x}$ $t = r\sqrt{(n - 2)/(1 - r^2)}$
χ^2 GOF Test	$\chi^2 = \sum_{i}^{k}(O_i - E_i)^2/E_i$ — O_i: The i-th element of the observed list; E_i: The i-th element of the expected list
χ^2 two-way Test	$\chi^2 = \sum_{i}^{k}\sum_{j}^{\ell}(O_{ij} - E_{ij})^2/E_{ij}$ — O_{ij}: The element at row i, column j of the observed matrix $E_{ij} = \sum_{i=1}^{k}O_{ij} \cdot \sum_{j=1}^{\ell}O_{ij} \,/\, \sum_{i=1}^{k}\sum_{j=1}^{\ell}O_{ij}$ — E_{ij}: The element at row i, column j of the expected matrix
2-Sample F Test	$F = s_{x1}^2/s_{x2}^2$
ANOVA Test	$F = MS/MSe \qquad MS = SS/Fdf \qquad MSe = SSe/Edf$ $SS = \sum_{i=1}^{k}n_i(\bar{x}_i - \bar{x})^2 \qquad SSe = \sum_{i=1}^{k}(n_i - 1)s_{xi}^2$ $Fdf = k - 1 \qquad Edf = \sum_{i=1}^{k}(n_i - 1)$

■ Confidence Interval

Confidence Interval	Left: confidence interval lower limit (left edge) Right: confidence interval upper limit (right edge)
1-Sample Z Interval	$Left, Right = \bar{x} \mp Z(\alpha/2) \cdot \sigma/\sqrt{n}$
2-Sample Z Interval	$Left, Right = (\bar{x}_1 - \bar{x}_2) \mp Z(\alpha/2)\sqrt{\sigma_1^2/n_1 + \sigma_2^2/n_2}$
1-Prop Z Interval	$Left, Right = x/n \mp Z(\alpha/2)\sqrt{1/n \cdot (x/n \cdot (1 - x/n))}$
2-Prop Z Interval	$Left, Right = (x_1/n_1 - x_2/n_2)$ $\mp Z(\alpha/2)\sqrt{(x_1/n_1 \cdot (1 - x_1/n_1))/n_1 + (x_2/n_2 \cdot (1 - x_2/n_2))/n_2}$
1-Sample t Interval	$Left, Right = \bar{x} \mp t_{n-1}(\alpha/2) \cdot s_x/\sqrt{n}$
2-Sample t Interval (pooled)	$Left, Right = (\bar{x}_1 - \bar{x}_2) \mp t_{n_1+n_2-2}(\alpha/2)\sqrt{s_p^2(1/n_1 + 1/n_2)}$ $s_p = \sqrt{((n_1 - 1)s_{x1}^2 + (n_2 - 1)s_{x2}^2)/(n_1 + n_2 - 2)}$
2-Sample t Interval (not pooled)	$Left, Right = (\bar{x}_1 - \bar{x}_2) \mp t_{df}(\alpha/2)\sqrt{s_{x1}^2/n_1 + s_{x2}^2/n_2}$ $df = 1/(C^2/(n_1 - 1) + (1 - C)^2/(n_2 - 1))$ $C = (s_{x1}^2/n_1)/(s_{x1}^2/n_1 + s_{x2}^2/n_2)$

α: level of significance $\alpha = 1 - [\text{C-Level}]$ C-Level: confidence level ($0 \leqq$ C-Level < 1)
$Z(\alpha/2)$: upper $\alpha/2$ point of standard normal distribution
$t_{df}(\alpha/2)$: upper $\alpha/2$ point of t distribution with df degrees of freedom

■ Distribution (Continuous)

Distribution	Probability Density	Cumulative Distribution
Normal Distribution	$p(x) = \dfrac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ $(\sigma > 0)$	$p = \displaystyle\int_{Lower}^{Upper} p(x)dx$
Student-t Distribution	$p(x) = \dfrac{\Gamma\left(\frac{df+1}{2}\right)}{\Gamma\left(\frac{df}{2}\right)} \times \dfrac{\left(1 + \frac{x^2}{df}\right)^{-\frac{df+1}{2}}}{\sqrt{\pi \times df}}$	
χ^2 Distribution	$p(x) = \dfrac{1}{\Gamma\left(\frac{df}{2}\right)} \times \left(\dfrac{1}{2}\right)^{\frac{df}{2}} \times x^{\left(\frac{df}{2}-1\right)} \times e^{-\frac{x}{2}}$ $(x \geqq 0)$	
F Distribution	$p(x) = \dfrac{\Gamma\left(\frac{ndf+ddf}{2}\right)}{\Gamma\left(\frac{ndf}{2}\right) \times \Gamma\left(\frac{ddf}{2}\right)} \left(\dfrac{ndf}{ddf}\right)^{\frac{ndf}{2}} x^{\frac{ndf}{2}-1} \left(1 + \dfrac{ndf \times x}{ddf}\right)^{-\frac{ndf+ddf}{2}}$ $(x \geqq 0)$	

Distribution	Inverse Cumulative Distribution		
Normal Distribution	$p = \int_{-\infty}^{Upper} p(x)dx$ tail = Left	$p = \int_{Lower}^{\infty} p(x)dx$ tail = Right	$p = \int_{Lower}^{Upper} p(x)dx$ tail = Central
Student-t Distribution	$p = \int_{Lower}^{\infty} p(x)dx$		
χ^2 Distribution			
F Distribution			

■ Distribution (Discrete)

Distribution	Probability
Binomial Distribution	$p(x) = {}_nC_x p^x (1-p)^{n-x}$ (x = 0, 1, ·······, n) n: number of trials
Poisson Distribution	$p(x) = \dfrac{e^{-\mu} \times \mu^x}{x!}$ (x = 0, 1, 2, ···) μ: mean ($\mu > 0$)
Geometric Distribution	$p(x) = p(1-p)^{x-1}$ (x = 1, 2, 3, ···)
Hypergeometric Distribution	$p(x) = \dfrac{{}_MC_x \times {}_{N-M}C_{n-x}}{{}_NC_n}$ n: Number of elements extracted from population ($0 \leqq x$ integer) M: Number of elements contained in attribute A ($0 \leqq M$ integer) N: Number of population elements ($n \leqq N$, $M \leqq N$ integer)

Distribution	Cumulative Distribution	Inverse Cumulative Distribution
Binomial Distribution	$p = \sum_{x=0}^{X} p(x)$	$p \leq \sum_{x=0}^{X} p(x)$
Poisson Distribution		
Geometric Distribution	$p = \sum_{x=1}^{X} p(x)$	$p \leq \sum_{x=1}^{X} p(x)$
Hypergeometric Distribution	$p = \sum_{x=0}^{X} p(x)$	$p \leq \sum_{x=0}^{X} p(x)$

Chapter 7 Financial Calculation (TVM)

Important!

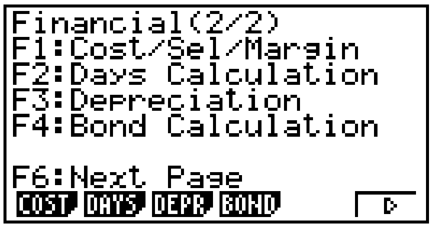
- The fx-7400GIII is not equipped with the **TVM** mode.

1. Before Performing Financial Calculations

From the Main Menu, enter the **TVM** mode and display the Financial screen like the one shown below.

Financial 1 screen

Financial 2 screen



- {**SMPL**} … {simple interest}
- {**CMPD**} … {compound interest}
- {**CASH**} … {cash flow (investment appraisal)}
- {**AMT**} … {amortization}
- {**CNVT**} … {interest rate conversion}
- {**COST**} … {cost, selling price, margin}
- {**DAYS**} … {day/date calculations}
- {**DEPR**} … {depreciation calculations}
- {**BOND**} … {bond calculations}

■ Setup Items

● Payment

- {**BGN**}/{**END**} … Specifies {beginning of the period}/{end of the period} payment

● Date Mode

- {**365**}/{**360**} … Specifies calculation according to a {365-day}/{360-day} year

● Periods/YR. (payment interval specification)

- {**Annu**}/{**Semi**} … {annual}/{semiannual}

Note the following points regarding Setup screen settings whenever using the **TVM** mode.

- The following graph Setup screen settings are all turned off for graphing in the **TVM** mode: Axes, Grid, Dual Screen.
- Drawing a financial graph while the Label item is turned on, displays the label CASH for the vertical axis (deposits, withdrawals), and TIME for the horizontal axis (frequency).

■ Graphing in the TVM Mode

After performing a financial calculation, you can use F6(GRPH) to graph the results as shown below.

- Pressing SHIFT F1(TRCE) while a graph is on the display activates Trace, which can be used to look up other financial values. In the case of simple interest, for example, pressing ▶ displays PV, SI, and SFV. Pressing ◀ displays the same values in reverse sequence.
- Zoom, Scroll, and Sketch cannot be used in the **TVM** mode.
- Whether you should use a positive or a negative value for the present value (PV) or the purchase price (PRC) depends on the type of calculation you are trying to perform.
- Note that graphs should be used only for reference purposes when viewing **TVM** mode calculation results.
- Note that calculation results produced in this mode should be regarded as reference values only.
- Whenever performing an actual financial transaction, be sure to check any calculation results obtained using this calculator with against the figures calculated by your financial institution.

2. Simple Interest

This calculator uses the following formulas to calculate simple interest.

• Formula

365-day Mode $\quad SI' = \frac{n}{365} \times PV \times i \quad \left(i = \frac{I\%}{100}\right)$

360-day Mode $\quad SI' = \frac{n}{360} \times PV \times i \quad \left(i = \frac{I\%}{100}\right)$

$$SI = -SI'$$
$$SFV = -(PV + SI')$$

SI : interest
n : number of interest periods
PV : principal
$I\%$: annual interest
SFV : principal plus interest

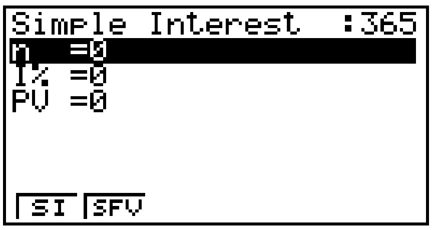
Press F1(SMPL) from the Financial 1 screen to display the following input screen for simple interest.

F1(SMPL)

n .... number of interest periods (days)

$I\%$ .... annual interest rate

PV .... principal



After configuring the parameters, use one of the function menus noted below to perform the corresponding calculation.

- {**SI**} … {simple interest}
- {**SFV**} … {simple future value}

- An error (Ma ERROR) occurs if parameters are not configured correctly.

Use the following function menus to maneuver between calculation result screens.

- {**REPT**} … {parameter input screen}
- {**GRPH**} … {draws graph}

After drawing a graph, you can press SHIFT F1(TRCE) to turn on trace and read calculation results along the graph.

Each press of ▶ while trace is turned on cycles the displayed value in the sequence: present value (PV) → simple interest (SI) → simple future value (SFV). Pressing ◀ cycles in the reverse direction.

Press EXIT to return to the parameter input screen.

3. Compound Interest

This calculator uses the following standard formulas to calculate compound interest.

• PV, PMT, FV, *n*

$I\% \neq 0$

$$PV = -(\alpha \times PMT + \beta \times FV) \qquad PMT = -\frac{PV + \beta \times FV}{\alpha}$$

$$FV = -\frac{PV + \alpha \times PMT}{\beta} \qquad n = \frac{\log\left\{\dfrac{(1+iS) \times PMT - FV \times i}{(1+iS) \times PMT + PV \times i}\right\}}{\log(1+i)}$$

$I\% = 0$

$$PV = -(PMT \times n + FV) \qquad PMT = -\frac{PV + FV}{n}$$

$$FV = -(PMT \times n + PV) \qquad n = -\frac{PV + FV}{PMT}$$

$$\alpha = (1 + i \times S) \times \frac{1-\beta}{i}, \quad \beta = (1+i)^{-n}$$

$$S = \begin{cases} 0 \text{ ....Payment : End (Setup Screen)} \\ 1 \text{ ....Payment : Begin (Setup Screen)} \end{cases}$$

$$i = \begin{cases} \dfrac{I\%}{100} \text{ .... } (P/Y = C/Y = 1) \\ \left(1 + \dfrac{I\%}{100 \times [C/Y]}\right)^{\frac{C/Y}{P/Y}} - 1 \text{ ..... (Other than those above)} \end{cases}$$

• I %

<u>i (effective interest rate)</u>

i (effective interest rate) is calculated using Newton's Method.

$PV + \alpha \times PMT + \beta \times FV = 0$

<u>To I % from i (effective interest rate)</u>

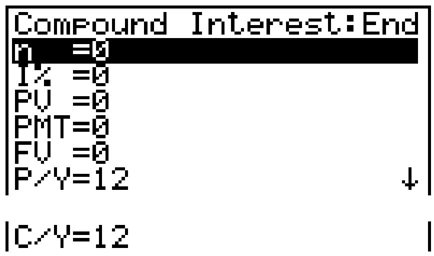
$$I\% = \begin{cases} i \times 100 \text{ .... } (P/Y = C/Y = 1) \\ \left\{ (1+i)^{\frac{P/Y}{C/Y}} - 1 \right\} \times C/Y \times 100 \text{... (Other than those above)} \end{cases}$$

n .... number of compound periods
$I\%$ .... annual interest rate
PV......... present value
PMT...... payment
FV......... future value
P/Y........ installment periods per year
C/Y........ compounding periods per year

• A deposit is indicated by a plus sign (+), while a withdrawal is indicated by a minus sign (–).

Press F2(CMPD) from the Financial 1 screen to display the following input screen for compound interest.

F2(CMPD)



n .... number of compound periods
$I\%$ .... annual interest rate
PV .... present value (loan amount in case of loan; principal in case of savings)
PMT ..... payment for each installment (payment in case of loan; deposit in case of savings)
FV .... future value (unpaid balance in case of loan; principal plus interest in case of savings)
P/Y .... installment periods per year
C/Y .... compounding periods per year

Important!

Inputting Values

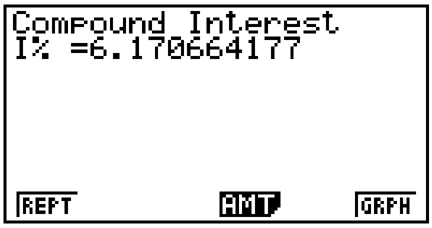
A period (n) is expressed as a positive value. Either the present value (PV) or future value (FV) is positive, while the other (PV or FV) is negative.

Precision

This calculator performs interest calculations using Newton's Method, which produces approximate values whose precision can be affected by various calculation conditions. Because of this, interest calculation results produced by this calculator should be used keeping the above limitation in mind or the results should be verified.

After configuring the parameters, use one of the function menus noted below to perform the corresponding calculation.

- {**n**} … {number of compound periods}
- {**I%**} … {annual interest rate}
- {**PV**} … {present value} (Loan: loan amount; Savings: balance)
- {**PMT**} … {payment} (Loan: installment; Savings: deposit)
- {**FV**} … {future value} (Loan: unpaid balance; Savings: principal plus interest)
- {**AMT**} … {amortization screen}



- An error (Ma ERROR) occurs if parameters are not configured correctly.

Use the following function menus to maneuver between calculation result screens.

- {**REPT**} … {parameter input screen}
- {**AMT**} … {amortization screen}
- {**GRPH**} … {draws graph}

After drawing a graph, you can press SHIFT F1(TRCE) to turn on trace and read calculation results along the graph.

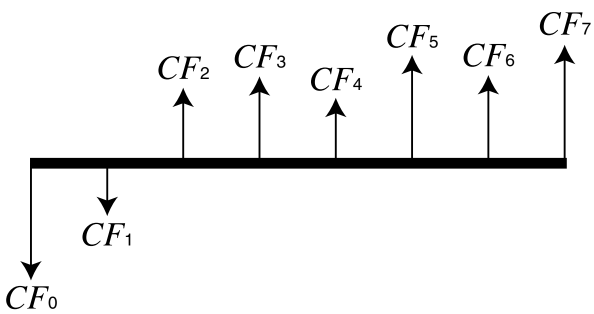
Press EXIT to return to the parameter input screen.

4. Cash Flow (Investment Appraisal)

This calculator uses the discounted cash flow (DCF) method to perform investment appraisal by totalling cash flow for a fixed period. This calculator can perform the following four types of investment appraisal.

- Net present value (NPV)
- Net future value (NFV)
- Internal rate of return (IRR)
- Payback period (PBP)

A cash flow diagram like the one shown below helps to visualize the movement of funds.



With this graph, the initial investment amount is represented by CF_0. The cash flow one year later is shown by CF_1, two years later by CF_2, and so on.

Investment appraisal can be used to clearly determine whether an investment is realizing profits that were originally targeted.

- ***NPV***

$$NPV = CF_0 + \frac{CF_1}{(1+i)} + \frac{CF_2}{(1+i)^2} + \frac{CF_3}{(1+i)^3} + \ldots + \frac{CF_n}{(1+i)^n} \qquad \left(i = \frac{I\%}{100}\right)$$

n: natural number up to 254

- ***NFV***

$$NFV = NPV \times (1+i)^n$$

- ***IRR***

$$0 = CF_0 + \frac{CF_1}{(1+i)} + \frac{CF_2}{(1+i)^2} + \frac{CF_3}{(1+i)^3} + \ldots + \frac{CF_n}{(1+i)^n}$$

In this formula, $NPV = 0$, and the value of IRR is equivalent to $i \times 100$. It should be noted, however, that minute fractional values tend to accumulate during the subsequent calculations performed automatically by the calculator, so NPV never actually reaches exactly zero. IRR becomes more accurate the closer that NPV approaches to zero.

- ***PBP***

$$PBP = \begin{cases} 0 \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots & (CF_0 \geqq 0) \\ n - \dfrac{NPV_n}{NPV_{n+1} - NPV_n} \ \ldots & \text{(Other than those above)} \end{cases} \qquad NPV_n = \sum_{k=0}^{n} \frac{CF_k}{(1+i)^k}$$

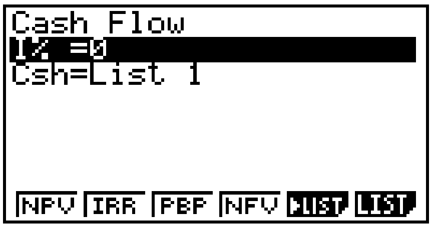
n: smallest positive integer that satisfies the conditions $NPV_n \leqq 0$, $NPV_{n+1} \geqq 0$, or 0

Press F3(CASH) from the Financial 1 screen to display the following input screen for Cash Flow.

F3(CASH)

$I\%$ .... interest rate

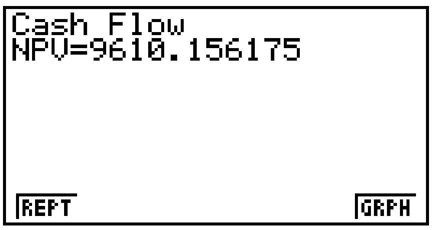
Csh .... list for cash flow



If you have not yet input data into a list, press F5(▶LIST) and input data into a list.

After configuring the parameters, use one of the function menus noted below to perform the corresponding calculation.

- {**NPV**} … {net present value}
- {**IRR**} … {internal rate of return}
- {**PBP**} … {payback period}
- {**NFV**} … {net future value}
- {**▶LIST**} … {inputs data into a list}
- {**LIST**} … {specifies a list for data input}

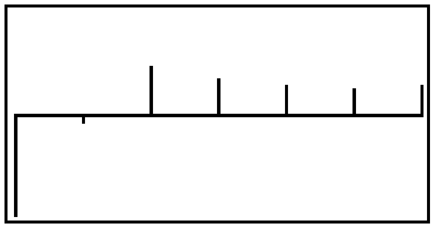


• An error (Ma ERROR) occurs if parameters are not configured correctly.

Use the following function menus to maneuver between calculation result screens.

• {**REPT**} … {parameter input screen}

• {**GRPH**} … {draws graph}



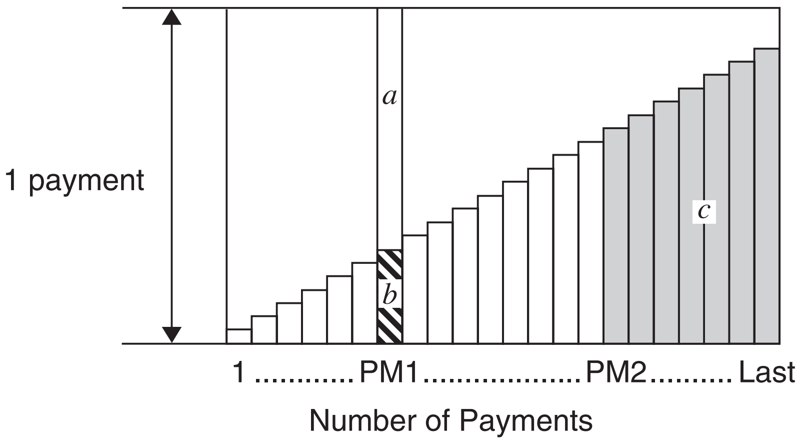
After drawing a graph, you can press SHIFT F1(TRCE) to turn on trace and read calculation results along the graph.

Press EXIT to return to the parameter input screen.

5. Amortization

This calculator can be used to calculate the principal and interest portion of a monthly installment, the remaining principal, and amount of principal and interest repaid up to any point.

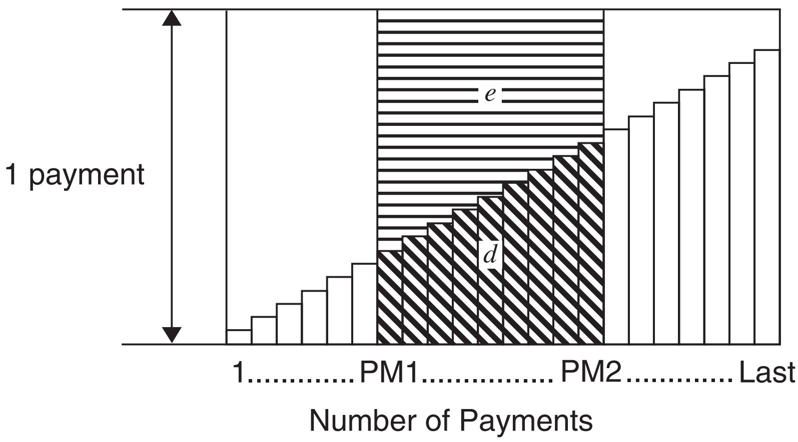
• Formula



a: interest portion of installment PM1 (INT)

b: principal portion of installment PM1 (PRN)

c: balance of principal after installment PM2 (BAL)



d: total principal from installment PM1 to payment of installment PM2 (ΣPRN)

e: total interest from installment PM1 to payment of installment PM2 (ΣINT)

*$a + b$ = one repayment (PMT)

$$a : INT_{PM1} = |\, BAL_{PM1-1} \times i \,| \times (PMT \text{ sign})$$
$$b : PRN_{PM1} = PMT + BAL_{PM1-1} \times i$$
$$c : BAL_{PM2} = BAL_{PM2-1} + PRN_{PM2}$$
$$d : \sum_{PM1}^{PM2} PRN = PRN_{PM1} + PRN_{PM1+1} + \ldots + PRN_{PM2}$$
$$e : \sum_{PM1}^{PM2} INT = INT_{PM1} + INT_{PM1+1} + \ldots + INT_{PM2}$$

$BAL_0 = PV$ ($INT_1 = 0$ and $PRN_1 = PMT$ at beginning of installment term)

• Converting between the nominal interest rate and effective interest rate

The nominal interest rate ($I\%$ value input by user) is converted to an effective interest rate ($I\%'$) for installment loans where the number of installments per year is different from the number of compound interest calculation periods.

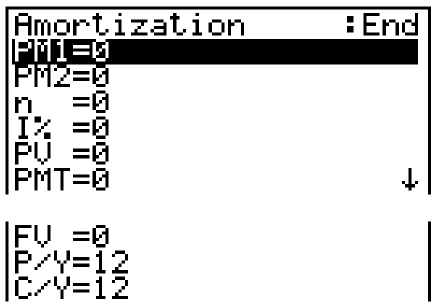
$$I\%' = \left\{ \left(1 + \frac{I\%}{100 \times [C/Y]}\right)^{\frac{[C/Y]}{[P/Y]}} - 1 \right\} \times 100$$

The following calculation is performed after conversion from the nominal interest rate to the effective interest rate, and the result is used for all subsequent calculations.

$$i = I\%' \div 100$$

Press F4(AMT) from the Financial 1 screen to display the following input screen for amortization.

F4(AMT)



PM1....... first installment of installments 1 through n

PM2....... second installment of installments 1 through n

n .... installments

$I\%$ .... interest rate

PV .... principal

PMT ..... payment for each installment

FV .... balance following final installment

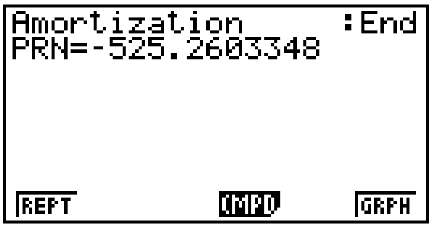
P/Y .... installments per year

C/Y .... compoundings per year

After configuring the parameters, use one of the function menus noted below to perform the corresponding calculation.

- {**BAL**} … {balance of principal after installment PM2}
- {**INT**} … {interest portion of installment PM1}
- {**PRN**} … {principal portion of installment PM1}

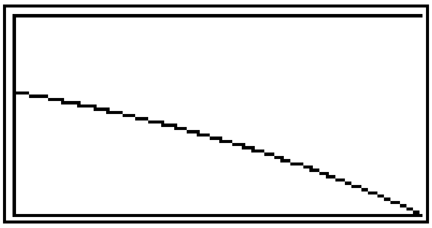
- {**ΣINT**} … {total interest paid from installment PM1 to installment PM2}
- {**ΣPRN**} … {total principal paid from installment PM1 to installment PM2}
- {**CMPD**} … {compound interest screen}



- An error (Ma ERROR) occurs if parameters are not configured correctly.

Use the following function menus to maneuver between calculation result screens.

- {**REPT**} … {parameter input screen}
- {**CMPD**} … {compound interest screen}
- {**GRPH**} … {draws graph}



After drawing a graph, you can press SHIFT F1 (TRCE) to turn on trace and read calculation results along the graph.

The first press of SHIFT F1 (TRCE) displays *INT* and *PRN* when $n = 1$. Each press of ▶ shows *INT* and *PRN* when $n = 2$, $n = 3$, and so on.

Press EXIT to return to the parameter input screen.

6. Interest Rate Conversion

The procedures in this section describe how to convert between the annual percentage rate and effective interest rate.

• Formula

$$EFF = \left[\left(1 + \frac{APR/100}{n}\right)^{n} - 1\right] \times 100$$

$$APR = \left[\left(1 + \frac{EFF}{100}\right)^{\frac{1}{n}} - 1\right] \times n \times 100$$

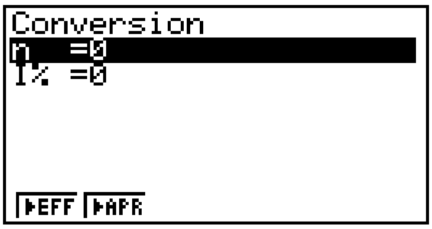
APR : annual percentage rate (%)
EFF : effective interest rate (%)
n : number of compoundings

Press F5 (CNVT) from the Financial 1 screen to display the following input screen for interest rate conversion.

F5 (CNVT)

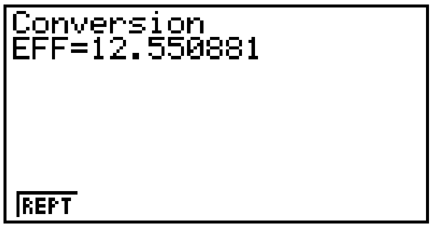
n .... number of compoundings

I% .... interest rate



After configuring the parameters, use one of the function menus noted below to perform the corresponding calculation.

- {►**EFF**} … {converts annual percentage rate to effective interest rate}
- {►**APR**} … {converts effective interest rate to annual percent rate}



- An error (Ma ERROR) occurs if parameters are not configured correctly.

Use the following function menu to maneuver between calculation result screens.

- {**REPT**} … {parameter input screen}

7. Cost, Selling Price, Margin

Cost, selling price, or margin can be calculated by inputting the other two values.

• Formula

$$CST = SEL\left(1-\frac{MRG}{100}\right)$$

$$SEL = \frac{CST}{1-\dfrac{MRG}{100}}$$

$$MRG(\%) = \left(1-\frac{CST}{SEL}\right)\times 100$$

CST : cost
SEL : selling price
MRG : margin

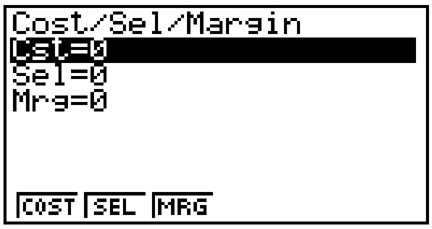
Press F1(COST) from the Financial 2 screen to display the following input screen.

F6(▷)F1(COST)

Cst......... cost

Sel......... selling price

Mrg........ margin



After configuring the parameters, use one of the function menus noted below to perform the corresponding calculation.

- {**COST**} … {cost}
- {**SEL**} … {selling price}
- {**MRG**} … {margin}

- An error (Ma ERROR) occurs if parameters are not configured correctly.

Use the following function menu to maneuver between calculation result screens.

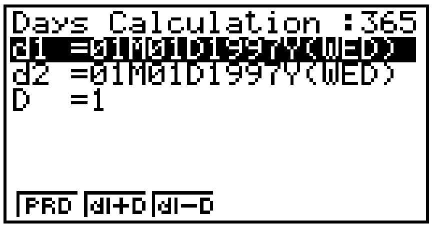
• {**REPT**} … {parameter input screen}

8. Day/Date Calculations

You can calculate the number of days between two dates, or you can determine what date comes a specific number of days before or after another date.

Press [F2](DAYS) from the Financial 2 screen to display the following input screen for day/date calculation.

[F6](▷)[F2](DAYS)

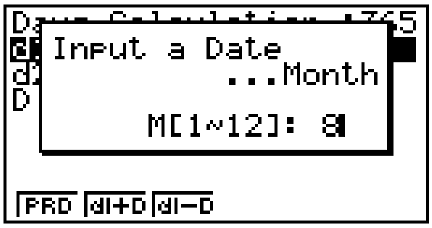


d1 .... date 1

d2 .... date 2

D .... number of days

To input a date, first highlight d1 or d2. Pressing a number key to input the month causes an input screen like the one shown below to appear on the display.



Input the month, day, and year, pressing [EXE] after each.

After configuring the parameters, use one of the function menus noted below to perform the corresponding calculation.

• {**PRD**} … {number of days from d1 to d2 (d2 – d1)}

• {**d1+D**} … {d1 plus a number of days (d1 + D)}

• {**d1–D**} … {d1 minus a number of days (d1 – D)}

• An error (Ma ERROR) occurs if parameters are not configured correctly.

Use the following function menu to maneuver between calculation result screens.

• {**REPT**} … {parameter input screen}

• The Setup screen can be used to specify either a 365-day or 360-day year for financial calculations. Day/date calculations are also performed in accordance with the current setting for number of days in the year, but the following calculations cannot be performed when the 360-day year is set. Attempting to do so causes an error.

  (Date) + (Number of Days)

  (Date) – (Number of Days)

• The allowable calculation range is January 1, 1901 to December 31, 2099.

• 360-day Date Mode Calculations

The following describes how calculations are processed when 360 is specified for the Date Mode item in the Setup screen.

• If d1 is day 31 of a month, d1 is treated as day 30 of that month is used.

• If d2 is day 31 of a month, d2 is treated as day 1 of the following month, unless d1 is day 30.

9. Depreciation

Depreciation lets you calculate the amount that a business expense can be offset by income (depreciated) over a given year.

- This calculator supports the following four types of depreciation calculations. straight-line (SL), fixed-percentage (FP), sum-of-the-years'-digits (SYD), or declining-balance (DB).
- Any one of the above methods can be used to calculate depreciation for a specified period. A table and graph of the depreciated amount and undepreciated amount in year j.

• Straight-Line Method (SL)

$$SL_1 = \frac{(PV - FV)}{n} \bullet \frac{\{Y-1\}}{12}$$

$$SL_j = \frac{(PV - FV)}{n}$$

$$SL_{n+1} = \frac{(PV - FV)}{n} \bullet \frac{12 - \{Y-1\}}{12}$$

$$(\{Y-1\} \neq 12)$$

SL_j : depreciation charge for the jth year
n : useful life
PV : original cost (basis)
FV : residual book value
j : year for calculation of depreciation cost
$Y-1$: number of months in the first year of depreciation

• Fixed-Percentage Method (FP)

$$FP_1 = PV \times \frac{I\%}{100} \times \frac{\{Y-1\}}{12}$$

$$FP_j = (RDV_{j-1} + FV) \times \frac{I\%}{100}$$

$$FP_{n+1} = RDV_n \quad (\{Y-1\} \neq 12)$$

$$RDV_1 = PV - FV - FP_1$$

$$RDV_j = RDV_{j-1} - FP_j$$

$$RDV_{n+1} = 0 \quad (\{Y-1\} \neq 12)$$

FP_j : depreciation charge for the jth year
RDV_j : remaining depreciable value at the end of jth year
$I\%$: depreciation ratio

• Sum-of-the-Years'-Digits Method (SYD)

$$Z = \frac{n(n+1)}{2} \qquad n' = n - \frac{\{Y-1\}}{12}$$

$$Z' = \frac{(n' \text{ integer part} + 1)(n' \text{ integer part} + 2 * n' \text{ fraction part})}{2}$$

$$SYD_1 = \frac{n}{Z} \times \frac{\{Y-1\}}{12} (PV - FV)$$

$$SYD_j = \left(\frac{n' - j + 2}{Z'}\right)(PV - FV - SYD_1) \qquad (j \neq 1)$$

$$SYD_{n+1} = \left(\frac{n' - (n+1) + 2}{Z'}\right)(PV - FV - SYD_1) \times \frac{12 - \{Y-1\}}{12} \qquad (\{Y-1\} \neq 12)$$

$$RDV_1 = PV - FV - SYD_1$$

$$RDV_j = RDV_{j-1} - SYD_j$$

SYD_j : depreciation charge for the jth year
RDV_j : remaining depreciable value at the end of jth year

• Declining-Balance Method (DB)

$$DB_1 = PV \times \frac{I\%}{100n} \times \frac{Y\text{–}1}{12}$$

$$RDV_1 = PV - FV - DB_1$$

$$DB_j = (RDV_{j-1} + FV) \times \frac{I\%}{100n}$$

$$RDV_j = RDV_{j-1} - DB_j$$

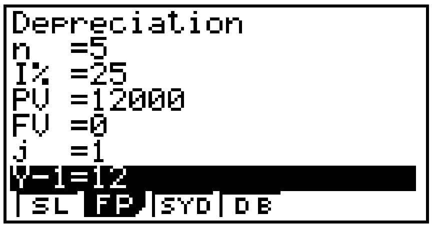
$$DB_{n+1} = RDV_n \qquad (\{Y\text{–}1\} \neq 12)$$

$$RDV_{n+1} = 0 \qquad (\{Y\text{–}1\} \neq 12)$$

DB_j : depreciation charge for the jth year
RDV_j : remaining depreciable value at the end of jth year
$I\%$: depreciation factor

Press F3(DEPR) from the Financial 2 screen to display the following input screen for depreciation calculation.

F6(▷)F3(DEPR)



n............ useful life

$I\%$ .... depreciation ratio in the case of the fixed percent (FP) method, depreciation factor in the case of the declining balance (DB) method

PV......... original cost (basis)

FV......... residual book value

j............ year for calculation of depreciation cost

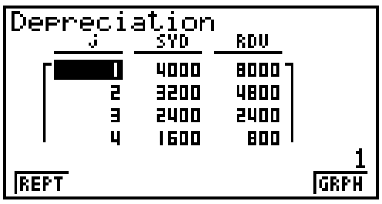
Y–1........ number of months in the first year of depreciation

After configuring the parameters, use one of the function menus noted below to perform the corresponding calculation.

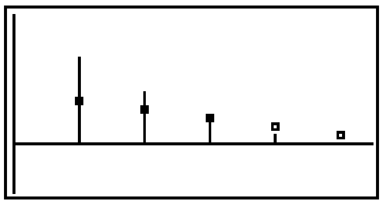
- {**SL**} … {Calculate depreciation for year j using the straight-line method}
- {**FP**} ... {**FP**} ....{Calculate depreciation for year j using the fixed-percentage method}
  {**I%**} .....{Calculate depreciation ratio}
- {**SYD**} … {Calculate depreciation for year j using the sum-of-the-years'-digits method}
- {**DB**} … {Calculate depreciation for year j calculated using the declining-balance method}

Calculation Result Output Examples

{SYD}



{SYD} – {TABL}



{SYD} – {GRPH}

An error (Ma ERROR) occurs if parameters are not configured correctly.

Use the following function menu to maneuver between calculation result screens.

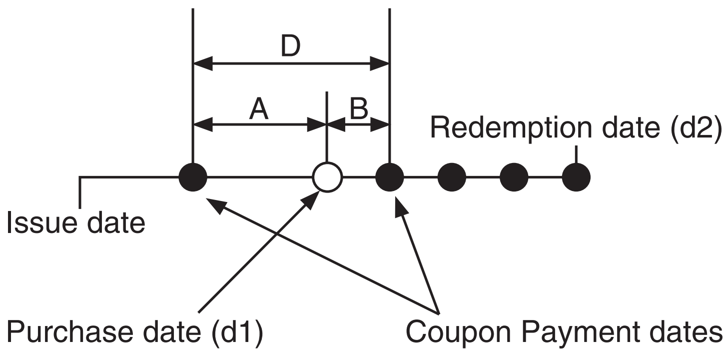
- {**REPT**} … {parameter input screen}
- {**TABL**} … {displays table}
- {**GRPH**} … {draws graph}

10. Bond Calculations

Bond calculation lets you calculate the purchase price or the annual yield of a bond.

Before starting bond calculations, use the Setup screen to configure "Date Mode" and "Periods/YR." settings (page 7-1).

• Formula



PRC : price per $100 of face value

CPN : annual coupon rate (%)

YLD : yield to maturity (%)

A : accrued days

M : number of coupon payments per year (1=annual, 2=semi annual)

N : number of coupon payments between settlement date and maturity date

RDB : redemption price or call price per $100 of face value

D : number of days in coupon period where settlement occurs

B : number of days from settlement date until next coupon payment date = D − A

INT : accrued interest

CST : price including interest

• Price per $100 of face value (PRC)

- For one or fewer coupon period to redemption

$$PRC = -\frac{RDV + \dfrac{CPN}{M}}{1 + \left(\dfrac{B}{D} \times \dfrac{YLD/100}{M}\right)} + \left(\frac{A}{D} \times \frac{CPN}{M}\right)$$

• For more than one coupon period to redemption

$$PRC = -\frac{RDV}{\left(1+\frac{YLD/100}{M}\right)^{(N-1+B/D)}} - \sum_{k=1}^{N} \frac{\frac{CPN}{M}}{\left(1+\frac{YLD/100}{M}\right)^{(k-1+B/D)}} + \frac{A}{D} \times \frac{CPN}{M}$$

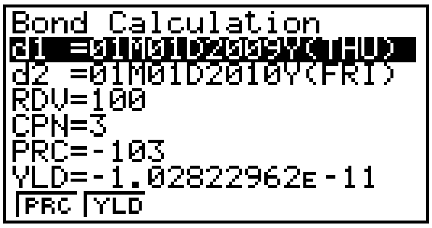
$$INT = -\frac{A}{D} \times \frac{CPN}{M} \qquad CST = PRC + INT$$

• Annual Yield (YLD)

YLD is calculated using Newton's Method.

Press F4(BOND) from the Financial 2 screen to display the following input screen for Bond calculation.

F6(▷)F4(BOND)



d1 .... purchase date (month, date, year)

d2 .... redemption date (month, date, year)

RDV ...... redemption price per \$100 of face value

CPN ...... coupon rate

PRC ...... price per \$100 of face value

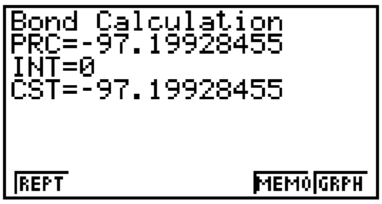
YLD ...... annual yield

After configuring the parameters, use one of the function menus noted below to perform the corresponding calculation.

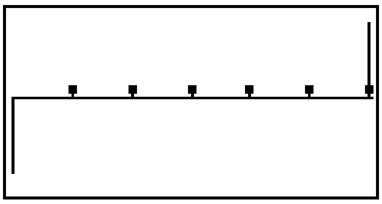
• {**PRC**} … {Calculate the bond's price (PRC), accrued interest (INT), and cost of bond (CST)}

• {**YLD**} … {Calculate the yield to maturity}

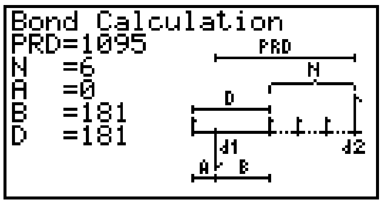
Calculation Result Output Examples



{PRC}



{PRC} – {GRPH}



{PRC} – {MEMO}

An error (Ma ERROR) occurs if parameters are not configured correctly.

Use the following function menu to maneuver between calculation result screens.

• {**REPT**} … {parameter input screen}

• {**GRPH**} … {draws graph}

• {**MEMO**} … {displays numbers of days used in calculations}

MEMO Screen

- The following describes the meaning of the MEMO screen display items.

  PRD ... number of days from d1 to d2

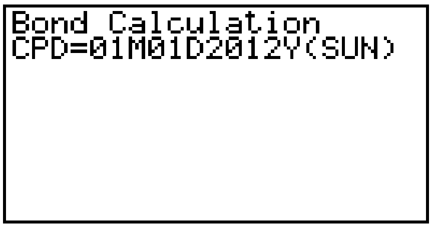
  N......... number of coupon payments between settlement date and maturity date

  A......... accrued days

  B......... number of days from settlement date until next coupon payment date (D–A)

  D .... number of days in coupon period where settlement occurs

- Each press of [EXE] while the MEMO screen is displayed cycles the Coupon Payment Day (CPD) display sequentially from the redemption year up to the purchase year. This is true only when the “Date Mode” setting on the “Setup” screen is “365”.



11. Financial Calculations Using Functions

Important!

- The following operations cannot be performed on the fx-7400GIII.

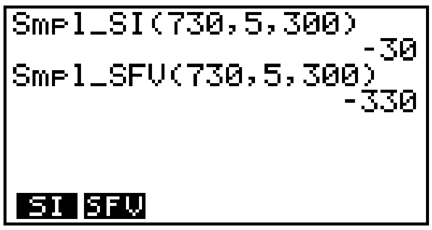
You can use special functions in the **RUN•MAT** mode or **PRGM** mode to perform calculations that are the same as the **TVM** mode financial calculations.

Example **To calculate the total interest and principal paid for a 2-year (730-day) $300 loan at a simple annual interest rate of 5%. Use a Date Mode setting of 365.**

1. From the Main Menu, enter the **RUN•MAT** mode.
2. Press the keys as follows.

[OPTN] [F6](▷) [F6](▷) [F6](▷) [F1](TVM)
[F1](SMPL) [F1](SI) [7] [3] [0] [,] [5] [,]
[3] [0] [0] [)] [EXE]

[F2](SFV) [7] [3] [0] [,] [5] [,] [3] [0] [0] [)]
[EXE]



- Use the **TVM** mode Setup screen ([SHIFT] [MENU](SET UP)) to change the Date Mode setting. You also can use special commands (DateMode365, DateMode360) in the **PRGM** mode to change the setting.
- For details about what you can do with the financial calculation functions and their syntax, see “Performing Financial Calculations in a Program” (page 8-38).

Chapter 8 Programming

Important!

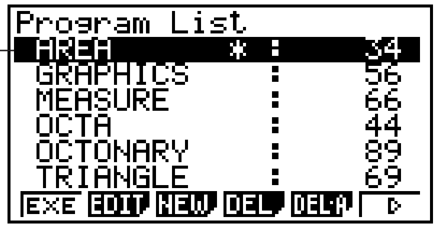
Input in the **PRGM** mode is always performed using the Linear input/output mode.

1. Basic Programming Steps

Commands and calculations are executed sequentially, just like manual calculation multi-statements.

1. From the Main Menu, enter the **PRGM** mode. When you do, a program list appears on the display.

Selected program area
(use ▲ and ▼ to move)



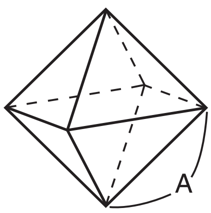
Files are listed in the alphabetic sequence of their names.

2. Register a file name.
3. Input the program.
4. Run the program.

- The values to the right of the program list indicate the number of bytes used by each program.
- A file name can be up to eight characters long.
- The following are the characters you can use in a file name: A through Z, r, θ, spaces, [,], {, }, ’, ”, ~, 0 through 9, ., +, –, ×, ÷
- Registering a file name uses 32 bytes of memory.

Example **To calculate the surface area (cm²) and volume (cm³) of three regular octahedrons when the length of one side is 7, 10, and 15 cm, respectively**

Store the calculation formula under the file name OCTA.



The following are the formulas used for calculating surface area S and volume V of a regular octahedron for which the length of one side A is known.

$$S = 2\sqrt{3}\,A^2, \quad V = \frac{\sqrt{2}}{3}A^3$$

① [MENU] PRGM

② [F3](NEW) [9](O) [ln](C) [÷](T) [X,θ,T](A) [EXE]

③ [SHIFT] [VARS](PRGM) [F4](?) [→] [ALPHA] [X,θ,T](A) [F6](▷) [F5](:)

[2] [×] [SHIFT] [x^2](√) [3] [×] [ALPHA] [X,θ,T](A) [x^2] [F6](▷) [F6](▷) [F5](◢)

[SHIFT] [x^2](√) [2] [÷] [3] [×] [ALPHA] [X,θ,T](A) [^] [3]

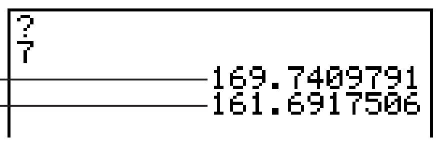
[EXIT] [EXIT]

④ [F1](EXE) or [EXE]

[7] [EXE](Value of A)

[EXE]

S when A = 7
V when A = 7



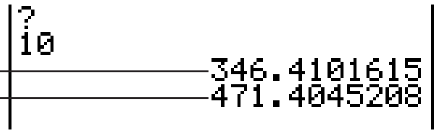
EXE EXE

1 0 EXE

EXE

S when A = 10

V when A = 10



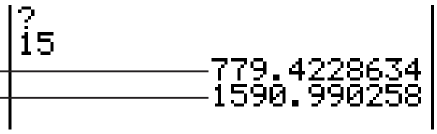
EXE EXE

1 5 EXE

EXE *1

S when A = 15

V when A = 15



*1 Pressing EXE while the program's final result is on the display exits the program.

- You can also run a program while in the **RUN•MAT** (or **RUN**) mode by inputting: Prog "<file name>" EXE.
- Pressing EXE while the final result of a program executed using this method is on the display re-executes the program.
- An error occurs if the program specified by Prog "<file name>" cannot be found.

2. PRGM Mode Function Keys

• File List Function Menu

Only the {NEW} and {LOAD} function menus are displayed when there are no program files in memory.

- {**EXE**}/{**EDIT**} ... program {execute}/{edit}
- {**NEW**} ... {new program}
- {**DEL**}/{**DEL•A**} ... {specific program}/{all program} delete
- {**SRC**}/{**REN**} ... file name {search}/{change}
- {**SV•AS**} ... saves program as a text file
- {**LOAD**} ... converts a text file to a program and saves it

• When you are registering a file name

- {**RUN**}/{**BASE**} ... {general calculation}/{number base} program input
- {**π0**} ... {password registration}
- {**SYBL**} ... {symbol menu}

• When you are inputting a program —— F1(RUN) … default

- {**TOP**}/{**BTM**} ... {top}/{bottom} of program
- {**SRC**} ... {search}
- {**MENU**} ... {mode menu}
  - {**STAT**}/{**MAT**}*/{**LIST**}/{**GRPH**}/{**DYNA**}*/{**TABL**}/{**RECR**}* ... {statistic}/{matrix}/{list}/{graph}/{Dynamic Graph}/{Table}/{recursion} menu
- {**A↔a**} ... {toggles between upper-case and lower-case input}
- {**CHAR**} ... {displays a screen for selecting various mathematical symbols, special symbols, and accented characters}

* Not included on the fx-7400GIII

• Pressing SHIFT VARS (PRGM) displays the following program (PRGM) menu.
- {**COM**} ... {program command menu}
- {**CTL**} ... {program control command menu}
- {**JUMP**} ... {jump command menu}
- {**?**}/{**◢**} ... {input}/{output} command
- {**CLR**}/{**DISP**} ... {clear}/{display} command menu
- {**REL**} ... {conditional jump relational operator menu}
- {**I/O**} ... {I/O control/transfer command menu}
- {**:**} ... {multi-statement command}
- {**STR**} ... {string command}

See "Command Reference" on page 8-9 for full details on each of these commands.

• Pressing SHIFT MENU (SET UP) displays the mode command menu shown below.
- {**ANGL**}/{**COOR**}/{**GRID**}/{**AXES**}/{**LABL**}/{**DISP**}/{**S/L**}/{**DRAW**}/{**DERV**}/{**BACK**}/{**FUNC**}/{**SIML**}/{**S-WIN**}/{**LIST**}/{**LOCS**}*/{**T-VAR**}/{**ΣDSP**}*/{**RESID**}/{**CPLX**}/{**FRAC**}/{**Y • SPD**}*/{**DATE**}*/{**PMT**}*/{**PRD**}*/{**INEQ**}/{**SIMP**}/{**Q1Q3**}   * Not included on the fx-7400GIII

See "Setup Screen Function Key Menus" on page 1-31 for details about each of these commands.

• When you are inputting a program —— F2 (BASE)[*1]

- {**TOP**}/{**BTM**}/{**SRC**}
- {**MENU**}
  - {**d~o**} ... {decimal}/{hexadecimal}/{binary}/{octal} value input
  - {**LOG**} ... {bitwise operator}
  - {**DISP**} ... conversion of displayed value to {decimal}/{hexadecimal}/{binary}/{octal}
- {**A↔a**}/{**SYBL**}

• Pressing SHIFT VARS (PRGM) displays the following PRGM (PROGRAM) menu.
- {**Prog**} ... {program recall}
- {**JUMP**}/{**?**}/{**◢**}
- {**REL**} ... {conditional jump relational operator menu}
- {**:**} ... {multi-statement command}

• Pressing SHIFT MENU (SET UP) displays the mode command menu shown below.
- {**Dec**}/{**Hex**}/{**Bin**}/{**Oct**}

*1 Programs input after pressing F2 (BASE) are indicated by B to the right of the file name.

3. Editing Program Contents

■ Debugging a Program

A problem in a program that keeps the program from running correctly is called a “bug”, and the process of eliminating such problems is called “debugging”. Either of the following symptoms indicates that your program contains bugs that require debugging.

- Error messages appearing when the program is run
- Results that are not within your expectations

• To eliminate bugs that cause error messages

An error message, like the one shown to the right, appears whenever something illegal occurs during program execution.

When such a message appears, press [EXIT] to display the place in the program where the error was caused. The cursor will be flashing at the location of the problem. Check the “Error Message Table” (page α-1) for steps you should take to correct the situation.

- Note that pressing [EXIT] does not display the location of the error if the program is password protected.

• To eliminate bugs that cause bad results

If your program produces results that are not what you normally expect, check the contents of the program and make necessary changes.

[F1](TOP)... Moves the cursor to the top of the program

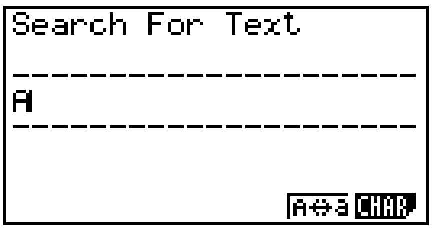
[F2](BTM)... Moves the cursor to the bottom of the program

■ Searching for Data Inside a Program

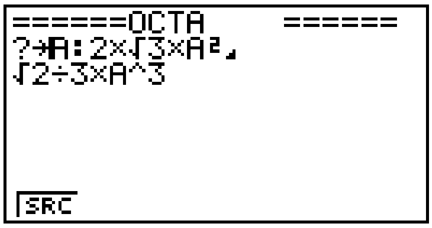
Example **To search for the letter “A” inside the program named OCTA**

1. Recall the program.
2. Press [F3](SRC) and input the data you want to find.

[F3](SRC)
[ALPHA] [X,θ,T](A)



3. Press [EXE] to begin the search. The contents of the program appear on the screen with the cursor located at the first instance of the data you specified.*1



4. Each press of [EXE] or [F1](SRC) causes the cursor to jump to the next instance of the data you specified.*2

*1 The message "Not Found" appears when the search data you specify cannot be found in the program.

*2 If there are no more instances of the data you specified, the search operation ends.

- You cannot specify the newline symbol (↵) or display command (◢) for the search data.
- Once the contents of the program are on the screen, you can use the cursor keys to move the cursor to another location before searching for the next instance of the data. Only the part of the program starting from the current cursor location is searched when you press [EXE].
- Once the search finds an instance of your data, inputting characters or moving the cursor causes the search operation to be cancelled.
- If you make a mistake while inputting characters to search for, press [AC] to clear your input and re-input from the beginning.

4. File Management

■ Deleting a Program

• To delete a specific program

1. While the program list is on the display, use ⏶ and ⏷ to move the highlighting to the name of the program you want to delete.
2. Press [F4](DEL).
3. Press [F1](YES) to delete the selected program or [F6](NO) to abort the operation without deleting anything.

• To delete all programs

1. While the program list is on the display, press [F5](DEL•A).
2. Press [F1](YES) to delete all the programs in the list or [F6](NO) to abort the operation without deleting anything.

- You also can delete all programs by entering the **MEMORY** mode from the Main Menu. See "Chapter 11 Memory Manager" for details.

■ Searching for a File

• To find a file using initial character search

Example **To use initial character search to recall the program named OCTA**

1. While the program list is on the display, press F6(▷)F1(SRC) and input the initial characters of the file you want to find.

   F6(▷)F1(SRC)

   9(O)ln(C)÷(T)

2. Press EXE to search.
   - The name that starts with the characters you input highlights.

- If there is no program whose file name starts with the characters you input, the message "Not Found" appears on the display. If this happens, press EXIT to clear the error message.

■ Editing a File Name

1. While the program list is on the display, use ▲ and ▼ to move the highlighting to the file whose name you want to edit and then press F6(▷)F2(REN).
2. Make any changes you want.
3. Press EXE to register the new name and return to the program list.

The program list is resorted according to the changes you made in the file name.

- If the modifications you make result in a file name that is identical to the name of a program already stored in memory, the message "Already Exists" appears. When this happens, you can perform either of the following two operations to correct the situation.
  - Press EXIT to clear the error and return to the file name editing screen.
  - Press AC to clear the input file name and input a new one.

■ Converting Programs and Text Files

You can convert programs created on this calculator to a text file, and then use a text editor or other application on your computer to edit them. You also can convert text files created and edited on your computer to a program that can be run by the calculator.

• Program and Text File Conversion Rules

Conversion of program and text files is subject to the following rules.

- Certain characters in the program name are automatically replaced and the result is assigned as the file name whenever you convert a program to a text file. When you convert from a text file to a program, the program name is assigned by converting in the opposite direction.

Program Name Characters	Text File Name Characters
r	_r_
θ	_t_
Leading/trailing spaces	_s_
"	_q_
Leading/trailing dots	_p_
×	_x_
÷	_d_
+	_+_
–	_-_

- The following header information is added to the text file when converting from a program to a text file.

  'Program Mode: RUN (RUN Mode program)

  'Program Mode: BASE (BASE Mode program)
- Converting a text file that contains the above header information to a program converts to a program of the mode specified in the header information. The header information line text is not included in the converted program.
- Converting a program to a text file causes all CASIO scientific function calculator-specific commands in the program to be replaced by special corresponding character strings. Conversely, converting from a text file to a program converts the special character strings back to their corresponding commands. For information about program commands and their corresponding special character strings, see “CASIO Scientific Function Calculator Special Commands ⇔ Text Conversion Table” (page 8-46).

• To convert a program to a text file

1. In the program list, use ⊜ and ⊝ to move the highlighting to the name of the program you want to convert to a text file.
2. Press F6(▷)F3(SV • AS).
   - This starts conversion to a text file. The message “Complete!” appears after conversion is complete. To close the message dialog box, press EXIT.
   - The resulting text file is stored in the storage memory’s PROGRAM folder, under a name that is basically the same as the original file, except for certain special characters. For details about special character exceptions, see “Program and Text File Conversion Rules” (page 8-6).

Important!

A program that is password protected cannot be converted to a text file.

• Auto Conversion from Text Files to Programs

Whenever you terminate the USB connection between the calculator and computer, all of the text files that were transferred from the computer to Storage Memory\@MainMem\PROGRAM\ while they were connected will be automatically converted to programs and stored in the calculator’s main memory.

For details, see “Transferring Data between the Calculator and a Personal Computer” (page 13-4).

• To convert a text file to a program

Important!

Using the procedure below to convert a text file to a program will create and save a program under a name that is basically the same as the original file, except for certain special characters. For details about special character exceptions, see “Program and Text File Conversion Rules” (page 8-6).

If there is already a program in memory with the same name as the program created by the conversion process, the existing program will be overwritten automatically with the new program. If you do not want such an existing program to be overwritten, use the program list to change its name before performing this procedure.

1. Copy the text file you want to convert to a program to the calculator’s storage memory root directory.
   - For information about the procedure for copying files from a computer or another calculator to this calculator’s storage memory, see “Chapter 13 Data Communication”.
2. From the Main Menu, enter the **PRGM** mode.
3. On the program list, press F6(▷) F4(LOAD).
   - This displays a list of folders and text files currently in the storage memory root directory.
4. Use ⏶ and ⏷ to move the highlighting to the text file you want to convert and then press F1(OPEN).

■ Registering a password

When inputting a program, you can protect it with a password that limits access to the program contents to those who know the password.

- You do not need to input the password to run a program.
- The password input procedure is identical to that used for file name input.

1. While the program list is on the display, press F3(NEW) and input the file name of the new program file.
2. Press F5(⊶) and then input the password.
3. Press EXE to register the file name and password. Now you can input the contents of the program file.
4. After inputting the program, press SHIFT EXIT(QUIT) to exit the program file and return to the program list. Files that are password protected are indicated by an asterisk to the right of the file name.

■ Recalling a Password Protected Program

1. In the program list, use ⏶ and ⏷ to move the highlighting to the name of the program you want to recall.
2. Press F2(EDIT).
3. Input the password and press EXE to recall the program.

- Inputting the wrong password when recalling a password protected program causes the message “Mismatch” to appear.

5. Command Reference

■ Command Index

The following are conventions that are used in this section when describing the various commands.

Boldface Text .... Actual commands and other items that always must be input are shown in boldface.

{Curly Brackets} .... Curly brackets are used to enclose a number of items, one of which must be selected when using a command. Do not input the curly brackets when inputting a command.

[Square Brackets] .... Square brackets are used to enclose items that are optional. Do not input the square brackets when inputting a command.

Numeric Expressions ... Numeric expressions (such as 10, 10 + 20, A) indicate constants, calculations, numeric constants, etc.

Alpha Characters .... Alpha characters indicate literal strings (such as AB).

■ Basic Operation Commands

? (Input Command)

Function: Prompts for input of values for assignment to variables during program execution.

Syntax: ? → <variable name>, "<prompt>" ? → <variable name>

Example: ? → A↵

Description:

- This command momentarily interrupts program execution and prompts for input of a value or expression for assignment to a variable. If you do not specify a prompt, execution of this command causes "?" to appear indicating the calculator is standing by for input. If a prompt is specified, "<prompt>?" appears to prompt input. Up to 255 bytes of text can be used for a prompt.
- Input in response to the input command must be a value or an expression, and the expression cannot be a multi-statement.
- You can specify a list name, matrix name, vector name, string memory, function memory (fn), graph (Yn), etc. as a variable name.

◢ (Output Command)

Function: Displays an intermediate result during program execution.

Description:

- This command momentarily interrupts program execution and displays alpha character text or the result of the calculation immediately before the command.
- The output command should be used at locations where you would normally press the EXE key during a manual calculation.

: (Multi-statement Command)

Function: Connects two statements for sequential execution without stopping.

Description:

- Unlike the output command (◢), statements connected with the multi-statement command are executed non-stop.
- The multi-statement command can be used to link two calculation expressions or two commands.
- You can also use a carriage return indicated by ↵ in place of the multi-statement command.

↵ (Carriage Return)

Function: Connects two statements for sequential execution without stopping.

Description:

- Operation of the carriage return is identical to that of the multi-statement command.
- You can create a blank line in a program by inputting a carriage return only. Using a carriage return in place of the multi-statement command makes the displayed program easier to read.

' (Comment Text Delimiter)

Function: Indicates comment text inserted inside a program.

Description: Inputting an apostrophe (') at the beginning of a line, causes everything from the beginning of the line up to the next Multi-statement Command (:), Carriage Return (↵), or Output Command (◢) is treated as comment text, which is ignored during execution.

■ Program Commands (COM)

If~Then~(Else~)IfEnd

Function: The Then-statement is executed only when the If-condition is true (non-zero). The Else-statement is executed when the If-condition is false (0). The IfEnd-statement is always executed following either the Then-statement or Else-statement.

Syntax:

If <condition> (numeric expression) {↵ / : / ◢} Then <statement> [{↵ / : / ◢} <statement>]

{↵ / : / ◢} (Else <statement> [{↵ / : / ◢} <statement>] {↵ / : / ◢}) IfEnd

Parameters: condition, numeric expression

Description:

(1) If ~ Then ~ IfEnd

- When the condition is true, execution proceeds with the Then-statement and then continues with the statement following IfEnd.
- When the condition is false, execution jumps to the statement following IfEnd.

(2) If ~ Then ~ Else ~ IfEnd

- When the condition is true, execution proceeds with the Then-statement and then jumps to the statement following IfEnd.
- When the condition is false, execution jumps to the Else-statement and then continues with the statement following IfEnd.

For~To~(Step~)Next

Function: This command repeats everything between the For-statement and the Next-statement. The starting value is assigned to the control variable with the first execution, and the value of the control variable is changed according to the step value with each execution. Execution continues until the value of the control variable exceeds the ending value.

Syntax: For <starting value> → <control variable name> To <ending value>

(Step <step value>) {↵ / : / ◢} Next

Parameters:

- control variable name: A to Z
- starting value: value or expression that produces a value (i.e. sin x, A, etc.)
- ending value: value or expression that produces a value (i.e. sin x, A, etc.)
- step value: numeric value (default: 1)

Description:

- The default step value is 1.
- Making the starting value less than the ending value and specifying a positive step value causes the control variable to be incremented with each execution. Making the starting value greater than the ending value and specifying a negative step value causes the control variable to be decremented with each execution.

Do~LpWhile

Function: This command repeats specific commands as long as its condition is true (non-zero).

Syntax:

$$\text{Do}\ \left\{\begin{array}{c}\hookleftarrow\\ :\\ \blacktriangle\end{array}\right\}\ \langle\text{statement}\rangle\ \left\{\begin{array}{c}\hookleftarrow\\ :\\ \blacktriangle\end{array}\right\}\ \text{LpWhile}\quad \underset{\text{numeric expression}}{\langle\underline{\text{condition}}\rangle}$$

Parameters: expression

Description:

- This command repeats the commands contained in the loop as long as its condition is true (non-zero). When the condition becomes false (0), execution proceeds from the statement following the LpWhile-statement.
- Since the condition comes after the LpWhile-statement, the condition is tested (checked) after all of the commands inside the loop are executed.

While~WhileEnd

Function: This command repeats specific commands as long as its condition is true (non-zero).

Syntax:

$$\text{While}\quad \underset{\text{numeric expression}}{\langle\underline{\text{condition}}\rangle}\ \left\{\begin{array}{c}\hookleftarrow\\ :\\ \blacktriangle\end{array}\right\}\ \langle\text{statement}\rangle\ \left\{\begin{array}{c}\hookleftarrow\\ :\\ \blacktriangle\end{array}\right\}\ \text{WhileEnd}$$

Parameters: expression

Description:

- This command repeats the commands contained in the loop as long as its condition is true (non-zero). When the condition becomes false (0), execution proceeds from the statement following the WhileEnd-statement.
- Since the condition comes after the While-statement, the condition is tested (checked) before the commands inside the loop are executed.

■ Program Control Commands (CTL)

Break

Function: This command breaks execution of a loop and continues from the next command following the loop.

Syntax: Break ↵

Description:

- This command breaks execution of a loop and continues from the next command following the loop.
- This command can be used to break execution of a For-statement, Do-statement, and While-statement.

Prog

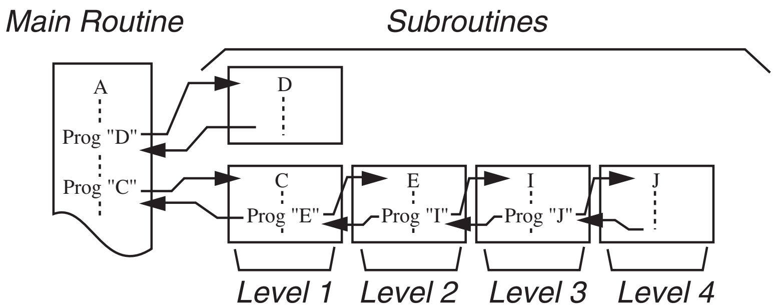
Function: This command specifies execution of another program as a subroutine. In the **RUN•MAT** (or **RUN**) mode, this command executes a new program.

Syntax: Prog "file name" ↵

Example: Prog "ABC" ↵

Description:

- Even when this command is located inside of a loop, its execution immediately breaks the loop and launches the subroutine.
- This command can be used as many times as necessary inside of a main routine to call up independent subroutines to perform specific tasks.
- A subroutine can be used in multiple locations in the same main routine, or it can be called up by any number of main routines.



- Calling up a subroutine causes it to be executed from the beginning. After execution of the subroutine is complete, execution returns to the main routine, continuing from the statement following the Prog command.
- A Goto~Lbl command inside of a subroutine is valid inside of that subroutine only. It cannot be used to jump to a label outside of the subroutine.
- If a subroutine with the file name specified by the Prog command does not exist, an error occurs.
- In the **RUN•MAT** (or **RUN**) mode, inputting the Prog command and pressing EXE launches the program specified by the command.

Return

Function: This command returns from a subroutine.

Syntax: Return ↵

Description: Execution of the Return command inside a main routine causes execution of the program to stop. Execution of the Return command within a subroutine terminates the subroutine and returns to the program from which the subroutine was jumped to.

Stop

Function: This command terminates execution of a program.

Syntax: Stop ↵

Description:

- This command terminates program execution.
- Execution of this command inside of a loop terminates program execution without an error being generated.

■ Jump Commands (JUMP)

Dsz

Function: This command is a count jump that decrements the value of a control variable by 1, and then jumps if the current value of the variable is zero.

Syntax:

Variable Value ≠ 0

Dsz <variable name> : <statement> { ↵ / : / ◢ } <statement>

Variable Value = 0

Parameters: variable name: A to Z, r, θ

[Example] Dsz B : Decrements the value assigned to variable B by 1.

Description: This command decrements the value of a control variable by 1, and then tests (checks) it. If the current value is non-zero, execution continues with the next statement. If the current value is zero, execution jumps to the statement following the multi-statement command (:), display command (◢), or carriage return (↵).

Goto~Lbl

Function: This command performs an unconditional jump to a specified location.

Syntax: Goto <label name> ~ Lbl <label name>

Parameters: label name: value (0 to 9), variable (A to Z, r, θ)

Description:

- This command consists of two parts: Goto n (where n is a parameter as described above) and Lbl n (where n is the parameter referenced by Goto n). This command causes program execution to jump to the Lbl-statement whose n parameter matches that specified by the Goto-statement.
- This command can be used to loop back to the beginning of a program or to jump to any location within the program.
- This command can be used in combination with conditional jumps and count jumps.
- If there is no Lbl-statement whose value matches that specified by the Goto-statement, an error occurs.

Isz

Function: This command is a count jump that increments the value of a control variable by 1, and then jumps if the current value of the variable is zero.

Syntax:

Variable Value ≠ 0

Isz <variable name> : <statement> { ↵ / : / ◢ } <statement>

Variable Value = 0

Parameters: variable name: A to Z, r, θ

[Example] Isz A : Increments the value assigned to variable A by 1.

Description: This command increments the value of a control variable by 1, and then tests (checks) it. If the current value is non-zero, execution continues with the next statement. If the current value is zero, execution jumps to the statement following the multi-statement command (:), display command (◢), or carriage return (↵).

⇒ (Jump Code)

Function: This code is used to set up conditions for a conditional jump. The jump is executed whenever the conditions are false.

Syntax:

True

<left side> <relational operator> <right side> ⇒ <statement> { ↵ / : / ◢ } <statement>

False

Parameters:

- left side/right side: variable (A to Z, r, θ), numeric constant, variable expression (such as: A × 2)
- relational operator: =, ≠, >, <, ≥, ≤ (page 8-20)

Description:

- The conditional jump compares the contents of two variables or the results of two expressions, and a decision is made whether or not to execute the jump based on the results of the comparison.
- If the comparison returns a true result, execution continues with the statement following the ⇒ command. If the comparison returns a false result, execution jumps to the statements following the multi-statement command (:), display command (◢), or carriage return (↵).

Menu

Function: Creates a branching menu in a program.

Syntax: Menu "<string (menu name)>", "<string (branch name) 1>", <value or variable 1>, "<string (branch name) 2>" ,<value or variable 2>, ... , "<string (branch name) n>", <value or variable n>

Parameters: value (0 to 9), variable (A to Z, r, θ)

Description:

- Each "<string (branch name) n>" ,<value or variable n> part is a branch set, and the entire branch set must be included.
- From two to nine branching sets can be included. An error occurs when there is only one or more than nine branching sets.
- Selecting a branch on the menu while the program is running jumps to the same type of label (Lbl n) as the one used in combination with the Goto command. Specifying “"OK", 3” for the “"<string (branch name) n>", <value or variable n>” part specifies a jump to Lbl 3.

Example: Lbl 2↵

Menu "IS IT DONE?", "OK", 1, "EXIT", 2↵

Lbl 1↵

"IT’S DONE !"

■ Clear Commands (CLR)

ClrGraph

Function: This command clears the graph screen.

Syntax: ClrGraph↵

Description: This command clears the graph screen during program execution.

ClrList

Function: This command deletes list data.

Syntax: ClrList <list name>

ClrList

Parameters: list name: 1 to 26, Ans

Description: This command deletes the data in the list specified by "list name". All list data is deleted if nothing is specified for "list name".

ClrMat	(Not included on the fx-7400GIII)

Function: This command deletes matrix data.

Syntax: ClrMat <matrix name>

ClrMat

Parameters: matrix name: A to Z, Ans

Description: This command deletes the data in the matrix specified by "matrix name". All matrix data is deleted if nothing is specified for "matrix name".

ClrText

Function: This command clears the text screen.

Syntax: ClrText↵

Description: This command clears text from the screen during program execution.

ClrVct	(Not included on the fx-7400GIII)

Function: This command deletes vector data.

Syntax: ClrVct <vector name>
ClrVct

Parameters: vector name: A to Z, Ans

Description: This command deletes the data in the vector specified by "vector name". All vector data is deleted if nothing is specified for "vector name".

■ Display Commands (DISP)

DispF-Tbl, DispR-Tbl*	* (Not included on the fx-7400GIII)	No parameters

Function: These commands display numeric tables.

Description:

- These commands generate numeric tables during program execution in accordance with conditions defined within the program.
- DispF-Tbl generates a function table, while DispR-Tbl generates a recursion table.

DrawDyna	(Not included on the fx-7400GIII)	No parameters

Function: This command executes a Dynamic Graph draw operation.

Description: This command draws a Dynamic Graph during program execution in accordance with the drawing conditions defined within the program.

DrawFTG-Con, DrawFTG-Plt	No parameters

Function: This command uses values in a generated table to graph a function.

Description:

- This command draws a function graph in accordance with conditions defined within the program.
- DrawFTG-Con produces a connect type graph, while DrawFTG-Plt produces a plot type graph.

DrawGraph	No parameters

Function: This command draws a graph.

Description: This command draws a graph in accordance with the drawing conditions defined within the program.

DrawR-Con, DrawR-Plt	(Not included on the fx-7400GIII)	No parameters

Function: These commands graph recursion expressions, with a_n (b_n or c_n) as the vertical axis and n as the horizontal axis.

Description:

- These commands graph recursion expressions in accordance with conditions defined within the program, with a_n (b_n or c_n) as the vertical axis and n as the horizontal axis.
- DrawR-Con produces a connect type graph, while DrawR-Plt produces a plot type graph.

DrawRΣ-Con, DrawRΣ-Plt	(Not included on the fx-7400GIII)	No parameters

Function: These commands graph recursion expressions, with Σa_n (Σb_n or Σc_n) as the vertical axis and n as the horizontal axis.

Description:

- These commands graph recursion expressions in accordance with conditions defined within the program, with Σa_n (Σb_n or Σc_n) as the vertical axis and n as the horizontal axis.
- DrawRΣ-Con produces a connect type graph, while DrawRΣ-Plt produces a plot type graph.

DrawStat

Function: This draws a statistical graph.

Syntax: See "Using Statistical Calculations and Graphs in a Program" on page 8-28.

Description: This command draws a statistical graph in accordance with conditions defined within the program.

DrawWeb	(Not included on the fx-7400GIII)

Function: This command graphs convergence/divergence of a recursion expression (WEB graph).

Syntax: DrawWeb <recursion type>[, <number of lines>] ↵

Example: DrawWeb a_{n+1} (b_{n+1} or c_{n+1}), 5 ↵

Description:

- This command graphs convergence/divergence of a recursion expression (WEB graph).
- Omitting the number of lines specification automatically specifies the default value 30.

PlotPhase	(Not included on the fx-7400GIII)

Function: Graphs a phase plot based on numeric sequences that correspond to the x-axis and y-axis.

Syntax: PlotPhase <x-axis numeric sequence name>, <y-axis numeric sequence name>

Description:

- Only the following commands can be input for each argument to specify the recursion table.

  a_n, b_n, c_n, a_{n+1}, b_{n+1}, c_{n+1}, a_{n+2}, b_{n+2}, c_{n+2}, Σa_n, Σb_n, Σc_n, Σa_{n+1}, Σb_{n+1}, Σc_{n+1}, Σa_{n+2}, Σb_{n+2}, Σc_{n+2}

- A memory ERROR occurs if you specify a numeric sequence name that does not have values stored in the recursion table.

Example: PlotPhase Σb_{n+1}, Σa_{n+1}

Graphs a phase plot using Σb_{n+1} for the x-axis and Σa_{n+1} for the y-axis.

■ Input/Output Commands (I/O)

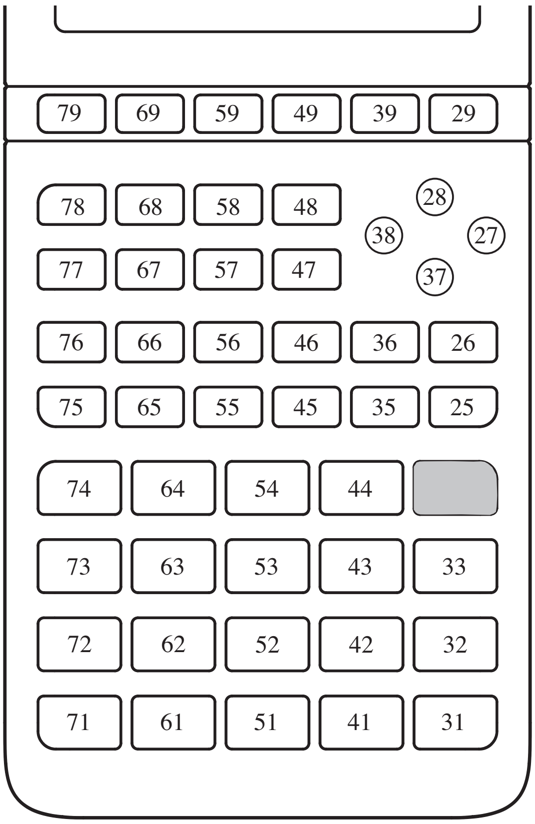
Getkey

Function: This command returns the code that corresponds to the last key pressed.

Syntax: Getkey↵

Description:

- This command returns the code that corresponds to the last key pressed.



- A value of zero is returned if no key was pressed previous to executing this command.
- This command can be used inside of a loop.

Locate

Function: This command displays alpha-numeric characters at a specific location on the text screen.

Syntax: Locate <column number>, <line number>, <value>

Locate <column number>, <line number>, <numeric expression>

Locate <column number>, <line number>, "<string>"

[Example] Locate 1, 1, "AB"↵

Parameters:

- line number: number from 1 to 7
- column number: number from 1 to 21
- value and numeric expression
- string: character string

Description:

- This command displays values (including variable contents) or text at a specific location on the text screen. If there is a calculation input, that calculation result is displayed.
- The line is designated by a value from 1 to 7, while the column is designated by a value from 1 to 21.

Example: Cls↵
Locate 7, 1, "CASIO FX"

This program displays the text "CASIO FX" in the center of the screen.

- In some cases, the ClrText command should be executed before running the above program.

Receive(/ Send(

Function: This command receives data from and sends data to a connected device.

Syntax: Receive(<data>) / Send(<data>)

Description:

- This command receives data from and sends data to a connected device.
- The following types of data can be received (sent) by this command.
  - Individual values assigned to variables
  - Matrix data (all values - individual values cannot be specified)
  - List data (all values - individual values cannot be specified)

OpenComport38k / CloseComport38k

Function: Opens and closes the 3-pin COM port (serial).

Description: See the Receive38k/Send38k command below.

Receive38k / Send38k

Function: Executes data send and receive at a data rate of 38 kbps.

Syntax: Send38k <expression>

Receive38k { <variable name> / <list name> }

Description:

- The OpenComport38k command must be executed before this command is executed.
- The CloseComport38k command must be executed after this command is executed.
- If this command is executed when the communication cable is not connected, program execution will continue without generating an error.

■ Conditional Jump Relational Operators (REL)

=, ≠, >, <, ≥, ≤

Function: These relational operators are used in combination with the conditional jump command.

Syntax: <left side> <relational operator> <right side>

Parameters:

- left side/right side: variable (A to Z, r, θ), numeric constant, variable expression (such as: A × 2)
- relational operator: =, ≠, >, <, ≥, ≤

■ Strings

A string is a series of characters enclosed in double quotes. In a program, strings are used to specify display text. A string made up of numbers (like "123") or an expression (like "x–1") cannot be processed as a calculation.

To display a string at a specific location on the screen, use the Locate command (page 8-19).

- To include double quotes (") or a backslash (\) in a string, put a backslash (\) in front of the double quotes (") or backslash (\).

  Example 1: To include Japan: “Tokyo” in a string
  "Japan:\"Tokyo\""

  Example 2: To include main\abc in a string
  "main\\abc"

You can input a backslash from the menu that appears when you press F6(CHAR) F2(SYBL) in the **PRGM** mode, or from the String category of the catalog that appears when you press SHIFT 4(CATALOG).

- You can assign strings to string memory (Str 1 through Str 20). For details about strings, see “String Memory” (page 2-8).
- You can use the “+” command (page 8-22) to connect strings inside of an argument.
- A function or command within a string function (Exp(, StrCmp(, etc.) is treated as a single character. For example, the “sin” function is treated as a single character.

Exp(

Function: Converts a string to an expression, and executes the expression.

Syntax: Exp("<string>"[)]

Exp►Str(

Function: Converts a graph expression to a string and assigns it to the specified variable.

Syntax: Exp►Str(<formula>, <string variable name>[)]

Description: A graph expression (Y_n, r, X_t, Y_t, X), recursion formula (a_n, a_{n+1}, a_{n+2}, b_n, b_{n+1}, b_{n+2}, c_n, c_{n+1}, c_{n+2}), or function memory (f_n) can be used as the first argument (<formula>).

StrCmp(

Function: Compares "<string 1>" and "<string 2>" (character code comparison).

Syntax: StrCmp("<string 1>", "<string 2>"[)]

Description: Compares two strings and returns one of the following values.

Returns 0 when "<string 1>" = "<string 2>".

Returns 1 when "<string 1>" > "<string 2>".

Returns –1 when "<string 1>" < "<string 2>".

StrInv(

Function: Inverts the sequence of a string.

Syntax: StrInv("<string>"[)]

StrJoin(

Function: Joins "<string 1>" and "<string 2>".

Syntax: StrJoin("<string 1>", "<string 2>"[)]

Note: The same result also can be achieved using the "+" command (page 8-22).

StrLeft(

Function: Copies a string up to the nth character from the left.

Syntax: StrLeft("<string>", n[)]   ($0 \leqq n \leqq 9999$, n is a natural number)

StrLen(

Function: Returns the length of a string (the number of its characters).

Syntax: StrLen("<string>"[)]

StrLwr(

Function: Converts all the characters of a string to lower case.

Syntax: StrLwr("<string>"[)]

StrMid(

Function: Extracts from the n-th to the m-th character of a string.

Syntax: StrMid("<string>", n [,m)] ($0 \leqq n \leqq 9999$, n is a natural number)

Description: Omitting "m" will extract from the n-th character to the end of the string.

StrRight(

Function: Copies a string up to the nth character from the right.

Syntax: StrRight("<string>", n[)] ($0 \leqq n \leqq 9999$, n is a natural number)

StrRotate(

Function: Rotates the left side part and right side part of a string at the nth character.

Syntax: StrRotate("<string>", [,n)] ($-9999 \leqq n \leqq 9999$, n is an integer)

Description: Rotation is to the left when "n" is positive, and to the right when "n" is negative. Omitting "n" uses a default value of +1.

Example: StrRotate("abcde", 2) .... Returns the string "cdeab".

StrShift(

Function: Shifts a string left or right n characters.

Syntax: StrShift("<string>", [,n)] ($-9999 \leqq n \leqq 9999$, n is an integer)

Description: Shift is to the left when "n" is positive, and to the right when "n" is negative. Omitting "n" uses a default value of +1.

Example: StrShift("abcde", 2) .... Returns the string "cde".

StrSrc(

Function: Searches "<string 1>" starting from the specified point (nth character from beginning of string) to determine if it contains the data specified by "<string 2>". If the data is found, this command returns the location of the first character of "<string 2>", starting from the beginning of "<string 1>".

Syntax: StrSrc("<string 1>", "<string 2>"[,n)] ($0 \leqq n \leqq 9999$, n is a natural number)

Description: Omitting the start point causes the search to start from the beginning of "<string 1>".

StrUpr(

Function: Converts all the characters of a string to upper case.

Syntax: StrUpr("<string>"[)]

+

Function: Joins "<string 1>" and "<string 2>".

Syntax: "<string 1>"+"<string 2>"

Example: "abc"+"de"→Str 1.......... Assigns "abcde" to Str 1.

■ Other

RclCapt

Function: Displayed the contents specified by the capture memory number.

Syntax: RclCapt <capture memory number> (capture memory number: 1 to 20)

6. Using Calculator Functions in Programs

■ Text Display

You can include text in a program by simply enclosing it between double quotation marks. Such text appears on the display during program execution, which means you can add labels to input prompts and results.

Program	**Display**
"CASIO"	CASIO
? → X	?
"X =" ? → X	X = ?

- If the text is followed by a calculation formula, be sure to insert a display command (◢) between the text and calculation.
- Inputting more than 21 characters causes the text to move down to the next line. The screen scrolls automatically if the text exceeds 21 characters.
- You can specify up to 255 bytes of text for a comment.

■ Specifying the Display Format of a Calculation Result in a Program

You can specify the display format of calculation results produced within a program as described below.

- Number of decimal places: Fix <number of digits> ... Number of digits: 0 to 9
- Number of significant digits: Sci <number of digits> ... Number of digits: 0 to 9
- Normal display mode: Norm <number*> ... Number: 1 or 2
- Engineering symbol display on EngOn
- Engineering symbol display off EngOff
- Enable engineering symbol on/off toggling Eng

* Input of a number can be omitted. Input without a number while the Fix, Sci, and Norm 2 settings are configured will switch to Norm 1. If Norm 1 is set, input will switch to Norm 2.

■ Using Matrix Row Operations in a Program (Not available on the fx-7400GIII)

These commands let you manipulate the rows of a matrix in a program.

- For this program, enter the **RUN•MAT** mode and then use the Matrix Editor to input the matrix, and then enter the **PRGM** mode to input the program.

• To swap the contents of two rows (Swap)

Example 1 **To swap the values of Row 2 and Row 3 in the following matrix:**

$$\text{Matrix A} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

The following is the syntax to use for this program.

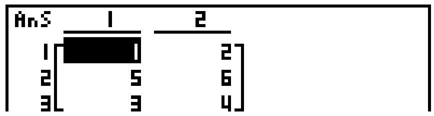
Swap A, 2, 3↵

Rows to be swapped

Matrix name

Mat A

Executing this program produces the following result.



• To calculate a scalar multiplication (∗ Row)

Example 2 **To calculate the product of Row 2 of the matrix in Example 1 and the scalar 4**

The following is the syntax to use for this program.

∗Row 4, A, 2↵

Row

Matrix name

Multiplier

Mat A

• To calculate a scalar multiplication and add the results to another row (∗Row+)

Example 3 **To calculate the product of Row 2 of the matrix in Example 1 and the scalar 4, then add the result to row 3**

The following is the syntax to use for this program.

∗Row+ 4, A, 2, 3↵

Rows to be added

Row for which scalar multiplication is to be calculated

Matrix name

Multiplier

Mat A

• To add two rows (Row+)

Example 4   To add Row 2 to Row 3 of the matrix in Example 1

The following is the syntax to use for this program.

Row+ A, 2, 3 ↵

- 3: *Row number to be added to*
- 2: *Row number to be added*
- A: *Matrix name*

Mat A

■ Using Graph Functions in a Program

You can incorporate graph functions into a program to draw complex graphs and to overlay graphs on top of each other. The following shows various types of syntax you need to use when programming with graph functions.

• V-Window	View Window –5, 5, 1, –5, 5, 1 ↵
• Graph function input	Y = Type ↵ ....Specifies graph type.
	"X^2 – 3" → Y1*1 ↵
• Graph draw operation	DrawGraph ↵

*1 Input this Y1 with VARS F4 (GRPH) F1 (Y) 1 (displayed as Y1). A Syntax ERROR will occur if you input "Y" with the calculator keys.

• Syntax of other graphing functions

• V-Window	View Window <Xmin>, <Xmax>, <Xscale>, <Ymin>, <Ymax>, <Yscale>, <Tθ min>, <Tθ max>, <Tθ pitch>
	StoV-Win <area of V-Win>............. area: 1 to 6
	RclV-Win <area of V-Win>............. area: 1 to 6
• Style	NormalG <area of graph>.............. area: 1 to 20
	NormalG <element of recursion formula> ... element: a_{n+1}, b_{n+1}, etc.
	ThickG <area of graph>................. area: 1 to 20
	ThickG <element of recursion formula> ... element: a_{n+1}, b_{n+1}, etc.
	BrokenThickG <area of graph>....... area: 1 to 20
	BrokenThickG <element of recursion formula> ... element: a_{n+1}, b_{n+1}, etc.
	DotG <area of graph>..................... area: 1 to 20
	DotG <element of recursion formula> ... element: a_{n+1}, b_{n+1}, etc.
• Zoom	Factor <X factor>, <Y factor>
	ZoomAuto...................................... Non-parameter
• Pict	StoPict <area of picture>................ area: 1 to 6 (area of picture: numeric expression)
	RclPict <area of picture> .... area: 1 to 6 (area of picture: numeric expression)
• Sketch	PlotOn <X-coordinate>, <Y-coordinate>
	PlotOff <X-coordinate>, <Y-coordinate>

PlotChg <X-coordinate>, <Y-coordinate>

PxlOn <line number>, <column number>

PxlOff <line number>, <column number>

PxlChg <line number>, <column number>

PxlTest <line number>, <column number>

Text <line number>, <column number>, "<text>"

Text <line number>, <column number>, <expression>

SketchThick <Sketch or Graph statement>

SketchBroken <Sketch or Graph statement>

SketchDot <Sketch or Graph statement>

SketchNormal <Sketch or Graph statement>

Tangent <function>, <X-coordinate>

Normal <function>, <X-coordinate>

Inverse <function>

Line

F-Line <X-coordinate 1>, <Y-coordinate 1>, <X-coordinate 2>, <Y-coordinate 2>

Circle <center point X-coordinate>, <center point Y-coordinate>, <radius R value>

Vertical <X-coordinate>

Horizontal <Y-coordinate>

• Graph Memory StoGMEM <graph memory number> ... number: 1 to 20

RclGMEM <graph memory number> ... number: 1 to 20

■ Using Background Picture in a Program

You can change the “Background” setting on the Setup screen from a program.

• Syntax when a background image is displayed

BG-Pict <area of picture> [,a] ... area: 1 to 20

Appending “a” at the end loads V-Window values (that are saved with the image data) when the background image is displayed.

• Syntax when a background image is not displayed (or hidden)

BG-None

■ Using Dynamic Graph Functions in a Program

Using Dynamic Graph functions in a program makes it possible to perform repeated Dynamic Graph operations. The following shows how to specify the Dynamic Graph range inside a program.

• Dynamic Graph range

1 → D Start ↵

5 → D End ↵

1 → D pitch ↵

■ Using Table & Graph Functions in a Program

Table & Graph functions in a program can generate numeric tables and perform graphing operations. The following shows various types of syntax you need to use when programming with Table & Graph functions.

- Table range setting

  1 → F Start↵

  5 → F End↵

  1 → F pitch↵

- Numeric table generation

  DispF-Tbl↵

- Number Table and Graph Creation Conditions

  VarList <list number> ... Number table/graph creation using the specified list (number: 1 to 26).

  VarRange ... Number table/graph creation using the table range.

- Graph draw operation

  Connect type: DrawFTG-Con↵

  Plot type: DrawFTG-Plt↵

■ Using Recursion Table & Graph Functions in a Program

Incorporating Recursion Table & Graph functions in a program lets you generate numeric tables and perform graphing operations. The following shows various types of syntax you need to use when programming with Recursion Table & Graph functions.

- Recursion formula input

  a_{n+1} Type↵ .... Specifies recursion type.

  "3a_n + 2" → a_{n+1}↵

  "4b_n + 6" → b_{n+1}↵

- Table range setting

  1 → R Start↵

  5 → R End↵

  1 → a_0↵

  2 → b_0↵

  1 → a_n Start↵

  3 → b_n Start↵

- Numeric table generation

  DispR-Tbl↵

- Graph draw operation

  Connect type: DrawR-Con↵, DrawRΣ-Con↵

  Plot type: DrawR-Plt↵, DrawRΣ-Plt↵

- Statistical convergence/divergence graph (WEB graph)

  DrawWeb a_{n+1}, 10↵

■ Configuring Residual Calculation Settings in a Program

You can configure residual calculation settings in a program and store residual values in a specified list. Use a syntax like the ones shown in the examples below.

- To specify a storage list and execute residual calculation

  Resid-List <list number> ... number: 1 to 26

- To skip residual calculation execution

  Resid-None

■ Specifying a List File for Use in a Program

You can specify a list file to be used when executing a list operation in a program. Display formats are as shown in the example below.

File <file number> ... number: 1 to 6

■ Using List Sort Functions in a Program

These functions let you sort data in lists into ascending or descending order.

• Ascending order

① ②
SortA (List 1, List 2, List 3)

Lists to be sorted (up to six can be specified)

① F4 F3 F1 ② OPTN F1 F1

• Descending order

③
SortD (List 1, List 2, List 3)

Lists to be sorted (up to six can be specified)

③ F4 F3 F2

■ Using Statistical Calculations and Graphs in a Program

Including statistical calculations and graphing operations in a program lets you calculate and graph statistical data.

• To set conditions and draw a statistical graph

Following a StatGraph command ("S-Gph1", "S-Gph2", or "S-Gph3"), you must specify the following graph conditions:

• Graph draw/non-draw status (DrawOn/DrawOff)
• Graph Type
• x-axis data location (list name)
• y-axis data location (list name)
• Frequency data location (list name)
• Mark Type (Cross, Dot, Square)
• Pie graph display setting (% or Data)
• Pie graph percentage data storage list specification (None or list name)
• First bar graph data (list name)
• Second and third bar graph data (list name)
• Bar graph orientation (Length or Horizontal)

The graph conditions that are required depends on the graph type. See "Changing Graph Parameters" (page 6-1).

- The following is a typical graph condition specification for a scatter diagram or *xy*Line graph.

  S-Gph1 DrawOn, Scatter, List 1, List 2, 1, Square ↵

  In the case of an *xy* line graph, replace "Scatter" in the above specification with "*xy*Line".

- The following is a typical graph condition specification for a normal probability plot.

  S-Gph1 DrawOn, NPPlot, List 1, Square ↵

- The following is a typical graph condition specification for a single-variable graph.

  S-Gph1 DrawOn, Hist, List 1, List 2 ↵

  The same format can be used for the following types of graphs, by simply replacing "Hist" in the above specification with the applicable graph type.

Histogram	Hist	Normal Distribution	N-Dist
Median Box	MedBox*1	Broken Line	Broken

*1 Outliers:On — S-Gph1 DrawOn, MedBox, List 1, 1, 1

Outliers:Off — S-Gph1 DrawOn, MedBox, List 1, 1, 0

- The following is a typical graph condition specification for a regression graph.

  S-Gph1 DrawOn, Linear, List 1, List 2, List 3 ↵

  The same format can be used for the following types of graphs, by simply replacing "Linear" in the above specification with the applicable graph type.

Linear Regression	Linear	Logarithmic Regression	Log
Med-Med	Med-Med	Exponential Regression	Exp(a·e^bx)
Quadratic Regression	Quad		Exp(a·b^x)
Cubic Regression	Cubic	Power Regression	Power
Quartic Regression	Quart		

- The following is a typical graph condition specification for a sinusoidal regression graph.

  S-Gph1 DrawOn, Sinusoidal, List 1, List 2 ↵

- The following is a typical graph condition specification for a logistic regression graph.

  S-Gph1 DrawOn, Logistic, List 1, List 2 ↵

- The following is a typical graph condition specification for a pie graph.

  S-Gph1 DrawOn, Pie, List 1, %, None ↵

- The following is a typical graph condition specification for a bar graph.

  S-Gph1 DrawOn, Bar, List 1, None, None, StickLength ↵

- To draw a statistical graph, insert the "DrawStat" command following the graph condition specification line.

  ClrGraph
  S-Wind Auto
  {1, 2, 3} → List 1
  {1, 2, 3} → List 2
  S-Gph1 DrawOn, Scatter, List 1, List 2, 1, Square ↵
  DrawStat

■ Using Distribution Graphs in a Program (Not available on the fx-7400GIII)

Special commands are used to draw distribution graphs in a program.

• To draw a normal cumulative distribution graph

① DrawDistNorm <Lower>, <Upper> [,σ, μ]

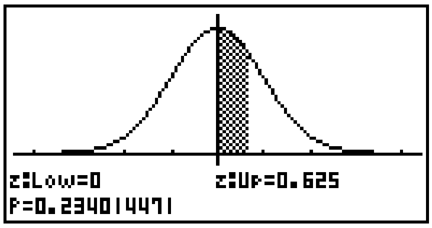
- Lower: Data lower limit
- Upper: Data upper limit
- σ: *Population standard deviation*[*1]
- μ: *Population mean*[*1]

① [F4] [F1] [F5] [F1]

*1 This can be omitted. Omitting these items performs the calculation using σ = 1 and μ = 0.

$$p = \frac{1}{\sqrt{2\pi}\sigma}\int_{Lower}^{Upper} e^{-\frac{(x-\mu)^2}{2\sigma^2}}dx \qquad \text{ZLow} = \frac{Lower-\mu}{\sigma} \qquad \text{ZUp} = \frac{Upper-\mu}{\sigma}$$

- Executing DrawDistNorm performs the above calculation in accordance with the specified conditions and draws the graph. At this time the ZLow ≦ x ≦ ZUp region on the graph is filled in.



- At the same time, the p, ZLow, and ZUp calculation result values are assigned respectively to variables p, ZLow, and ZUp, and p is assigned to Ans.

• To draw a Student-t cumulative distribution graph

① DrawDistT <Lower>, <Upper>, <df>

- Lower: Data lower limit
- Upper: Data upper limit
- df: Degree of freedom

① [F4] [F1] [F5] [F2]

$$p = \int_{Lower}^{Upper} \frac{\Gamma\left(\frac{df+1}{2}\right)}{\Gamma\left(\frac{df}{2}\right)} \times \frac{\left(1+\frac{x^2}{df}\right)^{-\frac{df+1}{2}}}{\sqrt{\pi \times df}}dx \qquad \text{tLow} = Lower \qquad \text{tUp} = Upper$$

- Executing DrawDistT performs the above calculation in accordance with the specified conditions and draws the graph. At this time the Lower ≦ x ≦ Upper region on the graph is filled in.
- At the same time, the p calculation result value and the Lower and Upper input values are assigned respectively to variables p, tLow, and tUp, and p is assigned to Ans.

- **To draw a χ^2 cumulative distribution graph**

① DrawDistChi <Lower>, <Upper>, <*df*>

Degree of freedom (*df*)
Data upper limit (Upper)
Data lower limit (Lower)

① F4 F1 F5 F3

$$p = \int_{Lower}^{Upper} \frac{1}{\Gamma\left(\frac{df}{2}\right)} \times \left(\frac{1}{2}\right)^{\frac{df}{2}} \times x^{\left(\frac{df}{2}-1\right)} \times e^{-\frac{x}{2}}\, dx$$

- Executing DrawDistChi performs the above calculation in accordance with the specified conditions and draws the graph. At this time the Lower ≦ x ≦ Upper region on the graph is filled in.
- At the same time, calculation result p is assigned to variables p and Ans.

- **To draw an F cumulative distribution graph**

① DrawDistF <Lower>, <Upper>, <*ndf*>, <*ddf*>

Degrees of freedom of denominator (*ddf*)
Degrees of freedom of numerator (*ndf*)
Data upper limit (Upper)
Data lower limit (Lower)

① F4 F1 F5 F4

$$p = \int_{Lower}^{Upper} \frac{\Gamma\left(\frac{ndf+ddf}{2}\right)}{\Gamma\left(\frac{ndf}{2}\right)\times\Gamma\left(\frac{ddf}{2}\right)} \times \left(\frac{ndf}{ddf}\right)^{\frac{ndf}{2}} \times x^{\left(\frac{ndf}{2}-1\right)} \times \left(1 + \frac{ndf \times x}{ddf}\right)^{-\frac{ndf+ddf}{2}} dx$$

- Executing DrawDistF performs the above calculation in accordance with the specified conditions and draws the graph. At this time the Lower ≦ x ≦ Upper region on the graph is filled in.
- At the same time, calculation result p is assigned to variables p and Ans.

■ Performing Statistical Calculations in a Program

- Single-variable statistical calculation

① 1-Variable List1, List 2

Frequency data (Frequency) (List 2)
x-axis data (XList) (List1)

① F4 F1 F6 F1

- Paired-variable statistical calculation

① 2-Variable List 1, List 2, List 3

Frequency data (Frequency) (List 3)
y-axis data (YList) (List 2)
x-axis data (XList) (List 1)

① F4 F1 F6 F2

- Regression statistical calculation

①LinearReg(ax+b) List 1, List 2, List 3

Calculation type* — LinearReg(ax+b)
Frequency data (Frequency) — List 3
y-axis data (YList) — List 2
x-axis data (XList) — List 1

① F4 F1 F6 F6 F1 F1

* Any one of the following can be specified as the calculation type.

LinearReg(ax+b)......linear regression ($ax+b$ type)
LinearReg(a+bx)......linear regression ($a+bx$ type)
Med-MedLine ....Med-Med calculation
QuadReg ....quadratic regression
CubicReg.................cubic regression
QuartReg ....quartic regression
LogReg ....logarithmic regression
ExpReg(a·eˆbx)........exponential regression ($a \cdot e^{bx}$ type)
ExpReg(a·bˆx)..........exponential regression ($a \cdot b^{x}$ type)
PowerReg ....power regression

- Sinusoidal regression statistical calculation

SinReg List 1, List 2

y-axis data (YList) — List 2
x-axis data (XList) — List 1

- Logistic regression statistical calculation

LogisticReg List 1, List 2

y-axis data (YList) — List 2
x-axis data (XList) — List 1

■ Performing Distribution Calculations in a Program

(Not available on the fx-7400GIII)

- The following values are substituted whenever any of the values enclosed in brackets ([ ]) are omitted.

  σ=1, μ=0, tail=L (Left)

- For the calculation formula of each probability density function, see "Statistic Formula" (page 6-55).

• Normal Distribution

NormPD(: Returns the normal probability density (p value) for the specified data.

Syntax: NormPD(x[, σ, μ)]

- A single value or a list can be specified for x. Calculation result p is assigned to variables p and Ans (ListAns when x is a list).

NormCD(: Returns the normal cumulative distribution (p value) for the specified data.

Syntax: NormCD(Lower, Upper[, σ, μ)]

- Single values or lists can be specified for Lower and Upper. Calculation results p, ZLow, and ZUp are assigned respectively to variables p, ZLow, and ZUp. Calculation result p also is assigned to Ans (ListAns when Lower and Upper are lists).

InvNormCD(: Returns the inverse normal cumulative distribution (lower and/or upper value(s)) for the specified p value.

Syntax: InvNormCD($\underbrace{\text{["L(or –1) or R(or 1) or C(or 0)"}}_{\text{tail (Left, Right, Central)}}$,]$p$[,$\sigma$, μ])

- A single value or a list can be specified for p. Calculation results are output in accordance with the tail setting as described below.

  tail = Left

  The Upper value is assigned to variables x1InvN and Ans (ListAns when p is a list).

  tail = Right

  The Lower value is assigned to variables x1InvN and Ans (ListAns when p is a list).

  tail = Central

  The Lower and Upper values are assigned respectively to variables x1InvN and x2InvN. Lower only is assigned to Ans (ListAns when p is a list).

• Student-t Distribution

tPD(: Returns the Student-t probability density (p value) for the specified data.

Syntax: tPD(x, df [)]

- A single value or a list can be specified for x. Calculation result p is assigned to variables p and Ans (ListAns when x is a list).

tCD(: Returns the Student-t cumulative distribution (p value) for the specified data.

Syntax: tCD(Lower,Upper,df [)]

- Single values or lists can be specified for Lower and Upper. Calculation results p, tLow, and tUp are assigned respectively to variables p, tLow, and tUp. Calculation result p also is assigned to Ans (ListAns when Lower and Upper are lists).

InvTCD(: Returns the inverse Student-t cumulative distribution (Lower value) for the specified p value.

Syntax: InvTCD(p,df [)]

- A single value or a list can be specified for p. The Lower value is assigned to the xInv and Ans variables (ListAns when p is a list).

• χ^2 Distribution

ChiPD(: Returns the χ^2 probability density (p value) for the specified data.

Syntax: ChiPD(x,df [)]

- A single value or a list can be specified for x. Calculation result p is assigned to variables p and Ans (ListAns when x is a list).

ChiCD(: Returns the χ^2 cumulative distribution (p value) for the specified data.

Syntax: ChiCD(Lower,Upper,df [)]

- Single values or lists can be specified for Lower and Upper. Calculation result p is assigned to variables p and Ans (ListAns when Lower and Upper are lists).

InvChiCD(: Returns the inverse χ^2 cumulative distribution (Lower value) for the specified p value.

Syntax: InvChiCD(p,df [)]

- A single value or a list can be specified for p. The Lower value is assigned to the xInv and Ans variables (ListAns when p is a list).

• *F* Distribution

FPD(: Returns the F probability density (p value) for the specified data.

Syntax: FPD(x,ndf,ddf [)]

- A single value or a list can be specified for x. Calculation result p is assigned to variables p and Ans (ListAns when x is a list).

FCD(: Returns the F cumulative distribution (p value) for the specified data.

Syntax: FCD(Lower,Upper,ndf,ddf [)]

- Single values or lists can be specified for Lower and Upper. Calculation result p is assigned to variables p and Ans (ListAns when Lower and Upper are lists).

InvFCD(: Returns the inverse F cumulative distribution (Lower value) for the specified data.

Syntax: InvFCD(p,ndf,ddf [)]

- A single value or a list can be specified for p. The Lower value is assigned to the xInv and Ans variables (ListAns when p is a list).

• Binomial Distribution

BinomialPD(: Returns the binomial probability (p value) for the specified data.

Syntax: BinomialPD([x,]n,P[)]

- A single value or a list can be specified for x. Calculation result p is assigned to variables p and Ans (ListAns when x is a list).

BinomialCD(: Returns the binomial cumulative distribution (p value) for the specified data.

Syntax: BinomialCD([X,]n,P[)]

- A single value or a list can be specified for each X. Calculation result p is assigned to variables p and Ans (ListAns when X is omitted or is a list).

InvBinomialCD(: Returns the inverse binomial cumulative distribution for the specified data.

Syntax: InvBinomialCD(p,n,P[)]

- A single value or a list can be specified for p. The calculation result X value is assigned to the xInv and Ans variables (ListAns when p is a list).

• Poisson Distribution

PoissonPD(: Returns the Poisson probability (p value) for the specified data.

Syntax: PoissonPD(x, μ[)]

- A single value or a list can be specified for x. Calculation result p is assigned to variables p and Ans (ListAns when x is a list).

PoissonCD(: Returns the Poisson cumulative distribution (p value) for the specified data.

Syntax: PoissonCD(X,μ[)]

- A single value or a list can be specified for each X. Calculation result p is assigned to variables p and Ans (ListAns when X is a list).

InvPoissonCD(: Returns the inverse Poisson cumulative distribution for the specified data.

Syntax: InvPoissonCD(p,μ[)]

- A single value or a list can be specified for p. The calculation result X value is assigned to the xInv and Ans variables (ListAns when p is a list).

• Geometric Distribution

GeoPD(: Returns the geometric probability (p value) for the specified data.

Syntax: GeoPD(x, P[)]

- A single value or a list can be specified for x. Calculation result p is assigned to variables p and Ans (ListAns when x is a list).

GeoCD(: Returns the geometric cumulative distribution (p value) for the specified data.

Syntax: GeoCD(X,P[)]

- A single value or a list can be specified for each X. Calculation result p is assigned to variables p and Ans (ListAns when X is a list).

InvGeoCD(: Returns the inverse geometric cumulative distribution for the specified data.

Syntax: InvGeoCD(p,P[)]

- A single value or a list can be specified for p. The calculation result X value is assigned to the xInv and Ans variables (ListAns when p is a list).

• Hypergeometric Distribution

HypergeoPD(: Returns the hypergeometric probability (p value) for the specified data.

Syntax: HypergeoPD(x, n, M, N[)]

- A single value or a list can be specified for x. Calculation result p is assigned to variables p and Ans (ListAns when x is a list).

HypergeoCD(: Returns the hypergeometric cumulative distribution (p value) for the specified data.

Syntax: HypergeoCD(X, n, M, N[)]

- A single value or a list can be specified for each X. Calculation result p is assigned to variables p and Ans (ListAns when X is a list).

InvHypergeoCD(: Returns the inverse hypergeometric cumulative distribution for the specified data.

Syntax: InvHypergeoCD(p, n, M, N[)]

- A single value or a list can be specified for p. The calculation result X value is assigned to the xInv and Ans variables (ListAns when p is a list).

■ Using the TEST Command to Execute a Command in a Program

(Not available on the fx-7400GIII)

- The following are the specifications ranges for the "μ condition" argument of the command.

  "<" or –1 when $\mu < \mu_0$

  "≠" or 0 when $\mu \neq \mu_0$

  ">" or 1 when $\mu > \mu_0$

  The above also apply for the "ρ condition" and "β&ρ condition" specification methods.
- For explanations of arguments that are not covered in detail here, see "Tests" (page 6-23) and "Input and Output Terms of Tests, Confidence Interval, and Distribution" (page 6-52).
- For the calculation formula of each command, see "Statistic Formula" (page 6-55).

• Z Test

OneSample$Z$Test: Executes 1-sample Z-test calculation.

Syntax: OneSample$Z$Test "μ condition", μ_0, σ, $\bar{x}$, n

Output Values: Z, p, $\bar{x}$, n are assigned respectively to variables z, p, $\bar{x}$, n and to ListAns elements 1 through 4.

Syntax: OneSample$Z$Test "μ condition", μ_0, σ, List[, Freq]

Output Values: Z, p, $\bar{x}$, s$_x$, n are assigned respectively to variables z, p, $\bar{x}$, s$_x$, n and to ListAns elements 1 through 5.

TwoSample$Z$Test: Executes 2-sample Z-test calculation.

Syntax: TwoSample$Z$Test "μ_1 condition", σ_1, σ_2, $\bar{x}_1$, n_1, $\bar{x}_2$, n_2

Output Values: Z, p, $\bar{x}_1$, $\bar{x}_2$, n_1, n_2 are assigned respectively to variables z, p, $\bar{x}_1$, $\bar{x}_2$, n_1, n_2 and to ListAns elements 1 through 6.

Syntax: TwoSample$Z$Test "μ_1 condition", σ_1, σ_2, List1, List2[, Freq1 [, Freq2]]

Output Values: Z, p, $\bar{x}_1$, $\bar{x}_2$, s$_{x1}$, s$_{x2}$, n_1, n_2 are assigned respectively to variables z, p, $\bar{x}_1$, $\bar{x}_2$, s$_{x1}$, s$_{x2}$, n_1, n_2 and to ListAns elements 1 through 8.

OneProp$Z$Test: Executes 1-proportion Z-test calculation.

Syntax: OneProp$Z$Test "p condition", p_0, x, n

Output Values: Z, p, $\hat{p}$, n are assigned respectively to variables z, p, $\hat{p}$, n and to ListAns elements 1 through 4.

TwoProp$Z$Test: Executes 2-proportion Z-test calculation.

Syntax: TwoProp$Z$Test "p_1 condition", x_1, n_1, x_2, n_2

Output Values: Z, p, $\hat{p}_1$, $\hat{p}_2$, $\hat{p}$, n_1, n_2 are assigned respectively to variables z, p, $\hat{p}_1$, $\hat{p}_2$, $\hat{p}$, n_1, n_2 and to ListAns elements 1 through 7.

• t Test

OneSampleTTest: Executes 1-sample t-test calculation.

Syntax: OneSampleTTest "μ condition", μ_0, $\bar{x}$, s$_x$, n
OneSampleTTest "μ condition", μ_0, List[, Freq]

Output Values: t, p, $\bar{x}$, s$_x$, n are assigned respectively to the variables with the same names and to ListAns elements 1 through 5.

TwoSampleTTest: Executes 2-sample t-test calculation.

Syntax : TwoSampleTTest "μ_1 condition", $\bar{x}_1$, s$_{x1}$, n_1, $\bar{x}_2$, s$_{x2}$, n_2[,Pooled condition]
TwoSampleTTest "μ_1 condition", List1, List2, [, Freq1[, Freq2[, Pooled condition]]]

Output Values: When Pooled condition = 0, t, p, df, $\bar{x}_1$ $\bar{x}_2$, s$_{x1}$, s$_{x2}$, n_1, n_2 are assigned respectively to the variables with the same names and to ListAns elements 1 through 9.
When Pooled condition = 1, t, p, df, $\bar{x}_1$, $\bar{x}_2$, s$_{x1}$, s$_{x2}$, s$_p$, n_1, n_2 are assigned respectively to the variables with the same names and to ListAns elements 1 through 10.

Note: Specify 0 when you want to turn off the Pooled condition and 1 when you want to turn it on. Omitting the input is treated as Pooled condition off.

LinRegTTest: Executes linear regression t-test calculation.

Syntax: LinRegTTest "β&ρ condition", XList, YList[, Freq]

Output Values: t, p, df, a, b, s, r, r^2 are assigned respectively to the variables with the same names and to ListAns elements 1 through 8.

• χ^2 Test

ChiGOFTest: Executes a chi-square goodness of fit test.

Syntax: ChiGOFTest List 1, List 2, df, List 3
(List 1 is the Observed list, List 2 is the Expected list, and List 3 is the CNTRB list.)

Output Values: χ^2, p, df are assigned respectively to the variables with the same names and to ListAns elements 1 through 3. The CNTRB list is stored in List 3.

ChiTest: Executes a chi-square test.

Syntax: ChiTest MatA, MatB
(MatA is the Observed matrix and MatB is the Expected matrix.)

Output Values: χ^2, p, df are assigned respectively to the variables with the same names and to ListAns elements 1 through 3. The Expected matrix is assigned to MatB.

• F Test

TwoSample$F$Test: Executes 2-sample F-test calculation.

Syntax: TwoSample$F$Test "σ_1 condition", s$_{x1}$, n_1, s$_{x2}$, n_2

Output Values: F, p, s$_{x1}$, s$_{x2}$, n_1, n_2 are assigned respectively to the variables with the same names and to ListAns elements 1 through 6.

Syntax: TwoSample$F$Test "σ_1 condition", List1, List2, [, Freq1 [, Freq2]]

Output Values: F, p, $\bar{x}_1$, $\bar{x}_2$, sx_1, sx_2, n_1, n_2 are assigned respectively to the variables with the same names and to ListAns elements 1 through 8.

• ANOVA

OneWayANOVA: Executes one-factor ANOVA analysis of variance.

Syntax: OneWayANOVA List1, List2
(List1 is Factor list (A) and List2 is the Dependent list.)

Output Values: Adf, Ass, Ams, AF, Ap, ERRdf, ERRss, ERRms are assigned respectively to variables Adf, SSa, MSa, Fa, pa, Edf, SSe, MSe.

Also, output values are assigned to MatAns as shown below.

$$\text{MatAns} = \begin{bmatrix} Adf & Ass & Ams & AF & Ap \\ ERRdf & ERRss & ERRms & 0 & 0 \end{bmatrix}$$

TwoWayANOVA: Executes two-factor ANOVA analysis of variance.

Syntax: TwoWayANOVA List1, List2, List3 (List1 is Factor list (A), List2 is Factor list (B), and List3 is the Dependent list.)

Output Values: Adf, Ass, Ams, AF, Ap, Bdf, Bss, Bms, BF, Bp, ABdf, ABss, ABms, ABF, ABp, ERRdf, ERRss, ERRms are assigned respectively to variables Adf, SSa, MSa, Fa, pa, Bdf, SSb, MSb, Fb, pb, ABdf, SSab, MSab, Fab, pab, Edf, SSe, MSe.

Also, output values are assigned to MatAns as shown below.

$$\text{MatAns} = \begin{bmatrix} Adf & Ass & Ams & AF & Ap \\ Bdf & Bss & Bms & BF & Bp \\ ABdf & ABss & ABms & ABF & ABp \\ ERRdf & ERRss & ERRms & 0 & 0 \end{bmatrix}$$

■ Performing Financial Calculations in a Program

(Not available on the fx-7400GIII)

• Setup Commands

- Date Mode Setting for Financial Calculations

  DateMode365....... 365 days

  DateMode360....... 360 days

- Payment Period Setting

  PmtBgn................. Start of period

  PmtEnd................. End of period

- Bond Calculation Payment Periods

  PeriodsAnnual...... Annual

  PeriodsSemi......... Semiannual

• Financial Calculation Commands

For the meaning of each argument, see "Chapter 7 Financial Calculation (TVM)".

• Simple Interest

Smpl_SI: Returns the interest based on simple interest calculation.

Syntax: Smpl_SI(n, I%, PV)

Smpl_SFV: Returns the total of principal and interest based on simple interest calculation.

Syntax: Smpl_SFV(n, I%, PV)

• Compound Interest

Note:

- P/Y and C/Y can be omitted for all compound interest calculations. When they are omitted, calculations are performed using P/Y=12 and C/Y=12.
- If you perform a calculation that uses a compound interest function (Cmpd_n(, Cmpd_I%(, Cmpd_PV(, Cmpd_PMT(, Cmpd_FV(), the argument(s) you input and the calculation results will be saved to the applicable variables (n, I%, PV, etc.). If you perform a calculation that uses any other type of financial calculation function, the argument and calculation results are not assigned to variables.

Cmpd_n: Returns the number of compound periods.

Syntax: Cmpd_n(I%, PV, PMT, FV, P/Y, C/Y)

Cmpd_I%: Returns the annual interest.

Syntax: Cmpd_I%(n, PV, PMT, FV, P/Y, C/Y)

Cmpd_PV: Returns the present value (loan amount for installment payments, principal for savings).

Syntax: Cmpd_PV(n, I%, PMT, FV, P/Y, C/Y)

Cmpd_PMT: Returns equal input/output values (payment amounts for installment payments, deposit amounts for savings) for a fixed period.

Syntax: Cmpd_PMT(n, I%, PV, FV, P/Y, C/Y)

Cmpd_FV: Returns the final input/output amount or total principal and interest.

Syntax: Cmpd_FV(n, I%, PV, PMT, P/Y, C/Y)

• Cash Flow (Investment Appraisal)

Cash_NPV: Returns the net present value.

Syntax: Cash_NPV(I%, Csh)

Cash_IRR: Returns the internal rate of return.

Syntax: Cash_IRR(Csh)

Cash_PBP: Returns the payback period.

Syntax: Cash_PBP(I%, Csh)

Cash_NFV: Returns the net future value.

Syntax: Cash_NFV(I%, Csh)

• Amortization

Amt_BAL: Returns the remaining principal balance following payment PM2.

Syntax: Amt_BAL(PM1, PM2, I%, PV, PMT, P/Y, C/Y)

Amt_INT: Returns the interest paid for payment PM1.

Syntax: Amt_INT(PM1, PM2, I%, PV, PMT, P/Y, C/Y)

Amt_PRN: Returns the principal and interest paid for payment PM1.

Syntax: Amt_PRN(PM1, PM2, I%, PV, PMT, P/Y, C/Y)

Amt_ΣINT: Returns the total principal and interest paid from payment PM1 to PM2.

Syntax: Amt_ΣINT(PM1, PM2, I%, PV, PMT, P/Y, C/Y)

Amt_ΣPRN: Returns the total principal paid from payment PM1 to PM2.

Syntax: Amt_ΣPRN(PM1, PM2, I%, PV, PMT, P/Y, C/Y)

• Interest Rate Conversion

Cnvt_EFF: Returns the interest rate converted from the nominal interest rate to the effective interest rate.

Syntax: Cnvt_EFF(n, I%)

Cnvt_APR: Returns the interest rate converted from the effective interest rate to the nominal interest rate.

Syntax: Cnvt_APR(n, I%)

• Cost, Selling Price, Margin Calculations

Cost: Returns the cost based on a specified selling price and margin.

Syntax: Cost(Sell, Margin)

Sell: Returns the selling price based on a specified cost and margin.

Syntax: Sell(Cost, Margin)

Margin: Returns the margin based on a specified cost and selling price.

Syntax: Margin(Cost, Sell)

• Day/Date Calculations

Days_Prd: Returns the number of days from a specified d1 to specified d2.

Syntax: Days_Prd(MM1, DD1, YYYY1, MM2, DD2, YYYY2)

• Bond Calculations

Bond_PRC: Returns in list form bond prices based on specified conditions.

Syntax: Bond_PRC(MM1, DD1, YYYY1, MM2, DD2, YYYY2, RDV, CPN, YLD) = {PRC, INT, CST}

Bond_YLD: Returns the yield based on specified conditions.

Syntax: Bond_YLD(MM1, DD1, YYYY1, MM2, DD2, YYYY2, RDV, CPN, PRC)

7. PRGM Mode Command List

Not all of the commands listed below are available on all models covered by this manual.

RUN Program

F4 (MENU) key

Level 1	Level 2	Level 3	Command
STAT	DRAW	On	DrawOn
		Off	DrawOff
	GRPH	GPH1	S-Gph1_
		GPH2	S-Gph2_
		GPH3	S-Gph3_
		Scat	Scatter
		xy	xyLine
		Hist	Hist
		Box	MedBox
		Bar	Bar
		N-Dis	N-Dist
		Brkn	Broken
		X	Linear
		Med	Med-Med
		X^2	Quad
		X^3	Cubic
		X^4	Quart
		Log	Log
		*1	
		Pwr	Power
		Sin	Sinusoidal
		NPP	NPPlot
		Lgst	Logistic
		Pie	Pie
	List		List_
	TYPE	*2	
	DIST	DrwN	DrawDistNorm_
		Drwt	DrawDistT_
		DrwC	DrawDistChi_
		DrwF	DrawDistF_
	CALC	1VAR	1-Variable_
		2VAR	2-Variable_
		*3	
		Med	Med-MedLine_
		X^2	QuadReg_
		X^3	CubicReg_
		X^4	QuartReg_
		Log	LogReg_
		*4	
		Pwr	PowerReg_
		Sin	SinReg_
		Lgst	LogisticReg_
MAT	Swap		Swap_
	×Rw		∗Row_
	×Rw+		∗Row+_
	Rw+		Row+_
LIST	Srt-A		SortA(
	Srt-D		SortD(
GRPH	SEL	On	G_SelOn_
		Off	G_SelOff_
	TYPE	Y=	Y=Type
		r=	r=Type
		Parm	ParamType
		X=	X=Type
		Y>	Y>Type
		Y<	Y<Type
		Y≥	Y≥Type
		Y≤	Y≤Type
		X>	X>Type
		X<	X<Type
		X≥	X≥Type
		X≤	X≤Type
	STYL	—	NormalG_
		━	ThickG_
		·····	BrokenThickG_
		······	DotG_
	GMEM	Sto	StoGMEM_
		Rcl	RclGMEM_
DYNA	On		D_SelOn_
	Off		D_SelOff_
	Var		D_Var_
	TYPE	Y=	Y=Type
		r=	r=Type
		Parm	ParamType
TABL	On		T_SelOn_
	Off		T_SelOff_
	TYPE	Y=	Y=Type
		r=	r=Type
		Parm	ParamType
	STYL	—	NormalG_
		━	ThickG_
		·····	BrokenThickG_
		······	DotG_
RECR	SEL+S	On	R_SelOn_
		Off	R_SelOff_
		—	NormalG_
		━	ThickG_
		·····	BrokenThickG_
		······	DotG_
	TYPE	a_n	a_nType
		a_{n+1}	a_{n+1}Type
		a_{n+2}	a_{n+2}Type
	n.a_n··	n	n
		a_n	a_n
		a_{n+1}	a_{n+1}
		a_{n+2}	a_{n+2}
		b_n	b_n
		b_{n+1}	b_{n+1}
		b_{n+2}	b_{n+2}
		c_n	c_n
		c_{n+1}	c_{n+1}
		c_{n+2}	c_{n+2}
		Σa_n	Σa_n
		Σa_{n+1}	Σa_{n+1}
		Σa_{n+2}	Σa_{n+2}
		Σb_n	Σb_n
		Σb_{n+1}	Σb_{n+1}
		Σb_{n+2}	Σb_{n+2}
		Σc_n	Σc_n
		Σc_{n+1}	Σc_{n+1}
		Σc_{n+2}	Σc_{n+2}
	RANG	a_0	Sel_a_0
		a_1	Sel_a_1

OPTN key

Level 1	Level 2	Level 3	Command
LIST	List		List_
	L→M		List→Mat(
	Dim		Dim_
	Fill		Fill(
	Seq		Seq(
	Min		Min(
	Max		Max(
	Mean		Mean(
	Med		Median(
	Aug		Augment(
	Sum		Sum_
	Prod		Prod_
	Cuml		Cuml_
	%		Percent_
	⊿		⊿List_
MAT	Mat		Mat_
	M→L		Mat→List(
	Det		Det_
	Trn		Trn_
	Aug		Augment(
	Iden		Identity_
	Dim		Dim_
	Fill		Fill(
	Ref		Ref_
	Rref		Rref_
	Vct		Vct_
	DotP		DotP(
	CrsP		CrossP(
	Angle		Angle(
	UntV		UnitV(
	Norm		Norm(
CPLX	i		i
	Abs		Abs_
	Arg		Arg_
	Conj		Conjg_
	ReP		ReP_
	ImP		ImP_
	▶r∠θ		▶r∠θ
	▶a+bi		▶a+bi

CALC	Solve		**Solve(**
	d/dx		**d/dx(**
	d^2/dx^2		**d^2/dx^2(**
	∫dx		**∫(**
	SolveN		**SolveN(**
	FMin		**FMin(**
	FMax		**FMax(**
	Σ(		**Σ(**
	log_ab		**log_ab(**
	Int÷		**Int÷**
	Rmdr		**Rmdr**
	Simp		**▶Simp**
STAT	x̂		**x̂**
	ŷ		**ŷ**
	DIST	*5	
	S·Dev		**StdDev(**
	Var		**Variance(**
	TEST	*6	
CONV	▶		**▶**
	LENG	fm	**[fm]**
		Å	**[Å]**
		μm	**[μm]**
		mm	**[mm]**
		cm	**[cm]**
		m	**[m]**
		km	**[km]**
		AU	**[AU]**
		l.y.	**[l.y.]**
		pc	**[pc]**
		Mil	**[Mil]**
		in	**[in]**
		ft	**[ft]**
		yd	**[yd]**
		fath	**[fath]**
		rd	**[rd]**
		mile	**[mile]**
		n mile	**[n mile]**
	AREA	cm^2	**[cm^2]**
		m^2	**[m^2]**
		ha	**[ha]**
		km^2	**[km^2]**
		in^2	**[in^2]**
		ft^2	**[ft^2]**
		yd^2	**[yd^2]**
		acre	**[acre]**
		$mile^2$	**[$mile^2$]**
	VLUM	cm^3	**[cm^3]**
		mL	**[mL]**
		L	**[L]**
		m^3	**[m^3]**
		in^3	**[in^3]**
		ft^3	**[ft^3]**
		fl_oz(UK)	**[fl_oz(UK)]**
		fl_oz(US)	**[fl_oz(US)]**
		gal(US)	**[gal(US)]**
		gal(UK)	**[gal(UK)]**
		pt	**[pt]**
		qt	**[qt]**
		tsp	**[tsp]**
		tbsp	**[tbsp]**
		cup	**[cup]**

TIME	ns	**[ns]**
	μs	**[μs]**
	ms	**[ms]**
	s	**[s]**
	min	**[min]**
	h	**[h]**
	day	**[day]**
	week	**[week]**
	yr	**[yr]**
	s-yr	**[s-yr]**
	t-yr	**[t-yr]**
TMPR	°C	**[°C]**
	K	**[K]**
	°F	**[°F]**
	°R	**[°R]**
VELO	m/s	**[m/s]**
	km/h	**[km/h]**
	knot	**[knot]**
	ft/s	**[ft/s]**
	mile/h	**[mile/h]**
MASS	u	**[u]**
	mg	**[mg]**
	g	**[g]**
	kg	**[kg]**
	mton	**[mton]**
	oz	**[oz]**
	lb	**[lb]**
	slug	**[slug]**
	ton(short)	**[ton(short)]**
	ton(long)	**[ton(long)]**
RORC	N	**[N]**
	lbf	**[lbf]**
	tonf	**[tonf]**
	dyne	**[dyne]**
	kgf	**[kgf]**
PRES	Pa	**[Pa]**
	kPa	**[kPa]**
	mmH_2O	**[mmH_2O]**
	mmHg	**[mmHg]**
	atm	**[atm]**
	inH_2O	**[inH_2O]**
	inHg	**[inHg]**
	lbf/in^2	**[lbf/in^2]**
	bar	**[bar]**
	kgf/cm^2	**[kgf/cm^2]**
ENGY	eV	**[eV]**
	J	**[J]**
	cal_{th}	**[cal_{th}]**
	cal_{15}	**[cal_{15}]**
	cal_{IT}	**[cal_{IT}]**
	$kcal_{th}$	**[$kcal_{th}$]**
	$kcal_{15}$	**[$kcal_{15}$]**
	$kcal_{IT}$	**[$kcal_{IT}$]**
	l-atm	**[l-atm]**
	kW•h	**[kW•h]**
	ft•lbf	**[ft•lbf]**
	Btu	**[Btu]**
	erg	**[erg]**
	kgf•m	**[kgf•m]**
PWR	W	**[W]**
	cal_{th}/s	**[cal_{th}/s]**

		hp	**[hp]**
		ft•lbf/s	**[ft•lbf/s]**
		Btu/min	**[Btu/min]**
HYP	sinh		**sinh_**
	cosh		**cosh_**
	tanh		**tanh_**
	$sinh^{-1}$		**$sinh^{-1}$_**
	$cosh^{-1}$		**$cosh^{-1}$_**
	$tanh^{-1}$		**$tanh^{-1}$_**
PROB	X!		**!**
	nPr		**P**
	nCr		**C**
	RAND	Ran#	**Ran#_**
		Int	**RanInt#(**
		Norm	**RanNorm#(**
		Bin	**RanBin#(**
		List	**RanList#(**
	P(		**P(**
	Q(		**Q(**
	R(		**R(**
	t(		**t(**
NUM	Abs		**Abs_**
	Int		**Int_**
	Frac		**Frac_**
	Rnd		**Rnd**
	Intg		**Intg_**
	RndFi		**RndFix(**
	GCD		**GCD(**
	LCM		**LCM(**
	MOD		**MOD(**
	MOD•E		**MOD_Exp(**
ANGL	°		**°**
	r		**r**
	g		**g**
	° ’ ”		**¤**
	Pol(		**Pol(**
	Rec(		**Rec(**
	▶DMS		**▶DMS**
ESYM	m		**m**
	μ		**μ**
	n		**n**
	p		**p**
	f		**f**
	k		**k**
	M		**M**
	G		**G**
	T		**T**
	P		**P**
	E		**E**
PICT	Sto		**StoPict_**
	Rcl		**RclPict_**
FMEM	fn		**fn**
LOGIC	And		**_And_**
	Or		**_Or_**
	Not		**Not_**
	Xor		**Xor_**
CAPT	Rcl		**RclCapt_**
TVM	SMPL	SI	**Smpl_SI(**
		SFV	**Smpl_SFV(**
	CMPD	n	**Cmpd_n(**
		I%	**Cmpd_I%(**

		PV	Cmpd_PV(
		PMT	Cmpd_PMT(
		FV	Cmpd_FV(
	CASH	NPV	Cash_NPV(
		IRR	Cash_IRR(
		PBP	Cash_PBP(
		NFV	Cash_NFV(
	AMT	BAL	Amt_BAL(
		INT	Amt_INT(
		PRN	Amt_PRN(
		ΣINT	Amt_ΣINT(
		ΣPRN	Amt_ΣPRN(
	CNVT	EFF	Cnvt_EFF(
		APR	Cnvt_APR(
	COST	Cost	Cost(
		Sell	Sell(
		Mrg	Margin(
	DAYS	PRD	Days_Prd(
	BOND	PRC	Bond_PRC(
		YLD	Bond_YLD(

VARS key

Level 1	Level 2	Level 3	Command
V-WIN	X	min	Xmin
		max	Xmax
		scal	Xscl
		dot	Xdot
	Y	min	Ymin
		max	Ymax
		scal	Yscl
	T,θ	min	Tθmin
		max	Tθmax
		ptch	Tθptch
	R-X	min	RightXmin
		max	RightXmax
		scal	RightXscl
		dot	RightXdot
	R-Y	min	RightYmin
		max	RightYmax
		scal	RightYscl
	R-T, θ	min	RightTθmin
		max	RightTθmax
		ptch	RightTθptch
FACT	Xfct		Xfct
	Yfct		Yfct
STAT	X	n	n
		$\bar{x}$	$\bar{x}$
		Σx	Σx
		Σx^2	Σx^2
		σ_x	σ_x
		s_x	s_x
		minX	minX
		maxX	maxX
	Y	$\bar{y}$	$\bar{y}$
		Σy	Σy
		Σy^2	Σy^2
		Σxy	Σxy
		σ_y	σ_y
		s_y	s_y
		minY	minY
		maxY	maxY
	GRPH	a	a
		b	b
		c	c
		d	d
		e	e
		r	r
		r^2	r^2
		MSe	MSe
		Q_1	Q_1
		Med	Med
		Q_3	Q_3
		Mod	Mod
		Strt	H_Start
		Pitch	H_pitch
	PTS	x_1	x_1
		y_1	y_1
		x_2	x_2
		y_2	y_2
		x_3	x_3
		y_3	y_3
	INPT	n	n
		$\bar{x}$	$\bar{x}$
		s_x	s_x
		n1	n1
		n2	n2
		$\bar{x}_1$	$\bar{x}_1$
		$\bar{x}_2$	$\bar{x}_2$
		s_{x1}	s_{x1}
		s_{x2}	s_{x2}
		s_p	s_p
	RESLT	*7	
GRPH	Y		Y
	r		r
	Xt		Xt
	Yt		Yt
	X		X
DYNA	Strt		D_Start
	End		D_End
	Pitch		D_pitch
TABL	Strt		F_Start
	End		F_End
	Pitch		F_pitch
	Reslt		F_Result
RECR	FORM	a_n	a_n
		a_{n+1}	a_{n+1}
		a_{n+2}	a_{n+2}
		b_n	b_n
		b_{n+1}	b_{n+1}
		b_{n+2}	b_{n+2}
		c_n	c_n
		c_{n+1}	c_{n+1}
		c_{n+2}	c_{n+2}
	RANG	Strt	R_Start
		End	R_End
		a_0	a_0
		a_1	a_1
		a_2	a_2
		b_0	b_0
		b_1	b_1
		b_2	b_2
		c_0	c_0
		c_1	c_1
		c_2	c_2
		a_nSt	a_nStart
		b_nSt	b_nStart
		c_nSt	c_nStart
	Reslt		R_Result
EQUA	S-Rlt		Sim_Result
	S-Cof		Sim_Coef
	P-Rlt		Ply_Result
	P-Cof		Ply_Coef
TVM	n		n
	I%		I%
	PV		PV
	PMT		PMT
	FV		FV
	P/Y		P/Y
	C/Y		C/Y
Str			Str_

SHIFT VARS (PRGM) key

Level 1	Level 2	Level 3	Command
COM	If		If_
	Then		Then_
	Else		Else_
	I-End		IfEnd
	For		For_
	To		_To_
	Step		_Step_
	Next		Next
	Whle		While_
	WEnd		WhileEnd
	Do		Do
	Lp-W		LpWhile_
CTL	Prog		Prog_
	Rtrn		Return
	Brk		Break
	Stop		Stop
JUMP	Lbl		Lbl_
	Goto		Goto_
	⇒		⇒
	Isz		Isz_
	Dsz		Dsz_
	Menu		Menu_
?			?
◢			◢
CLR	Text		ClrText
	Grph		ClrGraph
	List		ClrList_
	Mat		ClrMat_
	Vct		ClrVct_
DISP	Stat		DrawStat
	Grph		DrawGraph
	Dyna		DrawDyna
	F-Tbl	Tabl	DispF-Tbl
		G-Con	DrawFTG-Con
		G-Plt	DrawFTG-Plt

	R-Tbl	Tabl	DispR-Tbl
		Phase	PlotPhase
		Web	DrawWeb_
		an-Cn	DrawR-Con
		Σa-Cn	DrawRΣ-Con
		an-Pl	DrawR-Plt
		Σa-Pl	DrawRΣ-Plt
REL	=		=
	≠		≠
	>		>
	<		<
	≥		≥
	≤		≤
I/O	Lcte		Locate_
	Gtky		Getkey
	Send		Send(
	Recv		Receive(
	S38k		Send38k_
	R38k		Receive38k_
	Open		OpenComport38k
	Close		CloseComport38k
:			:
STR	Join		StrJoin(
	Len		StrLen(
	Cmp		StrCmp(
	Src		StrSrc(
	Left		StrLeft(
	Right		StrRight(
	Mid		StrMid(
	E▶S		Exp▶Str(
	Exp		Exp(
	Upr		StrUpr(
	Lwr		StrLwr(
	Inv		StrInv(
	Shift		StrShift(
	Rot		StrRotate(

SHIFT MENU (SET UP) key

Level 1	Level 2	Level 3	Command
ANGL	Deg		Deg
	Rad		Rad
	Gra		Gra
COOR	On		CoordOn
	Off		CoordOff
GRID	On		GridOn
	Off		GridOff
AXES	On		AxesOn
	Off		AxesOff
LABL	On		LabelOn
	Off		LabelOff
DISP	Fix		Fix_
	Sci		Sci_
	Norm		Norm_
	Eng	On	EngOn
		Off	EngOff
		Eng	Eng
S/L	—		S-L-Normal
	—		S-L-Thick
	·····		S-L-Broken
	······		S-L-Dot
DRAW	Con		G-Connect
	Plot		G-Plot
DERV	On		DerivOn
	Off		DerivOff
BACK	None		BG-None
	Pict		BG-Pict_
FUNC	On		FuncOn
	Off		FuncOff
SIML	On		SimulOn
	Off		SimulOff
S-WIN	Auto		S-WindAuto
	Man		S-WindMan
LIST	File		File_
LOCS	On		LocusOn
	Off		LocusOff
T-VAR	Rang		VarRange
	List		VarList_
ΣDSP	On		ΣdispOn
	Off		ΣdispOff
RESID	None		Resid-None
	List		Resid-List_
CPLX	Real		Real
	a+bi		a+bi
	r∠θ		r∠θ
FRAC	d/c		d/c
	ab/c		ab/c
Y•SPD	Norm		Y=DrawSpeedNorm
	High		Y=DrawSpeedHigh
DATE	365		DateMode365
	360		DateMode360
PMT	Bgn		PmtBgn
	End		PmtEnd
PRD	Annu		PeriodsAnnual
	Semi		PeriodsSemi
INEQ	And		IneqTypeAnd
	Or		IneqTypeOr
SIMP	Auto		SimplfyAuto
	Man		SimplfyMan
Q1Q3	Std		Q1Q3TypeStd
	OnD		Q1Q3TypeOnData
I·MLT	On		ImpMultiOn
	Off		ImpMultiOff

SHIFT key

Level 1	Level 2	Level 3	Command
ZOOM	Fact		Factor_
	Auto		ZoomAuto
V-WIN	V-Win		ViewWindow_
	Sto		StoV-Win_
	Rcl		RclV-Win_
SKTCH	Cls		Cls
	Tang		Tangent_
	Norm		Normal_
	Inv		Inverse_
	GRPH	Y=	Graph_Y=
		r=	Graph_r=
		Parm	Graph(X,Y)=(
		X=c	Graph_X=
		G-∫dx	Graph_∫
		Y>	Graph_Y>
		Y<	Graph_Y<
		Y≥	Graph_Y≥
		Y≤	Graph_Y≤
		X>	Graph_X>
		X<	Graph_X<
		X≥	Graph_X≥
		X≤	Graph_X≤
	PLOT	Plot	Plot_
		Pl-On	PlotOn_
		Pl-Off	PlotOff_
		Pl-Chg	PlotChg_
	LINE	Line	Line
		F-Line	F-Line_
	Crcl		Circle_
	Vert		Vertical_
	Hztl		Horizontal_
	Text		Text_
	PIXL	On	PxlOn_
		Off	PxlOff_
		Chg	PxlChg_
	Test		PxlTest(
	STYL	—	SketchNormal_
		—	SketchThick_
		·····	SketchBroken_
		······	SketchDot_

BASE Program

F4 (MENU) key

Level 1	Level 2	Level 3	Command
d~o	d		d
	h		h
	b		b
	o		o
LOG	Neg		Neg_
	Not		Not_
	and		and
	or		or
	xor		xor
	xnor		xnor
DISP	▶Dec		▶Dec
	▶Hex		▶Hex
	▶Bin		▶Bin
	▶Oct		▶Oct

SHIFT VARS (PRGM) key

Level 1	Level 2	Level 3	Command
Prog			Prog_
JUMP	Lbl		Lbl_
	Goto		Goto_
	⇒		⇒
	Isz		Isz_
	Dsz		Dsz_
	Menu		Menu_
?			?

◢			◢
REL	=		=
	≠		≠
	>		>
	<		<
	≥		≥
	≤		≤
:			:

SHIFT MENU (SET UP) key

Level 1	Level 2	Level 3	Command
Dec			**Dec**
Hex			**Hex**
Bin			**Bin**
Oct			**Oct**

	Level 3	Level 4	Command
*1	Exp	ae^bx	**Exp(ae^bx)**
		ab^x	**Exp(ab^x)**
*2	MARK	▫	**Square**
		×	**Cross**
		▪	**Dot**
	STICK	Leng	**StickLength**
		Hztl	**StickHoriz**
	%DATA	%	**%**
		Data	**Data**
	None		**None**
*3	X	ax+b	**LinearReg(ax+b)**
		a+bx	**LinearReg(a+bx)**
*4	EXP	ae^bx	**ExpReg(a•e^bx)**
		ab^x	**ExpReg(a•b^x)**
*5	NORM	NPd	**NormPD(**
		NCd	**NormCD(**
		InvN	**InvNormCD(**
	t	TPd	**tPD(**
		TCd	**tCD(**
		Invt	**InvTCD(**
	CHI	CPd	**ChiPD(**
		CCd	**ChiCD(**
		InvC	**InvChiCD(**
	F	FPd	**FPD(**
		FCd	**FCD(**
		InvF	**InvFCD(**
	BINM	BPd	**BinomialPD(**
		BCd	**BinomialCD(**
		InvB	**InvBinomialCD(**
	POISN	PPd	**PoissonPD(**
		PCd	**PoissonCD(**
		InvP	**InvPoissonCD(**
	GEO	GPd	**GeoPD(**
		GCd	**GeoCD(**
		InvG	**InvGeoCD(**
	H•GEO	HPd	**HypergeoPD(**
		HCd	**HypergeoCD(**
		InvH	**InvHyperGeoCD(**

*6	Z	1-S	**OneSampleZTest_**
		2-S	**TwoSampleZTest_**
		1-P	**OnePropZTest_**
		2-P	**TwoPropZTest_**
	t	1-S	**OneSampleTTest_**
		2-S	**TwoSampleTTest_**
		REG	**LinRegTTest_**
	Chi	GOF	**ChiGOFTest_**
		2-WAY	**ChiTest_**
	F		**TwoSampleFTest_**
	ANOV	1-W	**OneWayANOVA_**
		2-W	**TwoWayANOVA_**
*7	TEST	p	**p**
		z	**z**
		t	**t**
		Chi	χ^2
		F	**F**
		$\hat{p}$	$\hat{p}$
		$\hat{p}_1$	$\hat{p}_1$
		$\hat{p}_2$	$\hat{p}_2$
		df	**df**
		S_e	S_e
		r	**r**
		r^2	r^2
		pa	**pa**
		Fa	**Fa**
		Adf	**Adf**
		SSa	**SSa**
		MSa	**MSa**
		pb	**pb**
		Fb	**Fb**
		Bdf	**Bdf**
		SSb	**SSb**
		MSb	**MSb**
		pab	**pab**
		Fab	**Fab**
		ABdf	**ABdf**
		SSab	**SSab**
		MSab	**MSab**
		Edf	**Edf**
		SSe	**SSe**
		MSe	**MSe**
	INTR	Left	**Left**
		Right	**Right**
		$\hat{p}$	$\hat{p}$
		$\hat{p}_1$	$\hat{p}_1$
		$\hat{p}_2$	$\hat{p}_2$
		df	**df**
	DIST	p	**p**
		xInv	**xInv**
		x1Inv	**x1Inv**
		x2Inv	**x2Inv**
		zLow	**zLow**
		zUp	**zUp**
		tLow	**tLow**
		tUp	**tUp**

8. CASIO Scientific Function Calculator Special Commands ⇔ Text Conversion Table

The table below shows the special text strings that correspond to commands when converting between programs and text files. For details about the operations for converting between programs and text files, see “Converting Programs and Text Files” (page 8-6).

Important!

- Converting a program that contains the types of commands described below to a text file will cause the commands to be converted to text strings with underbar (_) characters appended at the beginning and end, as shown in the table below.
  - A command enclosed in quotation marks (" ")
  - A command in a comment line, which is a line that begins with a single quotation mark (')

Note that non-command alpha-numeric characters in a program that are enclosed in quotation marks (" ") or are in a comment line are output to the text file as-is.

Example:

In the program:	**In the text file (after conversion):**
"θ"	˝_Theta_˝
"Theta"*1	˝Theta˝
"Tθmax"*2	˝_TThetamax_˝
"TThetamax"*1	˝TThetamax˝
"or"*3	˝_or_˝
"or"*1	˝or˝

*1 Non-command alpha-numeric characters
*2 V-Window Tθmax command
*3 Logical operator or

Converting from a text file to a program converts the special character strings back to their corresponding commands, shown above.

- When converting a program that contains special characters input using F6(CHAR) when editing the program on the calculator, the special characters will be converted to character string codes as shown below.

  Example:

In the program:	**In the text file (after conversion):**
λ	#E54A
□	#E5A5
β	#E641
▲	#E69C
⇔	#E6D6

These codes are not included in the tables on the pages 8-47 through 8-52.

• "□" in the following tables indicates a space.

Command	Text
f	femto
p	pico
n	nano
μ	micro
m	milli
k	kilo
M	Mega
G	Giga
T	Tera
P	Peta
E	Exa
◢	Disps
↵	(CR)
→	->
ᴇ	Exp
≤	<=
≠	<>
≥	>=
⇒	=>
f_1	f1
f_2	f2
f_3	f3
f_4	f4
f_5	f5
f_6	f6
A	&HA
B	&HB
C	&HC
D	&HD
E	&HE
F	&HF
□	□
!	Char!
"	˝
#	#
$	$
%	%
&	&
'	’
(	(
)	)
∗	∗∗
+	++
,	,
-	Char-
.	.
/	//
0	0
1	1
2	2
3	3
4	4
5	5
6	6

Command	Text
7	7
8	8
9	9
:	:
;	;
<	<
=	=
>	>
?	?
@	@
A	A
B	B
C	C
D	D
E	E
F	F
G	G
H	H
I	I
J	J
K	K
L	L
M	M
N	N
O	O
P	P
Q	Q
R	R
S	S
T	T
U	U
V	V
W	W
X	X
Y	Y
Z	Z
[	[
\	¥
]	]
^	^^
_	_
'	`
a	a
b	b
c	c
d	d
e	e
f	f
g	g
h	h
i	i
j	j
k	k
l	l

Command	Text
m	m
n	n
o	o
p	p
q	q
r	r
s	s
t	t
u	u
v	v
w	w
x	x
y	y
z	z
{	{
|	|
}	}
~	˜
Pol(	Pol(
sin□	sin□
cos□	cos□
tan□	tan□
h	&h
ln□	ln□
√	Sqrt
-	(-)
P	nPr
+	+
xnor	xnor
^{2}	^<2>
° '	dms
∫(	Integral(
Mod	Mod
Σx^2	Sigmax^2
sin^{-1}□	sin^-1□
cos^{-1}□	cos^-1□
tan^{-1}□	tan^-1□
d	&d
log□	log□
$\sqrt[3]{}$	Cbrt
Abs□	Abs□
C	nCr
–	–
xor	xor
$^{-1}$	^<-1>
°	deg
Med	Med
Σx	Sigmax
Rec(	Rec(
sinh□	sinh□
cosh□	cosh□
tanh□	tanh□
o	&o
e^	e^

Command	Text
Int□	Int□
Not□	Not□
^	^
×	*
or	or
!	!
^{r}	rad
minY	minY
minX	minX
n	Statn
sinh^{-1}□	sinh^−1□
cosh^{-1}□	cosh^−1□
tanh^{-1}□	tanh^−1□
b	&b
$_{10}$	(10)
Frac□	Frac□
Neg□	Neg□
$^x\sqrt{\ }$	Xrt
÷	/
and	and
┘	frac
^{g}	gra
maxY	maxY
maxX	maxX
Σy^2	Sigmay2
Ans	Ans
Ran#□	Ran#
$\bar{x}$	x-bar
$\bar{y}$	y-bar
σx	sigmax
sx	Sx
σx	sigmay
sy	Sy
a	Regression_a
b	Regression_b
r	Regression_r
$\hat{x}$	x-hat
$\hat{y}$	y-hat
r	<r>
θ	Theta
Σy	Sigmay
π	pi
Cls	Cls
Rnd	Rnd
Dec	&D
Hex	&H
Bin	&B
Oct	&O
■	@D8
Norm□	Norm□
Deg	Deg
Rad	Rad
Gra	Gra
Eng	Eng
Intg□	Intg□

Command	Text
Σxy	Sigmaxy
Plot□	Plot□
Line	Line
Lbl□	Lbl□
Fix□	Fix□
Sci□	Sci□
Dsz□	Dsz□
Isz□	Isz□
Factor□	Factor□
ViewWindow□	ViewWindow□
Goto□	Goto□
Prog□	Prog□
Graph□Y=	Graph□Y=
Graph□∫	Graph□Integral
Graph□Y>	Graph□Y>
Graph□Y<	Graph□Y<
Graph□Y≥	Graph□Y>=
Graph□Y≤	Graph□Y<=
Graph□r=	Graph□r=
Graph(X,Y)=(	Graph(X,Y)=(
,	Para,
P(	ProbP(
Q(	ProbQ(
R(	ProbR(
t(	Probt(
Xmin	Xmin
Xmax	Xmax
Xscl	Xscl
Ymin	Ymin
Ymax	Ymax
Yscl	Yscl
Tθmin	TThetamin
Tθmax	TThetamax
Tθptch	TThetaptch
Xfct	Xfct
Yfct	Yfct
D□Start	D□Start
D□End	D□End
D□pitch	D□pitch
RightXmin	RightXmin
RightXmax	RightXmax
RightXscl	RightXscl
RightYmin	RightYmin
RightYmax	RightYmax
RightYscl	RightYscl
RightTθmin	RightTThetamin
RightTθmax	RightTThetamax
RightTθptch	RightTThetaptch
c	Regression_c
d	Regression_d
e	Regression_e
Max(	Max(
Det□	Det□
Arg□	Arg□
Conjg□	Conjg□

Command	Text
ReP□	ReP□
ImP□	ImP□
d/dx(	d/dx(
d^2/dx^2(	d^2/dx^2(
Solve(	Solve(
Σ(	Sigma(
FMin(	FMin(
FMax(	FMax(
Seq(	Seq(
Min(	Min(
Mean(	Mean(
Median(	Median(
SolveN(	SolveN(
MOD(	MOD(
MOD_Exp(	MOD_Exp(
GCD(	GCD(
LCM(	LCM(
StdDev(	StdDev(
Variance(	Variance(
Mat□	Mat□
Trn□	Trn□
*Row□	*Row□
*Row+□	*Row+□
Row+□	Row+□
Swap□	Swap□
Dim□	Dim□
Fill(	Fill(
Identity□	Identity□
Augment(	Augment(
List→Mat(	List->Mat(
Mat→List(	Mat->List(
Sum□	Sum□
Prod□	Prod□
Percent□	Percent□
Cuml□	Cuml□
i	Imaginary
List□	List□
ΔList□	Dlist□
∞	Infinity
∠	Angle
Ref□	Ref□
Rref□	Rref□
▶	Conv
Sim□Coef	Sim□Coef
Ply□Coef	Ply□Coef
Sim□Result	Sim□Result
Ply□Result	Ply□Result
n	Financial□n
I%	Financial□I%
PV	Financial□PV
PMT	Financial□PMT
FV	Financial□FV
List1	List1
List2	List2
List3	List3

Command	Text
List4	List4
List5	List5
List6	List6
Q_1	Q1
Q_3	Q3
x_1	x1
y_1	y1
x_2	x2
y_2	y2
x_3	x3
y_3	y3
Vct□	Vct□
logab(	logab(
RndFix(	RndFix(
RanInt#(	RanInt#(
RanList#(	RanList#(
RanBin#(	RanBin#(
RanNorm#(	RanNorm#(
Σa_n	Sigmaan
Σb_n	Sigmabn
Σc_n	Sigmacn
Getkey	Getkey
F□Result	F□Result
F□Start	F□Start
F□End	F□End
F□pitch	F□pitch
R□Result	R□Result
R□Start	R□Start
R□End	R□End
H□Start	H□Start
H□pitch	H□pitch
▶Simp□	>Simp
a_n	an□
a_{n+1}	an+1
a_{n+2}	an+2
$_n$	Subscriptn
a_0	a0
a_1	a1
a_2	a2
b_n	bn□
b_{n+1}	bn+1
b_{n+2}	bn+2
b_0	b0
b_1	b1
b_2	b2
a_nStart	anStart
b_nStart	bnStart
□And□	□And□
□Or□	□Or□
Not□	□Not□
□Xor□	□Xor□
Σa_{n+1}	Sigmaan+1
Σb_{n+1}	Sigmabn+1
Σc_{n+1}	Sigmacn+1
Σa_{n+2}	Sigmaan+2

Command	Text
Σb_{n+2}	Sigmabn+2
Σc_{n+2}	Sigmacn+2
□Int÷□	□Int/□
□Rmdr□	□Rmdr□
Fa	Fa
n1	n1
n2	n2
$\bar{x}$1	x-bar1
$\bar{x}$2	x-bar2
sx1	sx1
sx2	sx2
sp	Sxp
$\hat{p}$	p-hat
$\hat{p}$1	p-hat1
$\hat{p}$2	p-hat2
Left	Left
Right	Right
P/Y	P/Year
C/Y	C/Year
Fb	Fb
F	F-Value
z	z-Value
p	p-Value
t	t-Value
se	se
χ^2	x^2
r^2	r^2
Adf	Adf
Edf	Edf
df	df
SSa	SSa
MSa	MSa
SSe	SSe
MSe	MSe
Fab	Fab
Bdf	Bdf
ABdf	ABdf
pa	pa
pb	pb
pab	pab
CellSum(	CellSum(
CellProd(	CellProd(
CellMin(	CellMin(
CellMax(	CellMax(
CellMean(	CellMean(
CellMedian(	CellMedian(
CellIf(	CellIf(
Y	GraphY
r	Graphr
Xt	GraphXt
Yt	GraphYt
X	GraphX
SSb	SSb
SSab	SSab
MSb	MSb

Command	Text
MSab	MSab
[ns]	[ns]
[μs]	[micros]
[ms]	[ms]
[s]	[s]
[min]	[min]
[h]	[h]
[day]	[day]
[week]	[week]
[yr]	[yr]
[s-yr]	[s-yr]
[t-yr]	[t-yr]
[□C]	[Centigrade]
[K]	[Kel]
[□F]	[Fahrenheit]
[□R]	[Rankine]
[u]	[u]
[g]	[g]
[kg]	[kg]
[lb]	[lb]
[oz]	[oz]
[slug]	[slug]
[ton(short)]	[ton(short)]
[ton(long)]	[ton(long)]
[mton]	[mton]
[l-atm]	[l-atm]
[ft·lbf]	[ftlbf]
[calIT]	[calIT]
[calth]	[calth]
[Btu]	[Btu]
[kW·h]	[kWh]
[kgf·m]	[kgfm]
[Pa]	[Pa]
[kPa]	[kPa]
[bar]	[bar]
[mmH_2O]	[mmH2O]
[mmHg]	[mmHg]
[inH_2O]	[inH2O]
[inHg]	[inHg]
[lbf/in^2]	[lbf/in^2]
[kgf/cm^2]	[kgf/cm^2]
[atm]	[atm]
[dyne]	[dyne]
[N]	[New]
[kgf]	[kgf]
[lbf]	[lbf]
[tonf]	[tonf]
[fm]	[fm]
[mm]	[mm]
[cm]	[cm]
[m]	[m]
[km]	[km]
[Mil]	[Mil]
[in]	[in]
[ft]	[ft]

Command	Text
[yd]	[yd]
[fath]	[fath]
[rd]	[rd]
[mile]	[mile]
[n□mile]	[n_mile]
[acre]	[acre]
[ha]	[ha]
[cm^2]	[cm^2]
[m^2]	[m^2]
[km^2]	[km^2]
[in^2]	[in^2]
[ft^2]	[ft^2]
[yd^2]	[yd^2]
[mile^2]	[mile^2]
[m/s]	[m/s]
[km/h]	[km/h]
[ft/s]	[ft/s]
[mile/h]	[mile/h]
[knot]	[knot]
[mL]	[mL]
[L]	[Lit]
[tsp]	[tsp]
[cm^3]	[cm^3]
[m^3]	[m^3]
[tbsp]	[tbsp]
[in^3]	[in^3]
[ft^3]	[ft^3]
[fl_oz(UK)]	[fl_oz(UK)]
[fl_oz(US)]	[fl_oz(US)]
[cup]	[cup]
[pt]	[pt]
[qt]	[qt]
[gal(US)]	[gal(US)]
[gal(UK)]	[gal(UK)]
[μm]	[microm]
[mg]	[mg]
[A]	[Ang]
[AU]	[AstU]
[l.y.]	[l.y.]
[pc]	[pc]
[ft·lbf/s]	[ftlbf/s]
[calth/s]	[calth/s]
[hp]	[hp]
[Btu/min]	[Btu/min]
[W]	[Wat]
[eV]	[eV]
[erg]	[erg]
[J]	[Jou]
[cal$_{15}$]	[cal15]
[kcal$_{15}$]	[kcal15]
[kcalth]	[kcalth]
[kcalIT]	[kcalIT]
If□	If□
Then□	Then□
Else□	Else□

Command	Text
IfEnd	IfEnd
For□	For□
□To□	□To□
□Step□	□Step□
Next	Next
While□	While□
WhileEnd	WhileEnd
Do	Do
LpWhile□	LpWhile□
Return	Return
Break	Break
Stop	Stop
Locate□	Locate□
Send(	Send(
Receive(	Receive(
OpenComport38k	OpenComport38k
CloseComport38k	CloseComport38k
Send38k□	Send38k□
Recieve38k□	Recieve38k□
ClrText	ClrText
ClrGraph	ClrGraph
ClrList□	ClrList
LinearReg(a+bx)□	LinearReg(a+bx)□
S-L-Normal	S-L-Normal
S-L-Thick	S-L-Thick
S-L-Broken	S-L-Broken
S-L-Dot	S-L-Dot
DrawGraph	DrawGraph
PlotPhase□	PlotPhase□
DrawDyna	DrawDyna
DrawStat	DrawStat
DrawFTG-Con	DrawFTG-Con
DrawFTG-Plt	DrawFTG-Plt
DrawR-Con	DrawR-Con
DrawR-Plt	DrawR-Plt
DrawRΣ-Con	DrawRSigma-Con
DrawRΣ-Plt	DrawRSigma-Plt
DrawWeb□	DrawWeb□
NormalG□	NormalG□
ThickG□	ThickG□
BrokenThickG□	BrokenThickG□
DispF-Tbl	DispF-Tbl
DispR-Tbl	DispR-Tbl
SimplifyAuto	SimplifyAuto
SimplifyMan	SimplifyMan
NPPlot	NPPlot
Sinusoidal	Sinusoidal
SinReg□	SinReg□
Logistic	Logistic
LogisticReg□	LogisticReg□
Pie	Pie
Bar	Bar
DotG□	DotG
1-Variable□	1-Variable□
2-Variable□	2-Variable□

Command	Text
LinearReg(ax+b)□	LinearReg(ax+b)□
Med-MedLine□	Med-MedLine□
QuadReg□	QuadReg□
CubicReg□	CubicReg□
QuartReg□	QuartReg□
LogReg□	LogReg□
ExpReg(a·e^bx)□	ExpReg(ae^bx)□
PowerReg□	PowerReg□
S-Gph1□	S-Gph1□
S-Gph2□	S-Gph2□
S-Gph3□	S-Gph3□
Square	Square
Cross	Cross
Dot	Dot
Scatter	Scatter
xyLine	xyLine
Hist	Hist
MedBox	MedBox
N-Dist	N-Dist
Broken	Broken
Linear	Linear
Med-Med	Med-Med
Quad	Quad
Cubic	Cubic
Quart	Quart
Log	Log
Exp(a·e^bx)	Exp(ae^bx)
Power	Power
ExpReg(a·b^x)□	ExpReg(ab^x)□
S-WindAuto	S-WindAuto
S-WindMan	S-WindMan
Graph□X=	Graph□X=
Y=Type	Y=Type
r=Type	r=Type
ParamType	ParamType
X=Type	X=Type
X>Type	X>Type
X<Type	X<Type
Y>Type	Y>Type
Y<Type	Y<Type
Y≥Type	Y>=Type
Y≤Type	Y<=Type
X≥Type	X>=Type
X≤Type	X<=Type
G-Connect	G-Connect
G-Plot	G-Plot
Resid-None	Resid-None
Resid-List□	Resid-List□
BG-None	BG-None
BG-Pict□	BG-Pict□
GridOff	GridOff
GridOn	GridOn
Exp(a·b^x)	Exp(a^bx)
D□Var□	D□Var□
Q1Q3TypeStd	Q1Q3TypeStd

Command	Text
VarRange	VarRange
Q1Q3TypeOnData	Q1Q3TypeOnData
SketchNormal□	SketchNormal□
SketchThick□	SketchThick□
SketchBroken□	SketchBroken□
SketchDot□	SketchDot□
a_nType	anType
a_{n+1}Type	an+1Type
a_{n+2}Type	an+2Type
StoPict□	StoPict□
RclPict□	RclPict□
StoGMEM□	StoGMEM□
RclGMEM□	RclGMEM□
StoV-Win□	StoV-Win□
RclV-Win□	RclV-Win□
%	Display%
Data	DisplayData
Menu□	Menu□
RclCapt□	RclCapt
Tangent□	Tangent□
Normal□	Normal□
Inverse□	Inverse□
Vertical□	Vertical□
Horizontal□	Horizontal□
Text□	Text□
Circle□	Circle□
F-Line□	F-Line□
PlotOn□	PlotOn□
PlotOff□	PlotOff□
PlotChg□	PlotChg□
PxlOn□	PxlOn□
PxlOff□	PxlOff□
PxlChg□	PxlChg□
PxlTest(	PxlTest(
SortA(	SortA(
SortD(	SortD(
VarList1	VarList1
VarList2	VarList2
VarList3	VarList3
VarList4	VarList4
VarList5	VarList5
VarList6	VarList6
File1	File1
File2	File2
File3	File3
File4	File4
File5	File5
File6	File6
Y=DrawSpeedNorm	Y=DrawSpeedNorm
Y=DrawSpeedHigh	Y=DrawSpeedHigh
FuncOn	FuncOn
SimulOn	SimulOn
AxesOn	AxesOn
CoordOn	CoordOn
LabelOn	LabelOn

Command	Text
DerivOn	DerivOn
LocusOn	LocusOn
ΣdispOn	SigmadispOn
G□SelOn□	G□SelOn□
T□SelOn□	T□SelOn□
D□SelOn□	D□SelOn□
R□SelOn□	R□SelOn□
DrawOn	DrawOn
ImpMultiOn	ImpMultiOn
ab/c	ab/c
d/c	d/c
FuncOff	FuncOff
SimulOff	SimulOff
AxesOff	AxesOff
CoordOff	CoordOff
LabelOff	LabelOff
DerivOff	DerivOff
LocusOff	LocusOff
ΣdispOff	SigmadispOff
G□SelOff□	G□SelOff□
T□SelOff□	T□SelOff□
D□SelOff□	D□SelOff□
R□SelOff□	R□SelOff□
DrawOff	DrawOff
ImpMultiOff	ImpMultiOff
▶Dec	>&D
▶Hex	>&H
▶Bin	>&B
▶Oct	>&O
▶DMS	>DMS
▶a+b**i**	>a+bi
▶r∠θ	>re^Theta
Real	Real
a+b**i**	a+bi
r∠θ	re^Theta
EngOn	EngOn
EngOff	EngOff
Sel□a_0	Sel□a0
Sel□a_1	Sel□a1
c_n	cn□
c_{n+1}	cn+1
c_{n+2}	cn+2
c_0	c0
c_1	c1
c_2	c2
c_nStart	CnStart
IneqTypeAnd	IneqTypeAnd
f_n	fn
File□	File□
VarList□	VarList□
ClrMat□	ClrMat□
ZoomAuto	ZoomAuto
Xdot	Xdot
RightXdot	R-Xdot
DrawDistNorm□	DrawDistNorm□

Command	Text
DrawDistT□	DrawDistT□
DrawDistChi□	DrawDistChi□
DrawDistF□	DrawDistF□
None	None
StickLength	StickLength
StickHoriz	StickHoriz
IneqTypeOr	IneqTypeOr
Graph□X>	Graph□X>
Graph□X<	Graph□X<
Graph□X≥	Graph□X>=
Graph□X≤	Graph□X<=
StrJoin(	StrJoin(
StrLen(	StrLen(
StrCmp(	StrCmp(
StrSrc(	StrSrc(
StrLeft(	StrLeft(
StrRight(	StrRight(
StrMid(	StrMid(
Exp▶Str(	Exp>Str(
Exp(	Exp(
StrUpr(	StrUpr(
StrLwr(	StrLwr(
StrInv(	StrInv(
StrShift(	StrShift(
StrRotate(	StrRotate(
ClrVct□	ClrVct□
Str□	Str□
CrossP(	CrossP(
DotP(	DotP(
Norm(	Norm(
UnitV(	UnitV(
Angle(	Angle(
NormPD(	NormPD(
NormCD(	NormCD(
InvNormCD(	InvNormCD(
tPD(	tPD(
tCD(	tCD(
InvTCD(	InvTCD(
ChiPD(	ChiPD(
ChiCD(	ChiCD(
InvChiCD(	InvChiCD(
FPD(	FPD(
FCD(	FCD(
InvFCD(	InvFCD(
BinomialPD(	BinomialPD(
BinomialCD(	BinomialCD(
InvBinomialCD(	InvBinomialCD(
PoissonPD(	PoissonPD(
PoissonCD(	PoissonCD(
InvPoissonCD(	InvPoissonCD(
GeoPD(	GeoPD(
GeoCD(	GeoCD(
InvGeoCD(	InvGeoCD(
HypergeoPD(	HypergeoPD(
HypergeoCD(	HypergeoCD(
InvHypergeoCD(	InvHypergeoCD(

Command	Text
Smpl_SI(	Smpl_SI(
Smpl_SFV(	Smpl_SFV(
Cmpd_n(	Cmpd_n(
Cmpd_I%(	Cmpd_I%(
Cmpd_PV(	Cmpd_PV(
Cmpd_PMT(	Cmpd_PMT(
Cmpd_FV(	Cmpd_FV(
Cash_NPV(	Cash_NPV(
Cash_IRR(	Cash_IRR(
Cash_PBP(	Cash_PBP(
Cash_NFV(	Cash_NFV(
Amt_BAL(	Amt_BAL(
Amt_INT(	Amt_INT(
Amt_PRN(	Amt_PRN(
Amt_ΣINT(	Amt_SigmaINT(
Amt_ΣPRN(	Amt_SigmaPRN(
Cnvt_EFF(	Cnvt_EFF(
Cnvt_APR(	Cnvt_APR(
Cost(	Cost(
Sell(	Sell(
Margin(	Margin(
PmtEnd	PmtEnd
PmtBgn	PmtBgn
Bond_PRC(	Bond_PRC(
Bond_YLD(	Bond_YLD(
DateMode365	DateMode365
DateMode360	DateMode360
PeriodsAnnual	PeriodsAnnual
PeriodsSemi	PeriodsSemi
Days_Prd(	Days_Prd(
OneSampleZTest☐	OneSampleZTest☐
TwoSampleZTest☐	TwoSampleZTest☐
OnePropZTest☐	OnePropZTest☐
TwoPropZTest☐	TwoPropZTest☐
OneSampleTTest☐	OneSampleTTest☐
TwoSampleTTest☐	TwoSampleTTest☐
LinRegTTest☐	LinRegTTest☐
ChiGOFTest☐	ChiGOFTest☐
ChiTest☐	ChiTest☐
TwoSampleFTest☐	TwoSampleFTest☐
OneWayANOVA☐	OneWayANOVA☐
TwoWayANOVA☐	TwoWayANOVA☐
x1InvN	x1InvN
x2InvN	x2InvN
xInv	xInv
zLow	zLow
zUp	zUp
tLow	tLow
tUp	tUp

9. Program Library

- Be sure to check how many bytes of unused memory are remaining before attempting to perform any programming.

Program Name	Prime Factorization

Description

This program continually divides a natural number by factors until all its prime factors are produced.

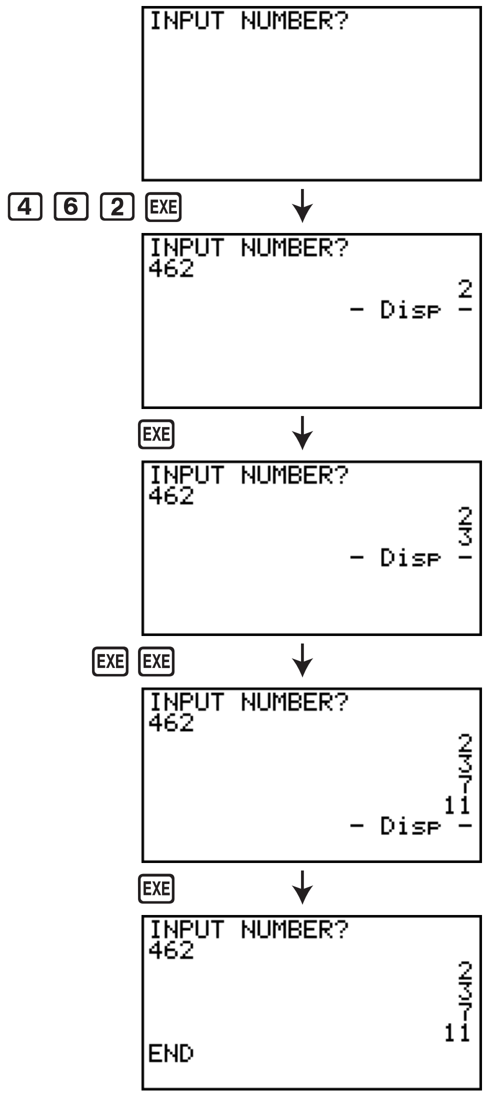
Purpose

This program accepts input of natural number A, and divides it by B (2, 3, 5, 7....) to find the prime factors of A.

- If a division operation does not produce a remainder, the result of the operation is assigned to A.
- The above procedure is repeated until B > A.

Example $462 = 2 \times 3 \times 7 \times 11$

```
ClrText↵
"INPUT NUMBER"?→A↵
2→B↵
Do↵
While Frac (A÷B)=0↵
B◢
A÷B→A↵
WhileEnd↵
If B=2↵
Then 3→B↵
Else B+2→B↵
IfEnd↵
LpWhile B≤A↵
"END"
```



Program Name Ellipse

Description

This program displays a number table of the following values based on input of the foci of an ellipse, the sum of the distance between the loci and foci, and the pitch (step size) of X.

Y1: Coordinate values of upper half of ellipse

Y2: Coordinate values of lower half of ellipse

Y3: Distances between right focus and loci

Y4: Distances between left focus and loci

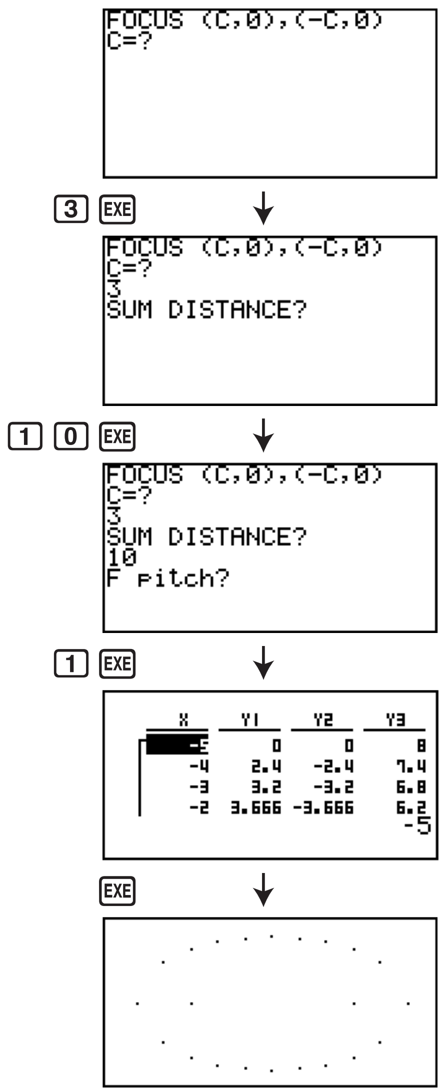
Y5: Sum of Y3 and Y4

Next, the program plots the foci and values in Y1 and Y2.

Purpose

This program shows that the sums of the distances between the loci and two foci of an ellipse are equal.

```
AxesOff↵
Do↵
ClrText↵
"FOCUS (C,0),(−C,0)"↵
"C="?→C↵
"SUM DISTANCE"?→D↵
LpWhile 2Abs C≥D Or D≤0↵
D÷2→A↵
√(A²−C²)→B↵
Y=Type↵
"B√(1−X²÷A²)"→Y1↵
"−Y1"→Y2↵
"√((X−C)²+Y1²)"→Y3↵
"√((X+C)²+Y1²)"→Y4↵
"Y3+Y4"→Y5↵
For 1→E To 20↵
If E≤5↵
Then T SelOn E↵
Else T SelOff E↵
IfEnd↵
Next↵
−Int A→F Start↵
Int A→F End↵
"F pitch"?→F pitch↵
DispF−Tbl◢
ClrGraph↵
1.2A→Xmax↵
−1.2A→Xmin↵
1.2B→Ymax↵
−1.2B→Ymin↵
T SelOff 3↵
T SelOff 4↵
T SelOff 5↵
DispF−Tbl↵
DrawFTG−Plt↵
PlotOn C,0↵
PlotOn −C,0◢
"END"
```



Chapter 9 Spreadsheet

The Spreadsheet application provides you with powerful, take-along-anywhere spreadsheet capabilities.

All of the operations in this section are performed in the **S • SHT** mode.

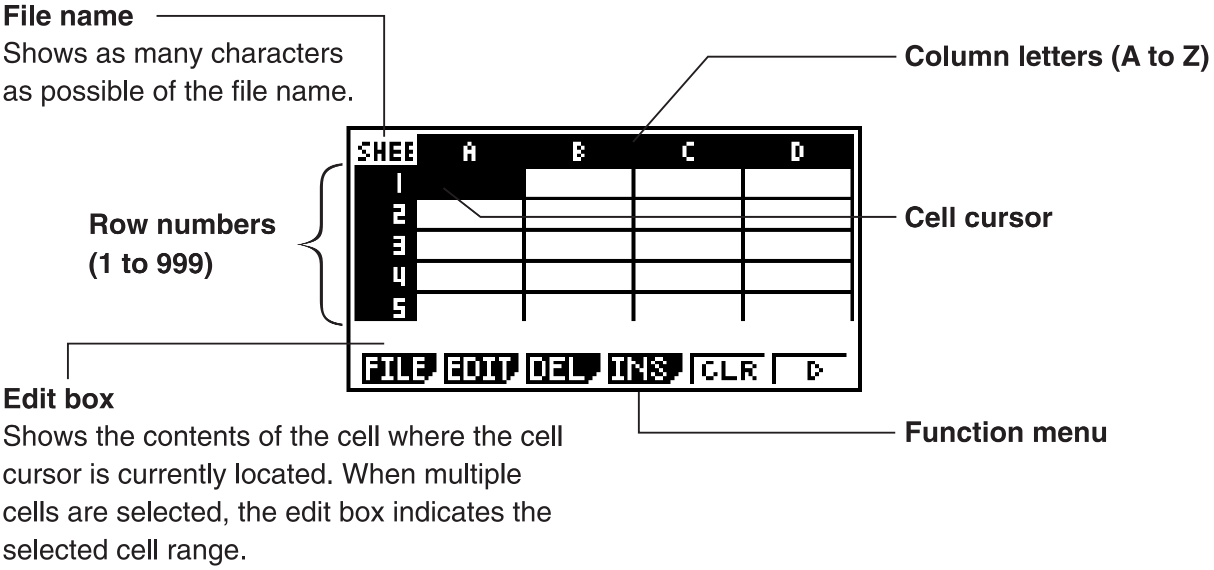
Important!

- The fx-7400GIII is not equipped with the **S • SHT** mode.

1. Spreadsheet Basics and the Function Menu

Selecting **S • SHT** on the Main Menu will display a spreadsheet screen. Entering the **S • SHT** mode automatically creates a new spreadsheet file named “SHEET”.

The spreadsheet screen shows a number of cells (squares) and the data contained in each cell.



You can enter the following types of data into a cell.

Constants	A constant is something whose value is fixed as soon as you finalize its input. A constant can be either a numeric value, or a calculation formula (such as 7+3, sin30, A1×2, etc.) that does not have an equal sign (=) in front of it.
Text	A character string that starts with a quote mark (") is treated as text.
Formula	A formula that starts out with an equal sign (=), such as =A1×2, is executed as it is written.

Note that complex numbers are not supported in the **S • SHT** mode.

■ Spreadsheet Screen Function Menu

- {**FILE**} ... Displays the following FILE submenu.
  - {**NEW**}/{**OPEN**}/{**SV • AS**}/{**RECAL**}/{**CSV**}
- {**EDIT**} ... Displays the following EDIT submenu.
  - {**CUT**}/{**PASTE**}/{**COPY**}/{**CELL**}/{**JUMP**}/{**SEQ**}/{**FILL**}/{**SRT • A**}/{**SRT • D**}
  - PASTE is displayed only immediately after CUT or COPY is executed.

- {**DEL**} ... Displays the following DEL (delete) submenu.
  - {**ROW**}/{**COL**}/{**ALL**}
- {**INS**} ... Displays the following INS (insert) submenu.
  - {**ROW**}/{**COL**}
- {**CLR**} ... Clears the content from a selected range of cells.
- {**GRPH**} ... Displays the following GRPH menu. (Same as in the **STAT** mode.)
  - {**GPH1**}/{**GPH2**}/{**GPH3**}/{**SEL**}/{**SET**}
- {**CALC**} ... Displays the following CALC (statistical calculation) menu. (Same as in the **STAT** mode.)
  - {**1VAR**}/{**2VAR**}/{**REG**}/{**SET**}
- {**STO**} ... Displays the following STO (store) submenu.
  - {**VAR**}/{**LIST**}/{**FILE**}/{**MAT**}/{**VCT**}
- {**RCL**} ... Displays the following RCL (recall) submenu.
  - {**LIST**}/{**FILE**}/{**MAT**}/{**VCT**}

- **Data Entry Function Menu**
- {**GRAB**} ... Enters the GRAB mode for entering a cell reference name.
- {**$**} ... Inputs the cell absolute reference command ($).
- {**:**} ... Inputs the cell range specification command (:).
- {**If**} ... Inputs the CellIf(command.
- {**CEL**} ... Displays a submenu for inputting the following commands.
  - CellMin(, CellMax(, CellMean(, CellMedian, CellSum, CellProd(
- {**REL**} ... Displays a submenu for inputting the following relational operators.
  - =, ≠, >, <, ≥, ≤

2. Basic Spreadsheet Operations

This section explains spreadsheet file operations, how to move the cursor and select one or more cells, and how to enter and edit data.

■ Spreadsheet File Operations

● To create a new file

1. Press F1(FILE)F1(NEW).
2. On the dialog box that appears, enter up to eight characters for the file name, and then press EXE.
   - This will create a new file and display a blank spreadsheet.
   - A new file will not be created it there is already a file with the same file name you enter in step 2. Instead, the existing file will be opened.

• To open a file

1. Press F1(FILE)F2(OPEN).
2. On the file list that appears, use ⏶ and ⏷ to select the file you want and then press EXE.

• Auto Save

In the **S • SHT** mode, Auto Save saves the currently open file automatically whenever you edit it. This means you do not need to perform any manual save operation.

• To save a file under a new name

1. Press F1(FILE)F3(SV • AS).
2. On the dialog box that appears, enter up to eight characters for the new file name, and then press EXE.
   - If a file already exists with the same file name you enter in step 2, a message will appear asking if you want to replace the existing file with the new one. Press F1(Yes) to replace the existing file, or F6(No) to cancel the save operation and return to the file name input dialog box in step 2.

• To delete a file

1. Press F1(FILE)F2(OPEN).
2. On the file list that appears, use ⏶ and ⏷ to select the file you want to delete and then press F1(DEL).
3. This causes a confirmation message to appear. Press F1(Yes) to delete the file, or F6(No) to cancel without deleting anything.
4. To return to the spreadsheet from the file list, press EXIT.
   - Deleting the currently open file will automatically create a new file named "SHEET" and display its spreadsheet.

■ Transferring Data between a Spreadsheet and CSV Files

You can import the contents of a CSV file stored with this calculator or transferred from a computer into a spreadsheet. You also can save the contents of a spreadsheet as a CSV file.

• To import the contents of a CSV file to a spreadsheet

1. Prepare the CSV file you want to import.
   - See "Import CSV File Requirements" (page 3-14).
2. Press F1(FILE)F5(CSV)F1(LOAD).
   - Pressing EXE in the next step will overwrite all of the data on the spreadsheet with the CSV file data.
3. On the select file dialog box that appears, use ⏶ and ⏷ to move the highlighting to the file you want to import and then press EXE.
   - This imports the contents of the CSV file you specified to the spreadsheet.

Important!

- All blank data in the CSV file is imported as a blank cell.
- An error occurs if a CSV file contains even a single text string data item.
- If the CSV file includes data that cannot be converted, an error message will appear showing the location in the CSV file (Example: row 2, column 3) where the data that cannot be converted is located.
- Attempting to import a CSV file that has more than 26 columns or 999 rows will cause an "Invalid Data Size" error.

• To save spreadsheet contents as a CSV file

1. If required, press F1(FILE)F4(RECAL) to recalculate the spreadsheet contents.
   - Note that recalculation is not performed automatically when you save spreadsheet contents to a CSV file. Be sure to perform recalculation if the spreadsheet contains a formula, which starts with an equals symbol (=). See "Inputting a Formula into a Cell" (page 9-9) for more information.
   - Formulas are not saved to the CSV file. Only calculation results are saved.
   - All ERROR cell data on the spreadsheet is saved as blank data.
2. Press F1(FILE)F5(CSV)F2(SV•AS).
   - This displays a folder selection screen.
3. Select the folder where you want to save the CSV file.
   - To store the CSV file in the root directory, highlight "ROOT".
   - To store the CSV file in a folder, use ⏶ and ⏷ to move the highlighting to the desired folder and then press F1(OPEN).
4. Press F1(SV•AS).
5. Input up to eight characters for the file name and then press EXE.
   - For information about how certain types of data is converted when being saved to a CSV file, see the "Important!" note under "To save matrix contents as a CSV file" (page 2-44).

• To specify the CSV file delimiter symbol and decimal point

Press F1(FILE)F5(CSV)F3(SET) to display the CSV format setting screen. Next, perform the procedure from step 3 under "Specifying the CSV File Delimiter Symbol and Decimal Point" (page 3-16).

■ Recalculating All of the Formulas in the Currently Open Spreadsheet

The **S•SHT** mode has an Auto Calc features that automatically recalculates all of the formulas in a spreadsheet whenever you open it or perform any editing operation. Auto Calc is enabled under initial factory default settings. You also can execute a recalculation manually, if you want.

• Auto Calc

Auto Calc is an **S • SHT** mode Setup item (page 1-34).

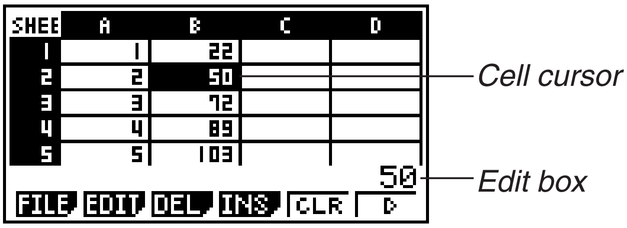
When Auto Calc is enabled (On), all of the formulas in a spreadsheet are recalculated when the spreadsheet is opened or when any editing operation is performed. It should be noted, however, that recalculation can slow down the overall processing speed. When Auto Calc is disabled (Off), you need to execute recalculation manually as required.

• To execute spreadsheet re-calculation manually

Press [F1] (FILE) [F4] (RECAL). This recalculates all of the formulas in the currently open file and displays the applicable results.

■ Using the Cell Cursor

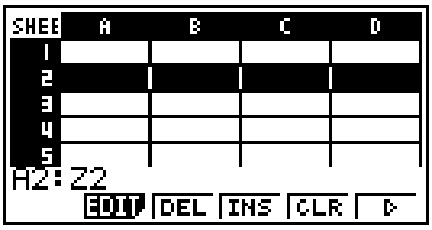
The cell cursor shows the cell that is selected on a spreadsheet. The highlighted cell is the one that is currently selected by the cell cursor.

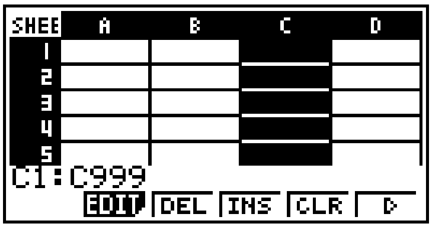
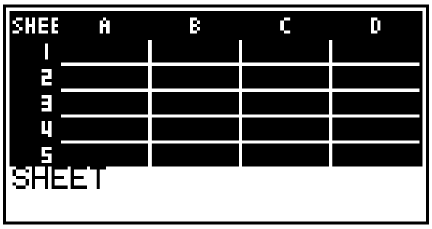


When a single cell is selected by the cell cursor, the contents of that cell are displayed in the edit box. The cell contents can be edited in the edit box.

When a multiple cells are selected by the cell cursor, the selection range is displayed in the edit box. In this case, you can copy, delete, or perform other cell operations on the entire range of selected cells.

• To select cells

To select this:	Do this:
A single cell	Use the cursor keys to move the cell cursor to the cell you want, or use the JUMP comment to jump directly to the cell.
A range of cells	See "To select a range of cells" (page 9-6).
An entire row of cells 	Move the cell cursor to column A of the row whose cells you want to select and then press ◀. Pressing ◀ while the cell cursor is located at cell A2, for example, will select the entire second row (from A2 to Z2). This will cause A2:Z2 (which indicates the selected range) to appear in the edit box.

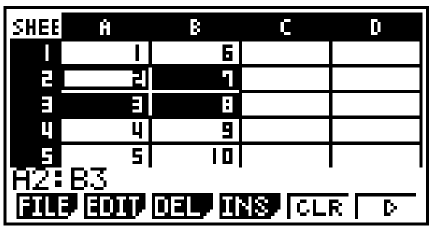
To select this:	Do this:
An entire column of cells.  	Move the cell cursor to row 1 of the column whose cells you want to select and then press ▲. Pressing ▲ while the cell cursor is located at cell C1, for example, will select the entire column C (from C1 to C999). This will cause C1:C999 (which indicates the selected range) to appear in the edit box.
All of the cells in the spreadsheet  	Press ◀ while the entire column A is selected or press ▲ while the entire row 1 is selected. This will select all of the cells in the spreadsheet and display the spreadsheet file name in the edit box.

• Using the JUMP Command to Move the Cell Cursor

To move the cell cursor to here:	Do this:
A particular cell	1. Press F2(EDIT)F4(JUMP)F1(GO). 2. On the dialog box that appears, enter the name of the cell (A1 to Z999) to which you want to jump. 3. Press EXE.
Line 1 of the current column	Press F2(EDIT)F4(JUMP)F2(TOP↑).
Column A of the current row	Press F2(EDIT)F4(JUMP)F3(TOP←).
Last line of the current column	Press F2(EDIT)F4(JUMP)F4(BOT↓).
Column Z of the current row	Press F2(EDIT)F4(JUMP)F5(BOT→).

• To select a range of cells

1. Move the cell cursor to the start point of the range of cells you want to select.
   - You could select and entire row or column of cells as the start point, if you want. For details about selecting cells, see "To select cells" on page 9-5.
2. Press SHIFT 8(CLIP).
   - This will change the cell cursor to a thick-line boundary instead of the normal highlighting.
3. Use the cursor keys to move the cell cursor to the end point of the range of cells you want to select.
   - The edit box will show the range of the selected cells.
   - To cancel cell selection, press EXIT. If you do, the cell cursor will be located at the end point of the range you selected.

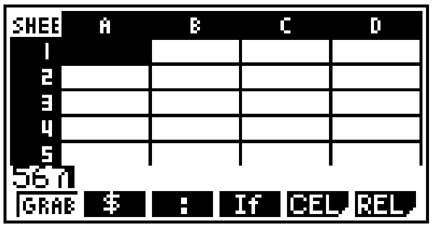


■ Data (Constants, Text, Formula) Input Basics

First let's have a look at a few basic procedures that apply regardless of the type of data you are inputting.

• To overwrite data currently in a cell with new data

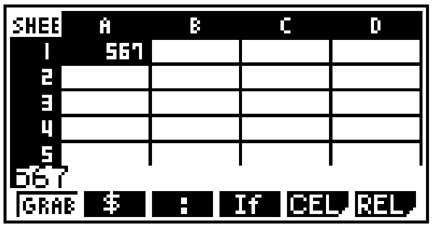
1. Move the cell cursor to the cell where you want to input data.
   - If the cell you select already contains data, the following step will overwrite the existing data with new input.
2. Use the calculator's keys to input data.
   - As you perform key operations to input values or text (such as [1], [ALPHA] [log] (B), etc.), the applicable figures will appear aligned left inside the edit box.
   - To cancel an input operation part way through at any point before advancing to step 3 below, press [EXIT]. This will return the cell contents to what they were in step 1 of this procedure.



3. To finalize and apply your input, press [EXE].

• To edit cell data

1. Move the cell cursor to the cell whose contents you want to edit.
2. Press [F2] (EDIT) [F3] (CELL).
   - Cell contents in the edit box will change from align left to align right. A text cursor will appear in the edit box so you can edit its contents.



3. Use [▶] and [◀] to move the cursor around the contents of the cell, and edit them as required.
   - To cancel an edit operation part way through at any point before advancing to step 4 below, press [EXIT]. This will return the cell contents to what they were in step 1 of this procedure.
4. To finalize and apply your edits, press [EXE].

• To move the cell cursor while inputting data into a cell

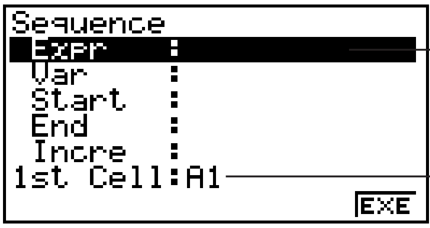
Under factory default settings, pressing [EXE] while inputting data into a cell will cause the cell cursor to move to the next line. You can specify movement to the next column instead using the "Move" setting as described on page 1-34.

■ Inputting a Constant (Value, Calculation Result, Number Sequence) into a Cell

A constant is something whose value is fixed as soon as you finalize its input. A constant can be either a numeric value, or a calculation formula (such as 7+3, sin30, A1×2, etc.) that does not have an equal sign (=) in front of it. Inputting [sin] [3] [0] [EXE], for example will cause the value 0.5 (the calculation result) to appear in the cell (when Deg is selected as the Angle unit).

• To input a number sequence automatically based on a function expression

1. Move the cell cursor to the cell where you want number sequence input to start.
   - Under initial default settings, automatic input of the number sequence will proceed downwards from the start cell. You can specify a different direction using the "Move" setting as described on page 1-34.
2. Press [F2](EDIT)[F5](SEQ) to display the Sequence screen, and then specify the function expression and values required to generate the required number sequence.



You can input data for the item that is highlighted on the screen.

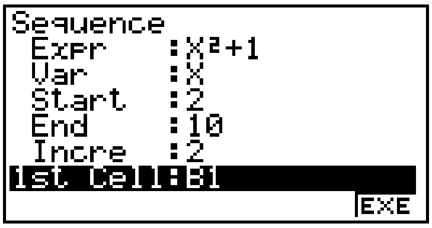
Reference name of the cell selected in step 1

Item	Description
Expr	Input the function expression $f(x)$ for generating the number sequence. Example: [ALPHA] [+](X) [x^2] [+] [1] [EXE] ($X^2 + 1$)
Var	Input the variable name used in the function expression input for Expr. Example: [ALPHA] [+](X) [EXE] (X)
Start	Input the starting value (X_1) of the value to be substituted for the variable specified by Var. Example: [2] [EXE]
End	Input the ending value (X_n) of the value to be substituted for the variable specified by Var. Example: [1] [0] [EXE]
Incre	Input the increment value (m) for successive value of X_1, as in: ($X_2 = X_1 + m$), ($X_3 = X_2 + m$), and so on. The number sequence is generated in the range of $X_1 + (n - 1)\ m \leqq X_n$. Example: [2] [EXE]
1st Cell	Input the reference name (A1, B2, etc.) of the cell where you want the first value of the number sequence to be input. Specify a cell here only if the starting cell is different from the one you specified in step 1 of this procedure. Example: [ALPHA] [log](B) [1] [EXE] (B1)

- Each time you press [EXE] after inputting data for a setting item, the highlighting will move to the next setting item. You also can use [▲] and [▼] to move the highlighting upwards and downwards as required.

- Performing the next step will input the number string automatically starting from the specified cell. If any cell that is within the range of cells where the number sequence values will be input already contains data, the existing data will be replaced with the number sequence values.

3. After inputting data for all the setting items, press [F6](EXE) or the [EXE] key to start number sequence generation and input.



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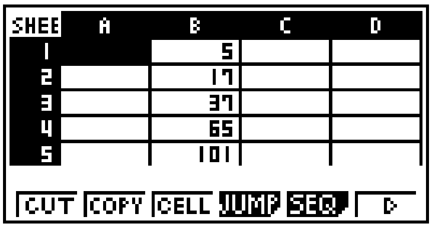


■ Inputting Text into a Cell

To input text, make sure the first thing you input into the cell is [ALPHA] [×10^x] ("). The quote mark (") tells the calculator that what follows is text, and should be displayed as-is without calculation. The quote mark (") is not displayed as part of the text.

■ Inputting a Formula into a Cell

For the sake of example, let's try making a table that contains data based on the formula <PRICE> × <QUANTITY> = <TOTAL>. To do this, we would put <PRICE> values in column A, <QUANITY> values in column B, and calculation formulas (like = A1 × B1, = A2 × B2, and so on) in column C. If the Auto Calc feature is enabled (On), the values in column C would be recalculated and updated any time we change the values in column A or B.

In this example, note that we must start out the data in column C with the equal sign (=) in order to indicate it is a formula. In addition to values, arithmetic operators, and cell reference names, a formula also can contain built-in function commands (page 2-13) and special **S • SHT** mode commands (page 9-15).

• Formula Input Example

	A	B	C
1	PRICE	QUANTITY	TOTAL
2	35	15	525
3	52	15	780
4	78	20	1560

Procedure

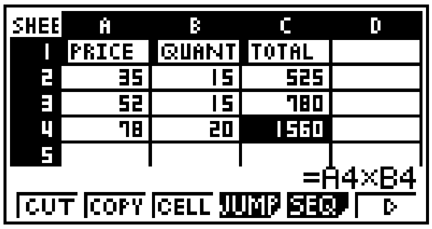
1. Input the text for line 1, and the applicable values in cells A2 through B4.
2. Move the cursor to cell C2, and input the formula for A2 × B2.

   [SHIFT] [•] (=) [ALPHA] [X,θ,T] (A) [2] [×] [ALPHA] [log] (B) [2] [EXE]

3. Copy the formula in cell C2 and copy it into cells C3 and C4. Move the cell cursor to cell C2 and then perform the following operation.

   F2(EDIT) F2(COPY) ▼ F1(PASTE) ▼ F1(PASTE) EXIT

   • For details about the copy and paste operations, see "Copying and Pasting Cell Contents" (page 9-11).



■ Inputting a Cell Reference Name

Each cell on a spreadsheet has what is called a "reference name", which is derived by combining its column name (A through Z) with its row name (1 through 999). A cell reference name can be used inside of a formula, which makes the value of the called cell part of the formula. See "Inputting a Formula into a Cell" (page 9-9) for more information. There are two methods you can use to input a cell reference name: direct input of the name and input using the GRAB command. The following illustrates how you would use each of these methods to input =A1+5 into cell B1.

• To input a cell reference name using direct input

Move the cell cursor to cell B1 and then perform the following operation.

SHIFT · (=) ALPHA X,θ,T (A) 1 + 5 EXE

• To input a cell reference name using the GRAB command

Move the cell cursor to cell B1 and then perform the following operation.

SHIFT · (=) F1(GRAB) ◀ F1(SET) + 5 EXE

• Commands F2(GO) through F6(BOT→) on the submenu that appears when you press F1(GRAB) are identical to commands F1(GO) through F5(BOT→) of the JUMP command submenu. See "Using the JUMP Command to Move the Cell Cursor" on page 9-6 about these commands.

■ Relative and Absolute Cell Reference Names

There are two types of cell reference names: relative and absolute. Normally, cell reference names are treated as being relative.

Relative Cell Reference Names

In the formula =A1+5, the cell reference name A1 indicates a relative cell reference. It is "relative" because copying the formula and pasting in a different cell will cause the cell reference name to change in accordance with the location of cell where it is pasted. If the formula =A1+5 is originally located in cell B1, for example, copying at pasting in cell C3 will result in =B3+5 in cell C3. Moving from column A to column B (one column) causes A to change to B, while moving from row 1 to row 3 changes (two rows) changes the 1 to 3.

Important!: If the result of a copy and paste operation causes a relative cell reference name to change to something that is outside the range of the spreadsheet cells, the applicable column letter and/or row number will be replaced by a question mark (?), and "ERROR" will be displayed as the cell's data.

Absolute Reference Names

If you want the row or the column, or both the row and the column parts of a cell reference name to remain the same to matter where you paste them, you need to create an absolute cell reference name. You do this by affixing a dollar sign ($) in front of the part of the cell reference name you want to remain unchanged. You have three options when using the dollar sign ($) to create an absolute cell reference name: absolute column with relative row ($A1), relative column with absolute row (A$1), and absolute row and column ($A$1).

• To input the absolute cell reference name symbol ($)

When inputting a cell reference into a spreadsheet cell, press F2($).

For example, the following key operation inputs the absolute cell reference name = $B$1.

SHIFT ⊡(=) F2($) ALPHA log(B) F2($) 1

■ Copying and Pasting Cell Contents

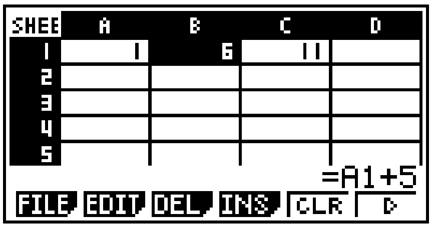
You can copy the contents of one or more cells and paste them into another location. Once you perform the copy operation, you can copy the contents to multiple locations, if you want.

• To copy and paste spreadsheet data

1. Select the cell(s) you want to copy.
   - See "To select cells" (page 9-5) for more information.
2 Press F2(EDIT) F2(COPY).
   - This will go into paste standby for the selected data, indicated by the F1 menu item changing to (PASTE).
   - You can exit the paste standby at any time before you perform step 4 below by pressing EXIT.
3. Use the cursor keys to move the cell cursor to location where you want to paste the data.
   - If you selected a range of cells in step 1, the cell you select with the cell cursor will be the upper left cell of the paste range.
   - If the location you select is within the range that you copied, performing step below will cause the exiting data to be overwritten with the pasted data.
4. Press F1(PASTE).
   - This will paste the copied data.
   - To paste the same data in other locations, repeat steps 3 and 4.
5. After you are finish pasting the data, press EXIT to exit paste standby.

■ Cutting and Pasting Cell Contents

You can use cut and paste to move the contents of one or more cells to another location. Cell contents (regardless of whether it includes relative or absolute cell name references) generally are unchanged by a cut and paste operation.



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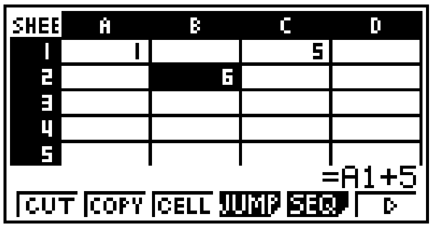
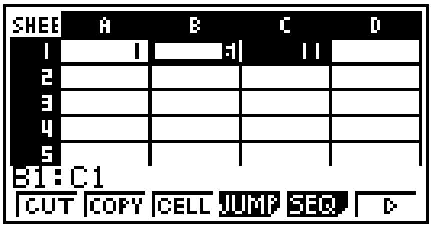


Cutting the formula =A1+5 in cell B1 and pasting it into cell B2. The A1 reference name is unchanged.

When you are cut and paste a range cells, reference names that affect relationships within the range are changed accordingly when the range is pasted in order to maintain the correct relationship, regardless of whether they are relative or absolute reference names.



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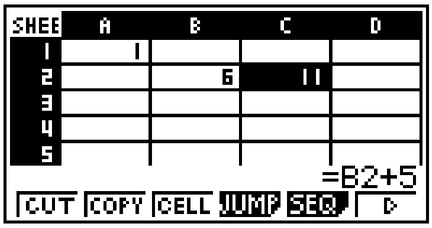


Cutting the B1:C1 range of cells that includes the formula =B1+5 and pasting it into B2:C2. The formula pasted into C2 is changed to =B2+5 in order to maintain the relationship with the cell to the left, which was also part of the pasted range.

• To cut and paste spreadsheet data

1. Select the cell(s) you want to cut.
   - See “To select cells” (page 9-5) for more information.
2 Press F2(EDIT)F1(CUT).
   - This will go into paste standby for the selected data, indicated by the F1 menu item changing to (PASTE).
   - You can exit the paste standby at any time before you perform step 4 below by pressing EXIT.
3. Use the cursor keys to move the cell cursor to location where you want to paste the data.
   - If you selected a range of cells in step 1, the cell you select with the cell cursor will be the upper left cell of the paste range.
   - If the location you select is within the range that you cut, performing step below will cause the exiting data to be overwritten with the pasted data.
4. Press F1(PASTE).
   - This will paste the data from the cell(s) you selected in step 1 and paste it into the location you selected in step 3.
   - Regardless of whether Auto Calc is enabled or disabled (page 9-5), pasting cut data will cause all of the formulas in the spreadsheet to be recalculated.

■ Inputting the Same Formula into a Range of Cells

Use the Fill command when you want to input the same formula into a specified range of cells. The rules governing relative and absolute cell name references are the same as those for copy and paste.

When you need to input the same formula into cells B1, B2, and B3, for example, the Fill command lets you do so by inputting the formula once, into cell B1. Note the following about how the Fill command handles cell name references in this case.

<table>
<tr><th>When cell B1 contains this:</th><th colspan="2">The Fill command will do this:</th></tr>
<tr><td>=A1×2</td><td><table><tr><th></th><th>A</th><th>B</th></tr><tr><td>1</td><td></td><td>=A1×2</td></tr><tr><td>2</td><td></td><td>=A2×2</td></tr><tr><td>3</td><td></td><td>=A3×2</td></tr></table></td><td rowspan="2">* Note that in actual practice cells B1, B2, and B3 will show the calculation results, not the formulas as shown here.</td></tr>
<tr><td>=$A$2×2</td><td><table><tr><th></th><th>A</th><th>B</th></tr><tr><td>1</td><td></td><td>=$A$2×2</td></tr><tr><td>2</td><td></td><td>=$A$2×2</td></tr><tr><td>3</td><td></td><td>=$A$2×2</td></tr></table></td></tr>
</table>

• To input the same formula into a range of cells

1. Select the range of cells into which you want to input the same formula.
   - In this example we will assume the B1:B3 is selected. See "To select a range of cells" (page 9-6).

2 Press [F2](EDIT)[F6](▷)[F1](FILL).

3. On the Fill screen that appears, enter the formula you want to input.

You can input data for the item that is highlighted on the screen.

This is the range of cells you selected in step 1.

   - In the "Formula" line, input =A1×2 ([SHIFT] [•](=) [ALPHA] [X,θ,T](A) [1] [×] [2] [EXE]). Pressing [EXE] will cause the cell cursor to move to the "Cell Range" line.
   - If any cell within the cell range already contains data, performing the next step will cause the existing data to be overwritten with the new fill data (formula).

4. Press [F6](EXE) or the [EXE] key.
   - This will input the formula into the range of cells you specified.

Sorting Constant Data

Note that only constant data can be sorted. You can select multiple columns within a single line or multiple lines within a single column for sorting.

• To sort constant data

1. Select a range of column cells in a single row or a range of row cells in a single column.
   - See "To select a range of cells" (page 9-6).
   - A Syntax ERROR message will appear if any of the cells in the range you select contain data other than constant data.
2. Depending on the type of sort you want to perform, perform either one of the following operations.

   To sort ascending: F2(EDIT)F6(▷)F2(SRT • A)

   To sort descending: F2(EDIT)F6(▷)F3(SRT • D)

Deleting and Inserting Cells

• To delete an entire line or column of cells

Select the row(s) or column(s) you want to delete and then press F3(DEL). This will delete the selected row(s) or column(s) immediately, without displaying a confirmation message.

You also can perform the following steps to delete a row or column.

1. Select one or more cells inside the row(s) or column(s) you want to delete.
   - If you want to delete lines 2 through 4, for example, you could select A2:B4, C2:C4, or any other range of cells that includes the lines to be deleted.
   - If you want to delete columns A and B, for example, you could select A1:B1, A2:B4, etc.
2. Press F3(DEL).
   - This enters delete standby. If you decide you want to cancel the delete operation at this time, press EXIT.
3. To delete the entire line(s) that include the cells you selected in step 1, press F1(ROW). To delete the entire column, press F2(COL).

• To delete the contents of all the cells in a spreadsheet

1. Press F3(DEL)F3(ALL).
2. In response to the confirmation message that appears, press F1(Yes) to delete the data or F6(No) to cancel without deleting anything.

• To insert a row or column of blank cells

1. Perform one of the following operations to specify the location of the insert and the number of rows or columns to be inserted.
   - **To insert rows**

     Starting with the row immediately below of the row where you want the insert to be performed, select the same number of rows that you want to insert.

     Example: To insert three rows above row 2, you could select A2:A4, B2:C4, etc.

- **To insert columns**

  Starting with the column immediately to the right of the column where you want the insert to be performed, select the same number of columns that you want to insert.

  Example: To insert three columns to the left of column B, you could select B2:D4, B10:D20, etc.

2. Press F4(INS).
   - This will enter insert standby. If you decide you want to cancel the insert operation at this time, press EXIT.
3. Press F1(ROW) to insert the applicable number of rows or F2(COL) to insert columns.
   - A Range ERROR occurs if an insert operation causes existing cells that contain data to move outside the range of A1:Z999.

• To clear the contents of specific cells

Select the cell or range of cells you want to clear and then press F5(CLR).

3. Using Special S•SHT Mode Commands

The **S•SHT** mode has a number of special commands like CellSum(, which returns the sum of a range of cells, and CellIf(, which specifies branching conditions. These special commands can be used inside of formulas.

■ Special S•SHT Mode Command List

"Input Key Operation" operations can be performed during cell input only.

You can omit anything enclosed in brackets ([ ]) in the Syntax of each command.

Command	Description
CellIf((Branch Condition)	Returns Expression 1 when the equality or inequality provided as the branch condition is true, and Expression 2 when it is false. **Input Key Operation:** F4(If) **Syntax:** CellIf(equality, expression 1, expression 2[)] or CellIf(inequality, expression 1, expression 2[)] **Example:** =CellIf(A1>B1, A1, B1) Returns the value of A1 when {Cell A1 value} > {Cell B1 value}. Otherwise, returns the value of B1.
CellMin((Cell Minimum Value)	Returns the minimum value in a specified range of cells. **Input Key Operation:** F5(CEL)F1(Min) **Syntax:** CellMin(start cell:end cell[)] **Example:** =CellMin(A3:C5) Returns the minimum value of the data in cell range A3:C5.
CellMax((Cell Maximum Value)	Returns the maximum value in a specified range of cells. **Input Key Operation:** F5(CEL)F2(Max) **Syntax:** CellMax(start cell:end cell[)] **Example:** =CellMax(A3:C5) Returns the maximum value of the data in cell range A3:C5.

Command	Description
CellMean((Mean of Cells)	Returns the mean value in a specified range of cells. **Input Key Operation:** [F5] (CEL) [F3] (Mean) **Syntax:** CellMean(start cell:end cell[)] **Example:** =CellMean(A3:C5) Returns the mean value of the data in cell range A3:C5.
CellMedian((Median of Cells)	Returns the median value in a specified range of cells. **Input Key Operation:** [F5] (CEL) [F4] (Med) **Syntax:** CellMedian(start cell:end cell[)] **Example:** =CellMedian(A3:C5) Returns the median value of the data in cell range A3:C5.
CellSum((Sum of Cells)	Returns the sum of the data in a specified range of cells. **Input Key Operation:** [F5] (CEL) [F5] (Sum) **Syntax:** CellSum(start cell:end cell[)] **Example:** =Cellsum(A3:C5) Returns the sum of the data in cell range A3:C5.
CellProd((Product of Cells)	Returns the product of the data in a specified range of cells. **Input Key Operation:** [F5] (CEL) [F6] (Prod) **Syntax:** CellProd(start cell:end cell[)] **Example:** =CellProd(B3:B5) Returns the product of the data in cell range B3:B5.

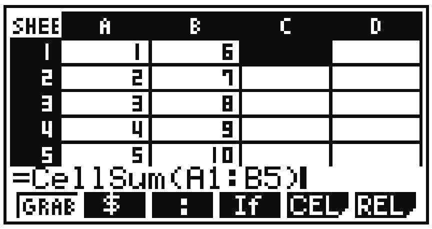
■ S • SHT Mode Command Example

This example inputs the special **S • SHT** mode formula CellSum(into cell C1 in order to calculate the sum of all the data in cell range A1:B5. It is assumed that there is already data in the cell range A1:B5.

1. Move the cell cursor to cell C1 and then perform the following operation.

   [SHIFT] [.] (=) [F5] (CEL) [F5] (Sum)

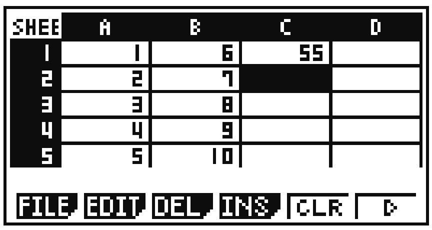
   [EXIT] [ALPHA] [X,θ,T] (A) [1] [F3] (:) [ALPHA] [log] (B) [5] [)]



   - You can perform the following operation, which uses the GRAB function (page 9-10) and CLIP function (page 9-6) in place of the underlined part in the above operation.

   [EXIT] [F1] (GRAB) [F4] (TOP←) (Enters the GRAB mode and moves the cursor to A1.)
   [SHIFT] [8] (CLIP) [▶] [▼] [▼] [▼] [▼] (Specifies the selection range for the CLIP function.)
   [EXE] [)]

2. Press [EXE] to finalize input of the formula.



4. Drawing Statistical Graphs, and Performing Statistical and Regression Calculations

When you want to check the correlation between two sets of data (such as temperature and the price of some product), trends become easier to spot if you draw a graph that uses one set of data as the x-axis and the other set of data as the y-axis.

With the spreadsheet you can input the values for each set of data and draw a scatter plot or other types of graphs. Performing regression calculations on the data will produce a regression formula and correlation coefficient, and you can overlay a regression graph over the scatter plot.

S•SHT mode graphing, statistical calculations, and regression calculations use the same functions as the **STAT** mode. The following shows an operation example that is unique to the **S•SHT** mode.

■ Example of Statistical Graph Operations (GRPH Menu)

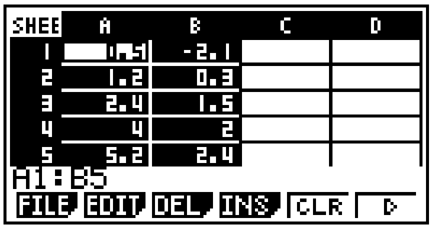
Input the following data and draw a statistical graph (scatter plot in this example).

0.5, 1.2, 2.4, 4.0, 5.2 (x-axis data)

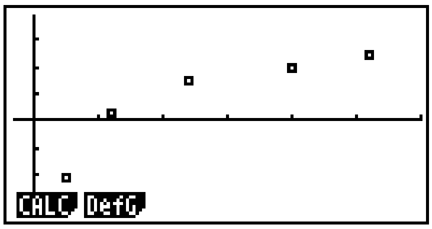
–2.1, 0.3, 1.5, 2.0, 2.4 (y-axis data)

• To input data and draw a statistical graph (scatter plot)

1. Input the statistical calculation data into the spreadsheet.
   - Here we will input the x-axis data into column A, and the y-axis data into column B.
2. Select the range of cells you want to graph (A1:B5).



3. Press F6(▷)F1(GRPH) to display the GRPH menu, and then press F1(GRPH1).
   - This will produce a scatter plot of the data in the range of cells you selected in step 2 of this procedure.
   - The graph shown here is what is produced under initial default **S•SHT** mode settings. You can change the configuration of graph settings on the screen that appears when you press F6(SET) on the GRPH menu. For details see “General Graph Settings Screen Operations” below.

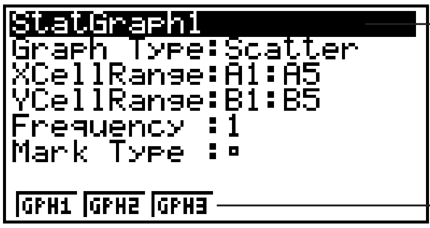


■ General Graph Settings Screen Operations

You can use the general graph setting screen to specify the range of data to be used for graphing, and to select the type of graph to be drawn.

• To configure statistical graph settings

1. Input the statistical calculation data into the spreadsheet and then select the range of cells you want to graph.
   - Actually, the above step is not necessary at this point. You also could configure settings first before inputting data and selecting the range of cells to be graphed.
2. Press F6(▷)F1(GRPH)F6(SET).
   - This will display the general graph settings screen (StatGraph1 in this example).



You can configure the setting for the item that is highlighted on the screen.

A function menu will appear when certain setting items are selected.

   - The number of columns you select in step 1 will determine what information is input automatically on the general graph settings screen.

If you select this number of columns:	This information will be input automatically:
1	XCellRange
2	XCellRange, YCellRange
3	XCellRange, YCellRange, Frequency

   - The following describes each of the setting items for this screen.

Item	Description
StatGraph1	Select the name of the setup you want. You can have up to three different setups registered, named StatGraph 1, 2, or 3.
Graph Type	Select the graph type. The initial default setting is Scat (scatter plot).
XCellRange	Specifies the cell range assigned to the graph x-axis (XCellRange). Only XCellRange is displayed for some Graph Types.
YCellRange	Specifies the cell range assigned to the graph y-axis (YCellRange). The YCellRange is not displayed for some Graph Types.
Frequency	Specifies the range cells that contain values indicating the frequency of each graph data item. Select F1(1) if you do not want to use frequency values.
Mark Type	Specify the type of mark (□, ×, or •) to use as the mark on the scatter plot.

3. Use ▲ and ▼ to move the highlighting to the setting item you want to change. On the function menu that appears, select the setting you want.
   - For details about the StatGraph1, Graph Type, and Mark Type settings, see “To display the general graph settings screen” (page 6-2).

- If you want to change the XCellRange, YCellRange, or Frequency setting, move the highlighting to the item you want to change and then input the cell range directly, or select F1(CELL) (F2(CELL) for Frequency) and then edit the currently input range. When inputting a cell range manually, use F1(:) to enter a colon (:) between two cells that define the range.

4. After configuring the required settings, press EXIT or EXE.

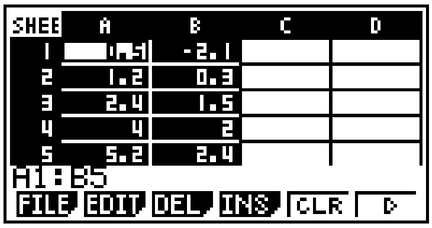
■ Example of Statistical Calculation Operation (CALC Menu)

This example uses the data from the “Drawing a Scatter Diagram and xy Line Graph” (page 6-10) to perform paired-variable statistical calculations.

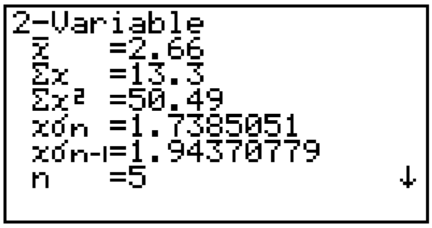
0.5,	1.2,	2.4,	4.0,	5.2	(x-data)
–2.1,	0.3,	1.5,	2.0,	2.4	(y-data)

• To perform paired-variable statistical calculations and regression calculations

1. Input the above x-data into cells A1:A5 of the spreadsheet and the y-data into cells B1:B5, and then select the range of the cells where you input the data (A1:B5).



2. Press F6(▷)F2(CALC) to display the CALC menu, and then press F2(2VAR).
   - This will display a screen of paired variable calculation results based on the data you selected in step 1. Use ▶ and ◀ to scroll the result screen. To close the screen, press EXIT.
   - For information about the meaning of each of the values on the result screen, see “Displaying the Calculation Results of a Drawn Paired-Variable Graph” on page 6-15.



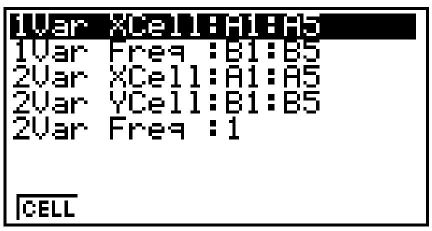
3. To return to the spreadsheet screen, press EXIT.

■ Using the Statistical Calculation Data Range Specification Screen

You can use a special setting screen to specify the range of data to be used for statistical calculation.

• To specify the data range for statistical calculation

1. Input the statistical calculation data into the spreadsheet and then select its range of cells.
2. Press F6(▷)F2(CALC)F6(SET).
   - This will display a setting screen like the one shown to the right.



- The number of columns you select in step 1 will determine what information is input automatically on the statistical calculation data range specification screen.

If you select this number of columns:	This information will be input automatically:
1	1Var XCell and 2Var XCell
2	1Var Freq and 2Var YCell
3	2Var Freq

- The following describes each of the setting items for this screen.

Item	Description
1Var XCell 1Var Freq	The cell range data specified here is used for variable x and Frequency values when performing single-variable statistical calculations.
2Var XCell 2Var YCell 2Var Freq	The cell range data specified here is used for variable x, variable y, and Frequency values when performing paired-variable statistical calculations.

3. If you want to change the cell range, use ⏶ and ⏷ to move the highlighting to the item you want to change and the input the new cell range.
   - To input the colon (:), press F1(:).
   - To edit the currently input cell range, press F1(CELL) (in the case of 1Var XCell, 2Var XCell, and 2Var YCell) or F2(CELL) (in the case of 1Var Freq and 2Var Freq).
4. After configuring the required settings, press EXIT or EXE.

■ STAT Mode and S • SHT Mode Function Menu Correspondence Table

In both the **STAT** mode and the **S • SHT** mode, statistical graph functions are on the GRPH function menu and statistical/regression calculation functions are on the CALC function menu. The structures of these menus and their submenus are the same in the **STAT** mode and the **S • SHT** mode. For details about each menu item, refer to the pages referenced in the table below.

For information about this menu item:	Refer to:
{GRPH} - {GPH1}	"Changing Graph Parameters" (page 6-1)
{GRPH} - {GPH2}	
{GRPH} - {GPH3}	
{GRPH} - {SEL}	"Graph draw/non-draw status" (page 6-3)
{GRPH} - {SET}	"Changing Graph Parameters" (page 6-1) "General graph settings"(page 6-1) "To display the general graph settings screen"(page 6-2) "General Graph Settings Screen Operations" (page 9-17)
{CALC} - {1VAR}	"Single-Variable Statistical Calculations" (page 6-16)

For information about this menu item:	Refer to:
{CALC} - {2VAR}	“Paired-Variable Statistical Calculations” (page 6-16)
{CALC} - {REG}	“Regression Calculation” (page 6-17)
{CALC} - {SET}	“Using the Statistical Calculation Data Range Specification Screen” (page 9-19)

5. S•SHT Mode Memory

You can use the calculator’s different types of memory (variables, list memory, file memory, matrix memory, vector memory) to store data, and recall data from a memory into the spreadsheet.

■ Saving Spreadsheet Data to a Memory

The following table shows an overview of the store operations for each type of memory. For details about each operation, see the example operations following the table.

Memory Type	Store Operation
Variables (A ~ Z, r, θ)	You can assign the content of a single cell to a variable. While a single cell is selected, press F6(▷)F3(STO)F1(VAR), and then specify the variable name on the screen that appears.
List Memory (List 1 ~ List 26)	You can store data in a range of cells in a single row or a single column in list memory. While a range of cells in a single row or single column is selected, press F6(▷)F3(STO)F2(LIST), and then specify the list number on the screen that appears.
File Memory (File 1 to File 6)	You can store data in a range of cells that spans a multiple rows and columns in file memory. While a range of cells is selected, press F6(▷)F3(STO)F3(FILE), and then specify the file number on the screen that appears. The first column of the selected range is stored in the specified file as List 1, the second column is saved as List 2, and so on.
Matrix Memory (Mat A ~ Mat Z)	You can store data in a range of cells that spans a multiple rows and columns in matrix memory. While a range of cells is selected, press F6(▷)F3(STO)F4(MAT), and then specify the matrix name on the screen that appears. The first column of the selected range is stored in the specified matrix as List 1, the second column is saved as List 2, and so on.
Vector Memory (Vct A ~ Vct Z)	You can store data in a range of cells in one row or one column in vector memory. While a range of cells in a single row or single column is selected, press F6(▷)F3(STO)F5(VCT), and then specify the vector name on the screen that appears.

Important!

The following describes what happens if you try to store data in memory when a cell does not contain any data, when a cell contains text, or when ERROR is displayed for a cell.

- If you are assigning data to a variable, an error occurs.
- If you are storing data in list memory, file memory, matrix memory, or vector memory, 0 is written into the applicable cell(s).

• Example: To store column data in list memory

1. In a single column, select the range of cells you want to store in list memory.
   - For example, you could select A1:A10.
2. Press [F6](▷)[F3](STO)[F2](LIST).
   - This will display a screen like the one shown to the right. The "Cell Range" setting will show the range of cells you selected in step 1.

3. Press [▼] to move the highlighting to "List[1-26]".
4. Input the List number (1 to 26) of the list memory where you want to store the data and then press [EXE].
   - Performing the next step will overwrite any data currently stored under the list memory number you specified here with the data in the range of cells specified by "CellRange".
5. Press [F6](EXE) or the [EXE] key to store the data.

■ Recalling Data from Memory to a Spreadsheet

The following table shows an overview of the recall operations for each type of memory. For details about each operation, see the example operations following the table.

Memory Type	Recall Operation
List Memory (List 1 ~ List 26)	You can recall data from a specified list memory to a range of cells in a single row or a single column. While the first cell of the range in a single row or single column is selected, press [F6](▷)[F4](RCL)[F1](LIST), and then specify the list number on the screen that appears. Whether the data is recalled in a column direction or row direction depends on the Setup screen's "Move" setting (page 1-34).
File Memory (File 1 ~ File 6)	You can recall data from a specified file memory to the spreadsheet. Select the cell you want to be the upper left corner of the recalled data and then press [F6](▷)[F4](RCL)[F2](FILE). Next, specify the file memory number on the screen that appears.
Matrix Memory (Mat A ~ Mat Z)	You can recall data from a specified matrix memory to the spreadsheet. Select the cell you want to be the upper left corner of the recalled data and then press [F6](▷)[F4](RCL)[F3](MAT). Next, specify the matrix name on the screen that appears.

Memory Type	Recall Operation
Vector Memory (Vct A ~ Vct Z)	You can recall data from a specified vector memory to a range of cells in a single row or a single column. While the first cell of the range in a single row or single column is selected, press F6(▷) F4(RCL) F4(VCT), and then specify the vector name on the screen that appears.

• Example: To recall data from a matrix memory to a spreadsheet

1. On the spreadsheet, select the upper left cell of the range where you want the recalled data to be input.
2. Press F6(▷) F4(RCL) F3(MAT).
   - This will display a screen like the one shown to the right. The "1st Cell" setting will show the name of the cell you selected in step 1.

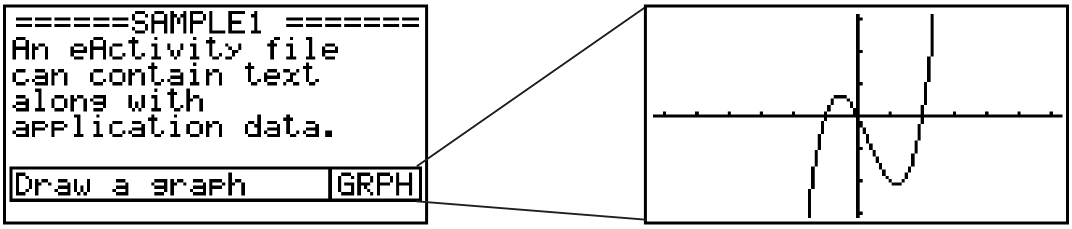
3. Input the name (A to Z) of the matrix memory whose data you want to recall and then press EXE.
4. Press F6(EXE) or EXE to recall the data.

Important!

When recalling list memory, file memory, matrix memory, or vector memory data, an error will occur if the recalled data runs outside the allowable range of the spreadsheet (A1:Z999).

Chapter 10 eActivity

You can use the **e • ACT** mode to input data into an eActivity file. You can input text and numeric expressions, and also paste data (like graphs, tables, etc.) from the calculator's built-in applications as "strips".



eActivity files can be used by a teacher, for example, to create math problems or exercises that provide hints to solutions, for distribution to students. Students can use eActivity files to keep classroom notes, memos of problems and their solutions, etc.

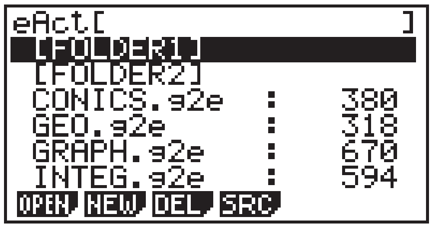
Important!

• The fx-7400GIII is not equipped with the **e • ACT** mode.

1. eActivity Overview

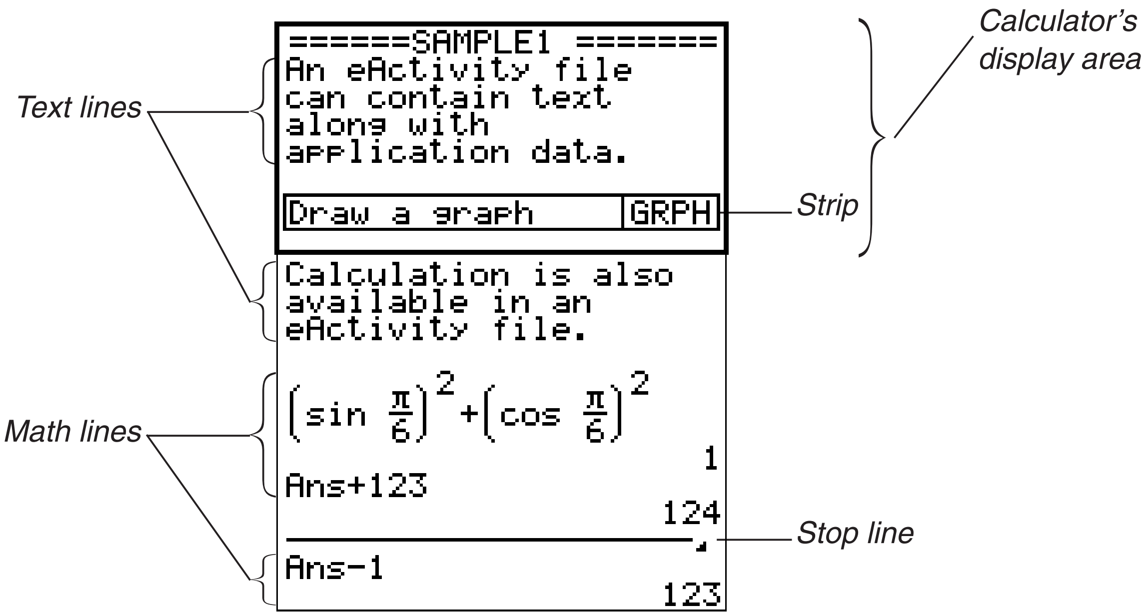
The first thing that appears when you select the **e • ACT** mode on the Main Menu is the file menu.

No **e • ACT** mode files in memory



At least one **e • ACT** mode file in

Opening a file in the **e • ACT** mode will display a workspace screen that you can use for inputting and editing text, calculation expressions, and other data.



The following explains the type of data you can input and edit in an eActivity file.

Text line ....A text line can be used to input characters, numbers, and expressions as text.

Calculation line......Use the calculation line to enter an executable calculation formula. The result will appear in the following line. Calculations are performed the same way as they are performed in the **RUN • MAT** mode, while natural input is enabled.

Stop line ....A stop line can be used to stop calculation at a particular point.

Strip.......................A strip can be used to embed data into an eActivity from the Graph, Conics Graph, Spreadsheet, or other built-in applications.

2. eActivity Function Menus

■ File List Function Menu

- {**OPEN**} ... Opens an eActivity file or folder.
- {**NEW**} ... Creates a new eActivity file.
- {**DEL**} ... Deletes an eActivity file.
- {**SRC**} ... Searches for an eActivity file.

- Only the F2 (NEW) function key is are displayed when there are no eActivity files in memory.
- At least 128 kbytes of memory area is required when the **e • ACT** mode is used for the first time. A Memory Full error will appear if there is not enough memory available.

■ Workspace Screen Function Menu

Part of the content of the workspace function menu depends on the line (or strip) that is currently selected.

- **Workspace Screen Common Menu Items**
- {**FILE**} ... Displays the following file operation submenu.
  - {**SAVE**} ... Saves the file currently being edited.
  - {**SV • AS**} ... Saves the file currently being edited under another name.
  - {**OPT**} ... See “Optimizing the Storage Memory” on page 11-11.
  - {**CAPA**} ... Displays a screen showing the data size of the file being edited and how much memory capacity remains.
- {**STRP**} ... Inserts a strip.
- {**JUMP**} ... Displays the following submenu to control cursor movement.
  - {**TOP**}/{**BTM**}/{**PgUp**}/{**PgDn**} ... See page 10-4.
- {**DEL-L**} ... Deletes the line that is currently selected or where the cursor is located.
- {**INS**} ... Displays the following insert submenu, for inserting a new line above the line that is currently selected or where the cursor is located.
  - {**TEXT**} ... Inserts a text line.
  - {**CALC**} ... Inserts a calculation line.
  - {**STOP**} ... Inserts a calculation stop line.

- {►**MAT**} ... Displays the Matrix Editor (page 10-7)/Vector Editor (page 10-7).
- {►**LIST**} ... Displays the List Editor (page 10-7).

- **Menu when a Text Line is Selected**
- {**TEXT**} ... Changes the current line from a text line to a calculation line.
- {**CHAR**} ... Displays a menu for inputting math symbols, special symbols, and characters of various languages.
- {**A↔a**} ... Toggles between uppercase and lowercase input while alpha character input is enabled (by pressing the [ALPHA] key).
- {**MATH**} ... Displays the MATH menu (page 1-13).

- **Menu when a Calculation Line or Stop Line is Selected**
- {**CALC**} ... Changes the current line from a calculation line to a text line.
- {**MATH**} ... Same as {MATH} under “Menu when a Text Line is Selected”.

- **Menu when a Strip is Selected**
- {**FILE**} ... Displays the following file operation submenu.
  - {**SAVE**}/{**SV • AS**}/{**OPT**}/{**CAPA**} ... Same as the {FILE} submenus under “Workspace Screen Common Menu Items”.
  - {**SIZE**} ... Displays the size of the strip at the current cursor position.
- {**CHAR**} ... Same as {CHAR} under “Menu when a Text Line is Selected”.
- {**A↔a**} ... Same as {A↔a} under “Menu when a Text Line is Selected”.

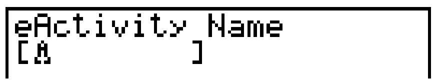
3. eActivity File Operations

This section explains the different file operations you can perform from the eActivity file menu screen. All of the operations in this section can be performed while the file menu is displayed.

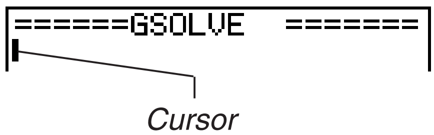
This section does not cover folder operations. For details about folders, see “Chapter 11 Memory Manager”.

• To create a new file

1. While the file menu is displayed, press [F2] (NEW).
   - This will display a file name input screen.



2. Input up to 8 characters for the file name and then press [EXE].
   - This displays a blank workspace screen.



   - The following are the characters allowed in a file name.

     A to Z, {, }, ’, ˜, 0 to 9

• To open a file

Use ▲ and ▼ to highlight the file you want to open, and then press F1(OPEN) or EXE*.

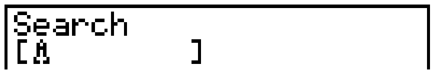
* If an error occurs, delete capture memory and clipboard data, or transfer the data to your computer.

• To delete a file

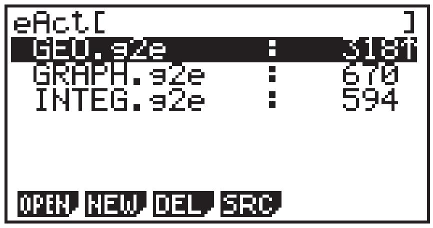
1. Use ▲ and ▼ to highlight the file you want to delete, and then press F3(DEL).
   - This will display a "Delete eActivity?" confirmation message.
2. Press F1(Yes) to delete the file or F6(No) to cancel without deleting anything.

• To search for a file

1. While the file menu is displayed, press F4(SRC).
   - This will display a file search screen.



2. Enter part or the entire name of the file you want to find.
   - File name characters are searched from left to right. Entering "IT" will count names like ITXX, ITABC, IT123 as hits, but not names like XXIT or ABITC.
3. Press EXE.
   - If a name matches the text you input in step 2, it will be selected on the file menu.



   - The message "Not Found" will appear if a match cannot be found. Press the EXIT key to close the message dialog box.

4. Inputting and Editing Data

All of the operations in this section are performed on the eActivity workspace screen. Use the procedures under "eActivity File Operations" (page 10-3) to create a new file or to open an existing file.

■ Cursor Movement and Scroll Operations

When you want to do this:	Use this key operation:
Move the cursor forward and back	▲ or ▼
Scroll one screen forward	SHIFT ▲ or F6(▷) F1(JUMP) F3(PgUp)
Scroll one screen back	SHIFT ▼ or F6(▷) F1(JUMP) F4(PgDn)
Move the cursor to the beginning of the workspace screen	F6(▷) F1(JUMP) F1(TOP)
Move the cursor to the end of the workspace screen	F6(▷) F1(JUMP) F2(BTM)

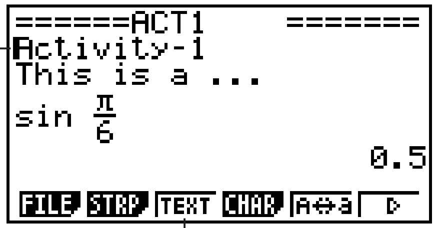
Inputting into a Text Line

Use a text line to input alphanumeric characters, expressions, etc.

• Inputting characters and expressions as text

1. Move the cursor to a text line.
   - While the cursor is in a text line, "TEXT" will be displayed for the F3 function menu item. This indicates that text input is enabled.

Text line cursor



[F3] key menu becomes "TEXT".

   - "CALC" will be displayed for the F3 function menu item if the cursor is located in a calculation line. Pressing [F3](CALC) will change the calculation line to a text line.
   - If the cursor is located in a strip, use ⏶ and ⏷ to move to the cursor to a text line.
   - On the function menu, selecting {INS} and then {TEXT} will insert a new text line above the line where the cursor is currently located.
2. Input the text or expression you want into the text strip.
   - See "Text Line Input and Editing Operations" described below.

• Text Line Input and Editing Operations

- You can input up to 255 bytes of text into a single text line. Text in the text line wraps automatically to fit inside the display area (Word Wrap Function). Note, however, that numeric expressions and commands do not wrap.*[1] Scroll arrows (◀▶) will appear on the left and right sides of the calculation line to let you know some of the calculation does not fit within the calculation line display area. In this case, you can use the left and right cursor keys to scroll the calculation.
- The [F5](A↔a) function key toggles between upper-case and lower-case input. This function is available only while alpha text input is enabled. See page 2-8 for details. The text line cursor is A while upper-case input is selected, and a during lower-case input.
- Press [EXE] to input a carriage return into text. No symbol will be displayed for a carriage return.
- If the text is wrapped into multiple lines, pressing the [AC] key will delete the line where the cursor is currently located only. The part of the text that is wrapped to other lines will not be deleted.
- Always use natural input (page 1-12) to input an expression into a text line.

*[1] Also, any word that includes the symbol " ' ", " { " or " |▯ ", which are input using the menu that appears when you press [F4](CHAR), does not wrap.

■ Inputting into a Calculation Line

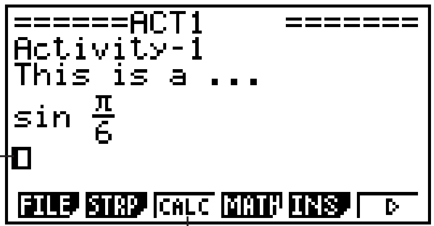
Inputting a calculation expression into an eActivity calculation line and pressing EXE will display the calculation result in the following line. Such a calculation line can be used in the same way as the **RUN • MAT** mode (page 1-3). A calculation line and its result make up one set.

- Note that the word wrap function does not apply in the case of math lines. Scroll arrows (◀ ▶) will appear on the left and right sides of the calculation line to let you know some of the calculation does not fit within the calculation line display area. In this case, you can use the left and right cursor keys to scroll the calculation.

• To input a calculation formula into an eActivity

1. Move the cursor to a calculation line.
   - While the cursor is in a calculation line, "CALC" will be displayed for the F3 function menu item. This indicates that calculation expression input is enabled.

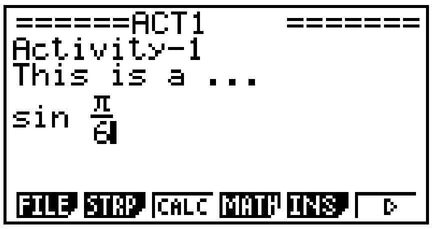
Math line cursor



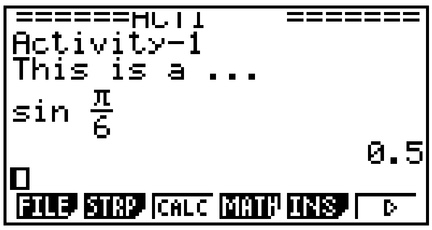
This will cause the F3 key menu to change to "CALC".

   - "TEXT" will be displayed for the F3 function menu item if the cursor is located in a text line. Pressing F3 (CALC) will change the calculation line to a text line.
   - If the cursor is located in a strip, use ▲ and ▼ to move to the cursor to a calculation line.
   - On the function menu, selecting {INS} and then {CALC} will insert a new calculation line above the line where the cursor is currently located.

2. Input a calculation expression (Example: sin ▭/▭ SHIFT ×10^x (π) ▼ 6).
   - Calculation line input and editing operations are the same as those in the natural input **RUN • MAT** mode.



3. To obtain the result of the calculation, press EXE.



• Matrix Calculations Using the Matrix Editor

Selecting {▶MAT} on the function menu displays the Matrix Editor.

Matrix Editor operations and matrix calculations in the **e • ACT** mode are the fundamentally identical to those in the **RUN • MAT** mode. For details about the Matrix Editor and matrix calculation operations, see "Matrix Calculations" (page 2-38). Note, however, that **e • ACT** mode Matrix Editor operations and matrix calculations differ from those in the **RUN • MAT** mode as described below.

- **e • ACT** mode matrix variable values are saved separately for each file. Matrix variable values will be different from those produced when called from a non-**e • ACT** mode.

• Vector Calculations Using the Vector Editor

Selecting {▶MAT} on the function menu displays the Vector Editor.

Vector Editor operations and vector calculations in the **e • ACT** mode are the fundamentally identical to those in the **RUN • MAT** mode. For details about the Vector Editor and vector calculation operations, see "Vector Calculations" (page 2-52). Note, however, that **e • ACT** mode Vector Editor operations and vector calculations differ from those in the **RUN • MAT** mode as described below.

- **e • ACT** mode vector memory is saved separately for each file. Vector memory will be different from those produced when called from a non-**e • ACT** mode.

• List Calculations Using the List Editor

Selecting {▶LIST} on the function menu displays the List Editor.

List Editor operations in the **e • ACT** mode are identical to those in the **STAT** mode ("Inputting and Editing a List", page 3-1). This processing and calculations are fundamentally the identical to those in the **RUN • MAT** mode ("Manipulating List Data" on page 3-5, "Arithmetic Calculations Using Lists" on page 3-10). Note, however, that **e • ACT** mode List Editor operations and list calculations differ from those in other modes as described below.

- The **e • ACT** mode List Editor function menu provides only screen two of the **STAT** mode List Editor function menu.
- To return to the workspace screen from the List Editor in the **e • ACT** mode, press EXIT.
- In the **e • ACT** mode, values for list variables are saved separately for each file. List variable values will be different from those produced when called from a non-**e • ACT** mode.

■ Inserting a Calculation Stop Line

Pressing EXE after you edit a calculation line on a workspace screen that contains multiple calculation lines will cause all of the calculations following the edited line to be re-calculated. Re-calculation can take quite a bit of time if there are a large number of calculation lines or if some of the calculations are complex. Inserting a calculation stop line will stop the re-calculation process at the point where the line is located.

• To insert a stop line

On the function menu, select {INS} and then {STOP} to insert a stop line above the currently selected line or strip.

■ Using Strips

Strips are tools that let you embed built-in application data into an eActivity file. Only one built-in application screen can be associated with each strip, and the strip can store the data (graphs, etc.) produced by the screen.

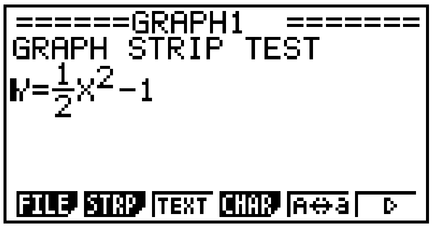
The table below shows the built-in application screens that can be inserted into strips. The "Strip Name" column shows the names included on the dialog box that appears when you press F2 (STRP).

Strip Data Type Table

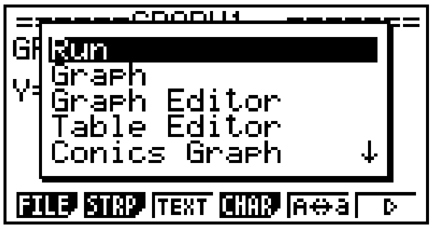
Data Type	Strip Name
RUN • MAT mode calculation data (When the **RUN • MAT** mode is called from an eActivity, it starts up in the natural input mode.)	Run (Math)
GRAPH mode graph screen data	Graph
GRAPH mode graph relation list screen data	Graph Editor
TABLE mode table relation list screen data	Table Editor
CONICS mode graph screen data	Conics Graph
CONICS mode function list screen data	Conics Editor
STAT mode statistical graph screen data	Stat Graph
STAT mode List Editor data	List Editor
EQUA mode calculation solution screen data	Solver
RECUR mode recursion type selection screen	Recur Editor
Notes screen data (Notes is a special eActivity application. See "Notes Strips" on page 10-10 for more information.)	Notes
RUN • MAT mode Matrix Editor data	Matrix Editor
RUN • MAT mode Vector Editor data	Vector Editor
EQUA mode simultaneous equation solution screen data	Simul Equation
EQUA mode high-order equation solution screen data	Poly Equation
DYNA mode graph screen data	Dynamic Graph
TVM mode calculation solution screen data	Financial
S • SHT mode spreadsheet screen data	Spreadsheet
E-CON3 mode setup wizard data	Econ SetupWizard
E-CON3 mode advanced setup data	Econ AdvancSetup
E-CON3 mode advanced setup data (Executing this strip starts sampling immediately based on the setup information that is recorded to the strip the first time the strip is executed.)	Econ Sampling
E-CON3 mode advanced setup data (Executing this strip graphs sampled data that is recorded to the strip the first time the strip is executed.)	Econ Graph

• To insert a strip

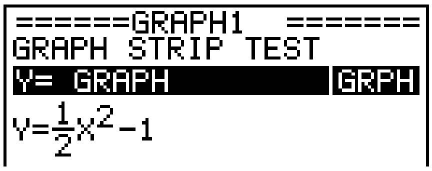
1. Move the cursor to the location where you want to insert the strip.



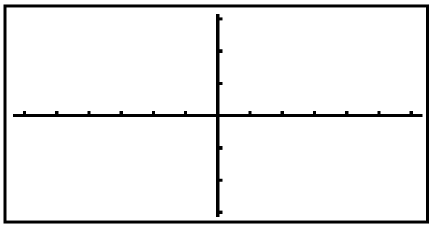
2. Press F2 (STRP).
   - This will display a dialog box with a list if insertable strips. For information about the display names and data types that appear on this dialog box, see the “Strip Data Type Table” (page 10-8).



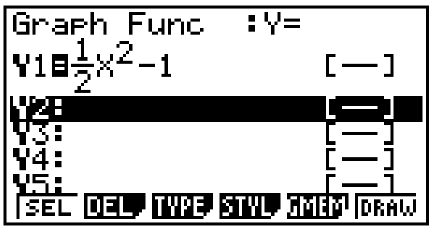
3. Use ⏷ and ⏶ to select the strip that corresponds to the type of data you want to insert.
   - In this example we will select “Graph” (**GRAPH** mode graph screen data).
4. Press EXE.
   - This will insert the type of strip you selected (Graph strip in this example) one line above the line where you located the cursor in step 1 of this procedure.
5. Input up to 16 characters for the strip title, and then press EXE.



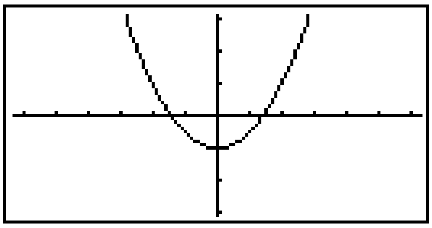
6. Press EXE again to start creating strip data.
   - This will start up the built in application for the selected strip type (**GRAPH** mode in this example), and display the graph screen. At this point, a blank graph screen appears because there is no data yet.



7. Press EXIT to display the graph function list screen.
8. Enter the function you want to graph.
   (Example: $Y = \frac{1}{2}X^2 - 1$)



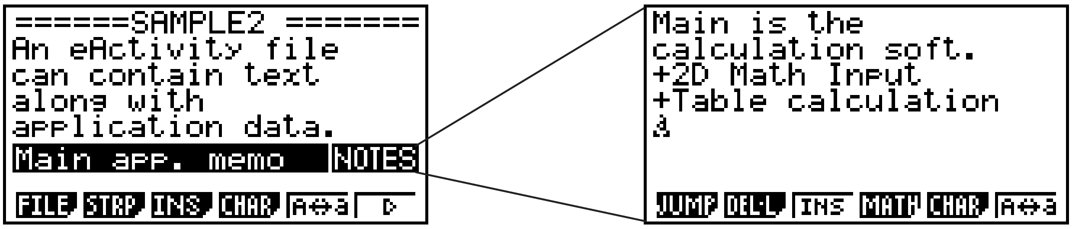
9. Press F6(DRAW).
   - This will graph the function you entered.



10. To return to the eActivity workspace screen, press SHIFT ➡( ).
    - The data that is graphed in step 8 will be saved in the Graph strip.
    - The saved graph data is linked to this Graph strip only. It is independent of data for modes that are entered from the Main Menu.
11. Pressing EXE here again will display the graph screen, and draw the graph based on the data saved by the strip.

• Notes Strips

"Notes" is a special eActivity text editor that comes in handy when you want to write long text explanations on the workspace screen. You can call up the Notes screen from a Notes strip on the workspace screen. Input and editing operations on the Notes screen are identical to those you use for an eActivity text line.



The following describes the Notes screen function menu items.

- {**JUMP**}... Displays a JUMP menu that you can use to jump to the top (F1(TOP)) of the data, the bottom (F2(BTM)) of the data, the previous page (F3(PgUp)), or the next page (F4(PgDn)).
- {**DEL-L**} ... Deletes the line that is currently selected or where the cursor is located.
- {**INS**} ... Inserts one new line above the line where the cursor is currently located.
- {**MATH**} ... Displays the MATH menu (page 1-13).
- {**CHAR**} ... Displays a menu for inputting math symbols, special symbols, and characters of various languages.
- {**A↔a**} ... Toggles between uppercase and lowercase input while alpha character input is enabled (by pressing the ALPHA key).

• To change the title of a strip

1. Use ▼ and ▲ to select the strip whose title you want to change.
2. Input up to 16 characters for the strip title, and then press EXE.
   - The remainder of the existing title will disappear as soon as you input the first character. Input the new title in its entirety. If you want to partially edit the existing title, press ◀ or ▶ first to move the cursor.
   - Pressing EXIT instead of EXE will exit trip title editing without changing anything.

- **To call an application from a strip**

Use ▼ and ▲ to select the strip whose application you want to call and then press EXE.

- This will display the application screen that corresponds to the selected strip. If the strip already contains data, the application is called using the data that was last saved.
- If you select a Conics Graph strip and press EXE without inputting any graph data, the Conics Editor screen appears in place of the Conics Graph screen.

- **To toggle between the eActivity workspace screen and an application screen called from a strip**

Press SHIFT →( ).

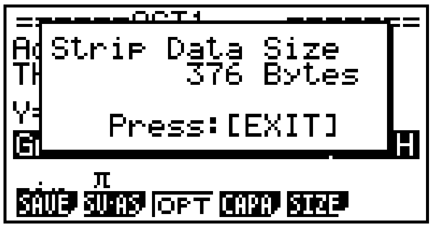
Each press of SHIFT →( ) toggles between the eActivity workspace screen and the application screen called from the strip.

- **To switch from an application screen called up from a strip to another application screen**

Press SHIFT ,( ). On the dialog box that appears, use ▼ and ▲ to select the name of an application and then press EXE.

- **To display the strip memory usage screen**

1. Use ▼ and ▲ to select the strip whose memory usage screen you want to view.
2. Press F1(FILE)F5(SIZE).
   - This will display the memory usage screen of the currently selected strip.



3. To exit the memory usage screen, press EXIT.

- **To delete a line or strip**

1. Move the cursor to the line or strip you want to delete.
   - If you move the cursor to a calculation line, note that both the calculation and the result will be deleted.
2. Press F6(▷)F2(DEL-L).
   - This causes a confirmation message to appear.
3. Press F1(Yes) to delete, or F6(No) to cancel without deleting anything.

■ Saving a File

Use the procedures in this section to save a file after inputting or editing it on the workspace screen.

An eActivity file for OS Version 2.0 or later may have a file name extension of “g2e”. Performing either of the following operations on a calculator model covered by this manual (with OS Version 2.0 or later operating system) to save an eActivity file always will cause the extension “g2e” to be appended to the file name.

- Saving a newly created file
- Saving an existing file using the “save as” operation (F1(FILE)F2(SV-AS))

If you save an eActivity file using a calculator model covered by this manual to save a file with a file name extension “g1e” (a file transferred from an older version calculator), the file name extension will be determined according to the following rules.

- The “g2e” extension is used for an eActivity file that includes data for new features (except for math functions and commands) added by OS Version 2.0 or later.
  Here, the expression “data for new features added by OS Version 2.0 or later” means, for example, calculation result data displayed in $\sqrt{\ }$ or π format.
- The “g1e” extension is used for eActivity files other than those described above.

• To replace the existing file with the new version

Press F1(FILE)F1(SAVE) to save the currently open file.

• To save a file under a new name

1. On the eActivity workspace screen, press F1(FILE)F2(SV-AS).
   - This will display a file name input screen.
2. Input up to 8 characters for the file name and then press EXE.
   - If a file already exists with the same file name you enter in step 2, a message will appear asking if you want to replace the existing file with the new one. Press F1(Yes) to replace the existing file, or F6(No) to cancel the save operation and return to the file name input dialog box in step 2.

Important!

- An eActivity file with the “g2e” file name extension cannot be opened on a calculator running an operating system older than OS Version 2.0.
- Opening an eActivity file with the “g1e” filename extension, inputting functions added with OS Version 2.0 or later, and then saving the file may cause the new save to retain the “g1e” file name extension. Though you will be able to open such a file on a calculator running an operating system older than OS Version 2.0 (since it has the “g1e” file name extension), you will not be able to use the math functions and commands added since OS Version 2.0.

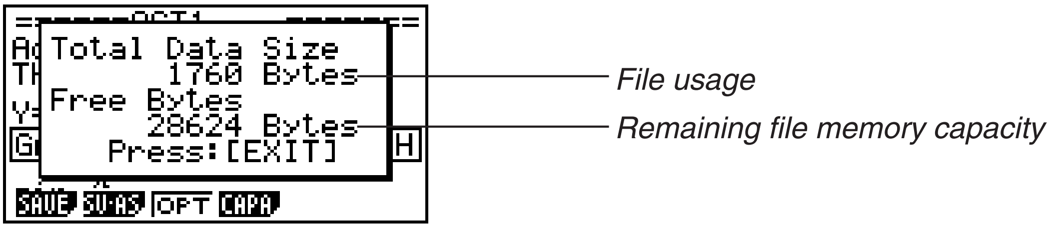
■ Displaying the eActivity Memory Usage Screen

The maximum size of an eActivity file is approximately 30,000 bytes.* You can use the eActivity file memory usage screen to check how much memory capacity remains for the file you are currently working on.

* Actual maximum file size depends on capture memory and clipboard memory usage, and may be less than 30,000 bytes.

• To display the eActivity memory usage screen

On the workspace screen, press F1(FILE)F4(CAPA).



To exit the memory usage screen, press EXIT.

• To return to the file list from the workspace screen

Press EXIT.

If a confirmation message appears asking if you want to save the current file appears, perform one of the operations described below.

To do this:	Press this key:
Overwrite the existing eActivity file with the edited version and return to the file list	F1(Yes)
Return to the file list without saving the file you are currently editing	F6(No)
Return to the eActivity workspace screen	AC

Chapter 11 Memory Manager

fx-7400GIII

This model supports the following data operations: data display, search, and delete.

Important!

The fx-7400GIII is not equipped with storage memory. Because of this, the storage memory operations described below are not supported.

fx-9860GIII/fx-9750GIII

These models are equipped with both a main memory and a storage memory, so the following data operations are supported: data display, search, and delete, as well as data copy between memories.

The main memory is a work area where you can input data, perform calculations, and run programs. Data in the main memory is relatively safe, but it can be deleted by batteries going dead or when you perform a full reset.

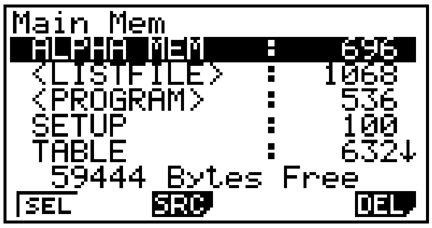
The storage memory uses "flash memory," so data is safe even when power is interrupted.

Normally, you should use the storage memory for data you need to store securely for long periods, loading data into the main memory only when you need it.

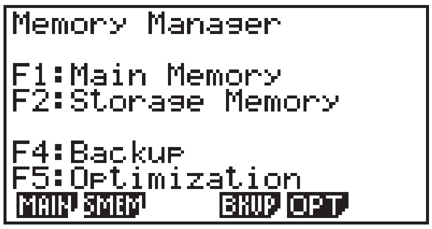
1. Using the Memory Manager

From the Main Menu, select the **MEMORY** icon to enter the **MEMORY** mode.

- On the fx-7400GIII, the main memory information screen shown to the right will appear. For information about using this screen, see "Memory Information Screen" (page 11-2).



- On the fx-9860GIII or fx-9750GIII, the screen shown to the right appears.

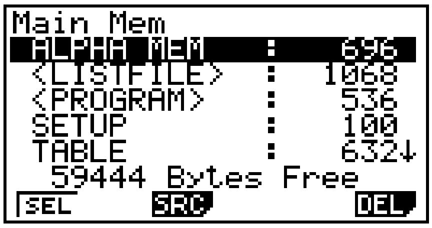


  - {**MAIN**} ... {displays main memory information}
  - {**SMEM**} ... {displays storage memory information}
  - {**BKUP**} ... {main memory backup}
  - {**OPT**} ... {storage memory optimization}

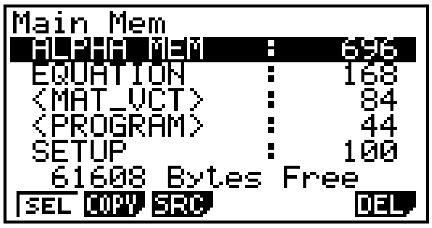
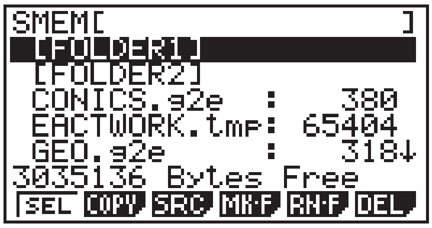
Memory Information Screen

The memory information screen shows information about one memory at a time: the calculator’s main memory or storage memory.

- Since the fx-7400GIII has only main memory, main memory contents only appear on the main memory information screen.



- With the fx-9860GIII or fx-9750GIII, perform one of the following **MEMORY** mode menu operations to display the memory information screen you want.

When this memory information screen is displayed:	**Press this key:**
Main memory	F1(MAIN) 
Storage memory	F2(SMEM) 

- Use the cursor ▲ and ▼ keys to move the highlighting and check the number of bytes used by each type of data.
- Line 7 shows how many bytes of memory are currently unused in the currently selected memory (main or storage).
- On the main memory screen, < > indicates a data group. On the storage memory screen, [ ] indicates folders.
- If the name of a file transferred to storage memory from your computer or other source has a file name that is more than eight characters long, its name will abbreviated to eight characters when displayed on the storage memory information screen (Example: AAAABBBBCC.txt > AAAABB~1.txt). Also, if a file name extension has more than three characters, everything after the third character of the file name extension will be trimmed off.
- When storage memory folder contents are displayed, the applicable path will be shown in brackets ([ ]) in the top line.

Moving the highlighting to a data group or folder and pressing EXE will display the data group or folder contents. Pressing EXIT will return to the previous screen.

The following data can be checked.

Main Memory

Data Name	Contents
ALPHA MEM	Alpha letter variables
<CAPTURE>	Capture memory group
CAPT n (n = 1 to 20)	Capture memory
CONICS*	Conics setting data
DYNA MEM*	Dynamic Graph memory
EQUATION	Equation data
FINANCIAL*	Financial data
<F-MEM>	Function memory group
F-MEM n (n = 1 to 20)	Function memory
<G-MEM>	Graph memory group
G-MEM n (n = 1 to 20)	Graph memory
<LISTFILE>	List file group
LIST n (n = 1 to 26, and Ans)	List memory contents
LIST FILE n (n = 1 to 6)	List file
<MAT_VCT>*	Matrix/Vector group
MAT n (n = A to Z, and Ans)*	Matrix
VCT n (n = A to Z, and Ans)*	Vector
<PICTURE>	Picture memory group
PICT n (n = 1 to 20)	Picture memory
<PROGRAM>	Program group
Each program name	Programs
RECURSION*	Recursion data
SETUP	Setup data
STAT	Stat result data
<STRING>	String memory group
STR n (n = 1 to 20)	String memory
SYSTEM	OS and data shared by applications (clipboard, replay, history, etc.)
<S-SHEET>*	Spreadsheet group
Each spreadsheet name*	Spreadsheet data
Each add-in application name*	Application-specific data
TABLE	Table data
<V-WIN>	V-Window memory group
V-WIN n (n = 1 to 6)	V-Window memory
Y=DATA	Graph expression

* Not included on the fx-7400GIII.

Storage Memory[*1]

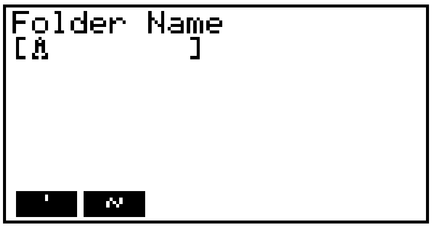
Data Name	Contents
*.g1m or .g2m file names	Data items listed in the Main Memory table that has been copied to storage memory. The names of these files have the extension ".g1m" or ".g2m".
eActivity data names	eActivity data stored in storage memory.
Add-in software names (Applications, languages, menus)	Add-in applications, add-in languages, and add-in menus stored in storage memory.
Folder names	Enclosed in square brackets ([ ]).
*.py file names	Python script files (py files). File names have the extension ".py" appended.
Unknown	Area that is unusable due to writing error, etc.

[*1] "No Data" is displayed when there is no data in storage memory.

■ Creating a Folder in Storage Memory

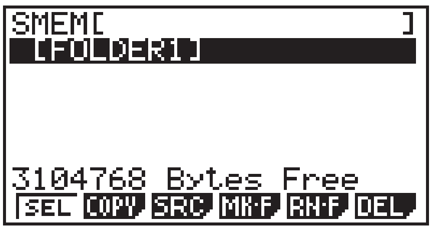
• To create a new folder

1. While storage memory data is on the display, press F4(MK • F) to display the folder name input screen.
2. Input up to eight characters for the name you want to give to the folder.



   - Only the following characters are supported: A through Z, {, }, ', ~, 0 through 9

     Inputting any invalid character will cause an "Invalid Name" error.
   - An "Invalid Name" also occurs if the name you input is already being used by an existing file.
   - To cancel folder creation, press EXIT.
3. Press EXE to create the folder and return to the storage memory information screen.



- This calculator supports nesting of folders up to three levels only.
- Though you can create folders on your computer nested to more than three levels in storage memory, this calculator will display only up to the third level. In this case you will be able to see folders stored in a level three folder, but you will not be able to open them.
- Selecting a folder stored in a level three folder and then performing the delete operation (page 11-8) will delete the selected (level 4) folder and everything inside it.

• To rename a folder

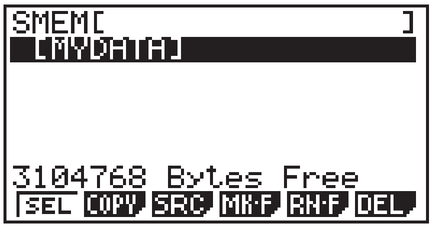
1. On the storage memory information screen, select the folder you want to rename.
2. Press F5(RN • F) to display the rename folder screen.
3. Input up to eight characters for the name you want to give to the folder.

• Only the following characters are supported: A through Z, {, }, ’, ~, 0 through 9
Inputting any invalid character will cause an “Invalid Name” error.

• An “Invalid Name” also occurs if the name you input is already being used by an existing file.

• To cancel folder creation, press EXIT.

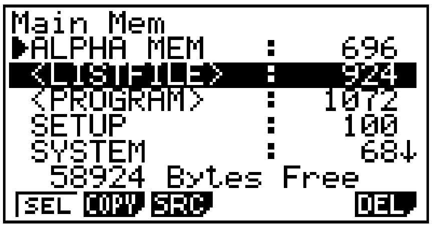
4. Press EXE to rename the folder and return to the storage memory information screen.



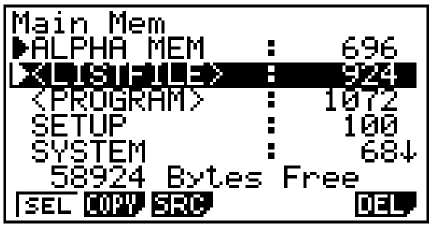
■ Selecting Data

• Press F1(SEL) to select the currently highlighted item, which is indicated by the black selection pointer (▶) appearing next to it. Pressing F1(SEL) again will deselect the item, causing the selection pointer to disappear.

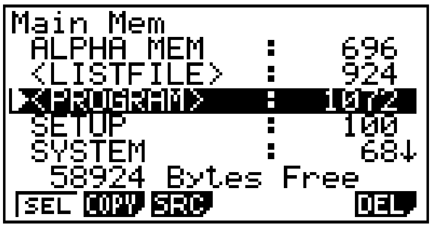
• You can select multiple files, if you want.



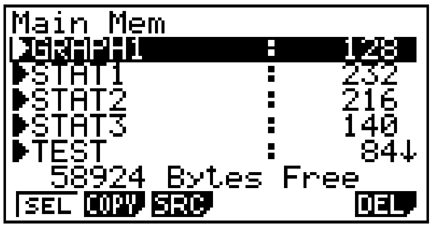
→
F1(SEL)
←



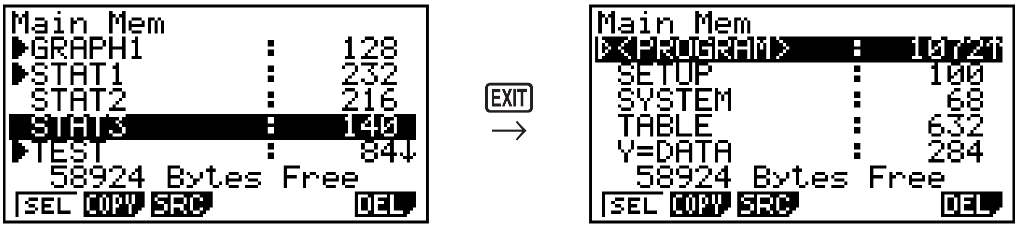
• Selecting a group or folder also selects everything inside of it. Deselecting a group or folder deselects all of its contents.



EXE
→



• If you select one or more individual items inside of a data group or folder, the black selection pointer (▶) appears next to each item, while a white selection pointer (▷) appears next to the group or folder name.



• Returning to the **MEMORY** mode initial screen deselects all currently selected items.

■ Copying Data

Important!

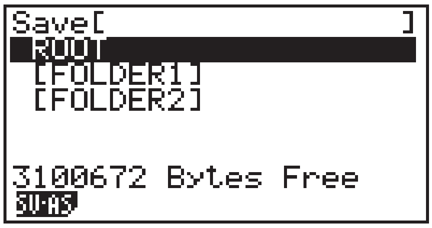
• Data copy is not supported on the fx-7400GIII.

• To copy from main memory to storage memory

Note

• The following procedure saves the selected data into a single file. You assign a name to the file, which is stored in storage memory.

1. On the main memory data information screen, select the data you want to copy.
2. Press F2(COPY).
   • This displays the folder selection screen.



3. Specify the folder you want.
   • Highlight ROOT to copy the data to the root directory.
   • To copy the data to a specific folder, use ▲ and ▼ to move the highlighting to the desired folder and then press F1(OPEN).
4. Press F1(SV • AS).
   • This displays the file name input screen.
5. Input the file name you want to give to the file.
   • To cancel the copy operation, press EXIT.
6. Press EXE to copy the data.
   • The message “Complete!” appears when the copy operation is complete.
   • The file name input screen does not appear when you copy data from storage memory to main memory.

• Error Checks During Data Copy

The following error checks are performed while a data copy operation is being executed.

Low battery check

The calculator performs low battery check before starting the data copy operation. If the battery is at Level 1, a low battery error occurs and the copy operation is not performed.

Available memory check

The calculator checks to see if there is enough free memory available to store the copied data.

A “Memory Full” error occurs if there is not enough memory available.

A “Too Much Data” error occurs when the number of data items is too great.

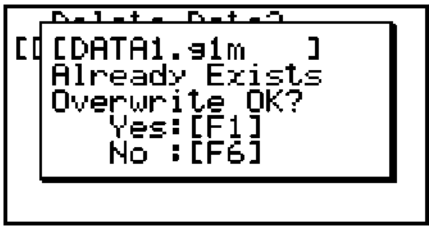
A “Fragmentation ERROR” occurs when there is enough free memory available, but a garbage collection operation is required.

If a “Fragmentation ERROR” occurs, perform the optimization procedure (page 11-11).

Overwrite check

The calculator checks to see if there is any existing data at the copy destination with the same name as the data being copied.

An overwrite confirmation message appears if there is data with the same name.



- F1 (Yes) ... overwrites the existing data with the new data
- F6 (No) ... advances to the next data item without copying the data with the same name

• Pressing AC will cancel the copy operation and return to the **MEMORY** mode initial screen.

Overwrite check is performed for the following types of data only. All other types of data are copied, without checking for data files with the same name.

- Programs
- Matrices/Vectors
- List files
- Graph memories
- Dynamic Graph memories
- Spreadsheet data

Overwrite check is performed for data of the same type only. If different types of data have the same name, the copy operation is performed without regard to the data with the same name.

Overwrite check applies only to the destination of the copy operation.

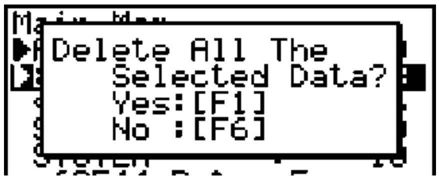
Type mismatch error check

eActivity data, add-in applications, add-in languages, add-in menus, and backup data cannot be copied to main memory. Attempting to do so will cause a type mismatch error.

Deleting Files

• To delete a main memory file

1. Display the main memory information screen.
   - See “Memory Information Screen” on page 11-2.
2. Select the file(s) you want to delete. You can select multiple files, if you want.
3. Press F6(DEL).
   - Press F1(Yes) to delete the file.
   - Press F6(No) to cancel the delete operation.



• To delete a storage memory file

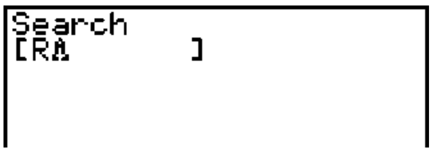
1. Display the storage memory information screen.
   - See “Memory Information Screen” on page 11-2.
2. Select the file(s) you want to delete. You can select multiple files, if you want.
3. Press F6(DEL).
   - Press F1(Yes) to delete the file.
   - Press F6(No) to cancel the delete operation.

Searching for a File

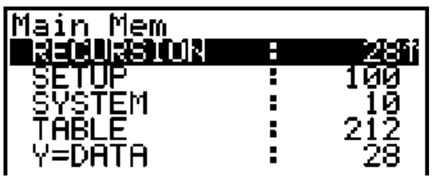
• To search for a file in the main memory

Example **To search for all files in the main memory whose names begin with the letter “R”**

1. Display the main memory information screen.
   - See “Memory Information Screen” on page 11-2.
2. Press F3(SRC).
   - Input the letter “R” for the keyword.



   - The first file name that begins with the letter “R” appears highlighted on display.

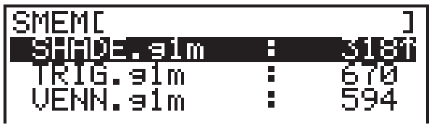


- You can input up to eight characters for the keyword.

• To search for a file in the storage memory

Example **To search for all files in the storage memory whose names begin with the letter "S"**

1. Display the storage memory information screen.
   - See "Memory Information Screen" on page 11-2.
2. Press [F3] (SRC).
   - Input the letter "S" for the keyword.
   - The first file name that begins with the letter "S" appears highlighted on display.



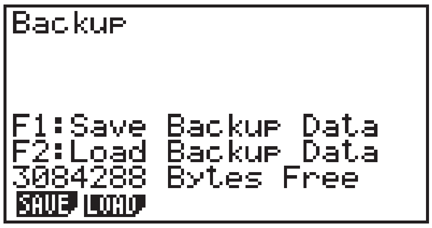
■ Backing Up Main Memory Data

Important!

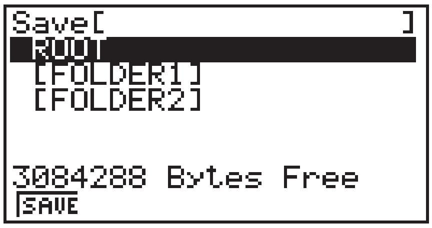
- Data back-up is not supported on the fx-7400GIII.

• To back up main memory data

1. On the initial **MEMORY** mode screen press [F4] (BKUP).



2. Press [F1] (SAVE).
   This displays a folder selection screen.



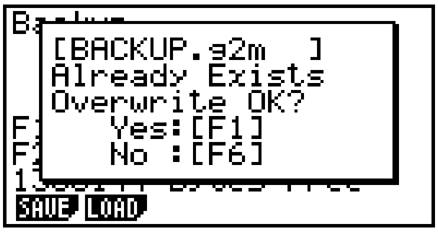
3. Specify the folder you want.
   - Highlight ROOT to save the data to the root directory.
   - To save the data to a specific folder, use ⏶ and ⏷ to move the highlighting to the desired folder and then press [F1] (OPEN).
4. Press [F1] (SAVE).

- Backup data is saved in a file named BACKUP.g2m.

The message "Complete!" appears when the backup operation is finished.

Press [EXIT] to return to the screen displayed in step 1.

The following message appears if there is already backup data in the storage memory.



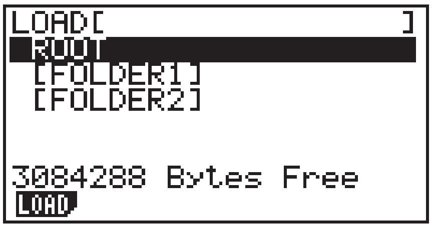
Press [F1] (Yes) to back up the data, or [F6] (No) to cancel the backup operation.

A "Memory Full" occurs when there is not enough space available in the storage memory to complete the backup operation.

• To restore backup data to the main memory

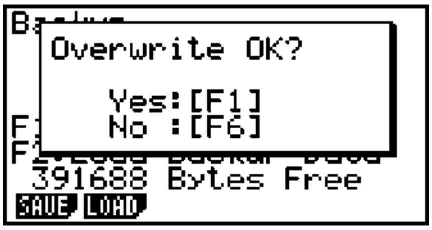
1. On the initial **MEMORY** mode screen press [F4] (BKUP).
   - On the screen that appears, you can confirm whether or not there is backup data in the storage memory.
2. Press [F2] (LOAD).

   This displays the folder selection screen.



3. Specify the folder you want.
   - Highlight ROOT to select the data to the root directory.
   - To select the data to a specific folder, use ⏶ and ⏷ to move the highlighting to the desired folder and then press [F1] (OPEN).
4. Press [F1] (LOAD).*[1]
   - A message appears to confirm whether or not you really want to restore the backed up data.

*[1] The message "No Data" will appear if there is no backup data stored in the folder. Pressing [EXIT] will return the screen in step 1.



Press [F1] (Yes) to restore the data and delete any data currently in the area.

Press [F6] (No) to cancel the data backup operation.

The message "Complete!" appears when the restore operation is finished.

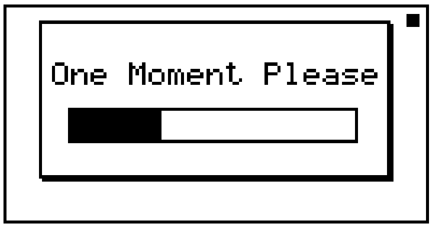
Press [EXIT] to return to the screen displayed in step 1.

■ Optimizing the Storage Memory

Storage memory can become fragmented after many store and load operations. Fragmentation can cause blocks of memory to become unavailable for data storage. Because of this, you should periodically perform the storage memory optimization procedure, which rearranges the data in the storage memory and makes memory usage more economical.

• To optimize the storage memory

1. On the initial **MEMORY** mode screen press F5 (OPT) to optimize the storage memory.



The message “Complete!” appears when the optimize operation is complete.

Press EXIT to return to the initial **MEMORY** mode screen.

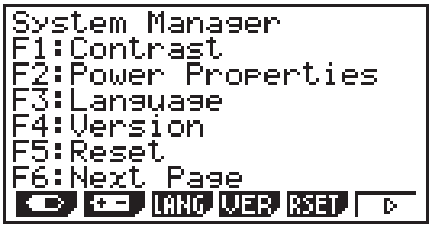
- In some cases, the amount of free memory capacity may be unchanged when you check it after performing the optimization procedure. This does not indicate any problem with the calculator.

Chapter 12 System Manager

Use the System Manager to view system information and make system settings.

1. Using the System Manager

From the Main Menu, enter the **SYSTEM** mode and display the following menu items.



- F1() ... {display contrast adjustment}
- F2() ... {Auto Power Off time setting}
- F3(LANG) ... {system language}
- F4(VER) ... {version}
- F5(RSET) ... {system reset operations}
- F6(▷)F5(OS) ... {OS update}*

* fx-9860GIII/fx-9750GIII only

2. System Settings

■ Contrast Adjustment

While the initial **SYSTEM** mode screen is displayed, press F1() to display the Contrast Adjustment screen.

- The ▶ cursor key makes display contrast darker.
- The ◀ cursor key makes display contrast lighter.
- F1(INIT) returns display contrast to its initial default.

Press EXIT or SHIFT EXIT(QUIT) to return to the initial **SYSTEM** mode screen.

You can adjust contrast while any screen is on the display by pressing SHIFT and then ▶ or ◀. To exit contrast adjustment, press SHIFT again.

12

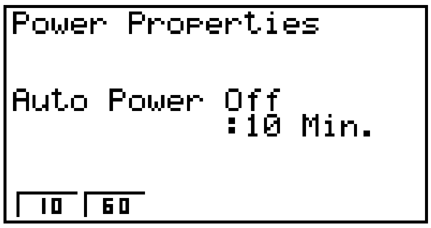
■ Power Properties Settings

• To specify the Auto Power Off trigger time

While the initial **SYSTEM** mode screen is displayed, press F2() to display the Power Properties setting screen.

- F1(10) ... {10 minutes} (initial default setting)
- F2(60) ... {60 minutes}

Press EXIT or SHIFT EXIT(QUIT) to return to the initial **SYSTEM** mode screen.



System Language Setting

Use LANG to specify the display language for built-in applications.

• To select the message language

1. From the initial **SYSTEM** mode screen, press F3(LANG) to display the Message Language selection screen.
2. Use the ▲ and ▼ cursor keys to select the language you want, and then press F1(SEL).
3. The pop up window appears using the language you selected. Check the contents and then press EXIT.
4. Press EXIT or SHIFT EXIT(QUIT) to return to the initial **SYSTEM** mode screen.

• To select the Menu Language (fx-9860GIII, fx-9750GIII)

1. From the initial **SYSTEM** mode screen, press F3(LANG) to display the Message Language selection screen.
2. Press F6(MENU).
3. Use the ▲ and ▼ cursor keys to select the language you want, and then press F1(SEL).
4. The pop up window appears using the language you selected. Check the contents and then press EXIT.
   - Press F6(MSG) to return to the Message Language selection screen.
5. Press EXIT or SHIFT EXIT(QUIT) to return to the initial **SYSTEM** mode screen.

Version List

Use VER (version) to display the operating system version. You can also register the user name you want.

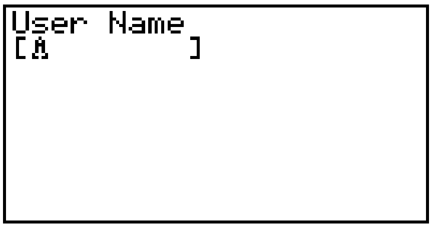
• To display version information

1. On the initial **SYSTEM** mode screen, press F4(VER) to display the Version list.
2. Use ▲ and ▼ to scroll the screen. The contents of the list are shown below.
   - Items marked with an asterisk (*) are displayed for all models. Other items are displayed on models that support the applicable functions.
     - Operating system version*
     - Add-in application names and versions (only installed add-ins are displayed)
     - Message languages and versions*
     - Menu languages and versions
     - User name*
3. Press EXIT or SHIFT EXIT(QUIT) to return to the initial **SYSTEM** mode screen.

- The operating system version that actually appears depends on the calculator model.

• To register a user name

1. While the Version list is displayed, press F1(NAME) to display the user name input screen.
2. Input up to eight characters for the user name you want.
3. After inputting the name, press EXE to register it, and return to the Version list.
   - If you want to cancel user name input and return to the Version list without registering a name, press EXIT.



■ Reset

1. While the initial **SYSTEM** mode screen is displayed, press F5(RSET) to display the Reset Screen 1.

Important!

Items that appear on the Reset Screen(s) depend on the calculator models.

- F1(STUP) ... {setup initialization}
- F2(MAIN) ... {main memory data clear}
- F3(ADD) ... {add-in application clear}[*1]
- F4(SMEM) ... {storage memory data clear}[*1]
- F5(A&S) ... {add-in application and storage memory data clear}[*1]

Pressing F6(▷) on the above screen displays the Reset Screen 2 shown below.

- F1(M&S) ... {main memory data and storage memory data clear}[*1]
- F2(ALL) ... {all memory clear}[*1]
- F3(RST1) ... {all memory clear, except for some add-in applications}[*1*2]

[*1] Not included on the fx-7400GIII.

[*2] For information about which add-in applications are not cleared, visit the website below.
https://edu.casio.com/products/graphic/gcreset/

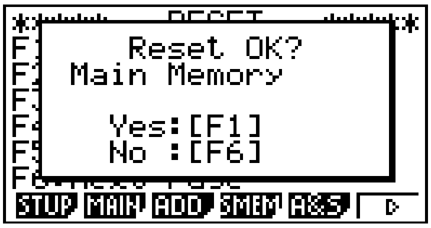
The following table shows the functions of the function keys. You can use the function keys to delete the specific data you want.

Function Key Functions

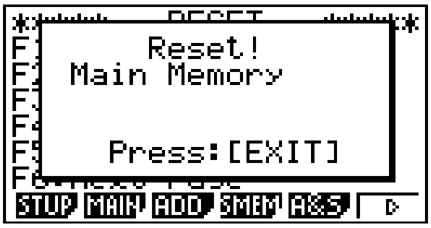
	Initialize Setup Information	Delete Main Memory Data	Delete Add-in Applications	Delete Storage Memory Data (Excluding Add-in Applications)
F1 (STUP)	○			
F2 (MAIN)	○	○		
F3 (ADD)			○	
F4 (SMEM)				○
F5 (A&S)			○	○
F6 (▷) F1 (M&S)	○	○		○
F6 (▷) F2 (ALL)	○	○	○	○
F6 (▷) F3 (RST1)	○	○	*3	○

*3 Some add-in applications are not deleted. For information about which add-in applications are not deleted, visit the website below.
https://edu.casio.com/products/graphic/gcreset/

2. Press the function key that corresponds to the reset operation you want to perform.
3. In response to the confirmation message that appears, press F1 (Yes) to perform the reset operation you specified, or F6 (No) to cancel.
4. A message appears to let you know when the reset operation is complete.



Screen produced when
F2 (MAIN) is pressed in step 2.



Screen produced when
F1 (Yes) is pressed in step 3.

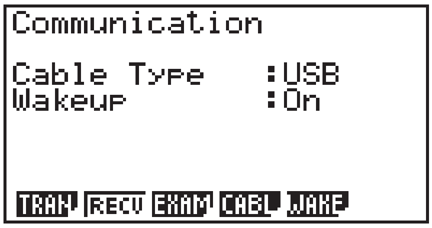
***Important!* (fx-9860GIII/fx-9750GIII only)**

Note that deleting add-in language data causes the language setting to switch automatically to English. The deleted language will no longer be available for display.

Chapter 13 Data Communication

This chapter explains how to transfer data between a calculator and a computer, or between two calculators. Data communication operations are performed in the **LINK** mode.

From the Main Menu, enter the **LINK** mode. The following data communication main menu appears on the display.



- {**TRAN**} ... {displays the data send screen}
- {**RECV**} ... {displays the data receive screen}
- {**EXAM**}* ... {displays the Examination Mode menu}
- {**CABL**}* ... {displays the cable type selection screen}
- {**WAKE**} ... {displays the wakeup setting screen}

* Not included on the fx-7400GIII

Communication parameters are fixed at the following settings.

- 3-pin serial port
  - Speed (BPS): 115200 bps max. (Connected with another fx-9860GIII, fx-9750GIII, fx-7400GIII, fx-9860GII SD, fx-9860GII, fx-9860GII s, fx-9860G AU PLUS, fx-9750GII, or fx-7400GII calculator)
  - Parity (PARITY): NONE
- USB port*
  - Communication speed is in accordance with USB standards.

  * The fx-7400GIII is not equipped with a USB port.

■ Configuring the Receiver's Wakeup Feature

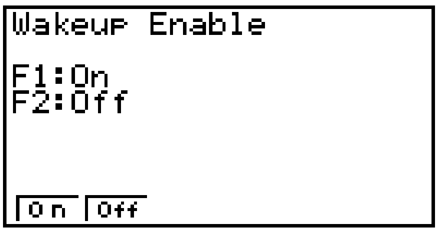
When Wakeup is turned on the receiver, the receiver turns on automatically when data transfer starts.

fx-7400GIII

- The receiver enters the receive mode automatically after it wakes up.

fx-9860GIII, fx-9750GIII

- When communicating between two calculators (3PIN selected as the cable type), the receiver enters the receive mode automatically after it wakes up.
- When communication is with a computer (USB selected as the cable type), connecting the USB cable to a computer and then to the calculator (while the calculator is turned off) will cause the calculator to turn on and the "Select Connection Mode" dialog box to appear.



1. On the receiver's data communication main menu, press F5(WAKE).

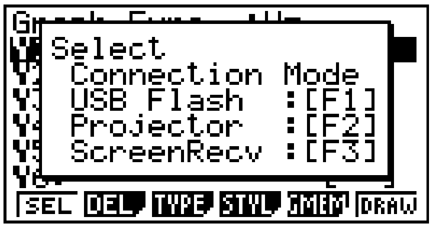
   This displays the Wakeup setting screen.

   - {**On**} ... {turns Wakeup on}
   - {**Off**} ... {turns Wakeup off}

2. Press F1(On).
   This turns on Wakeup and returns of the data communication main menu.
3. Turn off the receiver.
4. Connect the receiver to the sender.
5. Starting a send operation on the sender causes the receiver to turn on automatically and performs the data transfer operation.

■ Select Connection Mode Screen (fx-9860GIII/fx-9750GIII only)

Connecting the USB cable to the calculator will cause the "Select Connection Mode" dialog box to appear. The key operation you should perform on this screen depends on the device currently connected to the calculator.



- F1(USB Flash) ... Mode for connecting the calculator to a computer for data transfer. See "To establish a connection between the calculator and a computer" (page 13-3).
- F2(Projector) ... Mode for connecting the calculator to a projector and projecting the calculator screen. See "Connecting the Calculator to a Projector" (page 13-14).
- F3(ScreenRecv) ... Mode for using the Screen Receiver software on a computer to display the calculator screen on the computer. For details, see the separate "Screen Receiver User's Guide".
  Wait until the calculator screen appears on the Screen Receiver window before performing any calculator operation.

1. Performing Data Communication between the Calculator and a Personal Computer

(fx-9860GIII/fx-9750GIII only)

Establishing a USB connection between the calculator and a computer will cause the computer to recognize the calculator's storage memory as a mass storage drive. Connection immediately causes main memory contents to be read into storage memory automatically, so main memory data can be accessed from the computer. After a connection is established, data can be transferred between the calculator and computer using computer operations only.

■ Minimum Computer System Requirements

The following are the minimum requirements for a computer to exchange data with the calculator.

- USB port
- Running one of the following operating systems.

  Windows 8.1 (32-bit, 64-bit)
  Windows 10 (32-bit, 64-bit)
  macOS 10.13, macOS 10.14, macOS 10.15

■ Connecting and Disconnecting with a Computer in the Mass Storage Mode

Use the optionally available USB cable* to connect to your computer.

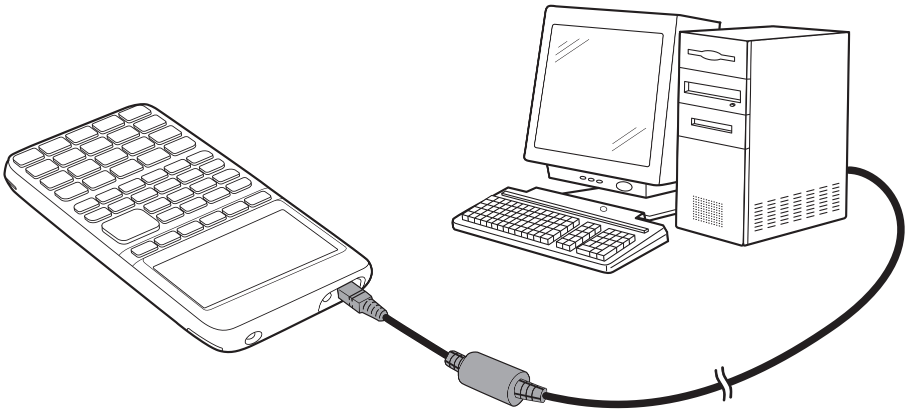
* Included with the calculator in some areas.

Important!

Never touch the USB cable plugs and screen while a data communication operation is in progress. Static electricity from your fingers can cause data communication to be terminated.

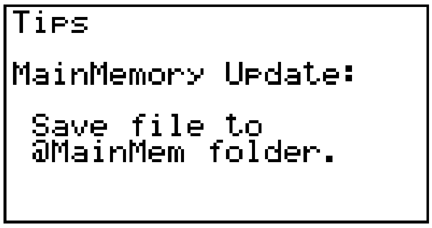
• To establish a connection between the calculator and a computer

1. Start up your computer.
2. After starting up your computer, use the USB cable to connect it to the calculator.



   - The calculator will turn on automatically and the “Select Connection Mode” screen will appear.

3. Press F1 (USB Flash).
   - The message “Preparing USB” will appear on the calculator screen. Stand by and do not perform any operation on the calculator. Establishing a connection between the calculator and a computer will cause the screen shown nearby to appear.



4. On your computer, open the calculator drive.
   - If you are using Windows, the location of the calculator drive will depend on your Windows Version. Use Windows Explorer to open the calculator drive.
     - Windows 8.1: Inside PC
     - Windows 10: Inside This PC
   - Under OS X or macOS, the calculator drive icon appears on the Mac desktop. Double-click the icon to open it.
   - The calculator drive represents calculator’s storage memory.
5. Perform the required operation on your computer to transfer the data.
   - For details about data transfer operations, see “Transferring Data between the Calculator and a Personal Computer” (page 13-4).

• To terminate the connection between the calculator and a computer

1. If the calculator is connected to a Windows computer, note the drive letter (E, F, G, etc.) assigned to the calculator drive.
2. Depending on the type of operating system your computer is running, perform one of the following operations.

   Important!
   Depending on your computer operating system, perform either of the operations below before disconnecting the USB cable from the calculator.

   - Windows: Click the "Safely Remove Hardware" icon in the task tray in the lower right corner of the display. On the menu that appears, select "USB mass storage device" whose letter matches the calculator drive letter you noted in step 1 above. Check to make sure the "Safe To Remove Hardware" message is displayed.
   - Mac OS: Drag the calculator drive icon to the Eject icon (Trash icon). Check to make sure that the calculator drive icon is no longer on your desktop.
3. The message "Updating Main Memory" will appear on the calculator screen. Stand by and do not perform any operation on the calculator. The message "Complete!" will appear after updating of main memory is complete. To close the message dialog box, press EXIT.
4. Disconnect the USB cable from the calculator.

■ Transferring Data between the Calculator and a Personal Computer

This section explains how to connect the calculator to the computer and open the calculator drive on the computer to transfer data.

• Main Memory Data during a USB Connection

The contents of the @MainMem folder in the calculator drive correspond to the contents of the calculator's main memory. Each time you establish a connection between the calculator and a computer, the contents of the calculator's main memory are copied to storage memory.
If there is not enough storage memory capacity to support the copy operation, the message "Storage Memory Full" will be displayed on the calculator and the copy operation will not be performed. If this happens, delete files you no longer need from storage memory to increase capacity, and then try establishing a USB connection again.

Each group in main memory is displayed as a folder in the @MainMem folder. Also, each data item in main memory is displayed as a file in the @MainMem folder.
Main Memory group names and data item names are displayed in the @MainMem folder as shown in the table below.

Main Memory Group Name	@MainMem Folder Name	Main Memory Item Name	@MainMem File Name
E-CON2	ECON2	Econ3Now	Econ3Now.g1m
		SUxxx	SUxxx.g1m
		SDxxx	SDxxx.g1m
		CPxxx	CPxxx.g1m
F-MEM	FMEM	F-MEM xx	FMEMxx.g1m
G-MEM	GMEM	G-MEM xx	GMEMxx.g2m

Main Memory Group Name	@MainMem Folder Name	Main Memory Item Name	@MainMem File Name
LISTFILE	LISTFILE	LIST xx	LISTxx.g1m or LISTxx.g2m
		LIST ANS	LISTANS.g1m or LISTANS.g2m
		LISTFILE x	FILEx.g1m or FILEx.g2m
MAT_VCT	MAT_VCT	MAT ANS	MATANS.g1m or MATANS.g2m
		MAT x	MATx.g1m or MATx.g2m
		VCT ANS	VCTANS.g2m
		VCT x	VCTx.g2m
PROGRAM	PROGRAM	<Program name>	<Program name>.g1m
			<Program name>.txt
S-SHEET	SSHEET	<Data name>	<Data name>.g1m or <Data name>.g2m
V-WIN	V-WIN	V-WIN x	VMEMx.g1m or VMEMx.g2m
PICTURE	PICTURE	PICTURE xx	PICTxx.g1m
CAPTURE	CAPTURE	CAPT xx	CAPTxx.g1m
STRING	STRING	STRING xx	STRINGxx.g2m
ROOT	ROOT	ALPHA MEM	ALPHAMEM.g1m or ALPHAMEM.g2m
		RECURSION	RECUR.g1m or RECUR.g2m
		SETUP	SETUP.g2m
		CONICS	CONICS.g1m
		DYNA MEM	DYNA MEM.g1m or DYNA MEM.g2m
		EQUATION	EQUATION.g1m or EQUATION.g2m
		FINANCIAL	FINANCE.g2m
		STAT	STAT.g1m or STAT.g2m
		SYSTEM	SYSTEM.g1m or SYSTEM.g2m
		TABLE	TABLE.g1m or TABLE.g2m
		Y=DATA	Y=DATA.g1m or Y=DATA.g2m
@GEOM	@GEOM	@IMAGE	@IMAGE.g1m
		<Data name>	<Data name>.g1m
@<Each add-in application name>	@<Each add-in application name>	@<Item name>	@<Item name>.g1m

• Main Memory Data Updating upon Termination of a USB Connection

While there is a USB connection between the calculator and a computer, you can use the computer to edit the @MainMem folder contents by deleting folders and files, editing files, adding files, etc. When you terminate the USB connection, the calculator's main memory data is updated with the current contents of the @MainMem folder. Note the following important points.

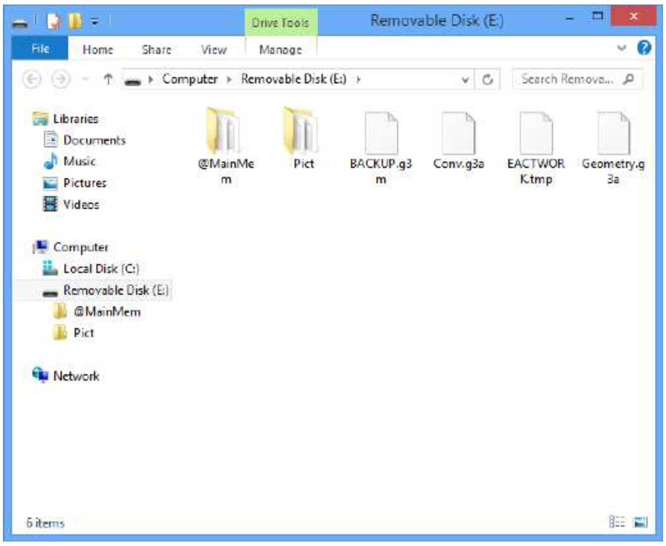
- Deleting the @MainMem folder will cause all data in the calculator's main memory to be initialized.
- Updating the @MainMem folder affects up to three levels of folders inside the storage memory root folder.

  SMEM ← Storage memory root folder
  - @MainMem (Level 1)
    - Folder (Level 2)
      - Folder (Level 3) ← Updating affects files up to this

  Any folders and files past Level 3 are moved to a folder named "SAVE-F" in storage memory.
- Adding a g1m file to the @MainMem folder while there is a USB connection between the calculator and a computer will copy the data item(s) included in the g1m file to the calculator's main memory. For details about the main memory data item names that correspond to the g1m file names in the @MainMem folder, see "Main Memory Data during a USB Connection" (page 13-4). If there is no group in main memory that corresponds to the data items included in the g1m file, a corresponding group will be created automatically and the data items will be copied to that group.
- Depending on the data type, an overwrite confirmation message will appear if there is already data with the same name in calculator's main memory as the data being copied from @MainMem folder. For information about which types of data cause a confirmation message to appear, see the "Overwrite Check" column in the data table on page 13-11. "Yes" means that a confirmation message is displayed, while "No" indicates that the copy operation is performed without any confirmation message.
- If you place a file or folder that is not supported by the calculator into the @MainMem folder, it will be transferred to a folder named "SAVE-F" in the calculator's storage memory and will not be shown in main memory.
- If the size of the data in the @MainMem folder exceeds the available capacity of main memory, the message "Memory ERROR" will appear on the calculator when you terminate the USB connection and main memory will not be updated.
- If there is an add-in file (.g1a/.g1l) in the @MainMem folder, that file will be moved to the storage memory root directory. Note, however, that if there is already and add-in with the same name in storage memory root directory, the existing add-in will be overwritten with the new one, without displaying a confirmation message.
- If a text file (.txt) has been added to the @MainMem\PROGRAM folder, it will be automatically converted to a program with same name as the file and stored in the main memory PROGRAM group. For details about the rules that govern file names and other conversion issues, see "Program and Text File Conversion Rules" (page 8-6).

• To transfer data between the calculator and a computer

1. Connect the calculator and computer, and open the calculator drive on the computer.
   - See "To establish a connection between the calculator and a computer" (page 13-3).



2. Copy, edit, delete, or add files as desired.
   - Use the same file operations that you normally do on your computer.
   - For information about the folders and files in the @MainMem folder, see "Main Memory Data during a USB Connection" (page 13-4) and "Main Memory Data Updating upon Termination of a USB Connection" (page 13-6).
3. After you finish all the operations you want to perform, terminate the connection between the calculator and a computer.
   - See "To terminate the connection between the calculator and a computer" (page 13-4).

Note

Copying a file to the storage memory can cause the connection between the calculator and computer to be dropped. If this happens, enter the **MEMORY** mode and execute an Optimize operation (page 11-11), and then re-establish a connection between the calculator and computer.

• To use your computer to edit a program created on the calculator

1. Use the calculator's **PRGM** mode to create the program. (See "Chapter 8 Programming.")
2. Connect the calculator and computer, and open the calculator drive on the computer.
3. Display the contents of the @MainMem\PROGRAM folder, and then use a text editor to open the text file with the same name as the program you want to edit.
   - If you are running Windows you could use Notepad, etc. With the Mac OS, you can use TextEdit, etc.
4. Perform the required edits.
   - For information about calculator commands and their corresponding special character strings, see "CASIO Scientific Function Calculator Special Commands ⇔ Text Conversion Table" (page 8-46).

5. After you are finished editing, save and close the text file.
   - Save the edits under a different file name, as required. If you use Save As to save your edits, be sure to save the new file in @MainMem\PROGRAM\.
   - Be sure to save the file in ASCII or ANSI code txt format.
6. Terminate the connection between the calculator and a computer
   - See “To terminate the connection between the calculator and a computer” (page 13-4).

■ Installing Add-In Files

Add-in files can be installed on the calculator to give it additional functions. The following are types of add-in files that are available.

- Add-in applications (.g1a): These files add new applications to the Main Menu.
- Add-in languages (.g1l): These files add languages to those that can be selected with the “System Language Setting” procedure (page 12-2) for on-screen messages.
- Add-in menus (.g1l): These files add languages to those that can be selected with the “System Language Setting” procedure (page 12-2) for function menus.

• To install an add-in file

In step 2 of the procedure under “To transfer data between the calculator and a computer” (page 13-7), copy the add-in file (.g1a/.g1l) you want to install to the calculator drive root directory.

■ USB Connection Precautions

- Depending on the operating system your computer is running, perform one of the following operations on the computer to terminate a connection with the calculator.
  - Windows: Click the “Safely Remove Hardware” icon in the task tray in the lower right corner of the display. On the menu that appears, select “USB mass storage device”. Check to make sure the “Safe To Remove Hardware” message is displayed.
  - Mac OS: Drag the calculator drive to Trash. Check to make sure that the calculator drive is no longer on your desktop.
- Never use a computer operation to format the calculator drive.
  Doing so will cause a “File System ERROR” message to appear on the calculator screen after you terminate the USB connection between the calculator and computer. When this happens, you will not be able to start up the calculator unless you perform an Initialize All operation, which deletes all data currently in calculator memory. For details, see “File System ERROR” (page α-5).
- When copying a file from your computer’s local disk to the calculator drive, it may take several minutes before copying starts. This is because copying automatically performs optimization of the calculator’s storage memory. It does not indicate malfunction. For information about storage memory optimization, see “Optimizing the Storage Memory” (page 11-11).
- A USB connection between the calculator and a computer may be terminated automatically if the computer enters a power save mode, sleep mode, or any other standby state.

2. Performing Data Communication between Two Calculators

The following procedure describes how to connect two units with the SB-62 cable*.

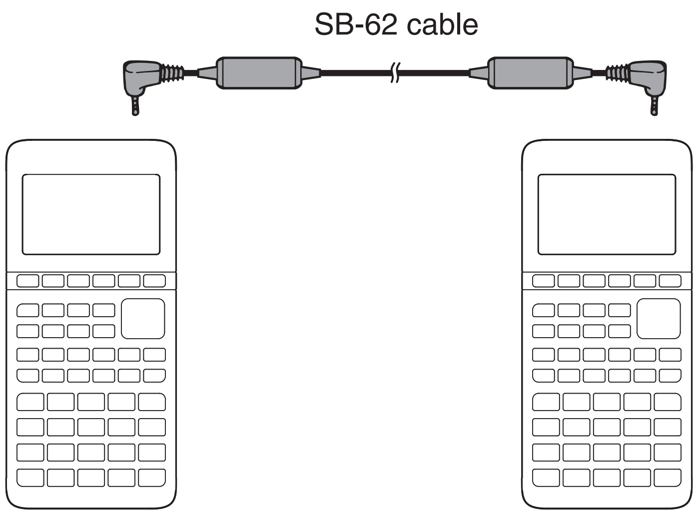
* Included with the calculator in some areas.

• To connect two units

1. Check to make sure that the power of both units is off.
2. Connect the two units using the SB-62 cable.

• Step 3 is not required on the fx-7400GIII.

3. Perform the following steps on both units to specify 3PIN as the cable type.
   (1) From the Main Menu, enter the **LINK** mode.
   (2) Press F4 (CABL). This displays the cable type selection screen.
   (3) Press F2 (3PIN).



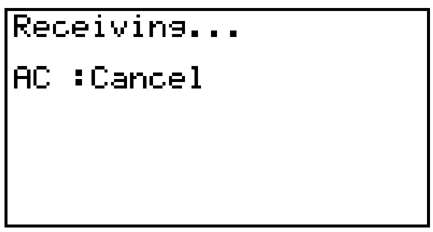
• Models that are supported for this configuration are shown below.
fx-9860GIII, fx-9750GIII, fx-7400GIII
Older Calculator Models:
fx-9860GII SD, fx-9860GII, fx-9860GII s, fx-9860G AU PLUS, fx-9750GII, fx-7400GII

■ Performing a Data Transfer Operation

Connect the two units and then perform the following procedures.

Receiving unit

To set up the calculator to receive data, press F2 (RECV) while the data communication main menu is displayed.

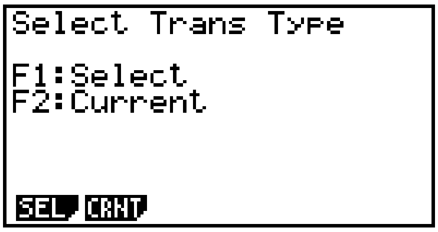


The calculator enters a data receive standby mode and waits for data to arrive. Actual data receive starts as soon as data is sent from the sending unit.

Sending unit

To set up the calculator to send data, press F1 (TRAN) while the data communication main menu is displayed.

This displays a screen for specifying the data selection method.

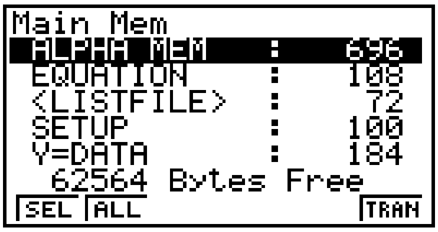


- {**SEL**} ... {selects new data}
- {**CRNT**} ... {automatically selects previously selected data*1}

*1 The previously selected data memory is cleared whenever you change to another mode.

• To send selected data items (Example: To send user data)

Press F1 (SEL) or F2 (CRNT) to display a data item selection screen.



- {**SEL**} ... {selects data item where cursor is located}
- {**ALL**} ... {selects all data}
- {**TRAN**} ... {sends selected data items}

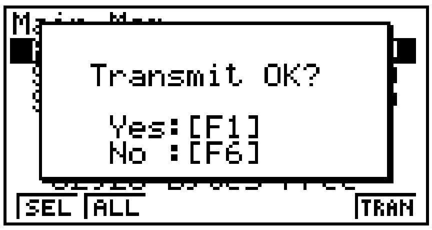
Use the ▲ and ▼ cursor keys to move the cursor to the data item you want to select and press F1 (SEL) to select it. Currently selected data items are marked with "▶". Pressing F6 (TRAN) sends all the selected data items.

- To deselect a data item, move the cursor to it and press F1 (SEL) again.

Only items that contain data appear on the data item selection screen. If there are too many data items to fit on a single screen, the list scrolls when you move the cursor to the bottom line of the items on the screen.

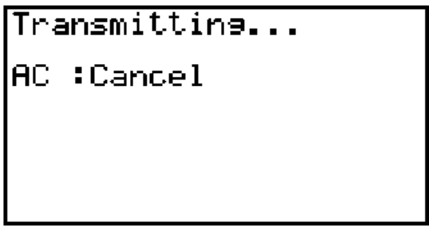
• To execute a send operation

After selecting the data items to send, press F6 (TRAN). A message appears to confirm that you want to execute the send operation.



- F1 (Yes) ... sends data
- F6 (No) ... returns to data selection screen

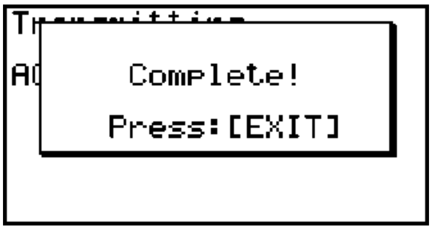
Press F1 (Yes) to send the data.



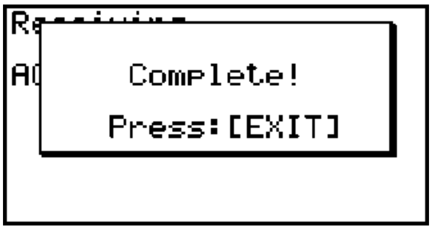
- You can interrupt a data operation at any time by pressing AC.

The following shows what the displays of the sending and receiving units look like after the data communication operation is complete.

Sending Unit



Receiving Unit



Press EXIT to return to the data communication main menu.

■ Data Communication Precautions

The following are the types of data items that can be sent.

Data Item	Contents	Overwrite Check[*2]
ALPHA MEM	Alpha memory contents	No
<CAPTURE>	Capture memory group	
CAPT n	Capture memory (1 to 20) data	No
CONICS[*1]	Conics setting data	No
DYNA MEM[*1]	Dynamic Graph functions	Yes
EQUATION	Equation calculation coefficient values	No
<E-CON2>[*1]	E-CON3 memory group	
CPn[*1]	Custom probe memory (1 to 99) contents	Yes
SUn[*1]	E-CON setup memory (1 to 99) contents	Yes
SDn[*1]	E-CON measurement memory (CH1, CH2, CH3, CHSNC, CHMIC, CHFFT) contents	Yes
Econ3Now[*1]	E-CON3 current setup memory contents	Yes
FINANCIAL[*1]	Financial data	No
<F-MEM>	Function memory group	
F-MEM n	Function memory (1 to 20) contents	No
<G-MEM>	Graph memory group	
G-MEM n	Graph memory (1 to 20) contents	Yes
<LISTFILE>	List file group	
LIST n	List memory (1 to 26, and Ans) contents	Yes
LIST FILE n	List file memory (1 to 6) contents	Yes
<MAT_VCT>[*1]	Matrix/Vector group	
MAT n[*1]	Matrix memory (A to Z, and Ans) contents	Yes
VCT n[*1]	Vector memory (A to Z, and Ans) contents	Yes
<PICTURE>	Picture memory group	
PICT n	Picture (graph) memory (1 to 20) data	No
<PROGRAM>	Program group	
Program names	Program contents (All programs are listed.)	Yes
RECURSION[*1]	Recursion data	No

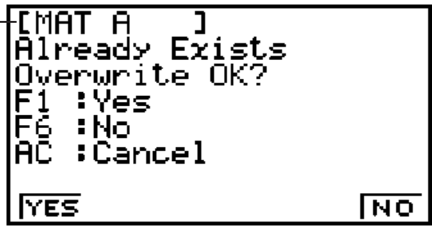
Data Item	Contents	Overwrite Check[*2]
SETUP	Setup data	No
STAT	Stat result data	No
<STRING>	String memory group	
STR n	String memory (1 to 20) data	No
SYSTEM	OS and data shared by applications (clipboard, replay, history, etc.)	No
<S-SHEET>[*1]	Spreadsheet group	
Spreadsheet data names[*1]	Spreadsheet data (All spreadsheet data are listed.)	Yes
TABLE	Table data	No
<V-WIN>	V-Window memory group	
V-WIN n	V-Window memory (1 to 6) contents	No
Y=DATA	Graph expressions, graph draw/non-draw status, V-Window contents, zoom factors	No

[*1] Not included on the fx-7400GIII.

[*2] No overwrite check: If the receiving unit already contains the same type of data, the existing data is overwritten with the new data.

With overwrite check: If the receiving unit already contains the same type of data, a message appears to ask if the existing data should be overwritten with the new data.

Data item name



- F1(YES) ... {replaces the receiving unit's existing data with the new data}
- F6(NO) ... {skips to next data item}

Note the following precautions whenever you perform data communication.

- An error occurs whenever you try to send data to a receiving unit that is not yet standing by to receive data. When this happens, press EXIT to clear the error and try again, after setting up the receiving unit to receive data.
- An error occurs whenever the receiving unit does not receive any data approximately six minutes after it is set up to receive data. When this happens, press EXIT to clear the error.
- An error occurs during data communication if the cable becomes disconnected, if the parameters of the two units do not match, or if any other communications problem occurs. When this happens, press EXIT to clear the error, then correct the problem before trying data communication again. If data communication is interrupted by the EXIT key operation or an error, any data successfully received up to the interruption will be in the memory of the receiving unit.
- An error occurs if the receiving unit memory becomes full during data communication. When this happens, press EXIT to clear the error and delete unneeded data from the receiving unit to make room for the new data, and then try again.

■ Exchanging Data with another Model Calculator

The fx-9860GIII, fx-9750GIII, or fx-7400GIII supports data exchange with the following calculator models.

• fx-9860GIII, fx-9750GIII, fx-7400GIII

Older Calculator Models:

• fx-9860GII SD, fx-9860GII, fx-9860GII s, fx-9860G AU PLUS, fx-9750GII, fx-7400GII

Below is a description of the basic operations performed when exchanging data between two calculators:

Sender	Receiver	Description
fx-9860GIII or fx-9750GIII	fx-9860GIII or fx-9750GIII	All data transferred.
	fx-7400GIII or an older calculator model	Data supported by the fx-9860GIII and fx-9750GIII but not supported by the receiving model is either not transmitted or converted before sending to a format compatible with the receiving model.
fx-7400GIII or an older calculator model	fx-9860GIII or fx-9750GIII	For the most part, data sent from another calculator model is received as is. However, when there is a difference between a function of the fx-9860GIII or fx-9750GIII and the function of the transmitter model, the fx-9860GIII or fx-9750GIII will convert the data as needed.
fx-7400GIII	fx-7400GIII or an older calculator model	All data transferred.
An older calculator model (except the fx-7400GII)	fx-7400GIII	Data supported by another calculator model but not supported by the fx-7400GIII is either not received or converted before receiving to a format compatible with the fx-7400GIII.
fx-7400GII	fx-7400GIII	All data transferred.

The following provides details about data compatibility between an fx-9860GIII or fx-9750GIII calculator and an fx-7400GIII calculator.

• Sending data from an fx-9860GIII or fx-9750GIII to an fx-7400GIII calculator

Sender: fx-9860GIII, fx-9750GIII

Receiver: fx-7400GIII

- When the following data includes a square root expression ($\sqrt{\ }$) or pi (π), they are sent as decimal values.
  - Alpha memory data (A to Z, r, θ)
  - Ans memory data
  - results and coefficients of simultaneous linear equations and higher order equations in **EQUA** mode
  - history data (including the "**SYSTEM**" data element)
  - list data
  - matrices/vectors data
- Before sending, the following numeric expressions in the Math input/output mode are converted to the Linear input/output mode:
  - graph expressions saved in **DYNA** and **RECUR** modes
  - Solve expressions saved in **EQUA** mode
  - graph expressions saved in **GRAPH** and **TABLE** modes

3. Connecting the Calculator to a Projector

You can connect the calculator to a CASIO projector and project calculator screen contents onto a screen.

• Connectable Projectors

For information about connectable projectors, visit the site below.
https://edu.casio.com/support/projector/

- You can also connect the calculator to a YP-100 Multifunctional Presentation Kit and project from the projectors other than the model shown above.

• To project calculator screen contents from a projector

1. Use the optionally available USB cable* to connect to the projector (or YP-100 unit).
   * Included with the calculator in some areas.
   - Connecting the USB cable to the calculator will cause the "Select Connection Mode" dialog box to appear.
2. Press [F2] (Projector).

• Precautions when Connecting

- An hourglass figure may remain projected on the screen after you connect the calculator to a projector (or YP-100). Also, changing to another screen while a graph is being drawn or while a **PRGM** mode program is running could possibly result in the projected screen being different from the calculator screen. If this happens, performing some operation on the calculator will restore normal display.
- If the calculator stops operating normally, disconnect the USB cable and then reconnect it. If this does not correct the problem, disconnect the USB cable, turn the projector (or YP-100) off and then back on, and then reconnect the USB cable.

Chapter 14 PYTHON (fx-9860GIII, fx-9750GIII only)

The **PYTHON** mode provides a runtime environment for the Python programming language. You can use the **PYTHON** mode to create, save, edit, and run Python files.

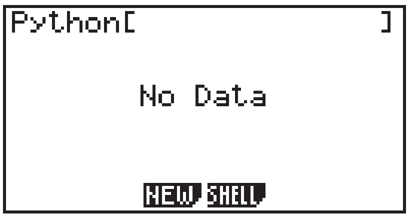
Important!

- The **PYTHON** mode supports a version of MicroPython Version 1.9.4, which has been adapted to run on this calculator. Note that generally, MicroPython is different from the Python that runs on a computer. Also, the **PYTHON** mode does not support all of the functions, commands, modules, and libraries of MicroPython.
- MicroPython is an open-source project. For license information, refer to “MicroPython license information” (page γ-1).
- The **PYTHON** mode performs executions using the MicroPython processing system. Because of this, calculation results and other data produced by this mode may differ from execution results of other function modes.
- Python is a registered trademark of the Python Software Foundation. Trademark (™) and registered trademark (®) symbols are not used in this manual.

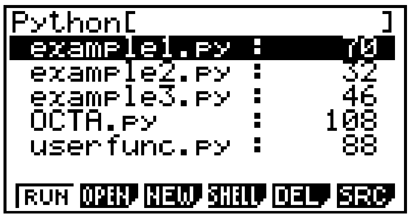
1. PYTHON Mode Overview

■ File List Screen

The first thing that appears when you select the **PYTHON** mode on the main menu is the file list screen.



When no py file* or folder is in memory



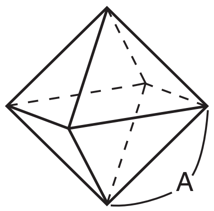
When there are py files or folders in memory

* In this manual, a file created in the **PYTHON** mode (file name extension py) is referred to as a “py file”.

■ Flow from py File Creation to Running the File

The example below explains the operation flow from creation of a new py file up to running it.

Example: **To create a py file that obtains the surface area and volume of a regular octahedron and to run it to calculate the surface area and volume when the length of one side is 10. The file name is OCTA.**

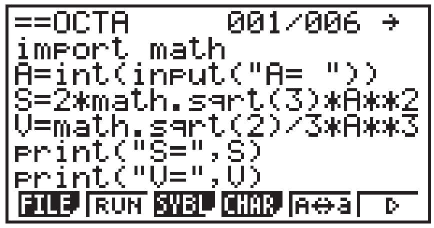


You can obtain the surface area (S) and volume (V) of a regular octahedron when the length of one side (A) is known using the formulas below.

$$S = 2\sqrt{3}\,A^2,\quad V = \frac{\sqrt{2}}{3}A^3$$

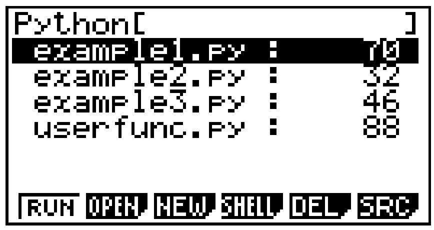
Here we will write a program that, when the py file is run, prompts for input of A, which is then used in the above formulas to output the calculation results. In this manual, a program written in Python (and stored in a py file) is called a "py script".

For this example, we will input a py script like the one shown in the screen shot to the right.



Procedure

1. From the main menu, enter the **PYTHON** mode.
   - This displays the file list screen.
   - File names are listed in alphabetical order.
   - The values on the right side of the file list indicate the number of bytes used by each py file.



2. Create a new file and register a file name*.

   Here we will use the procedure below to create a new py file named "OCTA".

   [F3](NEW)[F5](A↔a)[9](O)[ln](C)[÷](T)[X,θ,T](A)[EXE]
   - This displays the script editor screen.

   *** File Names**
   - You can input up to eight letters (eight bytes) for a file name.
   - A file name can be made up of single-byte alphanumeric characters (A to Z, a to z, 0 to 9). This calculator does not distinguish between uppercase and lower case letters.

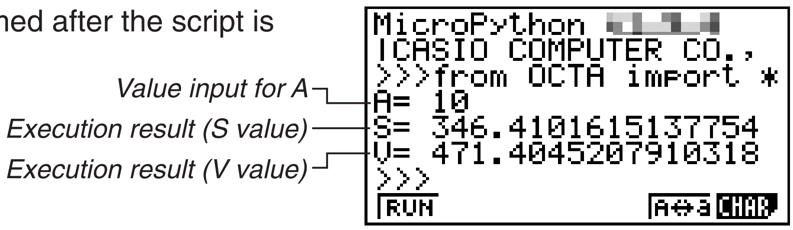
   Important!

   Note that a file with a name that starts with a numeral or a name that is a Python reserved word will not run.

3. Perform the key operations below to input each line of the py script.
   - You can use the **PYTHON** mode Catalog Function (page 14-9) for more efficient input of functions and commands. In the key operations below, text strings that are underlined and included in parentheses indicate function and command names input with the Catalog Function.

Perform this key operation:	**To input this:**
[SHIFT] [4] (CATALOG) [F6] (CTGY) [3] (math) [(] (I)(import math) [EXE] [EXE]	import math
[ALPHA] [F5] (A↔a) [X,θ,T] (A) [SHIFT] [.] (=) [SHIFT] [4] (CATALOG) [F6] (CTGY) [2] (Built-in) [(] (I) [▼] [▼] [▼] [▼] [▼] [▼] [▼] [▼] [▼] [▼] [▼] [▼] (int()) [EXE] [SHIFT] [4] (CATALOG) [▲] [▲] (input()) [EXE] [ALPHA] [×10ˣ] (") [ALPHA] [F5] (A↔a) [X,θ,T] (A) [SHIFT] [.] (=) [ALPHA] [.] (SPACE) [ALPHA] [×10ˣ] (") [▶] [▶] [EXE]	A=int(input("A= "))
[ALPHA] [F5] (A↔a) [×] (S) [SHIFT] [.] (=) [2] [×] [SHIFT] [4] (CATALOG) [F6] (CTGY) [3] (math) [7] (M)(math.) [EXE] [SHIFT] [x^2] (√) [3] [▶] [×] [ALPHA] [F5] (A↔a) [X,θ,T] (A) [x^2] [EXE]	S=2*math.sqrt(3)*A**2
[ALPHA] [F5] (A↔a) [2] (V) [SHIFT] [.] (=) [SHIFT] [4] (CATALOG)(math.) [EXE] [SHIFT] [x^2] (√) [2] [▶] [÷] [3] [×] [ALPHA] [F5] (A↔a) [X,θ,T] (A) [^] [3] [EXE]	V=math.sqrt(2)/3*A**3
[SHIFT] [4] (CATALOG) [F6] (CTGY) [2] (Built-in) [4] (P) [▼] [▼] [▼] [▼] (print()) [EXE] [ALPHA] [×10ˣ] (") [ALPHA] [F5] (A↔a) [×] (S) [SHIFT] [.] (=) [ALPHA] [×10ˣ] (") [,] [ALPHA] [F5] (A↔a) [×] (S) [▶] [EXE]	print("S=",S)
[SHIFT] [4] (CATALOG)(print()) [EXE] [ALPHA] [×10ˣ] (") [ALPHA] [F5] (A↔a) [2] (V) [SHIFT] [.] (=) [ALPHA] [×10ˣ] (") [,] [ALPHA] [F5] (A↔a) [2] (V)	print("V=",V)

4. Perform the key operation below to run the currently displayed py script.
   [F2] (RUN) [F1] (Yes)
   (Saves the script to a file before running it.)
   The operations below are performed after the script is running.
   [1] [0] (Inputs the value of A)
   [EXE]



- Following the operation above, you can re-run the same py script by performing the operation below.
  1. Press [EXIT] to return to the script editor screen.
  2. Press [F2] (RUN).

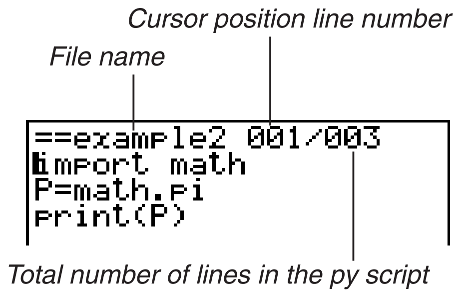
■ SHELL Screen

Pressing [F2](RUN) in step 4 of the procedure above starts up the **PYTHON** mode SHELL, which can be used for running py scripts. The screen that appears at this time is called the "SHELL screen". The SHELL screen not only lets you run py scripts that have been saved as files, you can also directly input expressions and commands and execute them one line at a time. For details about SHELL, see "Using the SHELL" (page 14-13).

- If a py script does not work normally due to input error, running the script in step 4 will display an error message. Press [EXIT] to return to the script editor screen from the SHELL screen. For information about how to correct a py script, see "Editing a py File" (page 14-17).

■ Script Editor Screen

You can use the script editor screen that appears in step 2 above to input up to 150 lines, each of which can contain up to 127 characters.
The editor screen status bar shows the name of the currently open py file, the total number of lines in the py script, and line number of the current cursor position.



For information about how to open a py file and check its contents, and how to debug a py script and edit it, see "Editing a py File" (page 14-17).

2. PYTHON Function Menu

■ File List Screen Function Menu

If there are no py files in memory, only the {NEW} and {SHELL} options will be available in the menu below.

- {**RUN**}/{**OPEN**} … runs or opens a saved py file for editing
- {**NEW**} … displays a file name registration screen for creating a new py file
- {**SHELL**} … runs shell and displays the SHELL screen
- {**DEL**} … deletes the specified py file
- {**SRC**} … searches for a file name

■ Function Menu for Registering a Name for a New py File

- {**A↔a**} … toggles between upper-case and lower-case input

■ Script Editor Screen Function Menu

- {**FILE**}
  - {**SAVE**} … overwrites the currently open py file
  - {**SV•AS**} … saves the currently open py file under a different name
- {**RUN**} ... displays the SHELL screen and runs the currently displayed py script
- {**SYBL**} … displays a symbol input function menu
- {**CHAR**} … displays an alphanumeric character, symbol, and operator input menu
- {**A↔a**} … toggles between upper-case and lower-case input
- {**COM**} … displays a conditional branch and loop command menu
  See "Using the Function Menu to Input Commands (Conditional Branches or Loops) as Statement Blocks" (page 14-8).
- {**OPER**} … displays an operator (= != > < % | ^ & ~) input menu
- {**JUMP**} … displays a line jump function menu
  - {**TOP**} … jumps to the top line of a py script
  - {**BTM**} … jumps to the bottom line of a py script
  - {**LINE**} … displays a line specification dialog box and jumps to the specified line of a py script
- {**SRC**} … searches for the specified string

■ SHELL Screen Function Menu

- {**RUN**} … runs the expression or command input in the last line (prompt line) of the SHELL screen
- {**A↔a**} … toggles between upper-case and lower-case input
- {**CHAR**} … displays an alphanumeric character, symbol, and operator input menu

3. Inputting Text and Commands

There are three ways to input text and commands in the **PYTHON** mode.

- Using the keyboard to input alpha characters, symbols, and functions (See the procedure below.)
- Function menu input
  - Alphanumeric character, symbol, and operator input (page 14-7)
  - Conditional branch command and loop command input (page 14-8)
- Using the catalog (function or command list) to select an item and input it (page 14-9)

■ Using the Keyboard to Directly Input Commands

From the script editor screen or SHELL screen, you can use the calculator's keyboard to input numbers, alpha characters, and the functions (√‾, log, etc.) assigned to each key.

• Using Keys to Input Numbers, Operators, Parentheses, and Functions

The table below shows what is input (number, operator, parentheses, or function) when you press a key, or press [SHIFT] and then a key.

Performing this key operation:	Inputs this:
[0] to [9]	0 to 9
[x^2]	**2
[^]	**
[X,θ,T]	X
[log]	log10()
[ln]	log()
[sin]	sin()
[cos]	cos()
[tan]	tan()
[(]	(
[)]	)
[•]	.
[,]	,
[×]	*
[÷]	/

Performing this key operation:	Inputs this:
[+]	+
[−]	−
[×10^x]	e
[SHIFT] [x^2] (√‾)	sqrt()
[SHIFT] [ln] (e^x)	exp()
[SHIFT] [sin] ($\sin^{-1}$)	asin()
[SHIFT] [cos] ($\cos^{-1}$)	acos()
[SHIFT] [tan] ($\tan^{-1}$)	atan()
[SHIFT] [)] (x^{-1})	**−1
[SHIFT] [×] ({)	{
[SHIFT] [÷] (})	}
[SHIFT] [+] ([ )	[
[SHIFT] [−] ( ])	]
[SHIFT] [0] (i)	1j
[SHIFT] [•] (=)	=
[SHIFT] [×10^x] (π)	pi

Important!

Among the text strings above that are input using key operations, *log*() and other functions that are followed by parentheses, *e* (base of a natural logarithm), and *pi* are math module functions. To use these functions, you first need to import the math module.* For details, see "Command Categories" (page 14-10) and "Operation Example: To use math module functions" (page 14-12).

* If you use *import* instead of *from* to input the module, you need to append "math." before each function you use. See "Using Modules (*import*)" (page 14-11 for more information).

• Alphabet Key Input

The first input immediately after ALPHA is pressed or if input was put into alpha lock by pressing SHIFT ALPHA (page 1-2), pressing a key will input the character marked in red on a key, a space or quotation marks (").

- Selecting {NEW} or {OPEN} from the file list screen will display the script editor screen and automatically puts input into lowercase alpha lock.

• Auto Indent when a Newline is Input

From the **PYTHON** mode script editor screen, pressing EXE will input a newline.

- Pressing EXE after a line that ends with a colon (:) automatically indents the new line two spaces more than the line above it (Auto Indent).
- Pressing EXE while the cursor is located in an indented line will indent the line following the newline by the same amount as the indented line above it.
- To perform a newline without indenting the new line, press SHIFT EXE.

Newline codes are not displayed in the **PYTHON** mode.

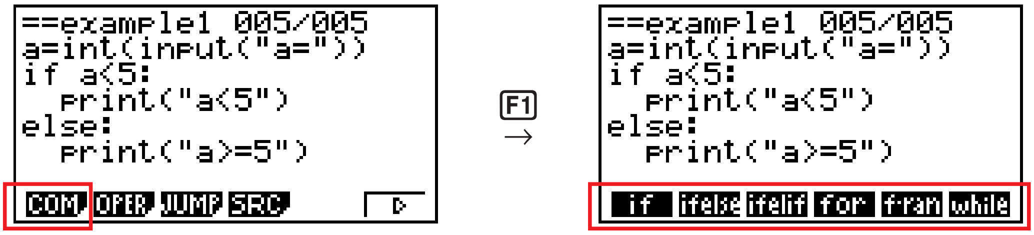
■ Using the Function Menu to Input Text (Alphanumeric Characters, Symbols, Operators)

Use the function menus shown in the table below to input alphanumeric characters, symbols, or operators.

Key Operation		Inputtable Characters (Alphanumeric Characters, Symbols, Operators)
Script Editor Screen	**SHELL Screen**	
F3(SYBL) (symbols)	—	, () [] : ; # ' " \ _
F4(CHAR) (alphanumeric characters, symbols, operators)	F6(CHAR) (alphanumeric characters, symbols, operators)	!"#$%&'()*+,-./0123 456789:;<=>?@ABCDEF GHIJKLMNOPQRSTUVWXY Z[\]^_`abcdefghijkl mnopqrstuvwxyz{|}~
F6(▷)F2(OPER) (operators)	—	= != > < % | ^ & ~

■ Using the Function Menu to Input Commands (Conditional Branches or Loops) as Statement Blocks

From the script editor screen, you can use the function menu {COM} menu to input conditional branch command and loop command statement blocks.



Perform this key operation:	To input this statement block:*
F6(▷)F1(COM) F1(if)	if□❙: □□

F6(▷)F1(COM)
F2(ifelse)
	if□❙:
	□□
	else:
	□□

F6(▷)F1(COM)
F3(ifelif)
	if□❙:
	□□
	elif:
	□□
	else:
	□□

Perform this key operation:	To input this statement block:*
F6(▷)F1(COM) F4(for)	for□i□in□❙: □□
F6(▷)F1(COM) F5(f·ran)	for□i□in□range(❙): □□
F6(▷)F1(COM) F6(while)	while□❙: □□

* The box (□) symbols in the above tables represent blank spaces. Box symbols do not appear on the display. The vertical lines (❙) are cursor locations immediately after input. The vertical line (❙) character is not inserted.

- In addition to the six statement blocks above, you can also use the catalog (page 14-9) to input the statement blocks shown below.
  - **for:range(,)**
  - **for:range(,,)**
  - **if·and:else**
  - **if·or:else**
  - **def:return**
- The SHELL screen allows one-line input only, so block statement input is not allowed. From the SHELL screen, selecting a menu that inputs statement blocks will input the first line of the block only.

• Example: To input an if...else statement

1. On the script editor screen, move the cursor to the line where you want to input the statement block and then press F6(▷)F1(COM)F2(ifelse).
   - This inputs the if...else statement block, with the cursor positioned for input of the if condition.
   - Lines 2 and 4 are indented two spaces automatically.

■ Inputting a Command from the Catalog (Catalog Function)

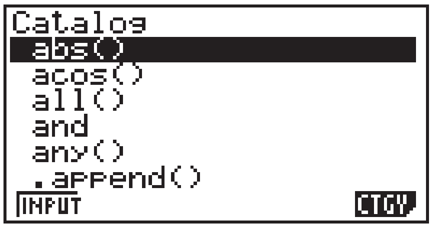
The catalog is a list of functions and commands. You can perform input by displaying the catalog screen and then selecting the desired function or command. This operation is possible on both the script editor screen and the SHELL screen.*

* Only when the cursor is in the prompt line.

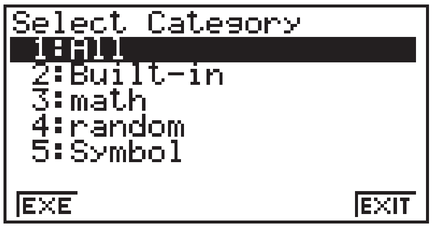
In the operations in this section, functions, commands, and other items that can be input from the catalog are collectively referred to as “commands”.

• To input a command from the catalog

1. On the script editor screen or SHELL screen press SHIFT 4 (CATALOG).
   - This displays the catalog command list screen.
   - If you want to select a command on this screen for input, go to step 4 of this procedure. If you want to select a category, go to step 2 of this procedure.



2. Press F6(CTGY).
   - This displays the category list.
   - For detailed information about each category, see “Command Categories” (page 14-10).



3. Press a number key (from 1 to 5) that corresponds to the category you want to select. Or you could use ▲ and ▼ to move the highlighting to the category and then press EXE.
   - This returns to the command list screen, which will now show only the commands inside the category you selected.

4. Use ▲ and ▼ to select the command you want to input.
5. After selecting the command you want to input, press F1(INPUT) or EXE.

- When you enter the **PYTHON** mode and display the catalog, the command that was selected the last time you displayed the catalog will appear first.

Command Categories

The contents of each category of the **PYTHON** mode catalog are described in the table below.

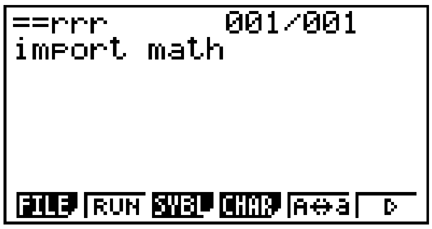
Category Name	Description
All	Shows a list of all functions and commands included in the **PYTHON** mode catalog.
Built-in	Shows a list of Python built-in functions and commands. The functions and commands included in this category can be used without importing a module.*
math	Shows a list of commands that import the Python math module* (math functions), and the functions included in the math module.
random	Shows a list of commands that import the Python random module* (random number functions), and the functions included in the random module.
Symbol	Shows a list of symbols and operators.

* For details about modules, see “Using Modules (*import*)” (page 14-11).

- Unlike the catalogs of other modes (page 1-9), there is no command history function or QR Code function in the **PYTHON** mode.

● Input Example: To use the Catalog Function to input “import math”

1. On the script editor screen, move the cursor to the line where you want to input the command and then press SHIFT 4(CATALOG).
2. Press F6(CTGY) to display the category screen, and then press 3(math).
3. Press ((I) searches for commands that begin with “i”.
4. After confirming that “import math” is selected, press EXE.
   - For details about “import math”, see “Using Modules (*import*)” (page 14-11).



■ Using Modules (*import*)

In the **PYTHON** mode, you can use Python built-in functions, and math module and random module functions. However, to use a function contained in a module you have to first import (*import*) the module.

import **Syntax**	**Description**
import <module name>	Imports the module (py file) specified by <module name>.
from <module name> import ∗	Imports all of the elements* included in the module specified by <module name>.
from <module name> import <element> [, <element>]	Imports the specified elements (functions, etc.) included in the module specified by <module name>.

* An element with a name that starts with an underscore (_) character cannot be imported.

- A single py file written by a py script is called a “module”. py files are imported using the same syntax as *import*.
- For an example of importing and using a py file, see “Sample 4: Importing a py File” in “Sample Scripts” (page 14-23).

Notation Examples:

import math (Imports the math module.)

from math import pi, sqrt (From the math module, imports *pi* and *sqrt* only.)

- If you use *import* to import a module, you need to include “<module name>.” before a function in order to use that function. To use *pi* within the math module, for example, it would need to be written as “math.pi”.
- When using *from* to import a module, do not use the syntax below.

    <module name>.<function name>

  Executing an import operation with this syntax will cause an error.

• Operation Example: To use math module functions

1. From the file list screen, press F4(SHELL).
2. Press SHIFT 4(CATALOG) to display the catalog.
3. Press F6(CTGY) to display the category screen, and then press 3(math).
4. Perform the key operation sequence below.

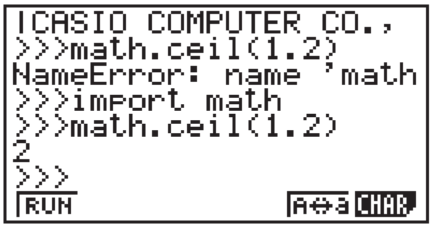
   7(M) EXE (Inputs "math.")

   SHIFT 4(CATALOG) ln(C) EXE (Inputs "ceil()")

5. Press 1 • 2 EXE.
   - The math module is not imported, so the "ceil()" math module function causes an error.

6. Press SHIFT 4(CATALOG) to display the catalog again, press ((I) to select "import math", and then press EXE.
7. Press EXE again to execute "import math".
   - This imports the math module.

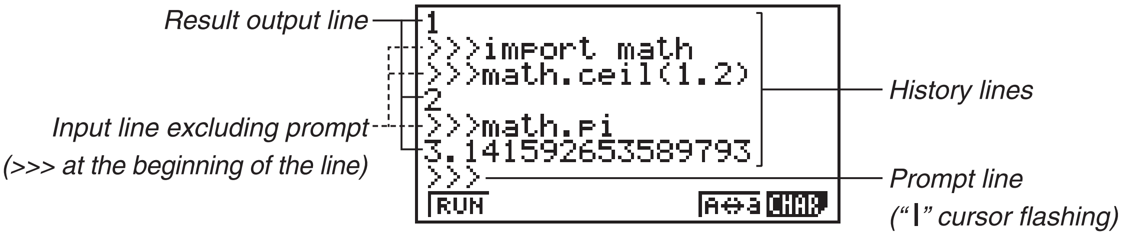
8. Use ⏶ to select the "math.ceil(1.2)" line you input in step 5 above, and then press EXE.
   - This will copy the selected line to the prompt line.
9. Press EXE.
   - This displays the execution result of "math.ceil(1.2)".



- The above operation can be performed by directly executing commands on the SHELL screen. For details about SHELL, see "Using the SHELL" (page 14-13).
- To use a math module and/or random module function in a py script, the applicable module import command must be written once an a line before the first use of the function.

4. Using the SHELL

The SHELL screen provides an interactive command line that can be used input expressions and commands, and output their results. You can directly input an expression or command on the SHELL screen and execute it to obtain a result. Running a py file will display its result on the SHELL screen.



SHELL Screen

- Up to 127 characters can be input into a prompt line, not counting the >>> characters at the beginning of the line.
- A result output line can contain up to 255 characters.
- All of the lines above the prompt line shows the input/output history.
  Up to 100 history lines, which consist of result output lines and input lines excluding prompt, are retained on the SHELL screen. This is in addition to the prompt line. History lines can be scolled from newest to oldest, and a history line can be copied to the prompt line.
  History contents are retained* even if you change to another screen within the **PYTHON** mode. They are deleted when you enter another function mode other than the **PYTHON** mode.

  * Though history contents are retained when you change from the SHELL screen to another **PYTHON** mode screen, the variables used by the SHELL are initialized whenever you change to another screen. See "Initializing the SHELL" (page 14-16) for more information.

■ Basic SHELL Screen Operations

• To display the SHELL screen

Performing any one of the operations below will display the SHELL screen.

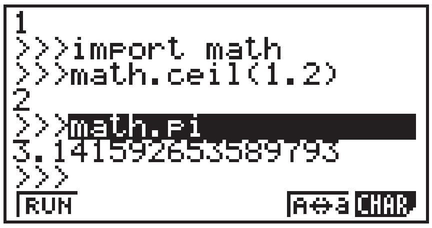
- From the file list screen, press [F4](SHELL).
- On the file list screen, select the py file and then press [F1](RUN) or [EXE].
  This runs the py file and displays the SHELL screen.
- From the script editor screen, press [F2](RUN).
  This runs the displayed py script and displays the SHELL screen.

- **To execute a command from the SHELL screen**

See "Inputting a Command Directly on the SHELL Screen and Executing It" (page 14-15).

- **To scroll the SHELL screen vertically (to display history lines)**

Press ⏶ or ⏷. The currently selected history line is the one that is highlighted.



- **To scroll one line of the SHELL screen (history line or prompt line) horizontally**

1. Use ⏶ and ⏷ to move the highlighting to the line you want to scroll.
2. Press ⏴ or ⏵.
   - A history line that is too long to display completely is indicated by arrows (◀ and ▶) that show in which direction there are additional characters. Arrows (◀ and ▶) are not displayed in the prompt line even if its contents are too long to display completely.

- **To copy one SHELL screen history line to the prompt line**

Use ⏶ and ⏷ to move the highlighting to the line you want to copy, and then press EXE.
For an actual operation example, see step 8 under "Operation Example: To use math module functions" (page 14-12).

- **To return to the file list screen from the SHELL screen**

Press EXIT.

- If the currently displayed SHELL screen was arrived at by pressing F2(RUN) to run a py script from the script editor screen, the first press of EXIT will return to the script editor screen. In this case, press EXIT again to return to the file list screen.
- Changing from the SHELL screen to another **PYTHON** mode screen will cause any variables used by the SHELL to be initialized. See "Initializing the SHELL" (page 14-16) for more information.

■ Inputting a Command Directly on the SHELL Screen and Executing It

You can input a single-line expression or command into the SHELL screen prompt line and execute it. The example operations below all start with the SHELL screen already displayed.

• Operation Example 1: To perform simple arithmetic operations

(2+3) × 10^2 = 500

(2 + 3) × 1 0 x^2 EXE

2+3 × (4+5) = 29

2 + 3 × (4 + 5) EXE

Note the important points below.

- Use the − key, not the (−) key, to input a minus sign.
- Calculation accuracy in the **PYTHON** mode is different from calculations performed in the **RUN•MAT** mode.

• Operation Example 2: To recall and run a py file from the SHELL screen

The operation below uses the “OCTA.py” file created using the example under “Flow from py File Creation to Running the File” (page 14-2). It assumes that the SHELL is already running. If you want to call the “OCTA.py” file from the SHELL, the SHELL must have been started up while the file list that contains the “OCTA.py” file was on the display.

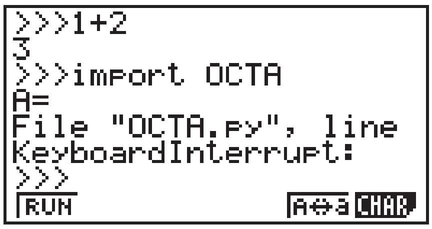
SHIFT 4 (CATALOG) F6 (CTGY) 2 (Built-in)

((I) ▼ ▼ ▼ ▼ ▼ ▼ ▼ (import) EXE

SHIFT ALPHA F5 (A↔a) 9 (O) ln (C) ÷ (T) X,θ,T (A) EXE

ALPHA 1 0 (Input of value for A) EXE

- To stop a running script, press AC.
  This will cause the message “KeyboardInterrupt:” to appear, with the cursor flashing in the bottom line (prompt line) of the display.



• *input* Operation in the PYTHON mode

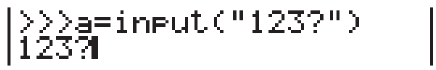
input is a built-in Python function that accepts user input while a py script is running.

input Syntax	Description
input([prompt text string])	While a py script is running, *input* writes the [prompt text string] of the argument into the SHELL result output line, and stands by for user input. A string variable name or a character string enclosed in double quotation marks (") or single quotation marks (') can be specified for the [prompt text string].

In the case of a string variable up to 16 characters long, all of the characters of the string variable name specified by *input* will be displayed as the prompt when the function is executed in the **PYTHON** mode. In the case of a string variable longer than 16 characters, the first 15 characters of the string variable followed by the similarity symbol (~) will be displayed as the prompt.

input execution example

Prompt text string up to 16 characters long
("123?" input as the prompt text string.)

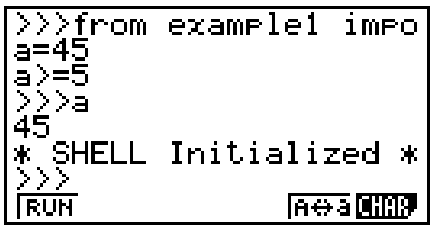


Prompt text string longer than 16 characters
("12345678901234567" input as the prompt text string.)

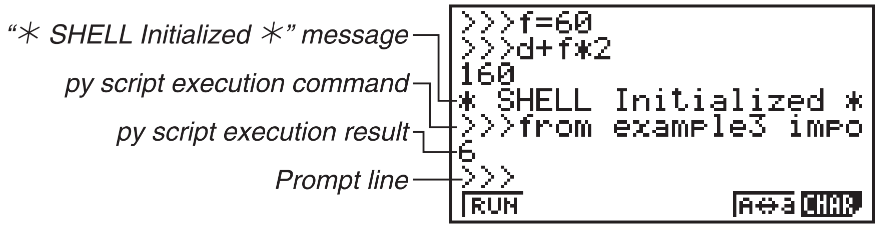
■ Initializing the SHELL

Functions and variables that are defined, modules that are imported, and the results of other SHELL operations are stored in the SHELL heap area (temporary storage memory area) while the SHELL is running. Whenever the SHELL is exited (by going to a different **PYTHON** mode screen), the SHELL heap area contents up to that point are cleared. This clearing of SHELL heap area contents is called "SHELL initialization".

- When you restart the SHELL in the **PYTHON** mode, the message "∗ SHELL Initialized ∗" will appear in the line above the bottom line (prompt line) of the SHELL screen.
- This message will appear only if you re-display the SHELL screen, but it won't appear the first time you display the SHELL screen after entering the **PYTHON** mode.



- If the SHELL is restarted by running a py script from the file list screen or script editor screen, the SHELL will be initialized before the py script is run. Because of this, the SHELL screen will appear as shown in the screen shot below.



5. Editing a py File

■ Displaying and Editing a py File

You can use the procedure below to open a stored py file and display its contents in the script editor screen, where you can edit them, if you want.

• To open a py file and display the script editor screen

1. From the main menu, enter the **PYTHON** mode.
2. On the file list screen that appears, use ▲ and ▼ to move the highlighting to the py file you want to open and then press F2(OPEN).
   - This opens the selected py file and displays the script editor screen.
   - Take care not to press EXE by mistake while the file list screen is displayed. Doing so will execute the py file and display the SHELL screen.

• To jump to the first line or the last line on the script editor screen

- To jump to the first line on the script editor screen, press F6(▷)F3(JUMP)F1(TOP).
- To jump to the last line on the script editor screen, press F6(▷)F3(JUMP)F2(BTM).

• To jump to a specific line number on the script editor screen

1. From the script editor screen, press F6(▷)F3(JUMP)F3(LINE).
2. On the dialog box that appears, input the number of line to which you want to jump and then press EXE.

• To search for text on the script editor screen

1. From the script editor screen, press F6(▷)F4(SRC).
2. On the screen that appears, enter the character string you want to search for and then press EXE.
   - This starts searching from the top of the py script, and moves the cursor to the left of the first character of the first matching character string that is found. If there is no matching character string found, the message "Not Found" will appear. If this happens, press EXIT.
   - To resume the search using the same character string, press F1(SRC).
   - You will be able to resume a search operation only while "SRC" is shown for the F1 function menu key, which indicates that there is at least one other matching character strings in the script. To cancel a search operation part way through, press EXIT. The search operation will end automatically if there are no more matches to the text string you specified.

• To copy or cut a script editor screen text string and store it on the clipboard

1. On the script editor screen, move the cursor to the beginning of the range you want to copy or cut and then press SHIFT 8(CLIP).
2. Move the cursor to the end of the range you want to copy or cut.
   - This causes the selected range to become highlighted.
   - It makes no difference whether you select from the beginning to the end of a range, or from the end to the beginning.
3. Press F1(COPY) or F2(CUT).

• To paste a character string that is on the clipboard

1. On the script editor screen, move the cursor to the location where you want to paste the text string.
2. Press SHIFT 9(PASTE).

■ Debugging a py Script

If a py file does not run as you expected it to, it may be due to a bug (error) in the py script.

The symptoms below indicate that a py file needs to be debugged.

- When running a py file script produces an error message.
- When running a py file does not produce the desired operations or results.

• Using Error Messages for Debugging

If an error message appears on the SHELL screen when you run a py file, perform the steps below.

1. Use ▲ to move the highlighting to the error message line, and then use ◀ and ▶ to check the details of the error message.
2. Press EXIT.
   - This returns to the screen from which the py file was run (script editor screen or file list screen). Open the py file where the error occurred and check the contents of the line for which an error message was displayed. Make corrections as required.
   - Note that an error message may not necessarily identify the actual problem.
   - Note that an error message will also appear if there is a SHELL input problem, making it appear that there is an error in the py file. For example, if input data does not match the data type specified by *input*, etc. If you are unable to find a problem with the line for which an error message was displayed, check if SHELL input is correct.

The function menu {JUMP} function comes in handy when you need to jump to a particular line on the script editor screen. See “To jump to a specific line number on the script editor screen” (page 14-17).

• Debugging Based on py File Running Results

If running a py file produces an unexpected result, check the entire content of the py file and make corrections as required.

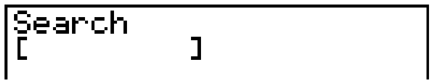
6. File Management (Searching For and Deleting Files)

You can use the file list screen to search for saved py files by their file names, and to delete files.

- py files you create in the **PYTHON** mode are stored in the calculator's storage memory.
- In addition to file operations described in this section, you can also use Memory Manager to create folders and perform other folder operations. See "Chapter 11 Memory Manager" for more information.

• To search for a py file by its file name

1. From the file list screen, press F6(SRC).
   - This displays a search text input screen.



2. Enter part or the entire name of the file you want to find.
   - You can input uppercase alphabetic characters only. Searches are not case-sensitive.
   - File name characters are searched from left to right. This means that if you enter "IT" here, names such as ITXX, ITABC, and IT123 will be regarded as hits, but names like XXIT and ABITC will not be hits.
3. Press EXE.
   - If a file name matches the character string you input in step 2, that file will be selected on the file list screen.
   - The message "Not Found" will appear if a matching file name cannot be found. Press EXIT to close the message dialog box.

• To delete a py file

1. From the file list screen, use ▼ and ▲ to highlight the file you want to delete, and then press F5(DEL).
   - This causes a delete confirmation message to appear.
2. Press F1(Yes) to delete or F6(No) to cancel the delete operation.

7. File Compatibility

py files can be shared between your calculator and a computer. A py file created with the calculator can be transferred to a computer for editing with a text editor or other software. A py file created on a computer can be transferred to and run on the calculator.

- py files you create in the **PYTHON** mode are stored in the calculator's storage memory (with file name extension py).
- For information about the procedure for transferring files between the calculator and a computer, see "Performing Data Communication between the Calculator and a Personal Computer" (page 13-2).

■ py Files Created and Saved with This Calculator

The formats of py files created and saved with this calculator are shown below.

Character Code:	ASCII code
Characters used:	ASCII*
Newline code:	CR+LF
Indent:	Spaces (two spaces for auto indent)

* ASCII characters are those shown below.
A-Z a-z 0-9 ! " # $ % & ' ( ) * + , – . / : ; < = > ? @
[\ ] ^ _ ` { | } ~ space

■ Precautions when Using an Externally Created py File on this Calculator

The restrictions below apply whenever you are trying to use the calculator's **PYTHON** mode to display (file name or file content), edit, or run a py file that was transferred to the computer from an external source.

• File Name Display

- Only py files whose file names consist of ASCII characters* are displayed on the **PYTHON** mode file list screen.
- Files with file names that include non-ASCII characters are not displayed.

  * However, the characters below are not allowed in file names.
  \ / : * ? " < > | .

- If the name of a py file transferred to storage memory from a computer or other source has a file name that is more than eight characters long, its name will abbreviated to eight characters when displayed on the storage memory information screen. (Example: AAAABBBBCC.py will become AAAABB~1.py.)

• File Content Display and Editing

Opening a py file that satisfies conditions (A) and (B) below in the **PYTHON** mode will produce a normal display of all of the file contents. A py file that shows contents can be displayed normally and edited in the **PYTHON** mode.

(A) py file written in ASCII characters only and saved using UTF-8 or other ASCII-compatible codes

- If a file saved with character codes that are not compatible with ASCII, none of its contents will be displayed if you open it in the **PYTHON** mode. All of the character will be replaced by spaces, or appear garbled.

(B) py file with up to 150 lines, each line containing up to 127 characters

- The contents of a py file that exceeds the number of characters and/or number of lines specified above cannot be displayed in the **PYTHON** mode. Attempting to open such a file will display an "Invalid Data Size" error.
- Though the contents of a py file that exceeds the number of characters and/or number of lines specified above cannot be displayed or edited in the **PYTHON** mode, you may be able to run it. See "Running a py File" (page 14-22).

- All tab codes in a py file will be replaced by two spaces when the file is opened in the **PYTHON** mode.
- No type of newline codes (LF, CR, CR+LF) have an effect on **PYTHON** mode display contents. All newline codes in a py file will be replaced by CR+LF (Windows standard newline code) when the file is opened in the **PYTHON** mode. Before transferring a py file that was edited and saved in the **PYTHON** mode to an external device for use on that device, replace its newline codes with the type that is appropriate for the environment where the file will be used.

• Running a py File

You may be able to run a py file if that file is displayed on the file list screen in the **PYTHON** mode. See "File Name Display" (page 14-21). Note the important points below.

- Running a py file that includes commands not supported by the calculator's **PYTHON** mode will result in an error.
- Using the **PYTHON** mode to open a py file created on an external device will cause characters and newline codes to be replaced. For details, see "File Content Display and Editing" (page 14-22). Because of this, opening a py file in the **PYTHON** mode, saving it, and running it, will change the content from the original py file, which may affect the running results.

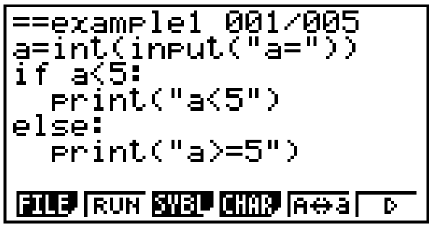
8. Sample Scripts

Sample 1: Conditional Branching

Purpose

With conditional branching a condition is evaluated and then processing follows one of multiple paths in accordance with the evaluation result.

The example below is for a simple “if... else...” statement.



Description

a=int(input("a="))	Accepts user input while the py script is running. Input values are converted to integers and define variable a.
if a<5:	If the variable a is less than 5,
print("a<5")	outputs the text string a<5.
else:	Otherwise (if variable a is 5 or greater),
print("a>=5")	outputs the text string a>=5.

Execution Result (when a=1 and a=10 are input)

(1) If you input a = 1

1

EXE

(2) If you input a = 10

1 0

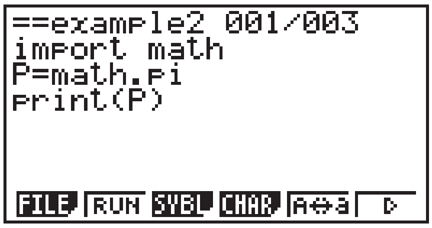
EXE

Sample 2: Importing a Module

Purpose

import imports a module and makes it possible to run the functions defined within it. Use the syntax below to execute function within the module.

<module name>.<function name>



Description

import math	Imports the math module and makes it possible to run the function defined by it.
P=math.pi	Defines variable P as *pi*, which is defined in the math module.
print(P)	Outputs the value stored in variable P.

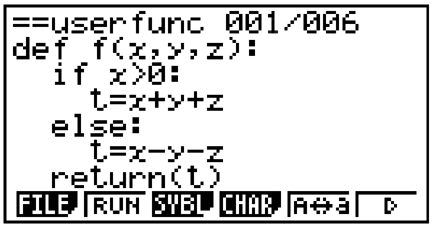
Execution Result

Sample 3: Defining a User-defined Function

Purpose

def defines a user-defined function.

The script below recalls and uses the py script created under "Sample 4: Importing a py File".



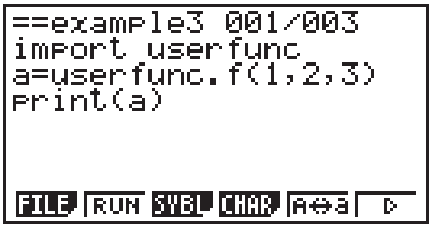
Description

def f(x,y,z):	Defines a user-defined function with function name f, and arguments x, y, and z.
if x>0:	If variable x is greater than 0,
t=x+y+z	defines variable t as the execution result of x+y+z.
else:	Otherwise (if variable x is 0 or less),
t=x-y-z	defines variable t as the execution result of x-y-z.
return(t)	Makes variable t the return value.

Running this py script as a standalone script will only define the user defined function. The function will not be executed so the py script will end without output.

Execution Result

Sample 4: Importing a py File



Purpose

import can be used to import py files into other py files and run the processes written in the imported py files.

This makes it possible to use user-defined functions and variables across multiple py files.

Use the syntax below for execution of a module function or variable.

```
<py file (module) name>.<function name or variable name>
```

Description

import userfunc	Imports userfunc.py and runs the written process.
a=userfunc.f(1,2,3)	Inputs arguments 1, 2, and 3 to the user defined function f defined by userfunc.py, executes the function f, and defines variable a as the result value.
print(a)	Outputs the value stored in the variable a.

Execution Result

Important!

- To import py files into other py file or files, all of the files must be in the same directory (folder).
- py files that can be imported with the SHELL screen are those described below.
  - If the SHELL is started up by a file list screen operation,* importable files are py files in the directory displayed on the file list screen.
  - If the SHELL is started up by a script editor screen operation,* importable files are py files in the same directory recalled with the script editor screen.

  * For actual operations, see “To display the SHELL screen” (page 14-13).

Appendix

1. Error Message Table

Message	Meaning	Countermeasure
Syntax ERROR	• Illegal syntax • Attempt to input an illegal command	• Press EXIT to display the error and make necessary corrections.
Ma ERROR	• Calculation result exceeds the display range. • Intermediate or final calculation result is outside the allowable calculation range. • Calculation is outside the input range of a function. • Mathematical error (division by zero, etc.) • Sufficient precision could not be obtained for Σ calculation, differential calculation, etc. • Solution could not be obtained for equation calculation, etc.	• Check input values and make corrections to ensure that values are within allowable limits.
Go ERROR	① No corresponding Lbl n for Goto n. ② No program stored in program area Prog "file name".	① Correctly input a Lbl n to correspond to the Goto n, or delete the Goto n if not required. ② Store a program in program area Prog "file name", or delete the Prog "file name" if not required.
Nesting ERROR	• Nesting of subroutines by Prog "file name" exceeds 10 levels.	• Ensure that Prog "file name" is not used to return from subroutines to main routine. If used, delete any unnecessary Prog "file name". • Trace the subroutine jump destinations and ensure that no jumps are made back to the original program area. Ensure that returns are made correctly.
Stack ERROR	• Execution of calculations that exceed the capacity of the stack for numeric values or stack for commands.	• Simplify the formulas to keep stacks within 10 levels for the numeric values and 26 levels for the commands. • Divide the formula into two or more parts.

α

Message	Meaning	Countermeasure
Memory ERROR	• Operation or memory storage operation exceeds remaining memory capacity.	• Keep the number of memories you use within the currently specified number of memories. • Simplify the data you are trying to store to keep it within the available memory capacity. • Delete no longer needed data to make room for the new data.
Argument ERROR	• Incorrect argument specification for a command that requires an argument.	• Correct the argument.
Dimension ERROR	• Illegal dimension used during matrix, vector, or list calculations.	• Check the matrix, vector, or list dimension.
Range ERROR	① Input of an improper V-Window value. ② V-Window range settings exceeded when a graph is redrawn. ③ Input of an improper value on the range screen and use of that value for execution. ④ The spreadsheet cell range was exceeded by paste, recall, or other cell operation.	① Change the V-Window value so it is within range. ② Redraw using the proper settings. ③ Input a proper range value. ④ Repeat the procedure taking care that the cell range is not exceeded.
Condition ERROR	• Execution of a calculation or function before all conditions required for execution are met.	• Check the conditions and make any necessary corrections.
Non-Real ERROR	• Calculation that produces a complex number when Real is specified for the Complex Mode setting on the Setup screen, even though the argument is a real number.	• Change the Complex Mode setting to something other than Real.
Complex Number In List	• List containing complex number used in a calculation or operation for which complex number data is invalid.	• Change all data in the list to real numbers.
Complex Number In Matrix	• Matrix containing complex number used in a calculation or operation for which complex number data is invalid.	• Change all data in the matrix to real numbers.
Complex Number In Matrix or Vector	• Matrix or vector containing complex number used in a calculation or operation for which complex number data is invalid.	• Change all data in the matrix or vector to real numbers.
Complex Number In Data	• Data sent from a function of this calculator (matrix, etc.) includes complex number data, but the corresponding function of the receiving calculator does not support data that includes complex numbers.	• Send data that does not include complex numbers.

Message	Meaning	Countermeasure
Can't Simplify	• Fraction simplification was attempted using the ►Simp function (page 2-23), but simplification could not be performed using the specified divisor. Example: Specifying a divisor of 3 to simplify the fraction 4/8.	• Specify a different divisor or execute ►Simp without specifying any divisor.
Can't Solve! Adjust initial value or bounds. Then try again.	• A Solve calculation could not obtain a solution within the specified range.	• Change the specified range. • Correct the input expression.
No Variable	① No variable specified within a graph function being used for Dynamic Graph. ② No variable within a Solve equation.	① Specify a variable for the graph function. ② Input a Solve equation that includes a variable.
Conversion ERROR	• Attempting to use the unit conversion command to convert between two units in different categories. • Executing a conversion calculation using the same command twice in a conversion expression.	• In a conversion expression, specify two different commands that are in the same category.
CSV error in row [A] or column [B]*1	• The imported CSV file included data that cannot be converted.	• Use your computer to check the row A, column B data in the file and change it to data that can be converted.
USB Connect ERROR*1	• USB cable connection broken during data communication.	• Use the USB cable to correctly connect the calculator and computer (or other device).
Com ERROR	• Problem with cable connection or parameter setting during program data communication.	• Check to make sure there is nothing wrong with the cable connection, and that parameters are configured correctly.
Transmit ERROR	• Problem with cable connection or parameter setting during data communication.	• Check to make sure there is nothing wrong with the cable connection, and that parameters are configured correctly.
Receive ERROR	• Problem with cable connection or parameter setting during data communication.	• Check to make sure there is nothing wrong with the cable connection, and that parameters are configured correctly.
Memory Full	• Memory of receiving unit became full during program data communication.	• Delete some data stored in the receiving unit and try again.

Message	Meaning	Countermeasure
Invalid Data Size	• Attempting to send data of a size that is not supported by the receiving device. Example: Attempting to send a matrix with more than 256 lines from the fx-9750GIII to an older model.	• Make sure the data being sent is of a size that is supported by the receiving device.
Invalid Data Number	• Attempting to send data with a data number that is not supported by the receiving device. Example: Attempting to send List 7 from the fx-9750GIII to an older model that supports only up to List 6.	• Specify a data number supported by the receiving device when sending data.
Time Out	• A Solve calculation or integration calculation was unable to satisfy convergence conditions.	• If you are performing a Solve calculation, try changing to the initial default estimated value. • If you are performing an integration calculation, try changing to a larger tol value.
Circular ERROR	• There is a circular reference (such as "=A1" in cell A1) in the spreadsheet.	• Change cell contents to remove the circular references.
Please Reconnect	• The connection was dropped for some reason while updating the operating system.	• Reconnect and try again.
Sub-folders in this folder cannot be displayed*1	• In the **MEMORY** mode, a level 3 nested storage memory folder is displayed, and it contains a level 4 nested folder. (The level 4 folder will be displayed, but it cannot be opened.)	• Use your computer*2 to store all files you want to access in the top three folder nesting levels.
Too Much Data	• The number of data items is too large.	• Delete unneeded data.
Fragmentation ERROR	• Memory must be optimized before any more data can be stored.	• Optimize memory.
Invalid Name	• The file name you input includes invalid characters.	• Use the correct characters to input a valid file name.
Invalid Type	• An illegal data type is specified.	• Specify valid data.
Storage Memory Full	• The storage memory is full.	• Delete unneeded data.
Data ERROR	• A data error occurred.	• Check to make sure you are writing correct type of data and try again.

Message	Meaning	Countermeasure
File System ERROR[*1]	• The calculator memory file system is corrupted or the storage memory format is one that cannot be read by the calculator.	• After reading the information under "Important!" below, perform an Initialize All operation as described in "Reset" (page 12-3). ***Important!*** Performing an Initialize All operation will delete all data in calculator memory, including language data. If you need the data in calculator memory, use the USB cable to connect the calculator to a computer and copy all of the data you want to keep to your computer's hard disk before performing the Initialize All operation. For more information, see "Performing Data Communication between the Calculator and a Personal Computer" (page 13-2).

[*1] fx-9860GIII/fx-9750GIII only

[*2] For details about using a computer to perform storage memory file and folder operations, see "Transferring Data between the Calculator and a Personal Computer" (page 13-4).

2. Input Ranges

Function	Input range for real number solutions	Internal digits	Precision	Notes
sin$x$ cos$x$ tan$x$	(DEG) $\lvert x\rvert < 9 \times (10^9)°$ (RAD) $\lvert x\rvert < 5 \times 10^7\pi$rad (GRA) $\lvert x\rvert < 1 \times 10^{10}$grad	15 digits	As a rule, precision is ±1 at the 10th digit.*	However, for tan$x$: $\lvert x\rvert \neq 90(2n+1)$: DEG $\lvert x\rvert \neq \pi/2(2n+1)$: RAD $\lvert x\rvert \neq 100(2n+1)$: GRA
$\sin^{-1}x$ $\cos^{-1}x$	$\lvert x\rvert \leqq 1$	"	"	
$\tan^{-1}x$	$\lvert x\rvert < 1 \times 10^{100}$			
sinh$x$ cosh$x$	$\lvert x\rvert \leqq 230.9516564$	"	"	
tanh$x$	$\lvert x\rvert < 1 \times 10^{100}$			
$\sinh^{-1}x$	$\lvert x\rvert < 1 \times 10^{100}$	"	"	
$\cosh^{-1}x$	$1 \leqq x < 1 \times 10^{100}$			
$\tanh^{-1}x$	$\lvert x\rvert < 1$			
log$x$ ln$x$	$1 \times 10^{-99} \leqq x < 1 \times 10^{100}$	"	"	• Complex numbers can be used as arguments.
10^x	$-1 \times 10^{100} < x < 100$	"	"	
e^x	-1×10^{100} $< x \leqq 230.2585092$			• Complex numbers can be used as arguments.
$\sqrt{x}$	$0 \leqq x < 1 \times 10^{100}$	"	"	
x^2	$\lvert x\rvert < 1 \times 10^{50}$			• Complex numbers can be used as arguments.
$1/x$	$\lvert x\rvert < 1 \times 10^{100}, x \neq 0$	"	"	• Complex numbers can be used as arguments.
$\sqrt[3]{x}$	$\lvert x\rvert < 1 \times 10^{100}$			
$x!$	$0 \leqq x \leqq 69$ (x is an integer)	"	"	
nPr nCr	Result $< 1 \times 10^{100}$ n, r (n and r are integers) $0 \leqq r \leqq n$, $n < 1 \times 10^{10}$	"	"	
Pol (x, y)	$\sqrt{x^2 + y^2} < 1 \times 10^{100}$	"	"	
Rec (r ,θ)	$\lvert r\rvert < 1 \times 10^{100}$ (DEG) $\lvert\theta\rvert < 9 \times (10^9)°$ (RAD) $\lvert\theta\rvert < 5 \times 10^7\pi$ rad (GRA) $\lvert\theta\rvert < 1 \times 10^{10}$grad	"	"	However, for tanθ : $\lvert\theta\rvert \neq 90(2n+1)$: DEG $\lvert\theta\rvert \neq \pi/2(2n+1)$: RAD $\lvert\theta\rvert \neq 100(2n+1)$: GRA

Function	Input range for real number solutions	Internal digits	Precision	Notes
° ’ ”	$\lvert a\rvert, b, c < 1 \times 10^{100}$ $0 \leqq b, c$	15 digits	As a rule, precision is ±1 at the 10th digit.*	
$\overleftarrow{\circ\ '\ ''}$	$\lvert x\rvert < 1 \times 10^{100}$ Sexagesimal display: $\lvert x\rvert < 1 \times 10^{7}$			
^(x^y)	$x > 0$: $-1 \times 10^{100} < y\log x < 100$ $x = 0 : y > 0$ $x < 0 : y = n, \frac{m}{2n+1}$ (m, n are integers) However; $-1 \times 10^{100} < y \log \lvert x\rvert < 100$	"	"	• Complex numbers can be used as arguments.
$\sqrt[x]{y}$	$y > 0 : x \neq 0$ $-1 \times 10^{100} < \frac{1}{x} \log y < 100$ $y = 0 : x > 0$ $y < 0 : x = 2n+1, \frac{2n+1}{m}$ ($m \neq 0$; m, n are integers) However; $-1 \times 10^{100} < \frac{1}{x} \log \lvert y\rvert < 100$	"	"	• Complex numbers can be used as arguments.
a^{b}/c	Total of integer, numerator and denominator must be within 10 digits (includes division marks).	"	"	

* For a single calculation, calculation error is ±1 at the 10th digit. (In the case of exponential display, calculation error is ±1 at the last significant digit.) Errors are cumulative in the case of consecutive calculations, which can also cause them to become large. (This is also true of internal consecutive calculations that are performed in the case of ^(x^y), $\sqrt[x]{y}$, $x!$, $\sqrt[3]{x}$, nPr, nCr, etc.)

In the vicinity of a function’s singular point and point of inflection, errors are cumulative and may become large.

Function	Input range
Binary, octal, decimal, hexadecimal calculation	Values fall within following ranges after conversion: DEC: $-2147483648 \leqq x \leqq 2147483647$ BIN: $1000000000000000 \leqq x \leqq 1111111111111111$ (negative) $0 \leqq x \leqq 111111111111111$ (0, positive) OCT: $20000000000 \leqq x \leqq 37777777777$ (negative) $0 \leqq x \leqq 17777777777$ (0, positive) HEX: $80000000 \leqq x \leqq$ FFFFFFFF (negative) $0 \leqq x \leqq$ 7FFFFFFF (0, positive)

Examination Mode (fx-9860GIII, fx-9750GIII only)

The Examination Mode puts some limits on calculator functions, which allows it to be used when taking an exam or test. Use the Examination Mode only when actually taking an exam or test.

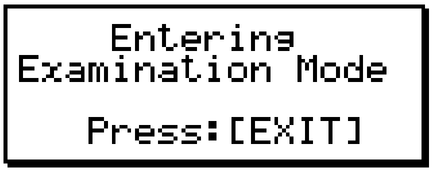
Entering the Examination Mode affects calculator operation as described below.

- The following modes and functions are disabled: **e•ACT** mode, **MEMORY** mode, **E-CON3** mode, **PYTHON** mode, **PRGM** mode, vector commands, program commands (◢ (Output Command), : (Multi-statement Command), ↵ (Carriage Return)), data transfer, add-in applications, add-in languages, storage memory access, user name editing, OS Update, Catalog QR Code function.
- User data (main memory) is backed up. The backed up data will be restored when you exit the Examination Mode. Any data created during an Examination Mode session will be deleted when the Examination Mode is exited.

• Entering the Examination Mode

1. Press [SHIFT] [AC/ON] (OFF) to turn off the calculator.
2. While holding down the [cos] and [7] keys, press the [AC/ON] key.
   - This displays the dialog box shown below.

3. Press [F1] (Yes).
   - Read the message on the dialog box that appears.
4. Press [F2].
   - This displays the dialog box shown below.



5. Press [EXIT].

- Only the settings below are saved before entering the Examination Mode.
  Input/Output, Frac Result, Angle, Complex Mode, Display, Imp Multi, Q1Q3 Type, Language
- fx-9750GIII: Entering the Examination Mode by selecting Math for the Input/Output setting of the Setup menu will cause the Input/Output setting to switch to Mth/Mix. Note that Math cannot be selected for the Input/Output setting while in the Examination Mode.

• Calculator Operation in the Examination Mode

- Entering the Examination Mode causes an icon (R) to flash on the display. The flash rate of the icon slows down about 15 minutes after entering the Examination Mode.

- The icon inverts its colors (R) to indicate that a calculation operation is in progress.
- In the Examination Mode, the Auto Power Off trigger setting is fixed at approximately 60 minutes.
- Pressing ALPHA (−) causes the dialog box shown below to appear. The dialog box shows the elapsed time in the Examination Mode.

  You can restart the elapsed time count by performing one of the operations below.
  - Press the RESTART button.
  - Remove the calculator's batteries.
  - Delete Main Memory data.
  - Re-enter the Examination Mode while already in the Examination Mode.
- The table below shows how certain operations affect the Examination Mode.

If you do this:	The calculator stays in Examination Mode.	Data input in Examination Mode is retained.
Turn power off and then back on again	Yes	Yes
Press the RESTART button	Yes	No
Remove the calculator's batteries	Yes	No
Delete Main Memory data	Yes	No

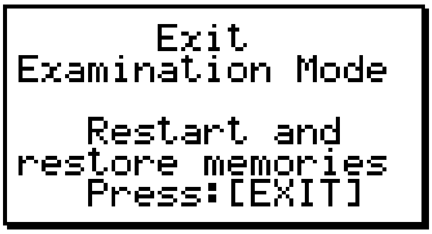
• Exiting the Examination Mode

There are three ways to exit the Examination Mode.

(1) Exiting the Examination Mode by Connecting to a Computer

1. Use the USB cable to connect the calculator that is in the Examination Mode to a computer.
2. When the "Select Connection Mode" dialog box appears on the calculator, press the calculator's F1 key.
3. On the computer, open the calculator drive.

4. On the computer, copy or delete any file that is on the calculator drive.
5. Terminate the connection between the calculator and computer.
   - The dialog box shown below will appear when you exit the Examination Mode.



(2) Exiting the Examination Mode by Allowing 12 Hours to Elapse

Approximately 12 hours after entering the Examination Mode, turning on the calculator will cause it to exit the Examination Mode automatically.

Important!

If you press the RESTART button or if you replace batteries before turning on the calculator, it will re-enter the Examination Mode when turned on, even if 12 hours have elapsed.

(3) Exiting the Examination Mode by Connecting to another Calculator

1. On the calculator that is in the Examination Mode (Calculator A), enter the **LINK** mode and then press F4(CABL) F2(3PIN).
2. Use the SB-62 cable to connect Calculator A to another calculator that is not in the Examination Mode (Calculator B).
3. On Calculator A, press F2(RECV).
4. On Calculator B*, enter the **LINK** mode and then press F3(EXAM) F1(UNLK) F1(Yes).
   - You could also transfer any data from Calculator B to Calculator A.

     Example: To transfer setup data to Calculator A

     1. On Calculator B, enter the **LINK** mode and then press F1(TRAN) F1(MAIN) F1(SEL).
     2. Use ▼ and ▲ to select “SETUP”.
     3. Press F1(SEL) F6(TRAN) F1(Yes).

     * Calculator with Examination Mode function

- The icon will disappear from the display when the calculator exits the Examination Mode.

• Displaying Examination Mode Help

You can display Examination Mode help in the **LINK** mode.

F3(EXAM) F2(ENTR) ... Displays help about entering the Examination Mode.

F3(EXAM) F3(APP) ... Displays help about what modes and functions are disabled in the Examination Mode.

F3(EXAM) F4(EXIT) ... Displays help about exiting the Examination Mode.

MicroPython license information

The MIT License (MIT)

E-CON3 Application

(English)

(fx-9860GIII, fx-9750GIII)

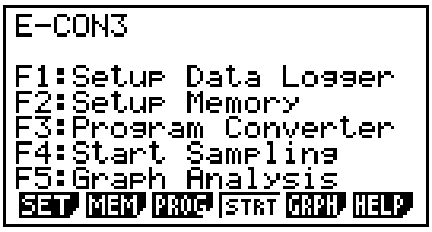
Important!

- Do not install Add-in E-CON2 on a calculator that has E-CON3 installed. Doing so may cause operational problems.
- All explanations in this section assume that you are fully familiar with all calculator and Data Logger (CMA CLAB* or CASIO EA-200) precautions, terminology, and operational procedures.
- The E-CON3 application is designed to get the most out of the measurement functions of the CASIO EA-200 Data Logger. Though it can run on a CMA CLAB Data Logger, CLAB does not have a SONIC port, microphone, or speaker as is equipped on the EA-200. While a calculator is connected to a CLAB Data Logger, attempting to configure E-CON3 application settings and perform measurement using parameters that are not supported by CLAB will cause an error.
- Unless specifically indicated otherwise, all page references in this "E-CON3 Application" chapter are to pages in this chapter.

* For information about CMA and the CLAB Data Logger, visit http://cma-science.nl/.

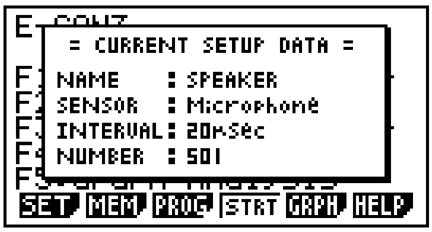
1 E-CON3 Overview

- From the Main Menu, select E-CON3 to enter the E-CON3 Mode.



E-CON3 Main Menu

- The “E-CON3 Mode” provides the functions listed below for simple and more efficient data sampling using a Data Logger.
  - F1(SET) .... Displays a screen for setting up a Data Logger.
  - F2(MEM)........ Displays a screen for saving Data Logger setup data under a file name.
  - F3(PROG) ..... Performs program conversion.
    - This function can be used to convert Data Logger setup data configured using E-CON3 to a Data Logger control program that can run on the fx-9860G SD/fx-9860G.
    - It also can be used to convert data to a program that can be run on a CFX-9850 Series/fx-7400 Series calculator.
  - F4(STRT)....... Starts data collection.
  - F5(GRPH)...... Graphs data sampled by a Data Logger, and provides tools for analyzing graphs. Graph Analysis tools include calculation of periodic frequency, various types of regression, Fourier series calculation, and more.
  - F6(HELP)....... Displays E-CON3 help.
- Pressing the OPTN key (Setup Preview) or a cursor key while the E-CON3 main menu is on the screen displays a preview dialog box that shows the contents of the setup in the current setup memory area.



To close the preview dialog box, press EXIT.

Note
For details about setup data and the current setup memory area, see “6 Using Setup Memory” (page 6-1).

About online help
Pressing the F6(HELP) key displays online help about the E-CON3 Mode.

2 Using the Setup Wizard

This section explains how to use the Setup Wizard to configure the Data Logger setup quickly and easily simply by replying to questions as they appear.
If you need more control over specific sampling parameters, you should consider using the Advanced Setup procedure on page 3-1.

■ Setup Wizard Parameters

Setup Wizard lets you make changes to the following three Data Logger basic sampling parameters using an interactive wizard format.

- Sensor (Select Sensor):
  Specify a CASIO, VERNIER* or CMA sensor from a menu of choices.
  *Vernier Software & Technology
- Total Sampling Time:
  Specify a value within the range of 0.01 second to 30 days.
- Sampling Time Unit (Select Unit):
  Specify seconds (sec), minutes (min), hours (hour), or days (day) as the time unit of the value you input for the total sampling time (Total Sampling Time).

Note
For some sensors (EA-200 built-in microphone, Vernier Photogate, etc.), sampling parameters are different from those shown above. The differences between sampling parameters and setup procedures for each sensor are described in this section.

Setup Wizard Rules

Note the following rules whenever you use the Setup Wizard.

- The EA-200 sampling channel is CH1 or SONIC.
- The CLAB sampling channel is CH1 only.
- The trigger for a Setup Wizard setup is always the EXE key.

• To configure a Data Logger setup using Setup Wizard

Before getting started...

- Before starting the procedure below, make sure you first decide if you want to start sampling immediately using the setup you configure with Setup Wizard, or if you want to store the setup for later sampling.
- See sections 6-1, 7-1, and 8-1 of this chapter (E-CON3 Application) for information about procedures required to start sampling and to store a setup. We recommend that you read through the entire procedure first, referencing the other sections and pages as noted, before actually trying to perform it.
- To terminate Setup Wizard part way through and cancel the setup, press SHIFT EXIT (QUIT).

1. Display the E-CON3 main menu (page 1-1).
2. Press F1 (SET) and then F1 (WIZ).
   - This launches the Setup Wizard and displays the “Select Sensor” screen.
3. Press one of the following function keys to specify the manufacturer of the sensor you are using for measurement: F1 (CASIO), F2 (VERNIER), F3 (CMA).
   - Pressing either key will display the corresponding sensor list.
4. Specify the sensor you want to use.
   Use the ▲ and ▼ cursor keys to move the highlighting to the sensor you want to use, and then press EXE.
   - If the sensor you specified has more than one option (more detailed specifications, such as sampling unit, mode, etc.), an option list will appear on the display at this time. If this happens, advance to step 5.
   - If the “Input Total Sampling Interval” screen appears, skip to step 6.
5. Select the options for the sensor you specified in step 4.
   Use the ▲ and ▼ cursor keys to move the highlighting to the option you want to select, and then press EXE.
   - If the “Input Total Sampling Interval” screen appears, advance to step 6.

   Important!
   When special settings are required by the sensor and/or option you select, other screens other than the “Input Total Sampling Interval” screen will appear on the display. The following shows where you should go to find information about the operations you need to perform for each sensor/option selection.

If you select this sensor/option:	Go here for more information:
[CASIO] - [Microphone] - [Sound wave & FFT]	"Using Setup Wizard to Configure Settings for FFT (Frequency Characteristics) Data Sampling" on page 2-4
[CASIO] - [Microphone] - [FFT only]	
[VERNIER] - [Photogate] - [Gate] or [CMA] - [Photogate] - [Gate]	"To configure a setup for Photogate alone" on page 2-5
[VERNIER] - [Photogate] - [Pulley] or [CMA] - [Photogate] - [Pulley]	"To configure a setup for Photogate and Smart Pulley" on page 2-6
[CASIO] - [Speaker] - [y=f(x)]	"Outputting the Waveform of a Function through the Speaker" on page 2-6

6. Use the number input keys to input the total sampling time. Just input a value.
   In step 8 of this procedure, you will be able to specify the unit (seconds, minutes, hours, days) of the value you input here.

   Note
   - With some sensors ([CASIO] - [Microphone] - [Sound wave], etc.) sampling time is limited to a few seconds. The unit for such a sensor is always seconds, and so the "Select Unit" screen does not appear.
   - If you specify a total sampling time value in the range of 10 seconds to 23 hours, 59 minutes, 59 seconds, real-time graphing will be performed during sampling. This is the same as selecting the Realtime Mode on the "Advanced Setup" screen.
7. After inputting total sampling time value you want, press [EXE]. This displays the "Select Unit" screen.
8. Use number keys [1] through [4] to specify the unit for the value you specified in step 6.
   - This displays a confirmation screen.
9. If there is not problem with the contents of the confirmation screen, press [F1].
   If you need to change the setup, press [F6] or [EXIT]. This will return to step 6 (for setting the total sampling interval), where you can change the setting.
   - Pressing [F1] will take you to the final Setup Wizard screen.
10. Press number keys described below to specify what you want to do with the setup you have configured.
    [1] (Start Setup).................Starts sampling using the setup (page 8-1)
    [2] (Save Setup-MEM).......Saves the setup (page 6-1)
    [3] (Convert Program)........Converts the setup to a program (page 7-1)

■ Using Setup Wizard to Configure Settings for FFT (Frequency Characteristics) Data Sampling (EA-200 only)

When you perform sound sampling executed the EA-200's built-in microphone (by specifying [CASIO] - [Microphone] as the sensor), Setup Wizard will provide you with three options: [Sound wave], [Sound wave & FFT], and [FFT only]. "Sound wave" records the following two dimensions for the sampled sound data: elapsed time (horizontal axis) and volume (vertical axis). "FFT" records the following two dimensions: frequency (horizontal axis) and volume (vertical axis).

The following shows the settings for recording FFT data.

1. Perform the first two steps of the procedure under "To configure a Data Logger setup using Setup Wizard" on page 2-2.
2. On the "Select Sensor" screen, select [CASIO] - [Microphone] - [Sound wave & FFT] or [CASIO] - [Microphone] - [FFT only].
   - This causes a "Select FFT Range" screen to appear.
   - You can select one of four settings for FFT Range. The setting you select will automatically apply the applicable fixed parameters shown below.

Setting / Parameter	2 - 1000 Hz: F1	4 - 2000 Hz: F2	6 - 3000 Hz: F3	8 - 4000 Hz: F4
Frequency pitch	2 Hz	4 Hz	6 Hz	8 Hz
Frequency max	1000 Hz	2000 Hz	3000 Hz	4000 Hz
Sampling interval	61 μsec	31 μsec	20 μsec	31 μsec
Number of samples	8192	8192	8192	4096

   The following explains the meaning of each parameter.

   Frequency pitch: Pitch in Hz at which sampling is performed

   Frequency max: Upper limit of sampling frequency (lower limit is fixed at 0 Hz)

   Sampling interval: Interval in μ seconds at which sampling is performed

   Number of samples: Number of times sampling is performed

3. Use function keys F1 through F4 to select an FFT Range setting.
   - Selecting an FFT Range causes the final Setup Wizard screen to appear.
4. Perform step 10 under "To configure a Data Logger setup using Setup Wizard" on page 2-2 to finalize the procedure.

■ Using Setup Wizard to Configure a Photogate Setup

Connection of a Vernier or CMA Photogate requires configuration of setup parameters that are slightly different from parameters for other types of sensors.

• To configure a setup for Photogate alone

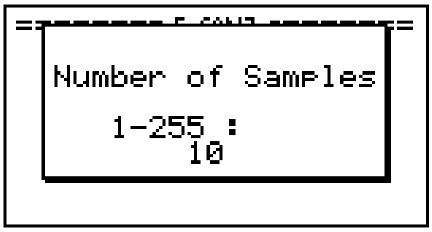
1. On the E-CON3 main menu, press F1(SET)F1(WIZ) to start the setup wizard.
   - This displays the “Select Sensor” dialog box.
2. If you are using a Vernier Photogate alone, select [VERNIER] - [Photogate] - [Gate]. When the “Select Channel” dialog box appears, advance to step 3 of this procedure.
   If you are using a CMA Photogate alone, select [CMA] - [Photogate] - [Gate]. When the “Gate Status” dialog box appears, advance to step 4 of this procedure.
3. Press F1(CH1) or F2(SONIC) to specify the channel where the Photogate is connected.
   - This displays the “Gate Status” dialog box.
4. On the “Gate Status” dialog box, select a gate status for measurement by pressing a function key (F1 through F4).
   - The gate status defines what Photogate status should cause timing to start, and what status should cause timing to stop.

     F1(Open-Open) .... Timing starts when the gate opens, and continues until it closes and then opens again.

     F2(Open-Close)........ Timing starts when the gate opens, and continues until it closes.

     F3(Close-Open)........ Timing starts when the gate closes, and continues until it opens.

     F4(Close-Close) .... Timing starts when the gate closes, and continues until it opens and then closes again.
   - Selecting a gate status causes a screen for specifying the number of samples to appear.



5. Input an integer in the range of 1 to 255 to specify the number of samples.
6. Perform step 10 (in the case of a Vernier Photogate) or steps 9 and 10 (in the case of a CMA Photogate) under “To configure a Data Logger setup using Setup Wizard” (page 2-2).

• To configure a setup for Photogate and Smart Pulley

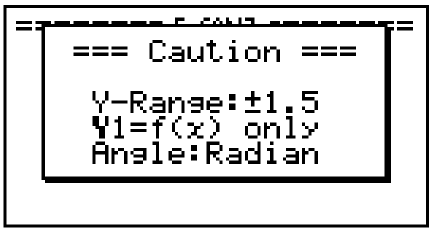
1. On the E-CON3 main menu, press F1(SET)F1(WIZ) to start the setup wizard.
2. This displays the “Select Sensor” dialog box.
3. If you are using a Vernier Photogate with Pulley, select [VERNIER] - [Photogate] - [Pulley]. When the “Select Channel” dialog box appears, advance to step 4 of this procedure.
   If you are using a CMA Photogate with Pulley, select [CMA] - [Photogate] - [Pulley]. When the “Input Distance(m)” dialog box appears, advance to step 5 of this procedure.
4. Press F1(CH1) or F2(SONIC) to specify the channel where the Photogate is connected.
   • This displays the “Input Distance(m)” dialog box.
5. On the “Input Distance(m)” dialog box, input a value in the range of 0.1 to 4.0 and then press EXE.
6. Perform step 10 (in the case of a Vernier Photogate) or steps 9 and 10 (in the case of a CMA Photogate) under “To configure a Data Logger setup using Setup Wizard” (page 2-2).

■ Outputting the Waveform of a Function through the Speaker (EA-200 only)

Normally, the Setup Wizard helps you configure setups for sensors connected to a Data Logger. If you select [CASIO] - [Speaker] - [y=f(x)] on the “Select Sensor” screen, however, it configures the EA-200 to output the sound that corresponds to a function that you input and graph on the calculator.

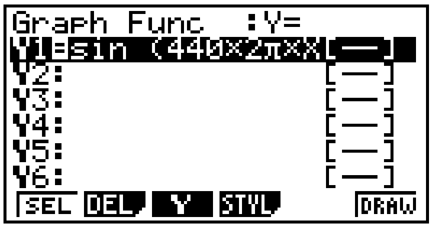
• To configure a setup for speaker output

1. Connect the data communication cable (SB-62) to the communication port of the calculator and the MASTER port of the EA-200.
2. Perform the first two steps of the procedure under “To configure a Data Logger setup using Setup Wizard” on page 2-2.
3. On the “Select Sensor” screen, select [CASIO] - [Speaker] - [y=f(x)].
   This displays a screen like the one shown below.



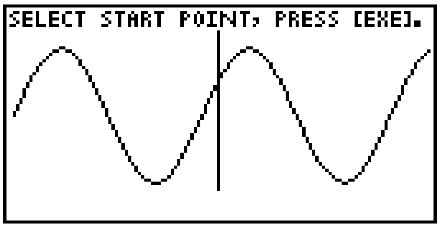
4. Press EXE to advance to the View Window setting screen.
   • The following settings are configured automatically: Ymin = –1.5 and Ymax = 1.5. Do not change these settings.
5. Press EXE or EXIT to advance to the graph function list.

6. In line “Y1”, input the function of the waveform for the sound you want to input.

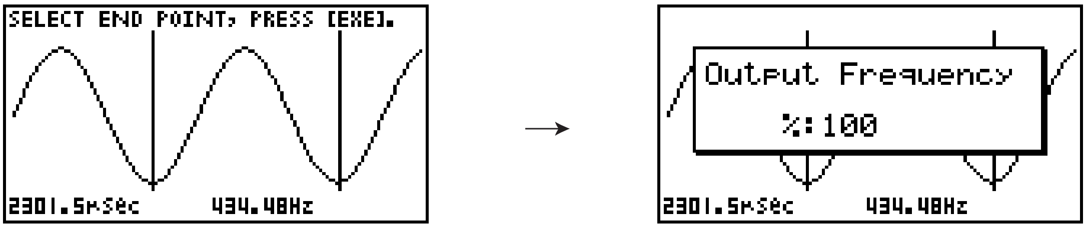


- Note that the angle unit is always radians.
- Input a function where the value of “Y” is within the range of –1.5 to +1.5.

7. Press F6 (DRAW) to graph the function.
   - This graphs the function and displays a vertical cursor line as shown below. Use the graph to specify the range that you want to output to the speaker.



8. Use the ◀ and ▶ cursor keys to move the cursor to the start point of the output, and then press EXE to register it.
9. Use the ◀ and ▶ cursor keys to move the cursor to the end point of the output, and then press EXE to register it.
   - After you specify the start point and end point, an output frequency dialog box shown below appears on the display.



10. Input a percent value for the output frequency value you want.
    - To output the original sound as-is, specify 100%. To raise the original sound by one octave, input a value of 200%. To lower the original sound by one octave, input a value of 50%.
11. After inputting an output frequency value, press EXE.
    - This outputs the waveform between the start point and end point from the EA-200 speaker.
    - If the sound you configured cannot be output for some reason, the message “Range Error” will appear. If this happens, press EXIT to scroll back through the previous setting screens and change the setup as required.
12. To terminate sound output, press the EA-200 [START/STOP] key.

13. Press [EXE].
    - This displays a screen like the one shown below.

14. Perform one of the following operations, depending on what you want to do.

    To change the output frequency and try again:
    Press [F1](Yes) to return to the “Output Frequency” dialog box. Next, repeat the above steps from step 10.

    To change the output range of the waveform graph and try again:
    Press [F6](No) to return to the graph screen in step 7. Next, repeat the above steps from step 8.

    To change the function:
    Press [F6](No) and then [EXIT] to return to the graph function list in step 6. Next, repeat the above steps from step 6.

    To exit the procedure and return to the E-CON3 main menu:
    Press [F6](No) and then press [EXIT] twice.

3 Using Advanced Setup

Advanced Setup provides you with total control over a number of parameters that you can adjust to configure the Data Logger setup that suits your particular needs.

The procedures in this section provide the general steps you should perform when using Advanced Setup to configure a Data Logger setup, and to returns setup settings to their initial default values. You can find details about individual settings and the options that are available with each setting are provided by the explanations that start on page 3-3.

■ Advanced Setup Operations

• To configure a Data Logger setup using Advanced Setup

The following procedure describes the general steps for using Advanced Setup. Refer to the pages as noted for more information.

1. Display the E-CON3 main menu (page 1-1).
2. Press F1 (SET). This displays the “Setup Data Logger” submenu.
3. Press F2 (ADV). This displays the Advanced Setup menu.

Advanced Setup Menu

4. If you want to configure a custom probe at this point, press 5 (Custom Probe). Next, follow the steps under “To configure a custom probe setup” on page 4-1.
   - You can also configure a custom probe during the procedure under “To configure Channel Setup settings” on page 3-3.
   - Custom probe configurations you have stored in memory can be selected using Channel in step 5, below.
5. Use the Advanced Setup function keys described below to set other parameters.
   - 1 (Channel)......Displays a screen that shows the sensors that are currently assigned to each channel (CH1, CH2, CH3, SONIC, Mic). You can also use this dialog to change sensor assignments. See “Channel Setup” on page 3-3 for more information.
   - 2 (Sample).......Displays a screen for selecting the sampling mode, and for specifying the sampling interval, the number of samples, and the warm-up mode. When “Fast” is selected for “Mode”, this dialog box also displays a setting for turning FFT (frequency characteristics) graphing on and off. See “Sample Setup” on page 3-5 for more information.

- 3 (Trigger)........Displays a screen for configuring sampling start (trigger) conditions. See “Trigger Setup” on page 3-8 for more information.
- 4 (Graph).........Displays a screen for configuring graph settings. See “Graph Setup” on page 3-13 for more information.

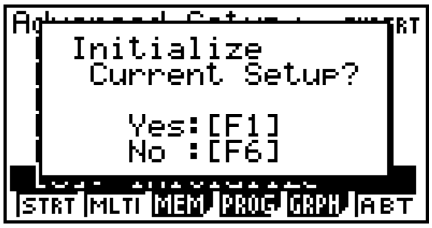
• You can return the settings on the above setup screens (1 through 4) using the procedure described under “To return setup parameters to their initial defaults”.

6. After you configure a setup, you can use the function key operations described below to start sampling or perform other operations.
   - F1 (STRT)....... Starts sampling using the setup (page 8-1).
   - F2 (MLTI)........ Starts MULTIMETER Mode sampling using the setup (page 5-1).
   - F3 (MEM)........ Saves the setup (page 6-1).
   - F4 (PROG) ..... Converts the setup to a program (page 7-1).
   - F5 (GRPH)...... Graphs data sampled by the Data Logger, and provides tools for analyzing graphs (page 10-1).
   - F6 (ABT)......... Displays version information about the Data Logger unit that is currently connected to the calculator.

• To return setup parameters to their initial defaults

Perform the following procedure when you want to return the parameters of the setup in the current setup memory area to their initial defaults.

1. While the Advanced Setup menu (page 3-1) is on the display, press 6 (Initialize).



2. In response to the confirmation message that appears, press F1 (Yes) to initialize the setup.

   • To clear the confirmation message without initializing the setup, press F6 (No).

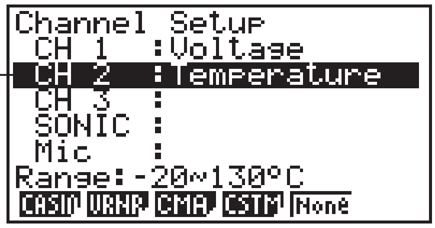
■ Channel Setup

The Channel Setup screen shows the sensors that are currently assigned to each channel (CH1, CH2, CH3, SONIC, Mic).

• To configure Channel Setup settings

1. While the Advanced Setup menu (page 3-1) is on the display, press [1](Channel).
   - This displays the Channel Setup screen.

Currently selected channel



Channel Setup Screen

2. Use the ⏶ and ⏷ cursor keys to move the highlighting to the channel whose setting you want to change.
3. What you need to do next depends on the currently selected channel.
   - CH1, CH2, or CH3

     Press a function key to display a menu of sensors that can be assigned to the selected channel.

     [F1](CASIO)....... Displays a menu of CASIO sensors.

     [F2](VRNR)........ Displays a menu of Vernier sensors.

     [F3](CMA).......... Displays a menu of CMA sensors.

     [F4](CSTM)........ Displays a menu of custom probes.

     [F5](None) .... Press this key when you want leave the channel without any sensor assigned to it.

   - SONIC Channel (EA-200 only)

     Press a function key to display a menu of sensors that can be assigned to this channel.

     [F1](CASIO)....... Displays a menu of CASIO sensors, but only “Motion” can be selected.

     [F2](VRNR)........ Displays a menu of Vernier sensors. You can select “Motion” or “Photogate”.

     Note
     - On the menu that appears after you select “Motion” from either the CASIO or Vernier sensor menu, select either “meters” or “feet” as the sampling unit.
     - After selecting “Motion” from either the CASIO or Vernier sensor menu, you can press the [OPTN] key to toggle “smoothing (correction of measurement error)” on (“-Smooth” displayed) and off (“-Smooth” not displayed).

- From the menu that appears after you select “Photogate” as the sensor, select [Gate] or [Pulley].

  [Gate] ....Select this option when using the Photogate sensor alone.

  [Pulley] ....Select this option when using the Photogate sensor along with a smart pulley.

  F5(None) .... Select this option to disable the SONIC channel.

- Mic Channel (EA-200 only)

  For this channel, the sensor is automatically set to Built-in (External) Microphone. However, you need to configure the settings described below.

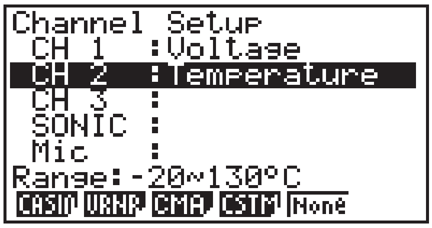
  F1(Snd) .... Select this option to record elapsed time and volume 2-dimensional sampled sound data (elapsed time on the horizontal axis, volume on the vertical axis).

  F2(FFT) .... Select this option to record frequency and volume 2-dimensional sampled sound data (frequency on the horizontal axis, volume on the vertical axis).

  F5(None) .... Select this option to disable the Mic channel.

4. Repeat steps 2 and 3 as many times as necessary to configure all the channels you want.
5. After all the settings are the way you want, press EXE.
   - This returns to the Advanced Setup menu.

   Note
   - When you select a channel on the Channel Setup screen, the sampling range of the selected channel appears in the bottom line of the screen.



In the above example, the range of the temperature sensor assigned to CH2 appears on the display.

If the sampling range value is too long to fit on the display, only the part of the value that fits on the display will be shown.

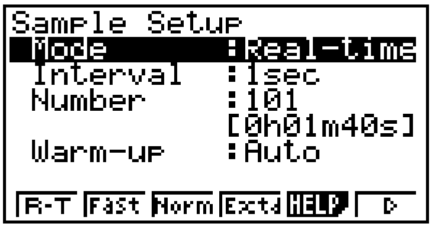
- Whenever the current Sample Setup (page 3-5) and Trigger Setup (page 3-8) settings become incompatible due to a change in Channel Setup settings, these settings revert automatically to their initial defaults. Selecting the Mic channel with Channel Setup while the Sample Setup has “Extended” selected for the sampling mode, for example, will cause the sampling mode to change automatically to “Fast” (which is the initial default setting when the Mic channel is selected). For information about the channels that can be selected for each sampling mode, see “Sample Setup” (page 3-5).

■ Sample Setup

The Sample Setup screen lets you configure a number of settings that control sampling.

• To configure Sample Setup settings

1. While the Advanced Setup menu (page 3-1) is on the display, press [2] (Sample).
   • This displays the Sample Setup screen, with the "Mode" line highlighted, which indicates that you can select the sampling mode.



2. Select the sampling mode that suits the type of sampling you want to perform.

To do this:	Press this key:	To select this mode:
Graph data in real-time as it is sampled	[F1] (R-T)	Realtime
Perform sampling of high-speed phenomena (sound, etc.)	[F2] (Fast)	Fast
Perform sampling over a long time (weather, etc.)	[F4] (Extd)	Extended*
Sample sound using the built-in microphone (EA-200 only)	[F6] (▷) [F1] (Snd)	Sound
Record the time of the occurrence of a particular trigger event as an absolute value starting from 0, which is the sampling start time	[F6] (▷) [F2] (Clck)	Clock
Perform periodic sampling, from a start trigger event to an end trigger event	[F6] (▷) [F3] (Priod)	Period
Perform sampling other than that described above	[F3] (Norm)	Normal

* While performing measurements with the Extended mode, the EA-200 will enter a power off sleep state while standing by.

• Note that the mode you select also determines the channel(s) you can use.

Sampling mode:	Selectable Channel(s)
Realtime, Extended, Normal	CH1, CH2, CH3, SONIC
Fast	CH1, Mic
Sound	Mic
Clock, Period	CH1

3. To change the sampling interval setting, move the highlighting to “Interval”. Next, press F1 to display a dialog box for specifying the sampling interval.
   - The range of values you can select depends on the current sampling mode setting.

If this sampling mode is selected:	This is the allowable setting range:
Realtime	0.2 to 299 sec
Fast	20 to 500 μsec
Extended	5 to 240 min
Period	“=Trigger” only (no value input required)
Sound	20 to 27 μsec
Clock	“=Trigger” only (no value input required)
Normal	0.0005 to 299 sec

4. To change the number of samples setting, move the highlighting to “Number”. Next, press F1 to display a dialog box for specifying the number of samples.
   - The total sampling time shown at the bottom of the dialog box is calculated by multiplying the “Sampling Interval” value you specified in step 3 by the number of samples you specify here.

   Important!
   - When all of the following conditions exist, a “Distance” setting appears in place of the “Number” setting. See “To configure the Distance setting” (page 3-7) for information about configuring the “Distance” setting.
     - Channel Setup (page 3-3): F2(VRNR) - [Photogate] - [Pulley],
       F3(CMA) - [Photogate] - [Pulley]
     - Sampling Mode (page 3-5): Clock

5. To change the warm-up time setting, move the highlighting to “Warm-up”. Next, perform one of the function key operations described below.

   Note
   - The “Warm-up” setting will not be displayed on the Sample Setup screen if “Fast”, “Sound” or “Extended” is currently selected as the sampling mode.

To do this:	Press this key:
Have the warm-up time for each sensor set automatically	F1(Auto)
Input a warm-up time, in seconds, manually	F2(Man)
Disable the warm-up time	F3(None)

   Important!
   - When the following condition exists, an “FFT Graph” setting appears in place of the “Warm-up” setting. See “To configure the FFT Graph setting” (page 3-7) for information about configuring the “FFT Graph” setting.
     - Sampling Mode (page 3-5): Fast

6. After all the settings are the way you want, press [EXE].
   - This returns to the Advanced Setup menu.

   Note
   - Whenever the current Channel Setup (page 3-3) and Trigger Setup (page 3-8) settings become incompatible due to a change in Sample Setup settings, these settings revert automatically to their initial defaults. Selecting “Realtime” as the sampling mode with Sample Setup while the Mic channel is selected with Channel Setup and the Trigger Setup has “Mic” selected for “Source”, for example, will cancel the Channel Setup Mic channel selection and change the Trigger Setup “Source” setting to “[EXE] key”.
     For information about the channels that can be selected for each sampling mode, see step 2 of “To configure Sample Setup settings”. For information about the trigger sources that can be selected for each sampling mode, see “Trigger Setup” (page 3-8).

• To configure the Distance setting

In place of step 3 of the procedure under “To configure Sample Setup settings”, press [F1] to display a dialog box for specifying the distance the weight travels in meters.

- Specify a value in the range of 0.1 to 4 meters.

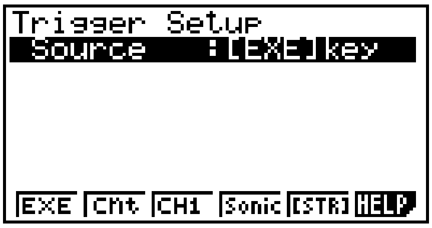
• To configure the FFT Graph setting

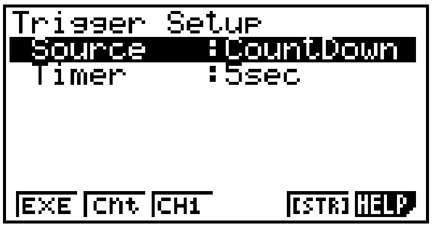
In place of step 5 of the procedure under “To configure Sample Setup settings”, press [F1] to display a dialog box for turning frequency characteristic graphing (FFT Graph) on and off.

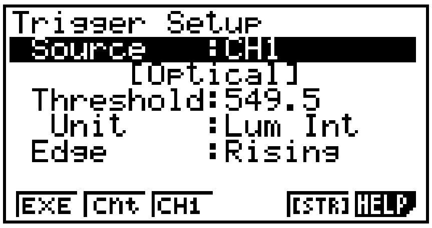
To do this:	Press this key:
Turn on graphing of frequency characteristics after sampling	[F1] (On)
Turn off graphing of frequency characteristics after sampling	[F2] (Off)

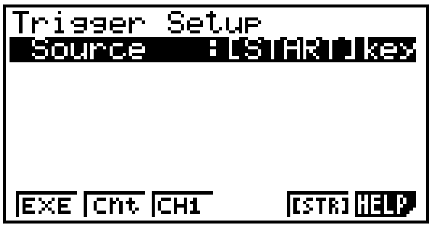
■ Trigger Setup

You can use the Trigger Setup screen to specify the event that causes sampling to start (EXE key operation, etc.) The event that causes sampling to start is called the “trigger source”, which is indicated as “Source” on the Trigger Setup screen.









The following table describes each of the six available trigger sources.

To start sampling when this happens:	Select this trigger source:
When the EXE key is pressed	[EXE] key
After the specified number of seconds are counted down	Count Down
When input at CH1 reaches a specified value	CH1
When input at the SONIC channel reaches a specified value (EA-200 only)	SONIC
When the built-in microphone detects sound (EA-200 only)	Mic
When the [START/STOP] key is pressed (EA-200 only)	[START] key
When [Button] is pressed (CLAB only)	[START] key

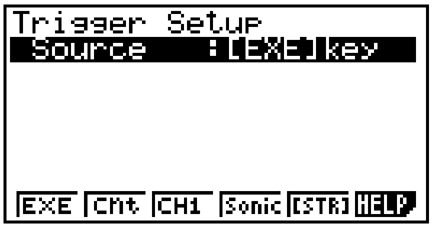
Note

The trigger sources you can select depends on the sampling mode selected with the Sample Setup (page 3-5).

For this sampling mode:	The following trigger source(s) can be selected:
Realtime	[EXE] key, Count Down
Fast	[EXE] key, Count Down, CH1, Mic
Normal	[EXE] key, Count Down, CH1, SONIC, [START] key
Extended	[EXE] key
Sound	[EXE] key, Count Down, Mic
Clock	CH1
Period	CH1

• To configure Trigger Setup settings

1. While the Advanced Setup menu (page 3-1) is on the display, press 3 (Trigger).
   - This displays the Trigger Setup screen with the “Source” line highlighted.



   - The function menu items that appears in the menu bar depend on the sampling mode selected with Sample Setup (page 3-5). The above screen shows the function menu when “Normal” is selected as the sample sampling mode.
2. Use the function keys to select the trigger source you want.
   - The following shows the trigger sources that can be selected for each sampling mode.

Sampling Mode	Trigger Source
Realtime	F1 (EXE) : [EXE] key, F2 (Cnt) : Count Down
Fast	F1 (EXE) : [EXE] key, F2 (Cnt) : Count Down, F3 (CH1), F5 (Mic)
Normal	F1 (EXE) : [EXE] key, F2 (Cnt) : Count Down, F3 (CH1), F4 (Sonic), F5 (STR) : [START] key
Sound	F1 (EXE) : [EXE] key, F2 (Cnt) : Count Down, F5 (Mic)

   - The trigger source is always “[EXE] key” when the sampling mode is “Extended”, and “CH1” when the sampling mode is “Clock” or “Period”.

3. Perform one of the following operations, in accordance with the trigger source that was selected in step 2.

If this is the trigger source:	Do this next:
[EXE] key	Press [EXE] to finalize Trigger Setup and return to the Advanced Setup menu.
Count Down	Specify the countdown start time. See "To specify the countdown start time" below.
CH1	Specify the trigger threshold value and trigger edge direction. See "To specify the trigger threshold value and trigger edge type", "To configure trigger threshold, trigger start edge, and trigger end edge settings" on page 3-11 or "To configure Photogate trigger start and end settings" on page 3-12.
SONIC	Specify the trigger threshold value and motion sensor level. See "To specify the trigger threshold value and motion sensor level" on page 3-12.
Mic	Specify microphone sensitivity. See "To specify microphone sensitivity" below.
[START] key	Press [EXE] to finalize Trigger Setup and return to the Advanced Setup menu.

• To specify the countdown start time

1. Move the highlighting to "Timer".
2. Press [F1](Time) to display a dialog box for specifying the countdown start time.
3. Input a value in seconds from 1 to 10.
4. Press [EXE] to finalize Trigger Setup and return to the Advanced Setup menu.

• To specify microphone sensitivity

1. Move the highlighting to "Sense" and then press one of the function keys describe below.

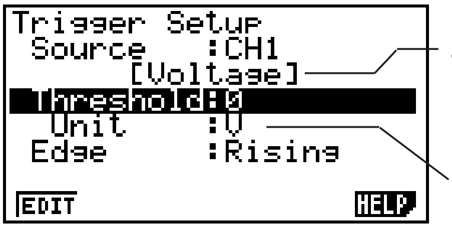
To select this level of microphone sensitivity:	Press this key:
Low	[F1](Low)
Medium	[F2](Mid)
High	[F3](High)

2. Press [EXE] to finalize Trigger Setup and return to the Advanced Setup menu (page 3-1).

• To specify the trigger threshold value and trigger edge type

Perform the following steps when "Fast", "Normal", or "Clock" is specified as the sampling mode (page 3-5).

1. Move the highlighting to "Threshold".
2. Press F1(EDIT) to display a dialog box for specifying the trigger threshold value, which is value that data needs to attain before sampling starts.



3. Input the value you want, and then press EXE.
4. Move the highlighting to "Edge".
5. Press one of the function keys described below.

To select this type of edge:	Press this key:
Falling	F1(Fall)
Rising	F2(Rise)

6. Press EXE to finalize Trigger Setup and return to the Advanced Setup menu (page 3-1).

• To configure trigger threshold, trigger start edge, and trigger end edge settings

Perform the following steps when "Period" is specified as the sampling mode (page 3-5).

1. Move the highlighting to "Threshold".
2. Press F1(EDIT) to display a dialog box for specifying the trigger threshold value, which is value that data needs to attain before sampling starts.
3. Input the value you want.
4. Move the highlighting to "Start to".
5. Press one of the function keys described below.

To select this type of edge:	Press this key:
Falling	F1(Fall)
Rising	F2(Rise)

6. Move the highlighting to "End Edge".
7. Press one of the function keys described below.

To select this type of edge:	Press this key:
Falling	F1(Fall)
Rising	F2(Rise)

8. Press EXE to finalize Trigger Setup and return to the Advanced Setup menu (page 3-1).

• To configure Photogate trigger start and end settings

Perform the following steps when CH1 is selected as a Photogate trigger source.

1. Move the highlighting to “Start to”.
2. Press one of the function keys described below.

To specify this Photogate status:	Press this key:
Photogate closed	F1(Close)
Photogate open	F2(Open)

3. Move the highlighting to “End Gate”.
4. Press one of the function keys described below.

To specify this Photogate status:	Press this key:
Photogate closed	F1(Close)
Photogate open	F2(Open)

5. Press EXE to finalize Trigger Setup and return to the Advanced Setup menu (page 3-1).

• To specify the trigger threshold value and motion sensor level

1. Move the highlighting to “Threshold”.
2. Press F1(EDIT) to display a dialog box for specifying the trigger threshold value, which is value that data needs to attain before sampling starts.
3. Input the value you want, and then press EXE.
4. Move the highlighting to “Level”.
5. Press one of the function keys described below.

To select this type of level:	Press this key:
Below	F1(Blw)
Above	F2(Abv)

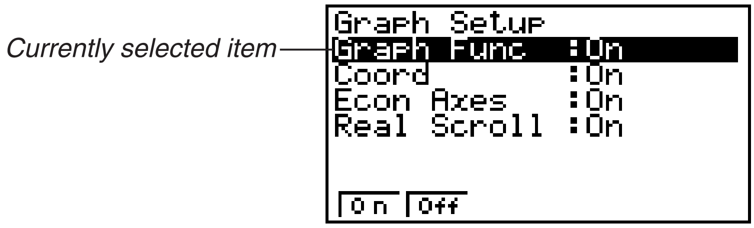
6. Press EXE to finalize Trigger Setup and return to the Advanced Setup menu (page 3-1).

■ Graph Setup

Use the Graph Setup screen to configure settings for the graph produced after sampling is complete. You use the Sample Setup settings (page 3-5) to turn graphing on or off.

• To configure Graph Setup settings

1. While the Advanced Setup menu (page 3-1) is on the display, press [4] (Graph).
   - This displays the Graph Setup screen.



Graph Setup Screen

2. To change the graph source data name display setting, use the ▲ and ▼ cursor keys to move the highlighting to “Graph Func”. Next, press one of the function keys described below.

To specify this graph source data name display setting:	Press this key:
Display source data name	[F1] (On)
Hide source data name	[F2] (Off)

   - When the graph data is stored in a sample data memory file, the file name appears as the source data name. When the graph data is stored in current data area, the channel name appears.

   Note
   - For details about sample data memory and current data area, see “9 Using Sample Data Memory”.

3. To change the trace operation coordinate display setting, use the ▲ and ▼ cursor keys to move the highlighting to “Coord”. Next, press one of the function keys described below.

To specify this coordinate display setting for the trace operation:	Press this key:
Display trace coordinates	[F1] (On)
Hide trace coordinates	[F2] (Off)

4. To change the numeric axes display setting, use the ▲ and ▼ cursor keys to move the highlighting to “Econ Axes”. Next, press one of the function keys described below.

To specify this axes display setting:	Press this key:
Display axes	[F1] (On)
Hide axes	[F2] (Off)

5. To change the real-time scroll setting, use the ▲ and ▼ cursor keys to move the highlighting to “RealScroll”. Next, press one of the function keys described below.

To specify this real-time scrolling setting:	Press this key:
Real-time scrolling on	F1 (On)
Real-time scrolling off	F2 (Off)

6. Press EXE to finalize Graph Setup and return to the Advanced Setup menu.

4 Using a Custom Probe

You can use the procedures in this section to configure a custom probe for use with a Data Logger.

Important!

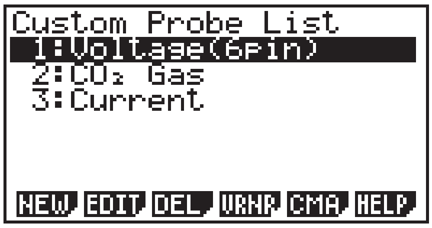
- The sensors (CASIO, Vernier, CMA) that appear on the list during Channel Setup (page 3-3) are E-CON3 mode standard sensors. If you want to use a sensor that is not included in the list, configure custom probe settings.
- A sensor with an output voltage in the range of 0 to 5 volts can be configured with E-CON3 as a custom probe. Use of sensors with an output voltage outside of this range is not supported.

■ Configuring a Custom Probe Setup

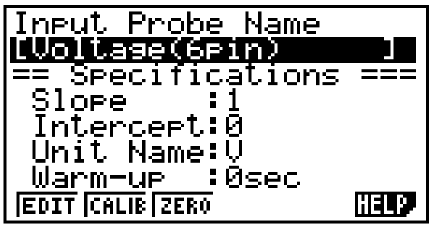
To configure a custom probe setup, you must input values for the constants of the fixed linear interpolation formula ($ax + b$). The required constants are slope (a) and intercept (b). x in the above expression ($ax + b$) is the sampled voltage value (sampling range: 0 to 5 volts).

• To configure a custom probe setup

1. From the E-CON3 main menu (page 1-1), press F1(SET) and then 2(ADV) to display the Advanced Setup menu.
   - See "3 Using Advanced Setup" for more information.
2. On the Advanced Setup menu (page 3-1), press 5(Custom Probe) to display the Custom Probe List.



   - The message "No Custom Probe" appears if the Custom Probe List is empty.
3. Press F1(NEW).
   - This displays a custom probe setup screen like the one shown below.



   - The initial default setting for the probe name is "Voltage(6pin)". The first step for configuring custom probe settings is to change this name to another one. If you want to leave the default name the way it is, skip steps 4 and 5.
4. Press F1(EDIT).
   - This enters the probe name editing mode.

5. Input up to 18 characters for the custom probe name, and then press [EXE].
   - This will cause the highlighting to move to “Slope”.
6. Use the function keys described below to configure the custom probe setup.
   - To change the setting of an item, first use the ▲ and ▼ cursor keys to move the highlighting to the item. Next, use the function keys to select the setting you want.

   (1) Slope
   Press [F1](EDIT) to input the slope for the linear interpolation formula.

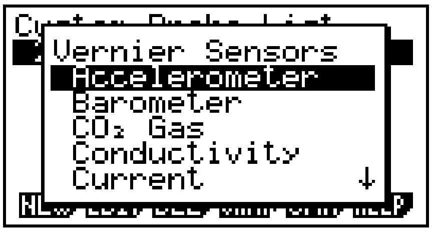
   (2) Intercept
   Press [F1](EDIT) to input the intercept for the linear interpolation formula.

   (3) Unit Name
   Press [F1](EDIT) to input up to eight characters for the unit name.

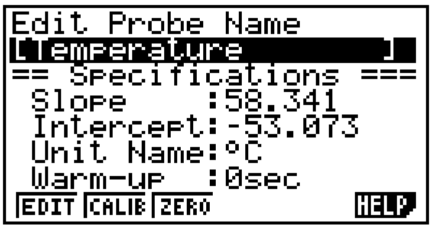
   (4) Warm-up
   Press [F1](EDIT) to input the warm-up time.
7. Press [EXE] and then input a memory number (1 to 99).
   - This saves the custom probe setup and returns to the Custom Probe List, which should now contain the new custom probe setup you configured.

• To recall the specifications of a Vernier or CMA sensor and configure custom probe settings

1. Perform the first two steps of the procedure under “To configure a custom probe setup” on page 4-1.
2. Press [F4](VRNR) or [F5](CMA).
   - This displays a sensor list.



3. Use the ▲ and ▼ keys to move the highlighting to the sensor whose setting you want to use as the basis of the custom probe settings, and then press [EXE].
   - The name and specifications of the sensor you select will appear on the custom probe setup screen.



   - To complete this procedure, perform steps 4 through 7 under “To configure a custom probe setup” (page 4-1).

■ Auto Calibrating a Custom Probe

Auto calibration automatically corrects the slope and intercept values of a custom probe setup based on two actual samples.

Important!

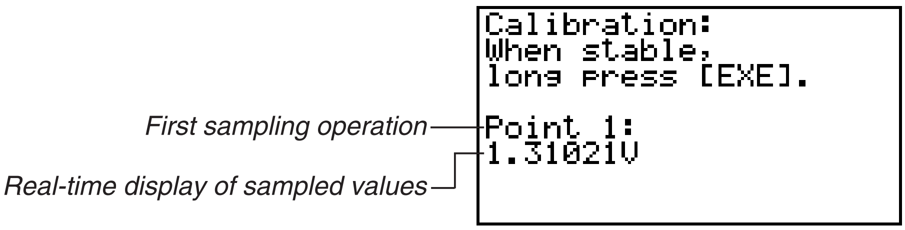
- Before performing the procedure below, you should prepare two conditions whose measurement values are known.
- When inputting reference value in step 5 of the procedure below, input the exact known measurement value of the condition you will sample in step 4. When inputting reference value in step 7 of the procedure below, input the exact known measurement value of the condition you will sample in step 6.

• To auto calibrate a custom probe

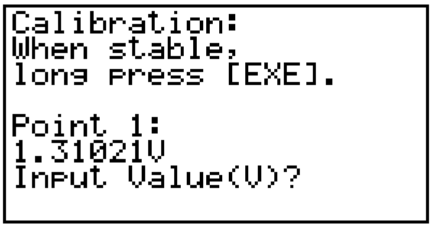
1. Connect the calculator and Data Logger, and connect the custom probe you want to auto calibrate to CH1 of the Data Logger.
2. What you should do first depends on whether you are configuring a new custom probe for calibration, or editing the configuration of an existing custom probe.

   If you are configuring a new custom probe:
   - Perform steps 1 through 6 of the procedure under “To configure a custom probe setup” on page 4-1.
   - Auto calibrate will automatically set the slope and intercept, so you do not need to specify them in step 6 of the above procedure.

   If you are editing the configuration of an existing custom probe:
   - Perform steps 1 through 3 of the procedure under “To edit a custom probe setup” on page 4-6.
3. Press [F2] (CALIB).
   - This will start the first sampling operation with the sensor connected to Data Logger’s CH1, and then display a screen like the one shown below.

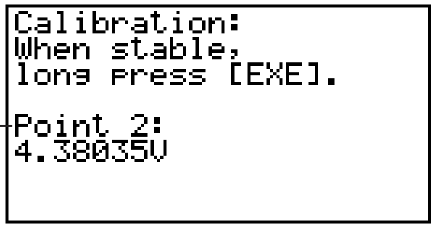


4. After the sampled value stabilizes, hold down EXE for a few seconds.
   • This will register the first sampled value and display it on the screen. At this time the cursor will appear at the bottom of the display, ready for input of a reference value.

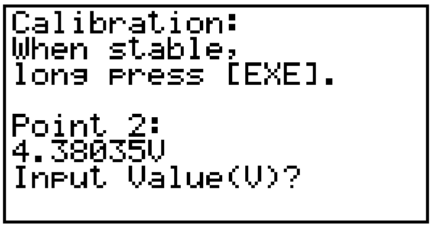


5. Use the key pad to input the reference value for the first sampled value, and then press EXE.
   • This cause sampling of the second value to be performed automatically, and display the same type of screen that appeared in step 3.

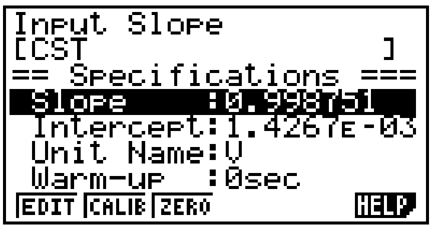
Second sampling operation



6. After the sampled value stabilizes, hold down EXE for a few seconds.
   • This will register the second sampled value and display it on the screen. The cursor will appear at the bottom of the display, ready for input of a reference value.



7. Use the key pad to input the reference value for the second sampled value, and then press EXE.
   • This will return to the custom probe setup screen.
   • The E-CON3 will calculate the slope and intercept value based on the two reference values that you input, and configure the settings automatically. The automatically configured values will appear on the custom probe setup screen, where you can view them.



8. Press EXE, and then input a memory number from 1 to 99.
   • This saves the custom probe setup and returns to the custom probe list.

■ Zero Adjusting a Custom Probe

This procedure zero adjusts a custom probe and sets its intercept value based on an actual sample using the applicable custom probe.

• To zero adjust a custom probe

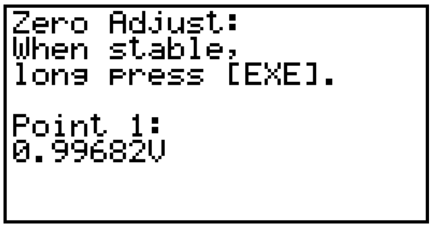
1. Connect the calculator and Data Logger, and connect the custom probe you want to zero adjust to CH1 of the Data Logger.

2. What you should do first depends on whether you are configuring a new custom probe for zero adjusting, or editing the configuration of an existing custom probe.

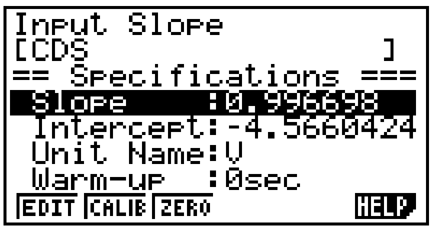
   If you are configuring a new custom probe:
   - Perform steps 1 through 6 of the procedure under “To configure a custom probe setup” on page 4-1.
   - Auto calibrate will automatically set the intercept, so you do not need to specify it in step 6 of the above procedure.

   If you are editing the configuration of an existing custom probe:
   - Perform steps 1 through 3 of the procedure under “To edit a custom probe setup” on page 4-6.

3. Press [F3] (ZERO).
   - This will start the sampling operation with the sensor connected to Data Logger’s CH1, and then display a screen like the one shown below.



4. At the point your want to perform zero adjustment (the point that the displayed value is the appropriate zero adjust value), press [EXE].
   - This will return to the custom probe setup screen.
   - The E-CON3 will set the intercept value automatically based on the sampled value. The automatically configured value will appear on the custom probe setup screen, where you can view it.



5. Press [EXE], and then input a memory number from 1 to 99.
   - This saves the custom probe setup and returns to the custom probe list.

■ Managing Custom Probe Setups

Use the procedures in this section to edit and delete existing custom probe setups.

• To edit a custom probe setup

1. Display the Custom Probe List.
2. Select the custom probe setup whose configuration you want to edit.
   - Use the ▲ and ▼ cursor keys to highlight the name of the custom probe you want.
3. Press F2(EDIT).
   - This displays the screen for configuring a custom probe setup.
   - To edit the custom probe setup, perform the procedure starting from step 6 under "To configure a custom probe setup" on page 4-1.

• To delete a custom probe setup

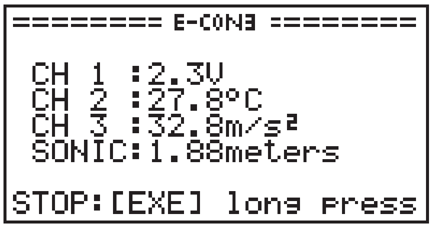
1. Display the Custom Probe List.
2. Select the custom probe setup you want to delete.
   - Use the ▲ and ▼ cursor keys to highlight the name of the custom probe setup you want.
3. Press F3(DEL).
4. In response to the confirmation message that appears, press F1(Yes) to delete the custom probe setup.
   - To clear the confirmation message without deleting anything, press F6(No).

5 Using the MULTIMETER Mode

You can use the Channel Setup screen (page 3-3) to configure a channel so that Data Logger MULTIMETER Mode sampling is triggered by a calculator operation.

• To use the MULTIMETER Mode

1. Connect the calculator and Data Logger, and connect the sensors you want to the applicable Data Logger channels.
2. From the Advanced Setup menu (page 3-1), use the Channel Setup screen (page 3-3) to configure sensor setups for each channel you will be using.
3. After configuring the sensor setups, press EXE to return to the Advanced Setup menu (page 3-1), and then press F2 (MLTI).
   - This starts sampling in the Data Logger MULTIMETER mode and displays a list of sample values for each channel.



   - Displayed sample data is refreshed at 0.5-second intervals.
   - Do not connect sensors to any other channels except for those you specified in step 2.
   - Data sampled in the MULTIMETER mode is not saved in memory.
4. To end MULTIMETER mode sampling, press the EXE key.

6 Using Setup Memory

Creating Data Logger setup data using the Setup Wizard or Advanced Setup causes the data to be stored in the "current setup memory area". The current contents of the current setup memory area are overwritten whenever you create other setup data.
You can use setup memory to save the current setup memory area contents to calculator memory to keep it from being overwritten, if you want.

■ Saving a Setup

A setup can be saved when any one of the following conditions exist.

- After configuring a new setup with Setup Wizard
  See step 8 under "To configure a Data Logger setup using Setup Wizard" on page 2-2.
- After configuring a new setup with Advanced Setup
  See step 6 under "To configure a Data Logger setup using Advanced Setup" on page 3-1 for more information.
- While the E-CON3 main menu (page 1-1) is on the display
  Performing the setup save operation while the E-CON3 main menu is on the display saves the contents of the current setup memory area (which were configured using Setup Wizard or Advanced Setup).

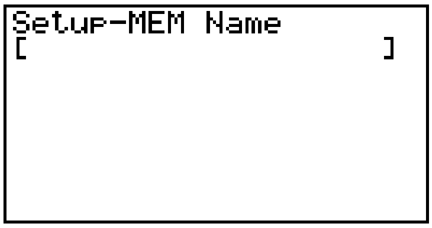
Details on saving a setup are listed below.

• To save a setup

1. If the final Setup Wizard screen is on the display, advance to step 2. If it isn't, start the save operation by performing one of the function key operations described below.
   - ✔ If the Advanced Setup menu (page 3-1) is on the display, press F3(MEM).
   - ✔ If the E-CON3 main menu (page 1-1) is on the display, press F2(MEM).
   - Performing any one of the above operations causes the setup memory list to appear.

   - The message "No Setup-MEM" appears if setup memory is empty.

2. If you are starting from the final Setup Wizard screen, press [2] (Save Setup-MEM).
   If you are starting from another screen, press [F2] (SAVE).
   - This displays the screen for inputting the setup name.



3. Input up to 18 characters for the setup name.
4. Press [EXE] and then input a memory number (1 to 99).
   - If you start from the final Setup Wizard screen, this saves the setup and the message "Complete!" appears. Press [EXE] to return to the final Setup Wizard screen.
   - If you start from the Advanced Setup menu (page 3-1) or the E-CON3 main menu (page 1-1), this saves the setup and returns to the setup memory list which includes the name you assigned it.

   Important!
   - Since you assign both a setup name and a file number to each setup, you can assign the same name to multiple setups, if you want.

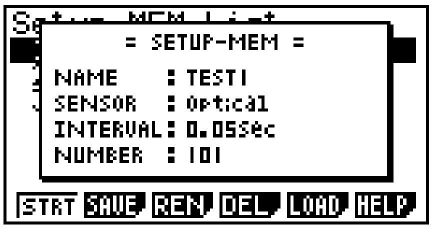
■ Using and Managing Setups in Setup Memory

All of the setups you save are shown in the setup memory list. After selecting a setup in the list, you can use it to sample data or you can edit it.

• To preview saved setup data

You can use the following procedure to check the contents of a setup before you use it for sampling.

1. On the E-CON3 main menu (page 1-1), press [F2] (MEM) to display the setup memory list.
2. Use the [▲] and [▼] cursor keys to highlight the name of the setup you want.
3. Press [OPTN] (Setup Preview).
   - This displays the preview dialog box.



4. To close the preview dialog box, press [EXIT].

• To recall a setup and use it for sampling

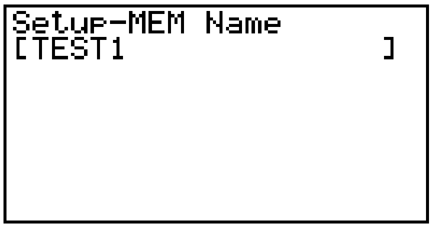
Be sure to perform the following steps before starting sampling with a Data Logger.

1. Connect the calculator to a Data Logger.
2. Turn on Data Logger power.
3. In accordance with the setup you plan to use, connect the proper sensor to the appropriate Data Logger channel.
4. Prepare the item whose data is to be sampled.
5. On the E-CON3 main menu (page 1-1), press F2(MEM) to display the setup memory list.
6. Use the ▲ and ▼ cursor keys to highlight the name of the setup you want.
7. Press F1(STRT).
8. In response to the confirmation message that appears, press F1.
   - Pressing EXE sets up the Data Logger and then starts sampling.
   - To clear the confirmation message without sampling, press F6.

   Note
   - See "Operations during a sampling operation" on page 8-2 for information about operations you can perform while a sampling operation is in progress.

• To change the name of setup data

1. On the E-CON3 main menu (page 1-1), press F2(MEM) to display the setup memory list.
2. Use the ▲ and ▼ cursor keys to highlight the name of the setup you want.
3. Press F3(REN).
   - This displays the screen for inputting the setup name.



4. Input up to 18 characters for the setup name, and then press EXE.
   - This changes the setup name and returns to the setup memory list.

• To delete setup data

1. On the E-CON3 main menu (page 1-1), press F2(MEM) to display the setup memory list.
2. Use the ▲ and ▼ cursor keys to highlight the name of the setup you want.
3. Press F4(DEL).
4. In response to the confirmation message that appears, press F1(Yes) to delete the setup.
   - To clear the confirmation message without deleting anything, press F6(No).

• To recall setup data

Recalling setup data stores it in the current setup memory area. You can then use Advanced Setup to edit the setup. This capability comes in handy when you need to perform a setup that is slightly different from one you have stored in memory.

1. On the E-CON3 main menu (page 1-1), press F2(MEM) to display the setup memory list.
2. Use the ▲ and ▼ cursor keys to highlight the name of the setup you want.
3. Press F5(LOAD).
4. In response to the confirmation message that appears, press F1(Yes) to recall the setup.
   - To clear the confirmation message without recalling the setup, press F6(No).

   Note
   - Recalling setup data replaces any other data currently in the current setup memory area.

7 Using Program Converter

Program Converter converts a Data Logger setup you configured using Setup Wizard or Advanced Setup to a program that can run on the calculator. You can also use Program Converter to convert a setup to a CFX-9850 Series/fx-7400 Series-compatible program.*1 *2

*1 See the documentation that came with your scientific calculator or EA-200 for information about how to use a converted program.

*2 See online help (PROGRAM CONVERTER HELP) for information about supported CFX-9850 Series and fx-7400 Series models.

■ Converting a Setup to a Program

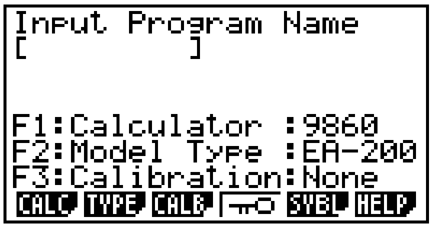
A setup can be converted to a program when any one of the following conditions exists.

- After configuring a new setup with Setup Wizard
  See step 8 under "To configure a Data Logger setup using Setup Wizard" on page 2-2.
- After configuring a new setup with Advanced Setup
  See step 6 under "To configure a Data Logger setup using Advanced Setup" on page 3-1 for more information.
- While the E-CON3 main menu (page 1-1) is on the display
  Performing the program converter operation while the E-CON3 main menu is on the display converts the contents of the current setup memory area (which were configured using Setup Wizard or Advanced Setup).

The program converter procedure is identical in all of the above cases.

• To convert a setup to a program

1. Start the converter operation by performing one of the key operations described below.
   - ✔ If the final Setup Wizard screen is on the display, press 3 (Convert Program).
   - ✔ If the Advanced Setup menu (page 3-1) is on the display, press F4 (PROG).
   - ✔ If the E-CON3 main menu (page 1-1) is on the display, press F3 (PROG).
   - After you perform any one of the above operations, the program converter screen will appear on the display.



2. Enter up to eight characters for the program name.

   Note
   Using the program converter initial default settings will create a program like the one below.

   • Associated Scientific Calculator: fx-9860 Series

   • Associated Data Logger: EA-200

   • Calibration: None

   • Password: None

   If you want to use these settings the way they are without changing them, skip steps 3 through 7 and go directly to step 8. If you want to change any of the settings, perform the applicable operations in steps 3 through 7.

3. Specify the scientific calculator model to be associated with the program. Perform one of the following key operations to associate the program with a scientific calculator.

To associate the program with this calculator:	Perform this key operation:
fx-9860 Series	F1(CALC) F1(9860)
CFX-9850 Series	F1(CALC) F2(9850)
fx-7400 Series	F1(CALC) F3(7400)

   • The number part of the scientific calculator model number you specify will appear in line "F1:" of the program converter screen.

   Note
   For information about F1(CALC)F4(→38K), see "Converting a CFX-9850 Series Program to a fx-9860 Series Compatible Program" (page 7-4).

4. Specify the Data Logger model (EA-100 or EA-200) to be associated with the program. Perform one of the following key operations to associate the program with a Data Logger.

To associate the program with this Data Logger:	Perform this key operation:
EA-200	F2(TYPE) F1(200)
EA-100	F2(TYPE) F2(100)

   • The number part of the Data Logger model number you specify will appear in line "F2:" of the program converter screen.

   Important!
   • Note that the capabilities of the EA-100 and EA-200 are different. Because of this, you should keep in mind that an EA-200 program converted to an EA-100 program and used to perform sampling with an EA-100 setup may not produce the desired results.

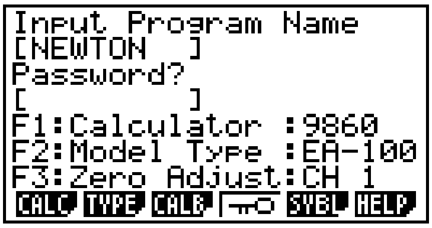
5. If you plan to use a custom probe connected to CH1 of the Data Logger, specify whether calibration or zero adjust should be performed. Perform one of the following key operations to configure the desired setting.

To perform this operation:	Perform this key operation:
Calibration of the CH1 custom probe	F3(CALB) F1(CALIB)
Zero adjust of the CH1 custom probe	F3(CALB) F2(ZERO)
No calibration	F3(CALB) F3(None)

• The operation you specify will appear in line "F3:" of the program converter screen.

6. To password protect the program, press F4( ).

• This will cause the "Password?" prompt and password input field to appear under the program name input field.



7. Enter up to eight characters for the password.

• If you change your mind about assigning a password, press EXIT here. This will cause the password input field to disappear and cancel password input.

8. After everything is the way you want, press EXE to convert the program in accordance with the setup.

• The message "Complete!" appears when conversion is complete. To clear the message and return to the screen that was on the display in step 1, press EXE or EXIT.

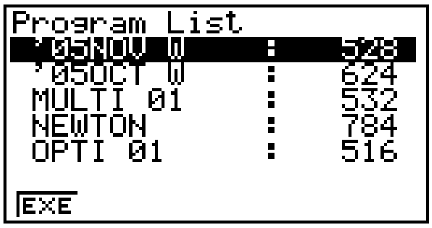
■ Converting a CFX-9850 Series Program to a fx-9860 Series Compatible Program

To use an EA-200 control program created on the CFX-9850 Series calculator (for use on the CFX-9850) on the E-CON3, you need to convert the program to an fx-9860 program. Conversion can be performed using the program converter.

EA-200 Control Program for CFX-9850 Series	→ Convert	EA-200 Control Program for fx-9860 Series

• To convert a program

1. Transfer the EA-200 control program created for the CFX-9850 Series to the fx-9860 main memory.
   - Use the cable that comes bundled with the fx-9860 to connect its 3-pin serial port to the 3-pin serial port of the CFX-9850. For details, see “Chapter 13 Data Communication”.
2. Perform step 1 under “To convert a setup to a program” on page 7-1, which displays the program converter screen.
3. Press F1(CALC) and then press F4(→38K).
   - This displays a list of programs currently in main memory.



4. Use ⏶ and ⏷ to move the highlighting of the program you want to convert, and then press F1(EXE) or EXE.
   - A program name input screen will appear after conversion is complete.

5. Enter up to eight characters for the program name.
   - If you want to password protect the program, perform steps 6 and 7 under “To convert a setup to a program” after inputting the program name.
6. Press EXE to start conversion of the program.
   - The message “Complete!” appears when conversion is complete. To clear the message, press EXE or EXIT.

8 Starting a Sampling Operation

The section describes how to use a setup configured using the E-CON3 Mode to start a Data Logger sampling operation.

■ Before getting started...

Be sure to perform the following steps before starting sampling with a Data Logger.

1. Connect the calculator to a Data Logger.
2. Turn on Data Logger power.
3. In accordance with the setup you plan to use, connect the proper sensor to the appropriate Data Logger channel.
4. Prepare the item whose data is to be sampled.

■ Starting a Sampling Operation

A sampling operation can be started when any one of the following conditions exist.

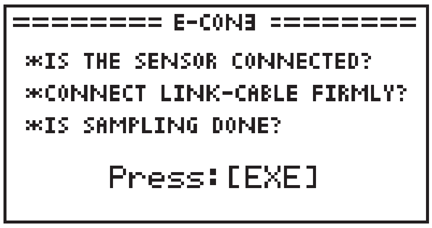
- After configuring a new setup with Setup Wizard
  See step 8 under "To configure a Data Logger setup using Setup Wizard" on page 2-2.
- After configuring a new setup with Advanced Setup
  See step 6 under "To configure a Data Logger setup using Advanced Setup" on page 3-1.
- While the E-CON3 main menu (page 1-1) is on the display
  Starting a sampling operation while the E-CON3 main menu is on the display performs sampling using the contents of the current setup memory area (which were configured using Setup Wizard or Advanced Setup).
- While the setup memory list is on the display
  You can select the setup you want on the setup memory list and then start sampling.

The following procedures explain the first three conditions described above. See "To recall a setup and use it for sampling" on page 6-3 for information about starting sampling from the setup memory list.

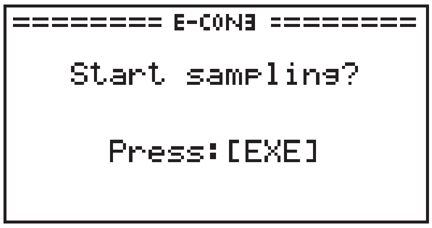
• To start sampling

1. Start the sampling operation by performing one of the function key operations described below.
   - ✔ If the final Setup Wizard screen is on the display, press [1] (Start Setup).
   - ✔ If the Advanced Setup menu (page 3-1) is on the display, press [F1] (STRT).
   - ✔ If the E-CON3 main menu (page 1-1) is on the display, press [F4] (STRT).

   • After you perform any one of the above operations, a sampling start confirmation screen like the one shown below will appear on the display.



2. Press [EXE].
   • This sets up the Data Logger using the setup data in the current setup memory area.
   • The message “Setting Data Logger...” remains on the display while Data Logger setup is in progress. You can cancel the setup operation any time this message is displayed by pressing [AC].
   • The screen shown below appears after Data Logger setup is complete.



3. Press [EXE] to start sampling.
   • The screens that appear while sampling is in progress and after sampling is complete depend on setup details (sampling mode, trigger setup, etc.). For details, see “Operations during a sampling operation” below.

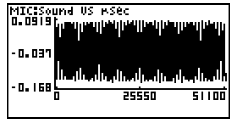
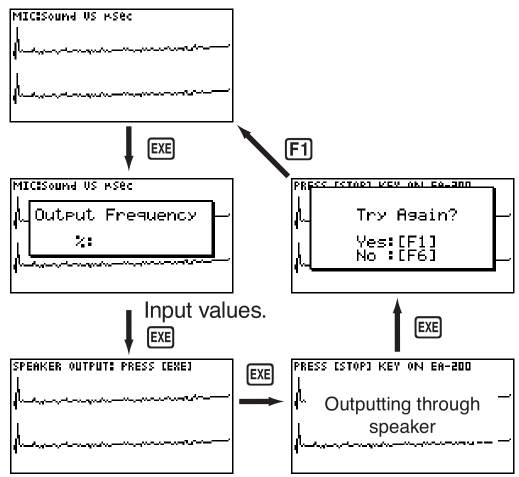
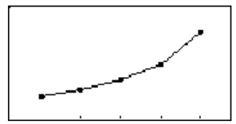
• Operations during a sampling operation

Sending a sample start command from the calculator to a Data Logger causes the following sequence to be performed.

Setup Data Transfer → Sampling Start → Sampling End →
Transfer of Sample Data from the Data Logger to the Calculator

The table on the next page shows how the trigger conditions and sensor type specified in the setup data affects the above sequence.

Starts Sampling

Mode	1. Data Logger Setup	2. Start Standby	3. Sampling	4. Graphing
Real-time	======== E-CON3 ======== Setting Data Logger... Cancel:[AC]	======== E-CON3 ======== Start sampling? Press:[EXE]	→	 Sampled values are saved as Current Sample Data.
Fast			======== E-CON3 ======== Sampling... Cancel:[AC] • The screen shown below appears when CH1, SONIC, or Mic is used as the trigger. ======== E-CON3 ======== When sampling is done ,press [EXE] key.	• **When Mode = Sound** Graph screen does not show all sampled values, but only a partial preview. 
Normal				
Sound				
Extended			======== E-CON3 ======== Sampling... View:[F1] Stop:[F6] Pressing F1 advances to "4. Graphing". Pressing EXE there returns to "3. Sampling".	
Period			======== E-CON3 ======== When sampling is done ,press [EXE] key.	• **When Number of Samples = 1** ======== E-CON3 ======== 0.5614sec The following three graph types can be produced when Photo-gate-Pulley is being used. 1. Time and distance graph 2. Time and velocity graph 3. Time and acceleration graph • **When Number of Samples > 1**  Sample values is stored as List data only.
Clock				

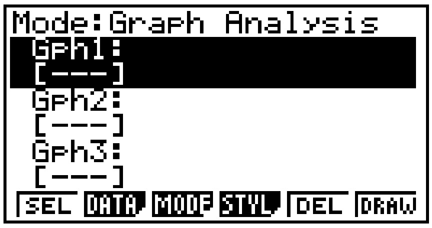
9 Using Sample Data Memory

Performing a Data Logger sampling operation from the E-CON3 Mode causes sampled results to be stored in the “current data area” of E-CON3 memory. Separate data is saved for each channel, and the data for a particular channel in the current data area is called that channel’s “current data”.
Any time you perform a sampling operation, the current data of the channel(s) you use is replaced by the newly sampled data. If you want to save a set of current data and keep it from being replaced by a new sampling operation, save the data in sample data memory under a different file name.

■ Managing Sample Data Files

• To save current sample data to a file

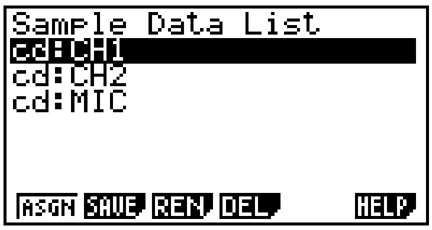
1. On the E-CON3 main menu (page 1-1), press F5(GRPH).
   • This displays the Graph Mode screen.



Graph Mode Screen

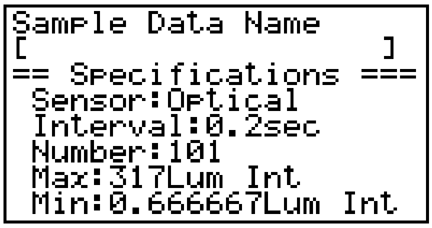
   • For details about the Graph Mode screen, see “10 Using the Graph Analysis Tools to Graph Data”.
2. Press F2(DATA).
   • This displays the Sampling Data List screen.

List of current data files
“cd” stands for “current data”. The text on the right side of the colon indicates the channel name.



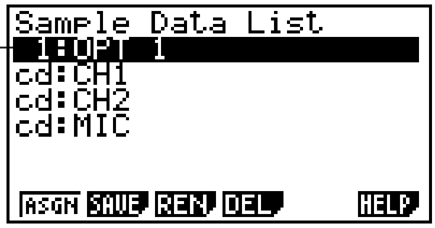
Sampling Data List Screen

3. Use the ▲ and ▼ cursor keys to move the highlighting to the current data file you want to save, and then press F2(SAVE).
   - This displays the screen for inputting a data name.



4. Enter up to 18 characters for the data file name, and then press EXE.
   - This displays a dialog box for inputting a memory number.
5. Enter a memory number in the range of 1 to 99, and then press EXE.
   - This saves the sample data at the location specified by the memory number you input.

The sample data file you save is indicated on the display using the format: <memory number>:<file name>.



   - If you specify a memory number that is already being used to store a data file, a confirmation message appears asking if you want to replace the existing file with the new data file. Press F1 to replace the existing data file, or F6 to return to the memory number input dialog box in Step 4.
6. To return to the E-CON3 main menu (page 1-1), press EXIT twice.

   Note
   - You could select another data file besides a current data file in step 3 of the above procedure and save it under a different memory number. You do not need to change the file's name as long as you use a different file number.

• To rename an existing sample data file

Note

• You cannot use this procedure to rename a current data file name.

1. On the E-CON3 main menu (page 1-1), press F5(GRPH).
   • This displays the Graph Mode screen.
2. Press F2(DATA).
   • This displays the Sampling Data List screen.
3. Use the ▲ and ▼ cursor keys to move the highlighting to the data file you want to rename, and then press F3(REN).
   • This displays the screen for inputting a file name.
4. Enter up to 18 characters for the new data file name, and then tap EXE.
   • This returns to the Sampling Data List screen.
5. To return to the E-CON3 main menu (page 1-1), press EXIT twice.

• To delete a sample data file

1. On the E-CON3 main menu (page 1-1), press F5(GRPH).
   • This displays the Graph Mode screen.
2. Press F2(DATA).
   • This displays the Sampling Data List screen.
3. Use the ▲ and ▼ cursor keys to move the highlighting to the data file you want to delete, and then press F4(DEL).
4. In response to the confirmation message that appears, press F1(Yes) to delete the data file.
   • To clear the confirmation message without deleting the data file, press F6(No).
   • This returns to the Sampling Data List screen.
5. To return to the E-CON3 main menu (page 1-1), press EXIT twice.

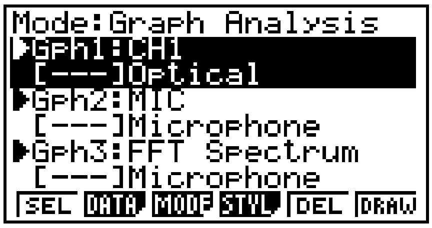
10 Using the Graph Analysis Tools to Graph Data

Graph Analysis tools make it possible to analyze graphs drawn from sampled data.

■ Accessing Graph Analysis Tools

You can access Graph Analysis tools using either of the two methods described below.

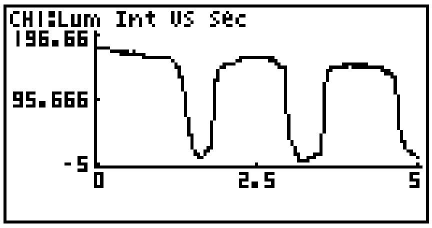
- **Accessing Graph Analysis tools from the Graph Mode screen, which is displayed by pressing F5(GRPH) on the E-CON3 main menu (page 1-1)**



Graph Mode Screen

- The main menu appears after you perform a sampling operation. Press F5(GRPH) at that time.
- When you access Graph Analysis tools using this method, you can select from among a variety of other Analysis modes. See "Selecting an Analysis Mode and Drawing a Graph" (page 10-2) for more information about the other Analysis modes.

- **Accessing Graph Analysis tools from the screen of a graph drawn after a sampling operation is executed from the Setup Wizard or from Advanced Setup (Realtime Mode)**



Graph Screen

- In this case, data is graphed after the sampling operation is complete, and the calculator accesses Graph Analysis tools automatically. See "Graph Screen Key Operations" on page 11-1.

■ Selecting an Analysis Mode and Drawing a Graph

This section contains a detailed procedure that covers all steps from selecting an analysis mode to drawing a graph.

Note

- Step 4 through step 6 are not essential and may be skipped, if you want. Skipping any step automatically applies the initial default values for its settings.
- If you skip step 2, the default analysis mode is the one whose name is displayed in the top line of the Graph Mode screen.

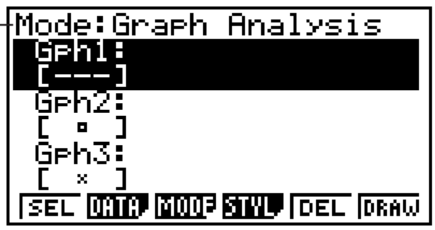
• To select an analysis mode and draw a graph

1. On the E-CON3 main menu (page 1-1), press F5(GRPH).
   - This displays the Graph Mode screen.
2. Press F3(MODE), and then select the analysis mode you want from the menu that appears.

To do this:	Perform this menu operation:	To select this mode:
Graph three sets of sampled data simultaneously	[Norm]	Graph Analysis
Graph sampled data along with its first and second derivative graph	[diff]	d/dt & d^2/dt^2
Display the graphs of different sampled data in upper and lower windows for comparison	[CMPR]→[GRPH]	Compare Graph
Output sampled data from the speaker, displaying graph of the raw data in the upper window and the output waveform in the lower window (EA-200 only)	[CMPR]→[Snd]	Compare Sound
Display the graph of sampled data in the upper window and its first derivative graph in the lower window	[CMPR]→[d/dt]	Compare d/dt
Display the graph of sampled data in the upper window and its second derivative graph in the lower window	[CMPR]→[d^2/dt^2]	Compare d^2/dt^2

- The name of the currently selected mode appears in the top line of the Graph Mode screen.

Analysis mode name

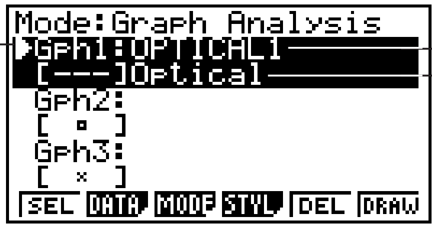


3. Press F2(DATA).
   - This displays the Sampling Data List screen.

4. Specify the sampled data for graphing.

a. Use the ▲ and ▼ cursor keys to move the highlighting to the name of the sampled data file you want to select, and then press F1(ASGN) or EXE.

- This returns to the Graph Mode screen, which shows the name of the sample data file you selected.



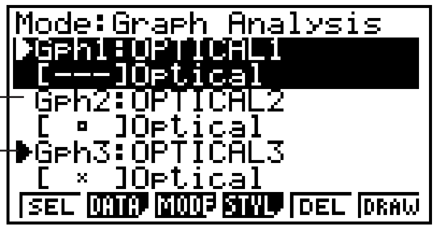
Graph Mode Screen

b. Repeat step a above to specify sample data files for other graphs, if there are any.

- If you select "Graph Analysis" as the analysis mode in step 2, you must specify sample data files for three graphs. If you select "Compare Graph" as the analysis mode in step 2, you must specify sample data files for two graphs. With other modes, you need to specify only one sample data file.
- For details about Sampling Data List screen operations, see "9 Using Sample Data Memory".

5. Turn on graphing for each of the graphs listed on the Graph Mode screen.

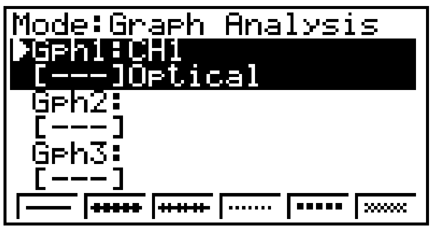
a. On the Graph Mode screen, use the ▲ and ▼ cursor keys to select a graph, and then press F1(SEL) to toggle graphing on or off.



b. Repeat step a to turn each of the graphs listed on the Graph Mode screen on or off.

6. Select the graph style you want to use.

a. On the Graph Mode screen, use the ▲ and ▼ cursor keys to move the highlighting to the graph (Gph1, Gph2, etc.) whose style you want to specify, and then press F4(STYL). This will cause the function menu to change as shown below.

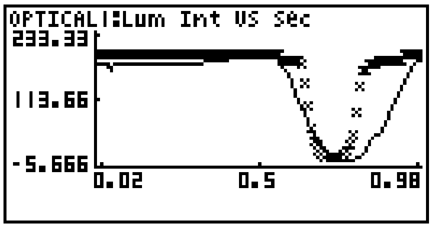


b. Use the function keys to specify the graph style you want.

To specify this graph style:	Press this key:
Line graph with dot (•) data markers	F1 (——)
Line graph with square (□) data markers	F2 (▪▪▪▪▪)
Line graph with X (×) data markers	F3 (××××)
Scatter graph with dot (•) data markers	F4 (·······)
Scatter graph with square (□) data markers	F5 (▪▪▪▪▪)
Scatter graph with X (×) data markers	F6 (×××××)

c. Repeat a and b to specify the style for each of the graphs on the Graph Mode screen.

7. On the Graph Mode screen, press F6 (DRAW) or EXE.
   - This draws the graph(s) in accordance with the settings you configured in step 2 through step 6.



Graph Screen

   - When a Graph screen is on the display, the function keys provide you with zooming and other capabilities to aid in graph analysis.

     For details about Graph screen function key operations, see the following section.

• To deselect sampled data assigned for graphing on the Graph Mode screen

1. On the Graph Mode screen, use the ▲ and ▼ cursor keys to move the highlighting to the graph (Gph1, Gph2, etc.) whose sampled data you want to deselect.
2. Press F5 (DEL).
   - This will deselect sample data assigned to the highlighted graph.

11 Graph Analysis Tool Graph Screen Operations

This section explains the various operations you can perform on the graph screen after drawing a graph.
You can perform these operations on a graph screen produced by a sampling operation, or by the operation described under "Selecting an Analysis Mode and Drawing a Graph" on page 10-2.

■ Graph Screen Key Operations

On the graph screen, you can use the keys described in the table below to analyze (CALC) graphs by reading data points along the graph (Trace) and enlarging specific parts of the graph (Zoom).

Key Operation	Description
SHIFT F1 (TRCE)	Displays a trace pointer on the graph along with the coordinates of the current cursor location. Trace can also be used to obtain the periodic frequency of a specific range on the graph and assign it to a variable. See "Using Trace" on page 11-3.
SHIFT F2 (ZOOM)	Starts a zoom operation, which you can use to enlarge or reduce the size of the graph along the x-axis or the y-axis. See "Using Zoom" on page 11-4.
SHIFT F3 (V-WIN)	Displays a function menu of special View Window commands for the E-CON3 Mode graph screen. For details about each command, see "Configuring View Window Parameters" on page 11-14.
SHIFT F4 (SKTCH)	Displays a menu that contains the following commands: Cls, Plot, F-Line, Text, PEN, Vert, and Hztl. For details about each command, see "5-10 Changing the Appearance of a Graph" under Chapter 5 of this manual.
OPTN F1 (PICT)	Saves the currently displayed graph as a graphic image. You can recall a saved graph image and overlay it on another graph to compare them. For details about these procedures, see "5-4 Storing a Graph in Picture Memory" under Chapter 5 of this manual.
OPTN F2 (LMEM)	Displays a menu of functions for saving the sample values in a specific range of a graph to a list. See "Transforming Sampled Data to List Data" on page 11-5.
OPTN F3 (EDIT)	Displays a menu of functions for zooming and editing a particular graph when the graph screen contains multiple graphs. See "Working with Multiple Graphs" on page 11-10.

Key Operation	Description
OPTN F4 (CALC)	Displays a menu that lets you transform a sample result graph to a function using Fourier series expansion, and to perform regression to determine the tendency of a graph. See “Using Fourier Series Expansion to Transform a Waveform to a Function” on page 11-6, and “Performing Regression” on page 11-8.
OPTN F5 (Y=fx)	Displays the graph function list, which lets you select a Y=f(x) graph to overlay on the sampled result graph. See “Overlaying a Y=f(x) Graph on a Sampled Result Graph” on page 11-9.
OPTN F6 (SPKR)	Starts an operation for outputting a specific range of a sound data waveform graph from the speaker (EA-200 only). See “Outputting a Specific Range of a Graph from the Speaker” on page 11-12.

■ Scrolling the Graph Screen

Press the cursor keys while the graph screen is on the display scrolls the graph left, right, up, or down.

Note

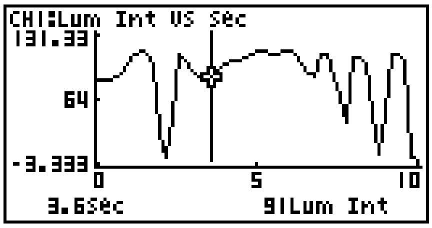
- The cursor keys perform different operations besides scrolling while a trace or graph operation is in progress. To perform a graph screen scroll operation in this case, press EXIT to cancel the trace or graph operation, and then press the cursor keys.

■ Using Trace

Trace displays a crosshair pointer on the displayed graph along with the coordinates of the current cursor position. You can use the cursor keys to move the pointer along the graph. You can also use trace to obtain the periodic frequency value for a particular range, and assign the range (time) and periodic frequency values in separate Alpha-Memory values.

• To use trace

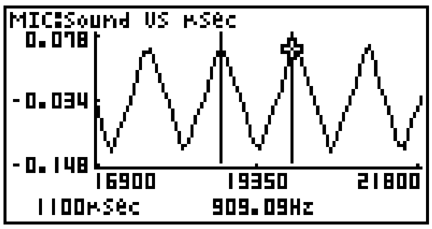
1. On the graph screen, press [SHIFT] [F1] (TRCE).
   - This causes a trace pointer to appear on the graph. The coordinates of the current trace pointer location are also shown on the display.



2. Use the ◀ and ▶ cursor keys to move the trace pointer along the graph to the location you want.
   - The coordinate values change in accordance with the trace pointer movement.
   - You can exit the trace pointer at any time by pressing [EXIT].

• To obtain the periodic frequency value

1. Use the procedure under "To use trace" above to start a trace operation.
2. Move the trace pointer to the start point of the range whose periodic frequency you want to obtain, and then press [EXE].
3. Move the trace pointer to the end point of the range whose periodic frequency you want to obtain.
   - This causes the period and periodic frequency value at the start point you selected in step 2 to appear along the bottom of the screen.



4. Press [EXE] to assign the period and periodic frequency values to Alpha-Memory variables.
   - This displays a dialog box for specifying variable names for [Period] and [Frequency] values.

   - The initial default variable name settings are "S" for the period and "H" for the periodic frequency. To change to another variable name, use the up and down cursor keys to move the highlighting to the item you want to change, and then press the applicable letter key.

5. After everything is the way you want, press [EXE].
   - This stores the values and exits the trace operation.
   - For details about using Alpha-Memory, see "Variables (Alpha Memory)" on page 2-7 under Chapter 2 of this manual.

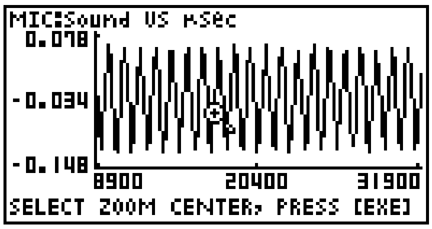
■ Using Zoom

Zoom lets you enlarge or reduce the size of the graph along the x-axis or the y-axis.

Note
- When there are multiple graphs on the screen, the procedure below zooms all of them. For information about zooming a particular graph when there are multiple graphs on the screen, see "Working with Multiple Graphs" on page 11-10.

• To zoom the graph screen

1. On the graph screen, press [SHIFT] [F2] (ZOOM).
   - This causes a magnifying glass cursor (🔍) to appear in the center of the screen.



2. Use the cursor keys to move the magnifying glass cursor to the location on the screen that you want at the center of the enlarged or reduced screen.

3. Press [EXE].
   - This causes the magnifying glass to disappear and enters the zoom mode.
   - The cursor keys perform the following operations in the zoom mode.

To do this:	Press this cursor key:
Enlarge the graph image horizontally	▶
Reduce the size of the graph image horizontally	◀
Enlarge the graph image vertically	▲
Reduce the size of the graph image vertically	▼

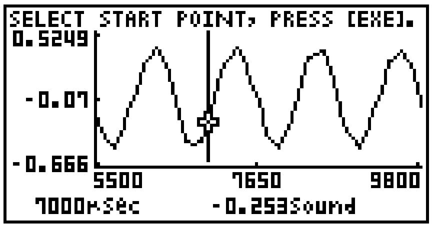
4. To exit the zoom mode, press [EXIT].

■ Transforming Sampled Data to List Data

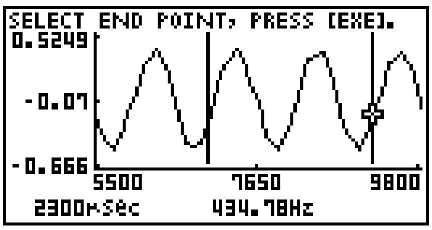
Use the following procedure to transform the sampled data in a specific range of a graph into list data.

• To transform sampled data to list data

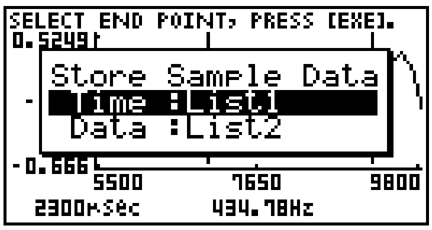
1. On the graph screen, press [OPTN], and then [F2] (LMEM).
   - This displays the [LMEM] menu.
2. Press [F2] (SEL).
   - This displays the trace pointer for selecting the range on the graph.
3. Move the trace pointer to the start point of the range you want to convert to list data, and then press [EXE].



4. Move the trace pointer to the end point of the range you want to convert to list data, and then press [EXE].
   - This displays a dialog box for specifying the lists where you want to store the time data and the sampled data.



→



   - The initial default lists are List 1 for the time and List 2 for sample data. To change to another list (List 1 to List 26), use the up and down cursor keys to move the highlighting to the list you want to change, and then input the applicable list number.

5. After everything is the way you want, press [EXE].
   - This saves the lists and the message "Complete!" appears. Press [EXE] to return to the graph screen.
   - For details about using list data, see "Chapter 3 List Function".

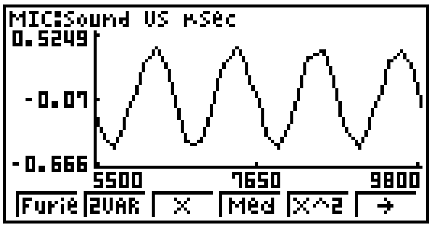
   Note
   - Pressing [F1](All) in place of [F2](SEL) in step 2 converts the entire graph to list data. In this case, the "Store Sample Data" dialog box appears as soon as you press [F1](All).

■ Using Fourier Series Expansion to Transform a Waveform to a Function

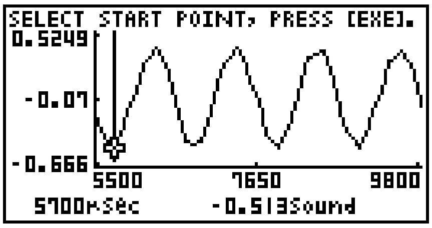
Fourier series expansion is effective for studying sounds by expressing them as functions. The procedure below assumes that there is a graph of sampled sound data already on the graph screen.

• To perform Fourier series expansion

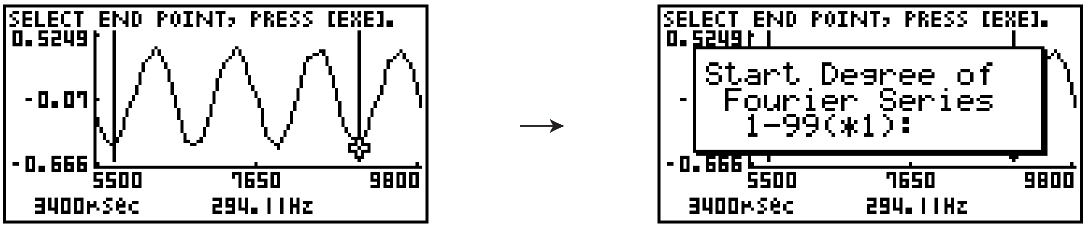
1. On the graph screen , press [OPTN], and then [F4](CALC).
   - The [CALC] menu appears at the bottom of the display.



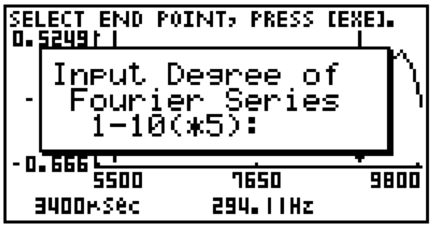
2. Press [F1](Furie).
   - This displays the trace pointer for selecting the graph range.
3. Move the trace pointer to the start point of the range for which you want to perform Fourier series expansion, and then press [EXE].



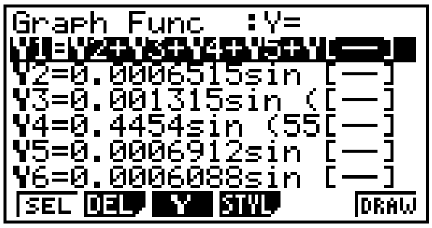
4. Move the trace pointer to the end point of the range for which you want to perform Fourier series expansion, and then press EXE.
   - This displays a dialog box for specifying the start degree of the Fourier series.



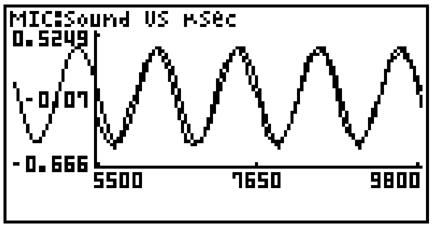
5. Input a value in the range of 1 to 99, and then press EXE.
   - This displays a dialog box for inputting the degree of the Fourier series.



6. Input a value in the range of 1 to 10, and then press EXE.
   - The graph function list appears with the calculation result.



7. Pressing F6(DRAW) here graphs the function.



   - This lets you compare the expanded function graph and the original graph to see if they are the same.

Note

When you press F6(DRAW) in step 7, the graph of the result of the Fourier series expansion may not align correctly with the original graph on which it is overlaid. If this happens, shift the position the original graph to align it with the overlaid graph.

For information about how to move the original graph, see “To move a particular graph on a multi-graph display” (page 11-12).

■ Performing Regression

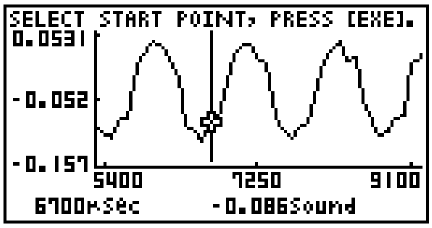
You can use the procedure below to perform regression for a range specified using the trace pointer. All of the following regression types are supported: Linear, Med-Med, Quadratic, Cubic, Quartic, Logarithmic, Exponential, Power, Sine, and Logistic.

For details about these regression types, see pages 6-12 through 6-14 under Chapter 6 of this manual.

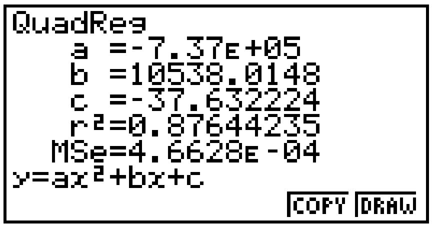
The following procedure shows how to perform quadratic regression. The same general steps can also be used to perform the other types of regression.

• To perform quadratic regression

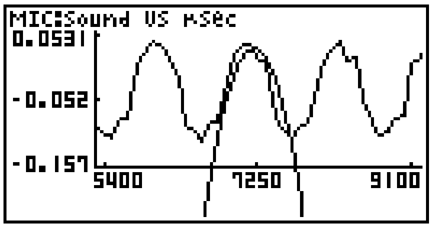
1. On the graph screen, press OPTN, and then F4 (CALC).
   - The [CALC] menu appears at the bottom of the display.
2. Press F5 (X^2).
   - This displays the trace pointer for selecting the range on the graph.



3. Move the trace pointer to the start point of the range for which you want to perform quadratic regression, and then press EXE.
4. Move the trace pointer to the end point of the range for which you want to perform quadratic regression, and then press EXE.
   - This displays the quadratic regression calculation result screen.



5. Press F6 (DRAW).
   - This draws a quadratic regression graph and overlays it over the original graph.



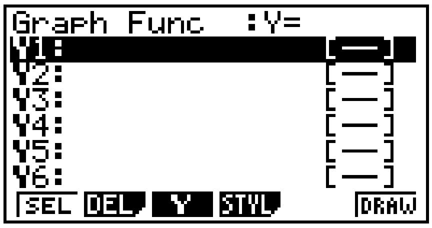
   - To delete the overlaid quadratic regression graph, press SHIFT F4 (SKTCH) and then F1 (Cls).

■ Overlaying a Y=f(x) Graph on a Sampled Result Graph

Use the following procedure when you want to overlay a Y=f(x) graph on the sampled result graph.

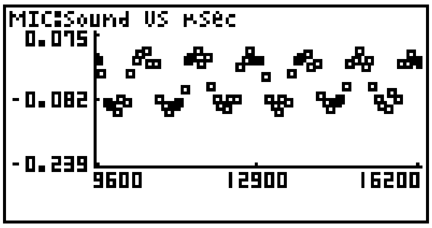
• To overlay a Y=f(x) graph on an existing graph

1. On the graph screen, press OPTN, and then F5 (Y=fx).
   - This displays the graph function list. Any functions you have previously input on the graph function list appear at this time.



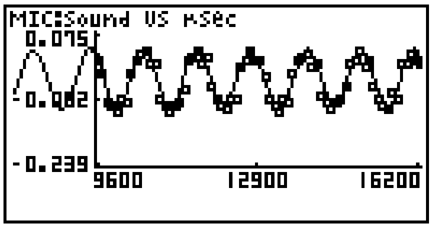
2. Input the function you want to graph.
   - To input a function, use the ▲ and ▼ cursor keys to move the highlighting to the line where you want to input it, and then use the calculator keys for input. Press EXE to store the function.
3. On the graph function list, specify which functions you want to graph.
   - Graphing is turned on for any function whose "=" symbol is highlighted. To toggle graphing of a function on or off, use the ▲ and ▼ cursor keys to move the highlighting to the function, and then press F1 (SEL).

4. After the graph function list settings are configured the way you want, press F6(DRAW).
   • This overlays graphs of all the functions for which graphing is turned on, over the graph that was originally on the graph screen.



Original Graph

→



Overlaid with Y=f(x) Graph

   • To delete the overlaid graph, press SHIFT F4(SKTCH) and then F1(Cls).

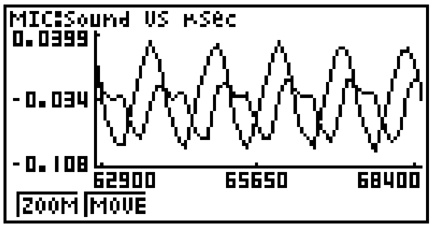
   Important!
   • The screenshot shown in step 4 above is of a function that was calculated and stored by performing regression on a graph that was drawn using sampled data. Note that overlaying a Y=f(x) graph on a sampled data graph does not automatically draw a regression graph based on sampled data.

■ Working with Multiple Graphs

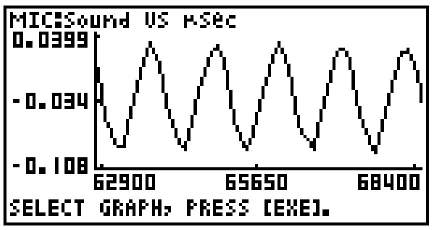
The procedures in this section explain how you can zoom or move a particular graph when there are multiple graphs on the display.

• To zoom a particular graph on a multi-graph display

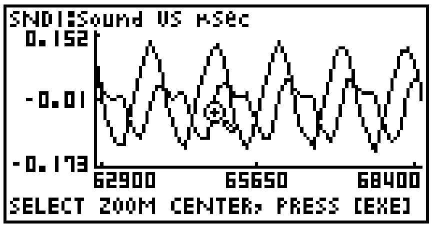
1. When the graph screen contains multiple graphs, press OPTN, and then F3(EDIT).
   • The [EDIT] menu appears at the bottom of the display.



2. Press F1(ZOOM).
   • This displays only one of the graphs that were originally on the graph screen.

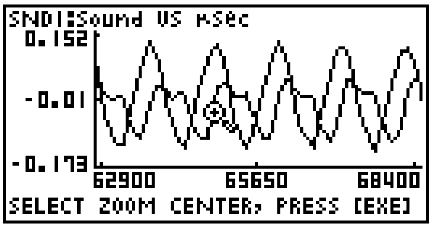


3. Use the ▲ and ▼ cursor keys to cycle through the graphs until the one you want is displayed, and then press EXE.
   - This enters the zoom mode and causes all of the graphs to reappear, along with a magnifying glass cursor (🔍) in the center of the screen.



4. Use the cursor keys to move the magnifying glass cursor to the location on the screen that you want at the center of the enlarged or reduced screen.
5. Press EXE.
   - This causes the magnifying glass to disappear and enters the zoom mode.
   - The cursor keys perform the following operations in the zoom mode.

To do this:	Press this cursor key:
Enlarge the graph image horizontally	▶
Reduce the size of the graph image horizontally	◀
Enlarge the graph image vertically	▲
Reduce the size of the graph image vertically	▼



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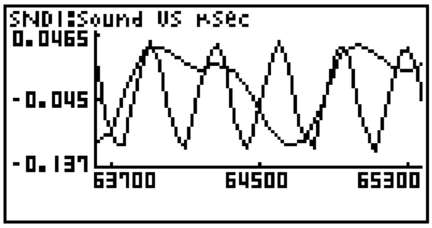
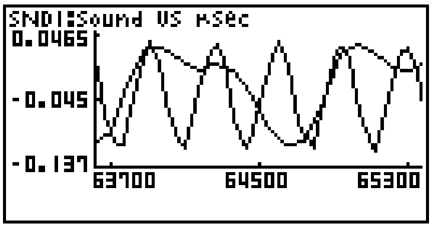


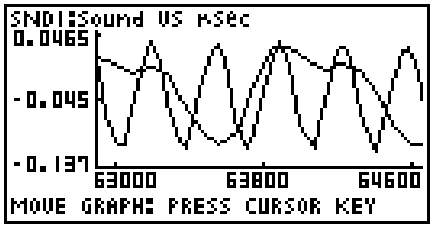
6. To exit the zoom mode, press EXIT.

• To move a particular graph on a multi-graph display

1. When the graph screen contains multiple graphs, press OPTN, and then F3(EDIT).
   • This displays the [EDIT] menu.
2. Press F2(MOVE).
   • This displays only one of the graphs that were originally on the graph screen.
3. Use the ▲ and ▼ cursor keys to cycle through the graphs until the one you want is displayed, and then press EXE.
   • This enters the move mode and causes all of the graphs to reappear.
4. Use the ◀ and ▶ cursor keys to move the graph left and right, or the ▲ and ▼ cursor keys to move the graph up and down.



→



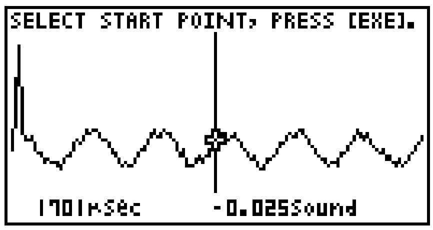
5. To exit the move mode, press EXIT.

■ Outputting a Specific Range of a Graph from the Speaker (EA-200 only)

Use the following procedure to output a specific range of a sound data waveform graph from the speaker.

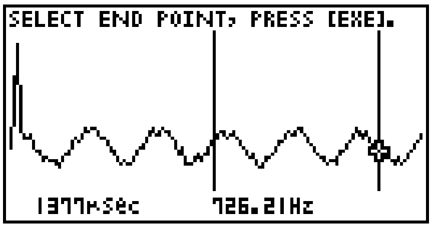
• To output a graph from the speaker

1. On the graph screen, press OPTN, and then F6(SPKR).
   • This displays the trace pointer for selecting the range on the graph.

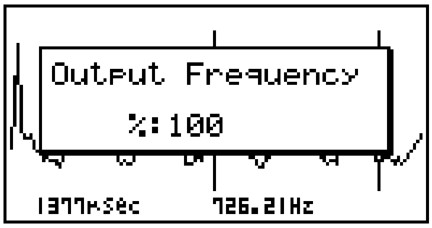


2. Move the trace pointer to the start point of the range you want to output from the speaker, and then press EXE.

3. Move the trace pointer to the end point of the range you want to output from the speaker, and then press EXE.
   - After you specify the start point and end point, an output frequency dialog box shown below appears on the display.



→

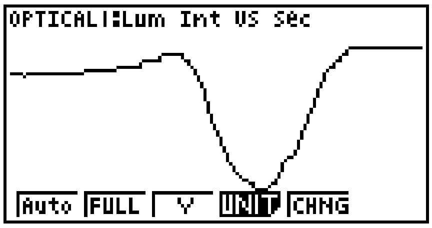


4. Input a percent value for the output frequency value you want.
   - The output frequency specification is a percent value. To output the original sound as-is, specify 100%. To raise the original sound by one octave, input a value of 200%. To lower the original sound by one octave, input a value of 50%.
5. After inputting an output frequency value, press EXE.
   - This outputs the waveform between the start point and end point from the EA-200 speaker.
   - If the sound you configured cannot be output for some reason, the message “Range Error” will appear. If this happens, press EXIT to scroll back through the previous setting screens and change the setup as required.
6. To terminate sound output, press the EA-200 [START/STOP] key.
7. Press EXE.
   - This displays a screen like the one shown below.

8. If you want to retry output from the speaker, press F1(Yes). To exit the procedure and return to the graph screen, press F6(No).
   - Pressing F1(Yes) returns to the “Output Frequency” dialog box. From there, repeat the above steps from step 4.

■ Configuring View Window Parameters

Pressing SHIFT F3 (V-Window) while the graph screen is on the display displays a View Window function key menu along the bottom of the display.



Press the function key that corresponds to the View Window parameter you want to configure.

Function Key	Description
F1 (Auto)	Automatically applies the following View Window parameters. Y-axis Elements: In accordance with screen size X-axis Elements: In accordance with screen size when 1 data item equals 1 dot; 1 data equals 1 dot in other cases
F2 (FULL)	Resizes the graph so all of it fits in the screen.
F3 (Y)	Resizes the graph so all of it fits in the screen along the Y-axis, without changing the X-axis dimensions.
F4 (UNIT)	Specifies the unit of the numeric axis grid displayed by the Econ Axes setting of the graph setup screen (page 3-13). F1 (μ sec): microseconds F2 (msec): milliseconds F3 (sec): seconds F4 (DHMS) : days, hours, minutes, seconds (1 day, 2 hours, 30 minutes, 5 seconds = 1d2h30m5s) F5 (Auto): Auto selection
F5 (CHNG)	Toggles display of the source data on the graph screen on and off.

To exit the View Window function key menu and return to the standard function key menu, press EXIT.

12 Calling E-CON3 Functions from an eActivity

You can call E-CON3 functions from an eActivity by including an “Econ strip” in the eActivity file. The following describes each of the four available Econ strips.

- **Econ SetupWizard strip**

  This strip calls the E-CON3 Setup Wizard. The Econ Setup Wizard strip makes it possible to perform the following series of operations from the eActivity: Data Logger setup using the Setup Wizard → Sampling → Graphing.

  Note
  - In the case of the Econ SetupWizard strip, the “3: Convert Program” is not available on the “Complete!” dialog box.

- **Econ AdvancedSetup strip**

  This strip calls the E-CON3 Advanced Setup screen. The Advanced Setup provides access to almost all executable functions (except for the program converter), including detailed Data Logger setup and sampling execution; graphing and Graph Analysis Tools; simultaneous sampling with multiple sensors using the MULTIMETER Mode, etc.

  Note
  - Using an Econ Advanced Setup strip to configure a setup causes the setup information to be registered in the applicable strip. This means that the next time you open the strip, sampling can be performed in accordance with the previously configured setup information.

- **Econ Sampling strip**

  This strip executes Data Logger measurement. To store Data Logger setup information for this strip, perform the Econ Advance Setup operation the first time the strip is executed.

- **Econ Graph strip**

  This strip graphs sampled data that is recorded in the strip. The sampled data is recorded to the strip the first time the strip is executed.

- **Econ Strip Memory Capacity Precautions**
  - The memory capacity of each Econ strip is 25 KB. An error will occur if you perform an operation that causes this capacity to be exceeded. Particular care is required when handling a large number of samples, which can cause memory capacity to be exceeded.
  - Always make sure that FFT Graph is turned off whenever performing sampling with the microphone. Leaving FFT Graph turned on cause memory capacity to be exceeded.
  - If an error occurs, press SHIFT ⇥ ( ) to return to the eActivity workspace screen and perform the procedure again.
  - For information about checking the memory usage of each strip, see “10-5 eActivity File Memory Usage Screen” under Chapter 10 of this manual.

For details about eActivity operations, see “Chapter 10 eActivity” of this manual.

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One or more of the following patents may be used in the product.
U.S.Pats. 7,927,221 8,214,413

SA2006-B

SL

fx-9860GIII *(različica 3.21)*
fx-9750GIII *(različica 3.21)*
fx-7400GIII *(različica 3.20)*

Programska oprema
Navodila za uporabo

Spletna stran CASIO Worldwide Education

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Priročniki so na voljo v več jezikih na

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• Vso dokumentacijo za uporabnike hranite na dosegu roke za poznejšo uporabo.

Vsebina

Poglavje 6 Statistični grafi in izračuni

Poglavje 7 Finančni izračun (TVM)

Poglavje 8 Programiranje

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Dodatek

Način pregleda (samo fx-9860GIII, fx-9750GIII) .... β -1

Aplikacija E-CON3 (angleščina) (fx-9860GIII, fx-9750GIII)

Seznanjanje – najprej preberite to!

■ O tem priročniku za uporabnike

u Razlike med funkcijami in zasloni, specifične za model

Ta priročnik za uporabo zajema več različnih modelov kalkulatorjev. Upoštevajte, da nekatere funkcije, opisane v tem priročniku, morda niso na voljo na vseh modelih, ki jih zajema ta priročnik za uporabo. Vsi posnetki zaslona v tem priročniku za uporabo prikazujejo zaslon fx-9860GIII, zasloni drugih modelov pa se lahko nekoliko razlikujejo.

u Naravno vnašanje in prikaz matematike

V začetnih privzetih nastavitvah sta fx-9860GIII ali fx-9750GIII nastavljena za uporabo »načina vnosa/izpisa matematike«, ki omogoča naravni vnos in prikaz matematičnih izrazov. To pomeni, da lahko vnašate ulomke, kvadratne korene, diferenciale in druge izraze tako, kot so zapisani. V »načinu vnosa/izpisa matematike« se večina rezultatov izračunov prikaže tudi z naravnim prikazom.

Po želji lahko izberete tudi »Linearni način vnosa/izpisa«, ki omogoča vnos in prikaz izračunskih izrazov v eni vrstici. Privzeta nastavitev načina vnosa/izpisa za modela fx-9860GIII in fx-9750GIII je matematični način vnosa/izpisa.

Primeri, prikazani v tem priročniku za uporabnika, so večinoma predstavljeni z uporabo linearne vnosne/izhodne funkcije. Če uporabljate fx-9860GIII ali fx-9750GIII, upoštevajte naslednje točke.

- Za informacije o preklopu med matematičnim načinom vnosa/izpisa in linearni načinom vnosa/izpisa glejte pojasnilo o nastavitvi načina „Vnos/izpis“ v poglavju „Uporaba zaslona za nastavitve“ (stran 1-30).
- Za informacije o vnosu in prikazu v matematičnem načinu vnosa/izpisa glejte »Uporaba matematičnega načina vnosa/izpisa« (stran 1-12).

u Za lastnike modelov, ki niso opremljeni z matematičnim načinom vnosa/izpisa (fx-7400GIII)...

fx-7400GIII ne vključuje matematičnega načina vnosa/izpisa. Pri izvajanju izračunov iz tega priročnika na fx-7400GIII uporabite linearni način vnosa.
Lastniki fx-7400GIII naj ignorirajo vse razlage v tem priročniku, ki se nanašajo na matematični vnosni/izhodni način.

u ! x(')

Zgornje navodilo pomeni, da morate pritisniti ! in nato x, kar bo vneslo simbol '. Vse operacije z več tipkami so označene na ta način. Prikazane so oznake na tipkah, sledijo pa jim vneseni znaki ali ukazi v oklepajih.

u m EQUA

To pomeni, da morate najprej pritisniti m, s pomočjo tipk za premikanje kurzorja (f, ②, d, e) izbrati način **EQUA** in nato pritisniti w. Postopki, ki jih morate izvesti, da vstopite v način iz glavnega menija, so označeni na ta način.

u Funkcijske tipke in meniji

- Mnoge operacije, ki jih izvaja ta kalkulator, lahko izvedete s pritiskom na funkcionalne tipke od 1 do 6. Operacija, dodeljena vsaki funkcionalni tipki, se spreminja glede na način, v katerem je kalkulator, trenutne dodelitve operacij pa so označene s funkcionalnimi meniji, ki se prikažejo na dnu zaslona.
- Ta uporabniški priročnik prikazuje trenutno delovanje, dodeljeno funkciji tipke, v oklepaju za tipko za to tipko. 1(Comp) na primer pomeni, da s pritiskom na 1 izberete {Comp}, kar je navedeno tudi v funkciji menija.
- Če je v funkciji menija za tipko 6 navedeno (g), to pomeni, da s pritiskom na tipko 6 prikažete naslednjo ali prejšnjo stran menijskih možnosti.

u Naslovi menija

- Naslovi menijev v tem priročniku za uporabnika vključujejo ključne operacije, potrebne za prikaz menija, ki je pojasnjen. Ključna operacija za meni, ki se prikaže s pritiskom na tipko K in nato
  {LIST}, bi bila prikazana kot: **[OPTN]-[LIST]**.
- 6(g) ključne operacije za prehod na drugo stran menija niso prikazane v ključnih operacijah naslova menija.

u Seznam ukazov

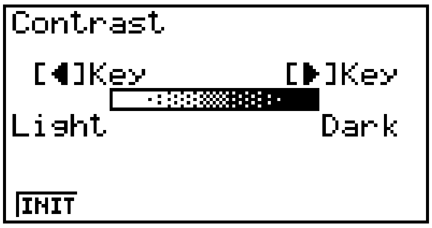
Seznam ukazov v načinu **PRGM** (stran 8-41) vsebuje grafični diagram poteka različnih menijev funkcijskih tipk in prikazuje, kako se pomakniti do menija ukazov, ki ga potrebujete.

Primer: Naslednja operacija prikaže Xfct: **[VARS]-[FACT]-[Xfct]**

■ Nastavitev kontrasta

Kontrast prilagodite, kadar so predmeti na zaslonu videti motni ali težko vidni.

1. S puščičnimi tipkami (f②, d, e) izberite ikono **SYSTEM** in pritisnite w, nato pa pritisnite 1 (◀▶), da prikažete zaslon za nastavitev kontrasta.



2. Nastavite kontrast.
   - Tipka za premikanje kurzorja e zaslon naredi kontrast temnejši.
   - Tipka za premikanje kurzorja d zaslon naredi svetlejšega.
   - 1(INIT) vrne kontrast zaslona na prvotno privzeto vrednost.

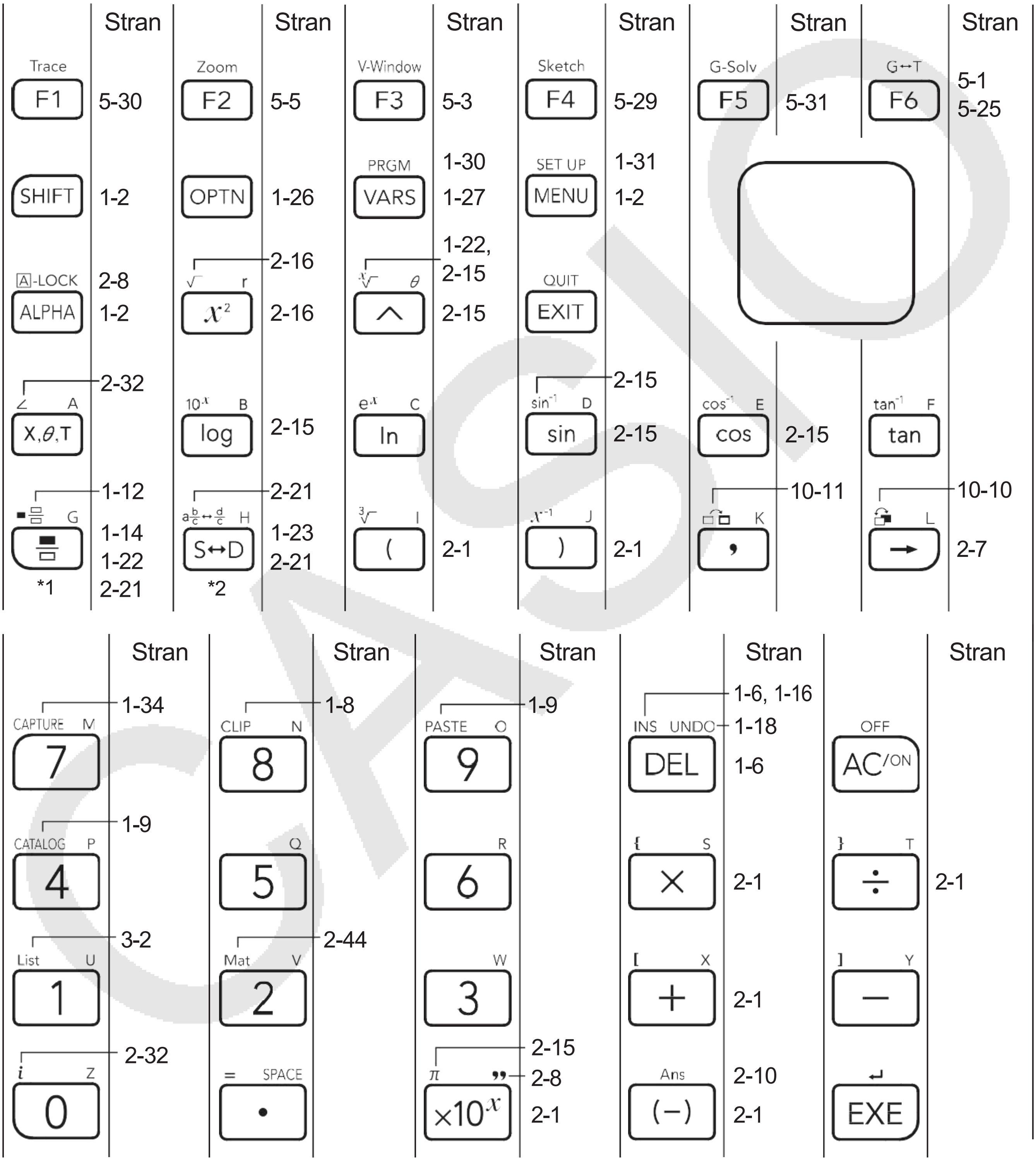
3. Za izhod iz nastavitve kontrasta zaslona pritisnite m.

Poglavje 1 Osnovno upravljanje

1. Tipke

1

■ Tabela tipk

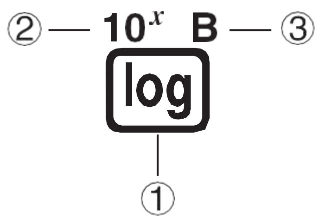


*1 fx-7400GIII: a b/c *2 fx-7400GIII: F↔D

Vse zgoraj opisane funkcije niso na voljo na vseh modelih, ki jih zajema ta priročnik. Glede na model kalkulatorja nekateri od zgoraj navedenih tipk morda niso vključeni v vaš kalkulator.

■ Oznake tipk

Mnoge tipke kalkulatorja se uporabljajo za več kot eno funkcijo. Funkcije, označene na tipkovnici, so označene z barvami, da lahko hitro in enostavno najdete tisto, ki jo potrebujete.



	Funkcija	Tipka Delovanje
①	log	l
2	10x	! l
3	B	a l

V nadaljevanju je opisana barvna koda, uporabljena za

Barva	Ključ za upravljanje
Rumena	Pritisnite ! in nato tipko, da izvedete označeno funkcijo.
Rdeča	Pritisnite a in nato tipko, da izvedete označeno funkcijo.

• A-LOCK ALPHA **Alpha Lock**

Običajno se tipkovnica takoj po pritisku na a in nato na tipko za vnos črke vrne na svoje primarne funkcije.
Če pritisnete ! in nato a, se tipkovnica zaklene v alfa vnos, dokler ponovno ne

2. Prikaz

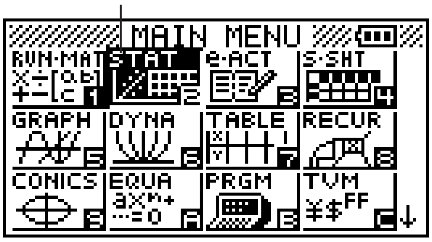
■ Izbiranje ikon

V tem poglavju je opisano, kako izbrati ikono v glavnem meniju, da vstopite v želeni

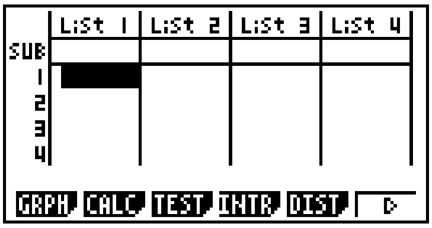
u Izbiranje ikone

1. Pritisnite m, da prikažete glavni meni.
2. S pomočjo tipk za premikanje kurzorja (d, e, f, ②) premaknite označitev na želeno ikono.

Trenutno izbrana ikona

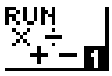


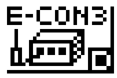
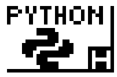
3. Pritisnite w, da prikažete začetni zaslon načina, katerega ikono ste izbrali. Tukaj bomo vstopili v način **STAT**.



- V način lahko vstopite tudi brez označitve ikone v glavnem meniju, tako da vnesete številko ali črko, označeno v spodnjem desnem kotu ikone.
- Za vstop v način uporabite samo zgoraj opisane postopke. Če uporabite kateri koli drug postopek, lahko se znajdete v načinu, ki ni tisti, ki ste ga izbrali. V nadaljevanju je pojasnjen

pomen posameznih ikon.

Ikona	Ime načina	Opis
	RUN (samo fx-7400GIII)	Ta način uporabite za aritmetične in funkcionalne izračune ter za izračune z binarnimi, osemštevnimi, decimalnimi in šestnajstičnimi vrednostmi.
	RUN • MAT* (Run • Matrix • Vector)	Ta način uporabite za aritmetične izračune, izračune funkcij, izračune z binarnimi, osemštevnimi, decimalnimi in šestnajstiškimi vrednostmi, izračune matrik in izračune vektorjev.
	STAT (Statistika)	Ta način uporabite za izvajanje statističnih izračunov z eno spremenljivko (standardni odmik) in z dvema spremenljivkama (regresija), za izvajanje testov, za analizo podatkov in za risanje statističnih grafikonov.
	e • ACT* (eAktivnost)	eActivity vam omogoča vnos besedila, matematičnih izrazov in drugih podatkov v vmesniku, podobnem zvezku. Ta način uporabite, ko želite shraniti besedilo ali formule ali vgrajene podatke aplikacije v datoteko.
	S • SHT* (Preglednica)	Ta način uporabite za izvajanje izračunov v preglednici. Vsaka datoteka vsebuje preglednico z 26 stolpci × 999 vrsticami. Poleg vgrajenih ukazov kalkulatorja in ukazov načina **S • SHT** lahko izvajate tudi statistične izračune in grafično prikazujete statistične podatke z istimi postopki, kot jih uporabljate v načinu **STAT**.
	GRAPH	Ta način uporabite za shranjevanje grafičnih funkcij in risanje grafikonov z uporabo teh funkcij.
	DYNA* (Dinamični grafikon)	Ta način uporabite za shranjevanje grafičnih funkcij in risanje več različic grafa s spreminjanjem vrednosti, dodeljenih spremenljivkam v funkciji.
	TABELA	Ta način uporabite za shranjevanje funkcij, ustvarjanje numerične tabele različnih rešitev, ko se spreminjajo vrednosti, dodeljene spremenljivkam v funkciji, in risanje grafikonov.
	RECUR* (Rekurzija)	Ta način uporabite za shranjevanje rekurzivnih formul, za ustvarjanje numerične tabele različnih rešitev, ko se spreminjajo vrednosti, dodeljene spremenljivkam v funkciji, in za risanje grafikonov.
	KONIČNE*	Ta način uporabite za risanje grafikonov koničnih presekov.
	EQUA (En ačba)	Ta način uporabite za reševanje linearnih enačb z dvema do šestimi neznankami in enačb višjega reda od 2. do 6. stopnje.

	PRGM (Program)	Ta način uporabite za shranjevanje programov v programskem območju in za zagon programov.
Ikona	**Ime načina**	**Opis**
	TVM* (Finančni)	Ta način uporabite za izvajanje finančnih izračunov in risanje grafikonov denarnega toka in drugih vrst grafikonov.
	E-CON3*	Ta način uporabite za nadzorovanje dodatnega podatkovnega zapisovalnika.
	LINK	Ta način uporabite za prenos vsebine pomnilnika ali varnostne kopije podatkov na drugo enoto ali osebni računalnik.
	MEMORY	Ta način uporabite za upravljanje podatkov, shranjenih v pomnilniku.
	SISTEM	Ta način uporabite za inicializacijo pomnilnika, nastavitev kontrasta in druge sistemske nastavitve.
	PYTHON*	Ta način uporabite za ustvarjanje in izvajanje skriptov v programskem jeziku Python.

* Ni vključeno v fx-7400GIII.

■ O meniju funkcij

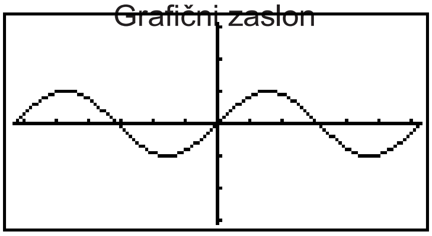
Uporabite funkcionalne tipke (1 do 6) za dostop do menijev in ukazov v menijski vrstici na dnu zaslona. Po videzu lahko razlikujete, ali je element v menijski vrstici meni ali ukaz.

■ O zaslonih

Ta kalkulator uporablja dva tipa zaslonov: zaslon za besedilo in zaslon za grafe. Zaslon za besedilo lahko prikaže 21 stolpcev in 8 vrstic znakov, pri čemer je spodnja vrstica namenjena meniju funkcijskih tipk. Zaslon za grafe uporablja površino, ki meri 127 (Š) × 63 (V) pik.

Besedilni zaslon

Grafični zaslon



■ Običajni zaslon

Kalkulator običajno prikazuje vrednosti do 10 mest. Vrednosti, ki presegajo to omejitev, se samodejno pretvorijo in prikažejo v eksponentnem formatu.

u **Kako razlagati eksponentni format**

1,2E+12 pomeni, da je rezultat enak 1,2× 10^{12} . To pomeni, da morate decimalno vejico v 1,2 premakniti dvanajst mest v desno, ker je eksponent pozitiven. Rezultat je vrednost 1.200.000.000.000.

1,2E–03 pomeni, da je rezultat enak 1,2× 10^{-3} . To pomeni, da morate decimalno vejico v številki 1,2 premakniti za tri mesta v levo, ker je eksponent negativen. Rezultat je vrednost 0,0012.

Za samodejni prehod na normalni prikaz lahko določite enega od dveh različnih razponov.

Norm 1.....................10^{-2} (0,01) > |x|, |x| > 10^{10}

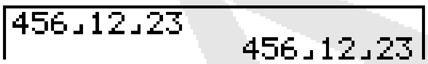
Norm 2 .... 10^{-9} (0,000000001) > |x|, |x| > 10^{10}

Vsi primeri v tem priročniku prikazujejo rezultate izračunov z uporabo norme 1. Podrobnosti o preklopu med normo 1 in normo 2 najdete na strani 2-12.

■ Posebni formati prikaza

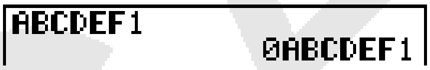
Ta kalkulator uporablja posebne oblike prikaza za prikazovanje ulomkov, šestnajstiških vrednosti in vrednosti v stopinjah/minutah/sekundah.

u Ulomki



. ... Prikazuje: 456 $\frac{12}{23}$

u Šestnajstiške vrednosti



. ... Pomeni: $0ABCDEF1_{(16)}$, kar je enako $180150001_{(10)}$

u Stopinje/minute/sekunde

. ... Označuje: 12° 34’ 56,78”

• Poleg zgoraj navedenega ta kalkulator uporablja tudi druge kazalnike ali simbole, ki so opisani v posameznih ustreznih poglavjih tega priročnika, ko se pojavijo.

3. Vnašanje in urejanje izračunov

■ Vnos izračunov

Ko ste pripravljeni vnesti izračun, najprej pritisnite AC , da počistite zaslon. Nato vnesite izračunske formule točno tako, kot so zapisane, od leve proti desni, in pritisnite w, da dobite rezultat.

Primer **2 + 3 – 4 + 10 =**

AC c+d-4 +b□w

2+3-4+10
11

■ Urejanje izračunov

S tipkama d in e premaknite kurzor na mesto, ki ga želite spremeniti, in nato izvedite eno od spodaj opisnih operacij. Po urejanju izračuna ga lahko izvedete s pritiskom na tipko w. Ali pa lahko s tipko e premaknete kurzor na konec izračuna in vnesete več.

- Za vnos*1 lahko izberete vstavljanje ali prepisovanje. Pri prepisovanju vneseno besedilo nadomesti besedilo na trenutni lokaciji kurzorja. Med vstavljanjem in prepisovanjem lahko preklapljate z izvedbo operacije: !D(INS). Kurzor se prikaže kot „I“ za vstavljanje in kot „▬ “ za prepisovanje.

  *1 fx-9860GIII ali fx-9750GIII: Vstavljanje in prepisovanje je mogoče le, če je izbran linearni

---

u Če želite

Primer **Za spremembo cos60 v sin60**

— — —	cos 60▌
ddd	▌cos 60
D	▌60
s	sin ▌60

---

u **Za izbris**

Primer **Za spremembo 369 ×× 2 v 369× 2**

	369××2▌
dD	369×▌2

V načinu vstavljanja tipka D deluje kot tipka za brisanje.

---

u Za vstavljanje

Primer **Sprememba 2.36^2 v**

AC c.dg6	2.36²▌
ddddd	▌2.36²
s	sin ▌2.36²

■ Uporaba pomnilnika ponovitev

Zadnji izvedeni izračun se vedno shrani v pomnilnik ponovnega predvajanja. Vsebino pomnilnika ponovnega predvajanja lahko prikličete s pritiskom na tipko d ali e. Če pritisnete e, se izračun prikaže s kurzorjem na začetku. S pritiskom na d se izračun prikaže s kurzorjem na koncu. Izračun lahko po želji spremenite in nato ponovno izvedete.

- Pomnilnik ponovnega predvajanja je omogočen samo v linearni načinu vnosa/iznosa. V matematičnem načinu vnosa/iznosa se namesto pomnilnika ponovnega predvajanja uporablja funkcija zgodovine. Za podrobnosti glejte „Funkcija zgodovine“ (stran 1-19).

Primer 1 **Za izvedbo naslednjih dveh izračunov**
4,12× 6,4 = 26,368
4,12× 7,1 = 29,252

AC 4 .bc*6 .4w	4.12×6.4 26.368
dddd	4.12×6.4
!D(INS)	4.12×6.4
h.b	4.12×7.1_
w	4.12×7.1 29.252

Po pritisku na gumb AC lahko pritisnete f ali ②, da prikličete prejšnje izračune, in sicer v zaporedju od najnovejšega do najstarejšega (funkcija Multi-Replay). Ko prikličete izračun, lahko s tipkama e in d premikate kurzor po izračunu in ga spreminjate, da ustvarite nov izračun.

Primer 2

AC bcd+4 f6w cd4 −f6 hw	123+456 579 234−567 −333
AC	
f (en izračun nazaj)	234−567
f (dva izračuna nazaj)	123+456

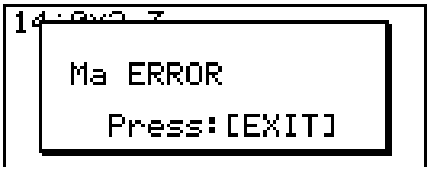
- Izračun ostane shranjen v pomnilniku ponovnega predvajanja, dokler ne izvedete drugega izračuna.
- Vsebina pomnilnika ponovnega predvajanja se ne izbriše, ko pritisnete tipko AC , tako da lahko izračun ponovno prikličete in izvedete tudi po pritisku tipke AC .

■ Popravljanje izvirnega izračuna

Primer **14÷ 0× 2,3 vneseno po pomoti za 14÷ 10× 2,3**

AC b4 /0 *c.d	14÷0×2.3

w



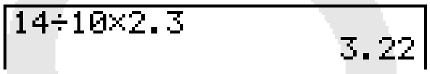
Pritisnite J .

Kazalec se samodejno postavi na mesto, kjer je prišlo do napake.

Opravite potrebne spremembe.
db

Ponovno

izvedite. w



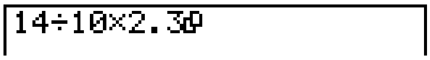
■ Uporaba odložišča za kopiranje in lepljenje

Funkcijo, ukaz ali drugo vnosno vrednost lahko kopirate (ali izrežete) v odložišče in nato vsebino odložišča prilepite na drugo mesto.

• Vsi postopki, opisani tukaj, uporabljajo linearni način vnosa/izpisa. Podrobnosti o kopiranju in lepljenju, ko je izbran matematični način vnosa/izpisa, najdete v poglavju „Uporaba odložišča za kopiranje in lepljenje v matematičnem načinu vnosa/izpisa“ (stran 1-20).

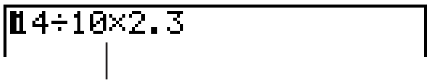
u **Določanje območja kopiranja**

1. Premaknite kurzor (I) na začetek ali konec območja besedila, ki ga želite kopirati, in nato pritisnite ! i (CLIP). Kurzor se spremeni v „ “.



2. S puščičnimi tipkami premaknite kurzor in označite del besedila, ki ga želite kopirati.

3. Pritisnite 1 (KOPIRAJ), da označeno besedilo kopirate v odložišče in zaprete način določanja območja kopiranja.



Izbrani znaki se pri kopiranju ne spremenijo.

Če želite preklicati označevanje besedila brez kopiranja, pritisnite J

u **Izrezanje besedila**

1. Premaknite kurzor (I) na začetek ali konec območja besedila, ki ga želite izrezati, in nato pritisnite ! i (CLIP). S tem se kurzor spremeni v „ “.

2. S puščičnimi tipkami premaknite kurzor in označite del besedila, ki ga želite izrezati.

3. Pritisnite 2(IZREŽI), da izrezano besedilo shranite v odložišče.

Izrezanje povzroči izbris originalnih znakov.

u Vstavljanje besedila

Premaknite kurzor na mesto, kamor želite prilepiti besedilo, in pritisnite (PASTE). Vsebina odložišča se prilepi na mesto kurzorja.

AC

(PASTE)

■ Funkcija kataloga

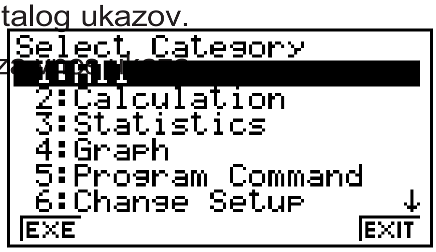
Katalog je abecedni seznam vseh ukazov, ki so na voljo na tem kalkulatorju*. Ukaz lahko vnesete tako, da odprete katalog in izberete želeni ukaz.

* fx-9860GIII, fx-9750GIII:

- Če v postopku spodaj izberete »1:Vse« za seznam kategorij, se prikažejo vsa imena ukazov, ki so na voljo na tem kalkulatorju, v abecednem vrstnem redu.
- Če izberete katero koli drugo možnost seznama kategorij, se namesto imen ukazov prikažejo imena funkcij. Uporaba imen funkcij je koristna, če ne poznate imena ukaza.
- V načinu **PYTHON** se v katalogu prikažejo samo ukazi, ki so specifični za način **PYTHON**.

u Uporaba kataloga za vnos ukaza

1. Pritisnite !4 (KATALOG), da prikažete abecedni katalog ukazov.
   - Prvi zaslon, ki se prikaže, je zadnji, ki ste ga uporabili za vnos ukaza.
2. Pritisnite 6(CTGY), da prikažete seznam kategorij.
   - Če želite, lahko ta korak preskočite in nadaljujete z 5. korakom.



3. Z uporabo tipk za premikanje kurzorja f② označite želeno kategorijo ukazov in nato pritisnite 1(EXE) ali w.
   - Prikaže se seznam ukazov v izbrani kategoriji.
   - fx-9860GIII, fx-9750GIII: Če izberete „2:Izračun“ ali „3:Statistika“, se prikaže zaslon za izbiro podkategorije. Z uporabo f in ② izberite podkategorijo.

4. Vnesite prvo črko ukaza, ki ga želite vnesti. Prikazal se bo prvi ukaz, ki se začne s to črko.
   - fx-9860GIII, fx-9750GIII: Za iskanje ukaza lahko vnesete do osem črk (samo če je v seznamu kategorij izbrana možnost „1:Vse“). Podrobnosti najdete v poglavju „Iskanje ukaza (samo fx-9860GIII/fx-9750GIII)“ (stran 1-10).
5. S puščičnimi tipkami f②) označite ukaz, ki ga želite vnesti, in nato pritisnite 1(INPUT) ali w.

***Opomba* (fx-9860GIII/fx-9750GIII)**

- Med zasloni lahko preklapljate s pritiskom na !f ali ②.

Primer **Uporaba kataloga za vnos ukaza ClrGraph**

AC!4 (CATALOG)I C)②~②w

S pritiskom na J ali J (QUIT) zaprete katalog.

u Iskanje ukaza (samo fx-9860GIII/fx-9750GIII)

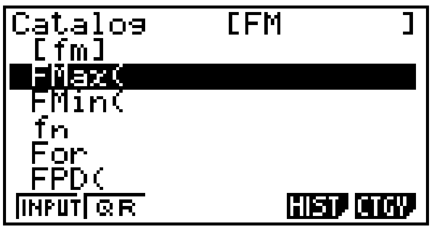
Ta metoda je koristna, če poznate ime ukaza, ki ga želite vnesti.

1. Pritisnite !4 (CATALOG), da prikažete zaslon kataloga.
2. Pritisnite 6(CTGY), da prikažete seznam kategorij.
3. Premaknite označitev na „1:All“ in nato pritisnite 1(EXE) ali w.
   - Prikaže se seznam vseh ukazov.

4. Vnesite nekaj črk iz imena ukaza.
   - Vnesete lahko do osem črk.
   - Z vsako vneseno črko se označitev premakne na prvo ime ukaza, ki se ujema.
5. Ko je želeni ukaz označen, pritisnite 1(INPUT) ali w.

Primer: **Za vnos ukaza „FMax(“**

AC!4 (CATALOG)6(CTGY)
1 (EXE)t(F)h(M)②



1(INPUT)

u Uporaba zgodovine ukazov (samo fx-9860GIII/fx-9750GIII)

Kalkulator shranjuje zgodovino zadnjih šestih ukazov, ki ste jih vnesli.

1. Prikaži enega od seznamov ukazov.
2. Pritisnite 5(HIST).
   - Prikaže se zgodovina ukazov.

3. Z uporabo f in ② premaknite označitev na ukaz, ki ga želite vnesti, in nato pritisnite 1(INPUT) ali w.

u Funkcija QR-kode (samo fx-9860GIII/fx-9750GIII)

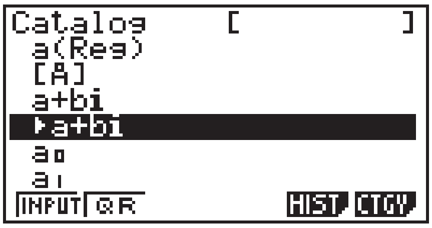
- Funkcijo QR-kode lahko uporabite za dostop do spletnega priročnika, ki zajema ukaze. Upoštevajte, da spletni priročnik ne vsebuje vseh ukazov. Upoštevajte, da funkcije QR-kode ni mogoče uporabljati na zaslonu zgodovine.
- Na zaslonu kalkulatorja se prikaže QR-koda*. Uporabite pametno napravo, da preberete QR-kodo in prikažete spletni priročnik.

  * QR-koda je registrirana blagovna znamka podjetja DENSO WAVE INCORPORATED v Japonski in drugih državah.

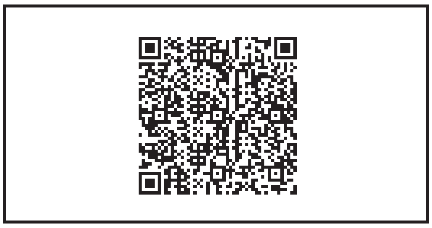
Pomembno!

- Postopki v tem poglavju predpostavljajo, da je na pametni napravi nameščen bralnik QR-kode in da se lahko poveže z internetom.

1. Izberite ukaz, ki je vključen v spletnem priročniku.
   - V meniju funkcij se prikaže 2(QR).



2. Pritisnite 2(QR).
   - Prikaže se QR-koda.



3. Uporabite svojo pametno napravo, da preberete prikazano QR kodo.
   - Na vaši pametni napravi se bo prikazal spletni priročnik.
   - Za informacije o branju QR kode glejte uporabniško dokumentacijo pametne naprave in bralnika QR kode, ki ga uporabljate.
   - Če imate težave z branjem QR kode, uporabite d in e za nastavitev svetlosti zaslona.

4. Pritisnite J , da zaprete zaslon s QR-kodo.
- Za izhod iz funkcije Katalog pritisnite AC ali !J

4. Uporaba načina za vnos/iznos matematičnih podatkov

Pomembno!

- fx-7400GIII ni opremljen z matematičnim načinom vnosa/izpisa.

Izbiranje »Math« za nastavitev načina »Input/Output« na zaslonu Setup (stran 1-31) vklopi način za vnos/iznos matematičnih podatkov, ki omogoča naraven vnos in prikaz določenih funkcij, tako kot so prikazane v učbeniku.

- Vse operacije v tem poglavju se izvajajo v matematičnem načinu vnosa/izpisa.
  - Začetna privzeta nastavitev je način matematičnega vnosa/izpisa. Če ste prešli na linearni način vnosa/izpisa, se pred izvedbo postopkov v tem poglavju vrnite na matematični način vnosa/izpisa. Informacije o preklopu načinov najdete v poglavju „Uporaba zaslona za nastavitve“ (stran 1-30).
  - Preden izvedete postopke iz tega poglavja, preklopite v matematični način vnosa/izpisa. Informacije o preklopu načinov najdete v poglavju „Uporaba zaslona za nastavitve“ (stran 1-30).
- V načinu matematičnega vnosa/izpisa je ves vnos v načinu vstavljanja (ne v načinu prepisovanja). Upoštevajte, da operacija !D(INS) (stran 1-6), ki jo uporabljate v načinu linearne vnosa/izpisa za preklop v način vstavljanja, v načinu matematičnega vnosa/izpisa opravlja povsem drugačno funkcijo. Za več informacij glejte »Uporaba vrednosti in izrazov kot argumentov« (stran 1-16).
- Če ni izrecno navedeno drugače, se vse operacije v tem poglavju izvajajo v načinu **RUN • MAT**.

Uporabniki fx-9750GIII...

Nastavitev načina „Vnos/iznos“ fx-9750GIII (stran 1-31) ima možnost „Mth/Mix“, ki omogoča enako operacijo vnosa kot pri izbiri „Math“. Edina razlika med „Mth/Mix“ in „Math“ je, da izpisuje rezultate izračunov, vključno z ' ali π , v decimalnem formatu.

Primere prikaza rezultatov izračuna, ko je izbrana možnost „Mth/Mix“, si oglejte v „Primer 4“ (stran 1-15) in „Način matematičnega vnosa/izpisa Vnos in prikaz rezultata v načinu EQUA“ (stran 1-26).

■ Vnosne operacije v načinu matematičnega vnosa/izpisa

u Funkcije in simboli v načinu matematičnega vnosa/izpisa

Spodaj navedene funkcije in simboli se lahko uporabljajo za naravni vnos v načinu matematičnega vnosa/izpisa. Stolpec „Bajti“ prikazuje število bajtov pomnilnika, ki se porabijo za vnos v načinu matematičnega vnosa/izpisa.

Funkcija/simbol	Tipka	Bajti
Delež (nepravilen)	$	9
Mešani ulomek*1	!$(&)	14

Pot	M	4
Kvadrat	x	4
Negativna potenca (obratna vrednost)	!) (x^{-1})	5
Funkcija/simbol	**Ključna operacija**	**Bajt**
ˉ	! x (ˉ)	6
Kubični koren	! ((^{3} ˉ)	9
Potencirani koren	! M (^{x} ˉ)	9
e^x	! ▮ (e^x)	6
10^x	! ▮ (10^x)	6
log(a,b)	(Vnos iz menija MATH*2)	7
Abs (absolutna vrednost)	(Vnos iz menija MATH*2)	6
Linearni diferencial*3	(Vnos iz menija MATH*2)	7
Kvadratni diferencial*3	(Vnos iz menija MATH*2)	7
Integral*3	(Vnos iz menija MATH*2)	8
Σ Izračun*(4)	(Vnos iz menija MATH*2)	11
Matrika, vektor	(Vnos iz menija MATH*2)	14*5
Oklepaji	(in)	1
Oklepaji (Uporabljajo se pri vnosu seznama.)	! × ({) in ! / (})	1
Oklepaji (uporabljajo se pri vnosu matrike/vektorja).	! + ([ ) in ! — ( ])	1

*1Mešani ulomki so podprti samo v načinu vnosa/izpisa Math.

*2 Za informacije o vnosu funkcij iz menija funkcij MATH glejte „Uporaba menija MATH“ v nadaljevanju.

*3 Toleranca ni mogoča v načinu vnosa/izpisa Math. Če želite določiti toleranco, uporabite način vnosa/izpisa Linear.

*4 Pri izračunuΣ a v matematičnem načinu vnosa/izpisa je korak vedno 1. Če želite določiti drug korak, uporabite linearni način vnosa/izpisa.

*5 To je število bajtov za matriko 2 × 2.

u Uporaba menija MATH

V načinu **RUN • MAT** se s pritiskom na 4(MATH) prikaže meni MATH.
Ta meni lahko uporabite za naravno vnašanje matrik, diferencialov, integralov itd.

- {**MAT**} ... {prikaže podmeni MAT za naravno vnašanje matrik/vektorjev}
  - {**2**× **2**} ... {vnaša matriko 2 × 2}
  - {**3**× **3**} ... {vnaša matriko 3 × 3}
  - {***m***× ***n***} ... {vnaša matriko/vektor z m vrsticami in n stolpci (do 6 × 6)}
  - {**2**× **1**} ... {vhodni vektor 2 × 1}
  - {**3**× **1**} ... {vhodni vektor 3 × 1}
  - {**1**× **2**} ... {vhodni vektor 1 × 2}
  - {**1**× **3**} ... {vhodni vektor 1 × 3}

- {**logab**} ... {začne naravni vnos logaritma $\log_a b$}
- {**Abs**} ... {začne naravni vnos absolutne vrednosti |X|}
- {***d/dx***} ... {začne naravni vnos linearne diferencialne funkcije $\frac{d}{dx} f(X)(x)(=)(a)$ }

- {d^2/dx^2} ... {začne naravni vnos kvadratnega diferenciala $\frac{d^2}{dx^2} f(x)_{x=a}$}
- {∫ dx} … {začetek naravnega vnosa integrala $\int_a^b f(x)dx$}
- {Σ (} … {začetek naravnega vnosa izračunaΣ $\sum_{x=\alpha}^{\beta} f(x)$}

---

u **Načini vnosa/izpisa v programu Math Primeri vnosa**

Ta razdelek vsebuje več različnih primerov, ki prikazujejo, kako deluje meni funkcij MATH. in druge tipke se lahko uporabljajo med naravnim vnosom v načinu matematičnega vnosa/izpisa. Pri vnosu vrednosti in podatkov bodite pozorni na položaj kurzorja za

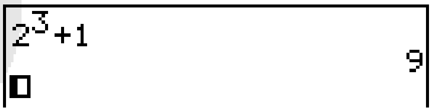
Primer 1 **Za vnos $2^3 + 1$**

d

e

+b

w



Primer 2 **Za vnos $\left(1+\frac{2}{5}\right)^2$**

AC (b+

-

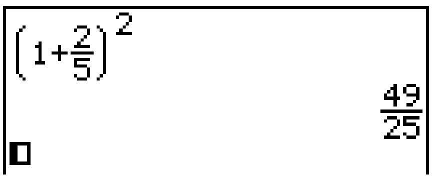
c(2)

f

e

)x

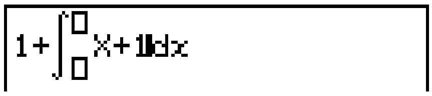
w



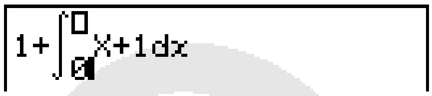
Primer 3 Za vnos $1+\int_0^1 x + 1dx$

AC b+4(MATH)6(g)1(∫ *dx)*

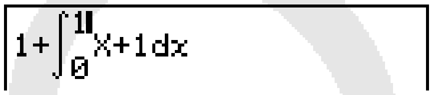
v+b



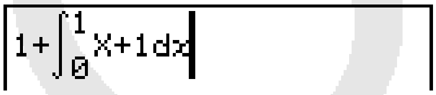
e 0



fb



e



w

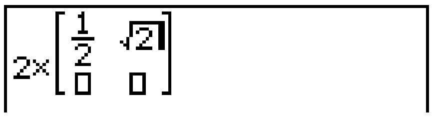
Primer 4 Za vnos $2 \times \begin{bmatrix} \frac{1}{2} & \sqrt{2} \\ \sqrt{2} & \frac{1}{2} \end{bmatrix}$

AC c*4(MATH)1(MAT)1(2×2)

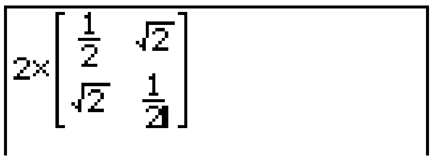
'b②

ee

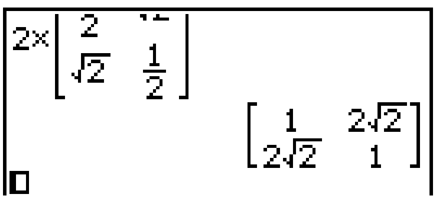
!x(')ce



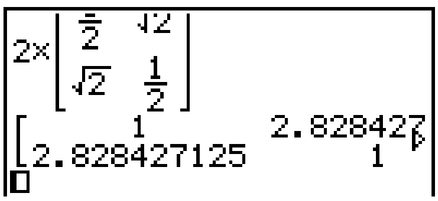
e!x(')cee'b②



w

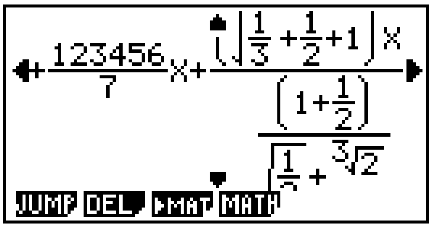


fx-9860GIII, fx-9750GIII
(Vnos/iznos: matematika)



fx-9750GIII
(Vnos/iznos: Mth/Mix)

u **Ko izračun ne ustreza oknu zaslona**



Na levi, desni, zgornji ali spodnji strani zaslona se prikažejo puščice, ki vas opozorijo, da je v ustrezni smeri več izračuna, kot je vidno na zaslonu.

Ko vidite puščico, lahko s pomočjo tipk za premikanje kurzorja pomikate vsebino zaslona in si ogledate želeni del.

u Omejitve vnosa v matematičnem načinu vnosa/izhoda

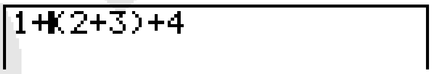
Nekatere vrste izrazov lahko povzročijo, da je navpična širina izračunske formule večja od ene vrstice zaslona. Največja dovoljena navpična širina izračunske formule je približno dva zaslona (120 pik). Izrazov, ki presegajo to omejitev, ni mogoče vnesti.

u Uporaba vrednosti in izrazov kot argumentov

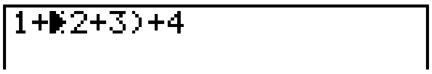
Vrednost ali izraz, ki ste ga že vnesli, lahko uporabite kot argument funkcije. Ko na primer vnesete „(2+3)“, lahko to uporabite kot argument funkcije ' kar da rezultat $\sqrt{(2+3)}$.

Primer

1. Premaknite kurzor tako, da se nahaja neposredno levo od dela izraza, ki ga želite uporabiti kot argument funkcije, ki jo boste vstavili.



2. Pritisnite !D(INS).
   - S tem se kurzor spremeni v kurzor za vstavljanje ▾.



3. Pritisnite ! ⤫ (▾), da vstavite funkcijo ▾.
   - To vstavi funkcijo ' in naredi izraz v oklepaju njen argument.

Kot je prikazano zgoraj, vrednost ali izraz desno od kurzorja po pritisku !D(INS) postane argument funkcije, ki je določena v nadaljevanju. Obseg, ki ga zajema argument, je vse do prve odprte oklepaj desno, če obstaja, ali vse do prve funkcije desno (sin(30), log2(4) itd.).

To zmogljivost je mogoče uporabiti z naslednjimi funkcijami.

Funkcija	Tipka	Izvirni izraz	Izraz po vstavitvi
Nepravilni ulomek	▾	1+(2+3)+4	$1+\frac{\square}{(2+3)}+4$
Moč	M	1+2(2+3)+4	$1+2^{(2+3)}+4$

Funkcija	Ključna operacija	Izvirni izraz	Izraz po vstavitvi
√	!x(√)	1+(2+3)+4	$1+\sqrt{(2+3)}+4$
Kubični koren	!(($\sqrt[3]{}$)		$1+\sqrt[3]{(2+3)}+4$
Potencirani koren	!M($\sqrt[x]{}$)		$1+\sqrt[\square]{((2+3))}+4$
e^x	!I(e^x)		$1+e^{(2+3)}+4$
10^x	!l(10^x)		$1+10^{(2+3)}+4$
log(a,b)	4(MATH)2($\log_a$ b)		$1+\log_{\square}((2+3))+4$
Absolutna vrednost	4(MATH)3(Abs)		$1+\lvert(2+3)\rvert+4$
Linearni diferencial	4(MATH)4(d/dx)	1+(X+3)+4	$1+\frac{d}{dx}((X+3))\Big\vert_{x=\square}+4$
Kvadratni diferencial	4(MATH)5(d^2/dx^2)		$1+\frac{d^2}{dx^2}((X+3))\Big\vert_{x=\square}+4$
Integral	4(MATH)6(g) 1(∫ dx)		$1+\int_{\square}^{\square}(X+3)dx+4$
Σ Izračun	4(MATH)6(g) 2(Σ ( )		$1+\sum_{\square=\square}^{\square}((X+3))+4$

• V linearni načinu vnosa/izpisa se s pritiskom na !D(INS) preklopi v način vstavljanja. Za več informacij glejte stran 1-6.

u Urejanje izračunov v matematičnem načinu vnosa/izpisa

Postopki za urejanje izračunov v matematičnem načinu vnosa/izpisa so v osnovi enaki kot v linearni načinu vnosa/izpisa. Za več informacij glejte „Urejanje izračunov“ (stran 1-6).

Upoštevajte pa, da se naslednje točke razlikujejo med matematičnim načinom vnosa/izpisa in linearni načinom vnosa/izpisa.

• Način prepisovanja, ki je na voljo v linearni načinu vnosa/izpisa, ni podprt v matematičnem načinu vnosa/izpisa. V matematičnem načinu vnosa/izpisa se vnos vedno vstavi na trenutno mesto kurzorja.

• V matematičnem načinu vnosa/izpisa pritisk na tipko D vedno izvede operacijo backspace.

• Upoštevajte naslednje operacije kurzorja, ki jih lahko uporabite med vnosom izračuna v matematičnem načinu vnosa/izpisa.

To storite tako:	Pritisnite to tipko:
Premaknite kurzor od konca izračuna na začetek	e
Premaknite kurzor z začetka izračuna na konec	d

■ Uporaba funkcij za razveljavljanje in ponovno izvajanje operacij

Med vnosom izraza v matematičnem načinu vnosa/izpisa (dokler ne pritisnete tipke w) lahko uporabite naslednje postopke, da razveljavite zadnjo tipko in ponovite tipko, ki ste jo pravkar razveljavili.

- Za razveljavitev zadnje tipke pritisnite: aD(UNDO).
- Če želite ponoviti ključno operacijo, ki ste jo pravkar razveljavili, ponovno pritisnite: aD(UNDO).

• Z UNDO lahko prekličete tudi operacijo s tipko AC . Po pritisku na AC za izbris izraza, ki ste ga vnesli, bo pritisk na aD(UNDO) obnovil tisto, kar je bilo na zaslonu pred pritiskom na AC .

• UNDO lahko uporabite tudi za preklic operacije s puščičnimi tipkami. Če med vnosom pritisnete e in nato aD(UNDO), se kurzor vrne na mesto, kjer je bil pred pritiskom e.

• Operacija UNDO je onemogočena, ko je tipkovnica zaklenjena v alfa načinu. S pritiskom na tipko aD(UNDO), ko je tipkovnica zaklenjena v alfa načinu, se izvede enaka operacija brisanja kot s tipko D.

Primer

b+'be

D

aD(UNDO)

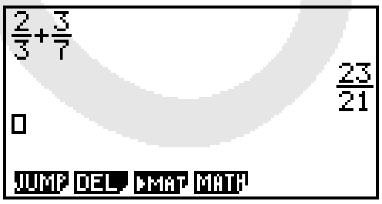
c

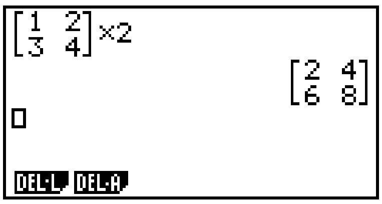
AC

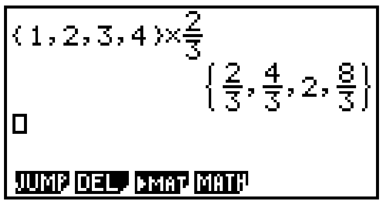
aD(UNDO)

■ Način vnosa/izpisa matematičnih izrazov Prikaz rezultatov izračuna

Ulomki, matrike, vektorji in seznami, ki so rezultat izračunov v matematičnem načinu vnosa/izpisa, se prikažejo v naravnem formatu, tako kot so prikazani v učbeniku.







Primeri prikazov rezultatov izračunov

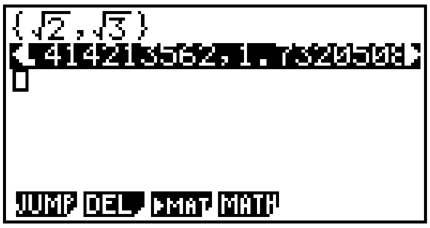
• Deli se prikažejo kot nepravilni ali mešani deli, odvisno od nastavitve „Frac Result“ (Rezultat dela) na zaslonu Setup (Nastavitve). Za podrobnosti glejte „Uporaba zaslona Setup“ (stran 1-30).

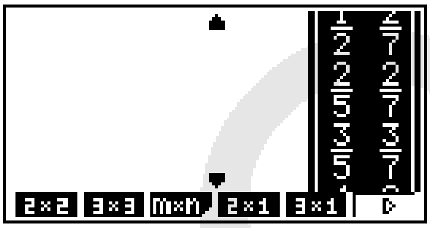
• Matrike so prikazane v naravnem formatu, do 6 × 6. Matrika, ki ima več kot šest vrstic ali stolpcev, bo prikazana na zaslonu MatAns, ki je enak zaslonu, ki se uporablja v linearni vnosni/izhodni način.

• Vektorji so prikazani v naravnem formatu do 1 × 6 ali 6 × 1. Vektor, ki ima več kot šest vrstic ali stolpcev, bo prikazan na zaslonu VctAns, ki je enak zaslonu, ki se uporablja v linearni vhodno-izhodni način.

• Seznami se prikažejo v naravnem formatu za do 20 elementov. Seznam, ki ima več kot 20 elementov, se prikaže na zaslonu ListAns, ki je enak zaslonu, ki se uporablja v linearni vnosni/izhodni način.

• Na levi, desni, zgornji ali spodnji strani zaslona se prikažejo puščice, ki vas obvestijo, da so v ustrezni smeri na voljo dodatni podatki, ki niso prikazani na zaslonu.





Z uporabo tipk za premikanje kurzorja lahko pomikate zaslon in si ogledate želene podatke.

• Če med izbiro rezultata izračuna pritisnete 2(DEL)1(DEL・L), se izbrišejo tako rezultat kot izračun, ki ga je ustvaril.

• Množiteljskega znaka ni mogoče izpustiti neposredno pred nepravilnim ali mešanim ulomkom. V tem primeru vedno vnesite množiteljski znak.

Primer: $2\times\frac{2}{5}$ c*c'f

• Po tipki M, x ali !)(x^{-1}) ne sme takoj slediti druga tipka M, x ali !)(). V tem primeru uporabite oklepaje, da ločite tipke.

Primer: $(3^2)^{-1}$ (dx)!)(x^{-1})

■ Funkcija zgodovine

Funkcija zgodovine ohranja zgodovino izračunskih izrazov in rezultatov v načinu vnosa/izpisa Math. Ohranja se do 30 nizov izračunskih izrazov in rezultatov.

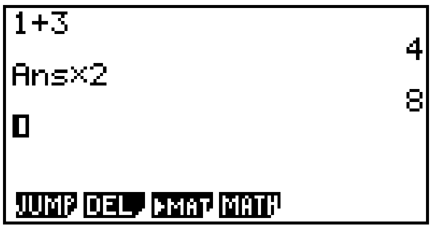
b+cw
*cw

Lahko tudi uredite izraze za izračun, ki jih vzdržuje funkcija zgodovine, in ponovno izračunate. S tem se bodo ponovno izračunali vsi izrazi, začenši z uredjenim izrazom.

Primer **Če želite spremeniti „1+2“ v „1+3“ in ponovno izračunati**

Izvedite naslednjo operacijo v skladu z zgornjim primerom.

ffffdDdw



- Vrednost, shranjena v pomnilniku odgovorov, je vedno odvisna od rezultata zadnjega izvedenega izračuna. Če zgodovina vsebuje operacije, ki uporabljajo pomnilnik odgovorov, lahko urejanje izračuna vpliva na vrednost pomnilnika odgovorov, ki se uporablja v nadaljnjih izračunih.
  - Če imate vrsto izračunov, ki uporabljajo pomnilnik odgovorov, da vključijo rezultat prejšnjega izračuna v naslednji izračun, bo urejanje izračuna vplivalo na rezultate vseh drugih izračunov, ki sledijo.
  - Ko prvi izračun zgodovine vključuje vsebino pomnilnika odgovorov, je vrednost pomnilnika odgovorov „0“, ker pred prvim izračunom v zgodovini ni nobenega izračuna.

■ Uporaba odložišča za kopiranje in lepljenje v načinu za vnos/iznos matematičnih podatkov

Funkcijo, ukaz ali drugo vnos lahko kopirate v odložišče in nato vsebino odložišča prilepite na drugo mesto.

- V načinu za vnos/iznos matematičnih podatkov lahko kot območje za kopiranje določite le eno vrstico.
- Spodnjo operacijo kopiranja je mogoče izvesti samo na vhodni vrstici (vrstica izračunske formule, ki ste jo vnesli vi). Če želite kopirati izračunski rezultat v zgodovini, glejte „Kopiranje izračunskega rezultata v zgodovini“ (stran 1-20).
- Operacija CUT je podprta samo za linearni način vnosa/izpisa. Ni podprta za matematični način vnosa/izpisa.

u **Kopiranje besedila**

1. S pomočjo tipk za premikanje kurzorja premaknite kurzor na vnosno vrstico, ki jo želite kopirati.
2. Pritisnite (CLIP). Kazalec se bo spremenil v „ “.
3. Pritisnite 1(CPY・L), da izbrano besedilo kopirate v odložišče.

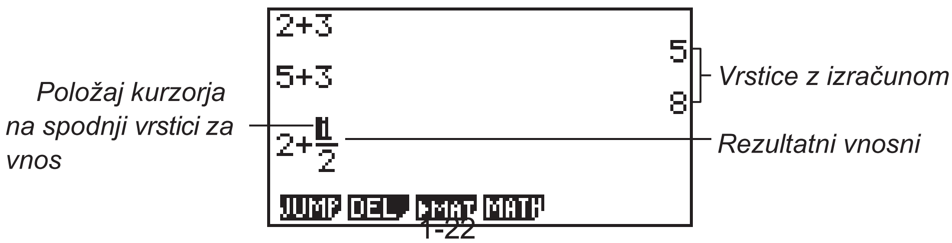
- Upoštevajte naslednje točke o vsebini odložišča.
  - Z izvedbo zgornje operacije ali operacije iz poglavja „Kopiranje vrstice z izračunskim rezultatom iz zgodovine“ (stran 1-21) se trenutna vsebina odložišča prepiše.
  - Z izvedbo operacije lepljenja iz »Lepljenje besedila« spodaj se prilepi trenutna vsebina odložišča.

u **Vlepljanje besedila**

Premaknite kurzor na mesto, kamor želite vstaviti besedilo, in nato pritisnite (PASTE). Vsebina odložišča se prilepi na mesto kazalca.

■ Kopiranje rezultata izračuna v zgodovini

V načinu **RUN・MAT** in **e • ACT** lahko vsebino vrstice z rezultatom izračuna (vrstica, v kateri je na desni strani prikazan rezultat izračuna) kopirate na končno mesto kazalca v spodnji vrstici za vnos.



v

r

s

t

i

c

i

Pomembno!

- V načinu **e • ACT** je opisano kopiranje mogoče izvesti samo na vrstici z izračunskim rezultatom izračunske vrstice.
- V načinu **RUN • MAT** je ta operacija mogoča le, če so nastavitve zaslona Setup konfigurirane, kot je prikazano spodaj.
  - Način: Comp
  - Vnos/iznos: fx-9860GIII: Math, fx-9750GIII: Math ali Mth/Mix

  V načinu **e • ACT** je to operacijo mogoče izvesti ne glede na nastavitve na zaslonu Setup.

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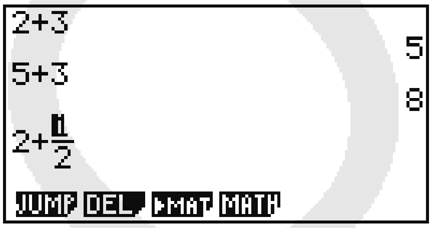
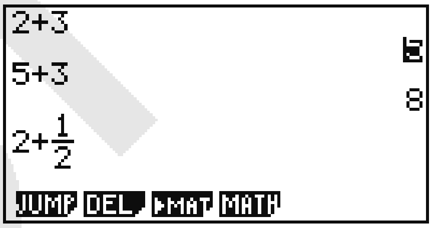
u **Kopiranje vrstice z izračunskim rezultatom v zgodovini**

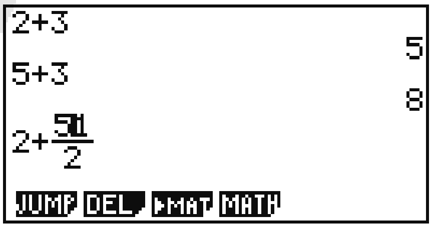
1. Premaknite kurzor na mesto v spodnji vrstici za vnos,



2. Pritisnite ! f.*[2]
3. Z uporabo f in c premaknite označitev na vrstico z izračunskim rezultatom, ki jo želite kopirati.*[3]

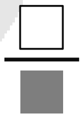


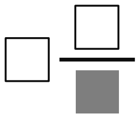
4. Pritisnite

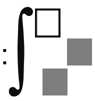


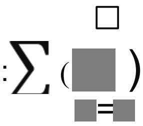
*[1] Če je spodnja vrstica za vnos v načinu **e • ACT** vrstica za besedilo, ne morete kopirati na mesto kurzorja v vrstici za besedilo. V tem primeru bo po izvedbi koraka 3 zgoraj navedenega postopka na dnu vstavljena nova vrstica izračuna, v katero bo kopirana vsebina.

*[2] Pri kopiranju v spodaj opisane ciljne vrstice se prepričajte, da v koraku 2 izvedete ukaz !f (ki zapre urejanje vrstice za vnos).

- Nepravilni 

- Mešani 

- Integral: 
  dx

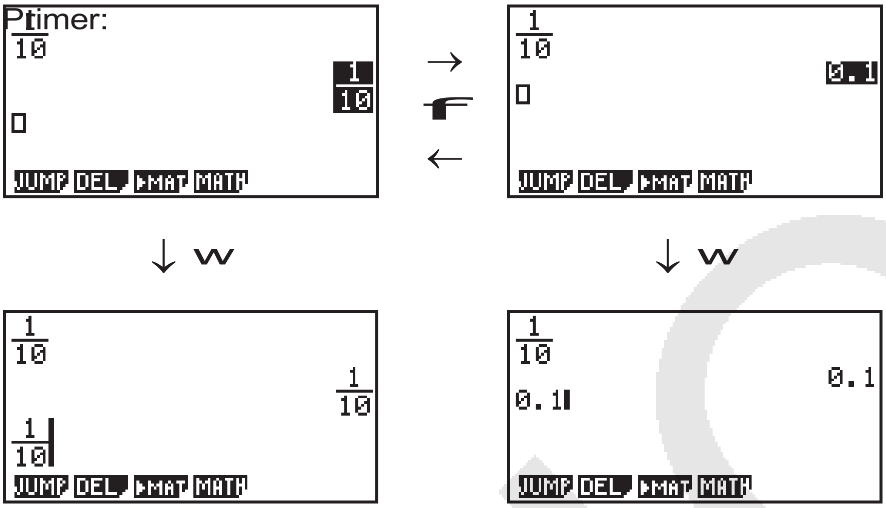
- Σ Izračun: 

- V drugo ali naslednjo vrstico matrike ali vektorja

V primerih, ki niso navedeni zgoraj, lahko preskočite ključno operacijo v koraku 2.

*3 Po označitvi vrstice z izračunskim rezultatom, ki ga želite kopirati, in pred izvedbo koraka 3 postopka lahko s pomočjo spodnjih tipk spremenite format prikaza izračunskega rezultata. Format prikaza kopiranega rezultata je tisti, ki je veljal v trenutku, ko ste v koraku 3 pritisnili tipko w.

- Oblika ulomka, korena, π a in decimalna oblika: f (strani 1-23, 2-21) Primer:



- Nepravilni ulomek in mešani ulomek: fF (stran 2-21)
- Šestdesetiški sistem: K6(g)5(ANGL)5(°’”) (stran 2-14)
- ENG: K6(g)6(g)1(ESYM)6(g)6(g)2(ENG) (strani 2-14, 2-21)
- ENG: K6(g)6(g)1(ESYM)6(g)6(g)3(ENG) (strani 2-14, 2-21)

*4 V spodnjih primerih se kopiranje ne izvede, ko je pritisnjen gumb w.

(a) Če je izračunani rezultat, ki ste ga izbrali v koraku 3, takšen, da ga ni mogoče kopirati (seznam, matrika, vektor ali drug izračunani rezultat v posebnem formatu)

(b) Če je izračunani rezultat, ki ste ga izbrali v koraku 3, vrsta vrednosti ali oblika, ki je ni mogoče vnesti v ciljno mesto kopiranja

(c) Če kopirani rezultat presega število dovoljenih bajtov cilja kopiranja

V primerih (b) in (c) se vsebina ne bo kopirala na položaj kurzorja, ampak se bo izbrana vsebina kopirala v odložišče.

■ Izračunavanje operacij v načinu za vnos/iznos matematičnih podatkov

V tem poglavju so predstavljeni primeri izračunov v načinu za vnos/iznos matematičnih podatkov.

• Podrobnosti o računskih operacijah najdete v poglavju 2 Ročno računanje.

u Izvajanje funkcionalnih izračunov z uporabo načina za vnos/iznos matematičnih podatkov

Primer	Operacija
$\frac{6}{4\times5} \left(=\frac{3}{10}\right)$	AC 6'4*5
$\cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$ (Kot: Rad)	AC c(!5(π)
log28 = 3	AC 4(MATH)2(log$_a$ b) 2e8w
$\sqrt[7]{123}$ = 1,988647795	AC ! M($\sqrt[x]{\ }$) 7e123w
2 + 3 × $\sqrt[3]{64}$ − 4 = 10	AC 2+3*! M($\sqrt[x]{\ }$)

$\left\|\log\frac{3}{4}\right\|$ = 0,1249387366	AC 4(MATH)3(Abs)l3'4w
$\frac{2}{5}$(+) (3)$\frac{1}{4}$—$\frac{1}{20}$	AC 2'5e+3 ∎ ˉ(⊂)1 e4w
$1,5 + 2,3i = \frac{3}{2} + \frac{23}{10}$	AC 1,5+2,3 ∎ 0(*i*)vvf (F na fx-
$\frac{(d)}{dx}$ (X(3) + 4x(2) + x − $_{x=3}$ = 52	AC 4(MATH)4(*d/dx*)vM3e+4 vx+v-6e3w
$\int_1^5 2x^2 + 3x + 4dx = \frac{404}{3}$	AC 4(MATH)6(g)1(∫ *dx*) 2vx+3v+4e1 e5w
$\sum_{k=2}^{6}\left(k^2 - 3k + 5\right) =$	AC 4(MATH)6(g)2(Σ)a,(K)x− 3a,(K)

■ Izvedba matričnih/vektorskih izračunov z uporabo načina za

u **Za določitev dimenzij (velikosti) matrike/vektorja**

1. V načinu **RUN • MAT** pritisnite !m(SET UP) 1 (Math) J .
2. Pritisnite 4(MATH), da prikažete meni MATH.
3. Pritisnite 1(MAT), da prikažete naslednji meni.
   - {**2**× **2**} … {vnesite matriko 2 × 2}
   - {**3**× **3**} … {vnos matrike 3 × 3}
   - {***m***× ***n***} … {vnos matrike ali vektorja m-vrstic × n-stolpcev (do 6 × 6)}
   - {**2**× **1**} … {vhodni vektor 2 × 1}
   - {**3**× **1**} … {vhodni vektor 3 × 1}
   - {**1**× **2**} … {vhodni vektor 1 × 2}

Primer ×**Za ustvarjanje matrike z 2 vrsticami** in **3 stolpci**

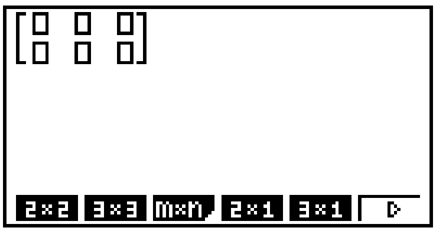
Določite število vrstic.

cw

Določite število stolpcev.

dw

w



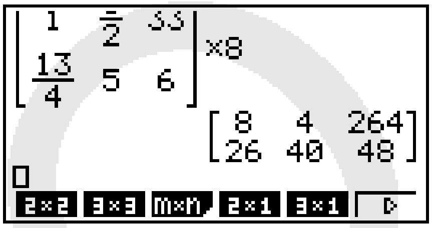
u **Za vnos vrednosti celic**

Primer **Za izvedbo spodaj prikazanega izračuna**

$$\begin{bmatrix} 1 & \frac{1}{2} & 33 \\ \frac{13}{4} & 5 & 6 \end{bmatrix} \times 8$$

Naslednja operacija je nadaljevanje primerjalnega izračuna na prejšnji strani.

beb'ceedde
bd'④ eefe⑥
e
*iw



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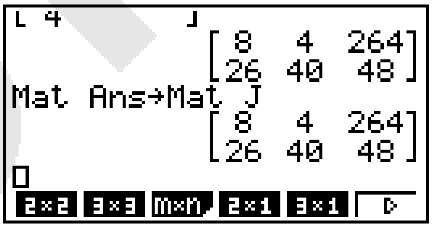
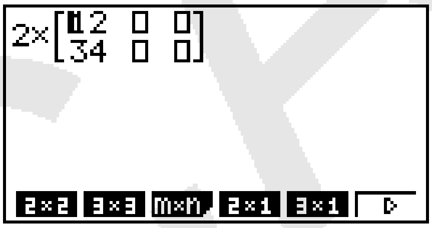
u **Dodelitev matrike, ustvarjene z uporabo načina vnosa/izpisa Math, matrici v načinu MAT**

Primer **Dodelitev rezultata izračuna matriči Mat J**

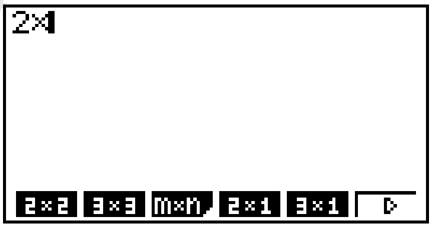
!c(Mat)!-(Ans)a
!c(Mat)a)(J)w



- Če pritisnete tipko D, ko je kurzor na vrhu (zgornjem levem kotu) matrike, se izbriše celotna matrika.



D
⇒



■ Uporaba grafičnih načinov in načina EQUA v načinu za vnos/izpis matematičnih izrazov

Uporaba načina za vnos/izpis matematike s katerim koli od spodnjih načinov vam omogoča vnos številčnih izrazov, kot so zapisani v učbeniku, in prikaz rezultatov izračunov v naravnem formatu.

Načini, ki podpirajo vnos izrazov, kot so zapisani v učbenikih:

RUN • MAT, e • ACT, GRAPH, DYNA, TABLE, RECUR, EQUA (SOLV)

Načini, ki podpirajo naravni format prikaza:

RUN • MAT, e • ACT, EQUA

Naslednja pojasnila prikazujejo delovanje načinov vnosa/izpisa v načinih **GRAPH**, **DYNA**, **TABLE**, **RECUR** in **EQUA** ter naravno prikazovanje rezultatov izračunov v načinu **EQUA**.

- Za podrobnosti o delovanju posameznega izračuna glejte poglavja, ki obravnavajo vsak izračun.
- Za podrobnosti o vnosnih operacijah v matematičnem načinu vnosa/izpisa in prikazih rezultatov izračunov v načinu **RUN • MAT** glejte „Vnosne operacije v matematičnem načinu vnosa/izpisa“ (stran 1-12) in „Izračunske operacije v matematičnem načinu vnosa/izpisa“ (stran 1-22).
- Vnosne operacije in prikaz rezultatov v načinu **e • ACT** so enaki kot v načinu **RUN • MAT** . Za informacije o operacijah v načinu **e • ACT** glejte „Poglavje 10 eActivity“.

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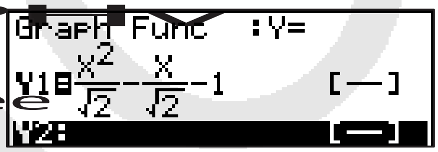
u **Vnos v matematičnem načinu vnosa/izpisa v načinu GRAPH**

Način vnosa/izpisa Math lahko uporabite za vnos grafičnih izrazov v načinih **GRAPH**, **DYNA**, **TABLE** in **RECUR**.

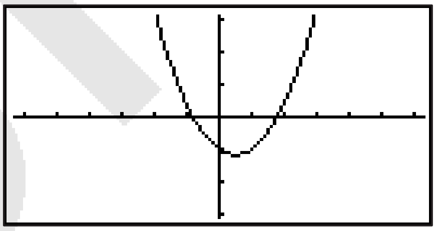
Primer 1 **V načinu GRAPH vnesite funkcijo y=** x^2 **−** $\frac{x}{'2}$**−1'2 in jo nato grafično**

Prepričajte se, da so v oknu View Window nastavljene začetne privzete nastavitve.

mGRAPHY
X'!x(')c
ee-V'!x(')cee



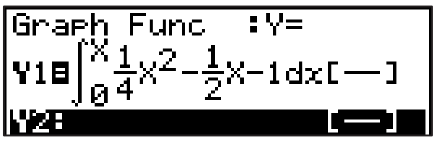
6(DRAW)



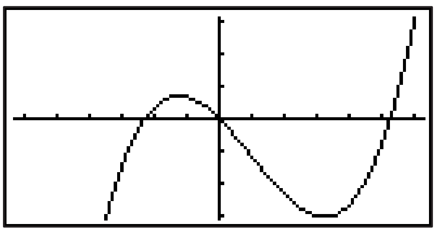
Primer 2 **V načinu GRAPH vnesite funkcijo y= in jo** $\int_0^x \frac{1}{4}x^2 - \frac{1}{2}x - 1dx$ **in nato narisajte.**

Preverite, ali so v oknu Pogled nastavljene začetne privzete nastavitve.

mGRAPHK2(CALC)3(∫ dx)
b'4 evx-b'ce
v-be0 evw



6(DRAW)



- **Način vnosa/izpisa matematike Vnos in prikaz rezultata v načinu EQUA**

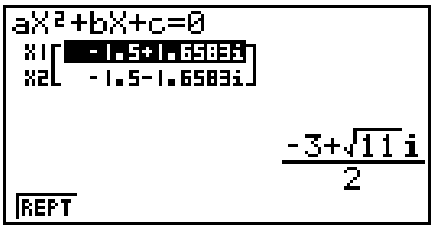
Način vnosa/izpisa matematike lahko uporabite v načinu **EQUA** za vnos in prikaz, kot je prikazano spodaj.

- V primeru simultanih enačb (1(SIML)) in enačb višjega reda (2(POLY)) se rešitve izpišejo v naravnem formatu (ulomki, $\sqrt{}$, π) kadar je to mogoče.
- V primeru reševalca (3(SOLV)) lahko uporabite naravni vnos v načinu za vnos/izpis matematičnih izrazov.

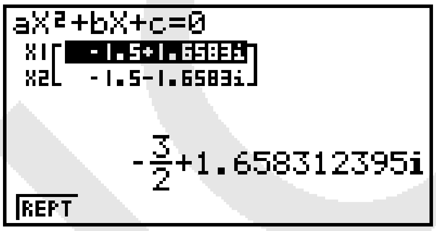
Primer **Za rešitev kvadratne enačbe $x^2 + 3x + 5 = 0$ v načinu EQUA**

mEQUA!m(SET UP)②②②②(Complex Mode)

2 (*a*+*bi*)J 2 (POLY) 1 (2)bwdwfww



fx-9860GIII, fx-9750GIII
(Vnos/iznos: Matematika)



fx-9750GIII
(Vnos/iznos: Mth/Mix)

5. Meniju možnosti (OPTN)

Meniju možnosti omogoča dostop do znanstvenih funkcij in funkcij, ki niso označene na tipkovnici kalkulatorja. Vsebina menija možnosti se razlikuje glede na način, v katerem ste, ko pritisnete tipko K.

- Meniju možnosti se ne prikaže, če pritisnete tipko K, ko je kot privzeti številčni sistem nastavljen binarni, osmični, decimalni ali šestnajstični sistem.
- Podrobnosti o ukazih, vključenih v meniju možnosti (OPTN), najdete v točki „Tipka K“ v „Seznam ukazov v načinu PRGM“ (stran 8-41).
- Pomeni postavk menija možnosti so opisani v poglavjih, ki obravnavajo posamezne načine.

Naslednji seznam prikazuje meni možnosti, ki se prikaže, ko je izbran način **RUN • MAT** (ali **RUN**) ali **PR**GM.

Postavke, označene z zvezdico (*), niso vključene v fx-7400GIII.

- {**LIST**} ... {meni funkcij seznama}
- {**MAT**}* ... {meni za operacije z matrikami/vektorji}
- {**CPLX**} ... {meni za izračun kompleksnih števil}
- {**CALC**} ... {meni funkcionalne analize}
- {**STAT**} ... {meni za statistično ocenjeno vrednost parnih spremenljivk} (fx-7400GIII)
  {meni za statistično ocenjeno vrednost, porazdelitev, standardno odstopanje, varianco in testne funkcije za pare spremenljivk} (fx-9860GIII, fx-9750GIII)
- {**CONV**} ... {meni za pretvorbo merskih enot}
- {**HYP**} ... {meni za hiperbolični izračun}
- {**PROB**} ... {meni za izračun verjetnosti/porazdelitve}
- {**NUM**} ... {meni za numerično izračunavanje}

- {**ANGL**} ... {meni za pretvorbo kota/koordinat, šestdesetiški vnos/pretvorba}
- {**ESYM**} ... {meni inženirskih simbolov}
- {**PICT**} ... {meni za shranjevanje/ponovno prikazovanje grafikonov}
- {**FMEM**} ... {meni za pomnilnik funkcij}
- {**LOGIC**} ... {meni logičnih operatorjev}
- {**CAPT**} ... {meni za zajem zaslona}
- {**TVM**}* ... {meni za finančne izračune}
- Elementi PICT, FMEM in CAPT se ne prikažejo, če je v nastavitvenem zaslonu za način »Vnos/iznos« izbrana možnost »Matematika«.

6. Meniju spremenljivih podatkov (VARS)

Za prikaz spremenljivih podatkov pritisnite J, da se prikaže meni spremenljivih podatkov.

- Upoštevajte, da se elementi EQUA in TVM prikažejo za funkcijski tipki (3 in 4) samo, če dostopate do menija spremenljivih podatkov iz načina **RUN • MAT** (ali **RUN**) ali **PRGM**.
- Meniju spremenljivih podatkov se ne prikaže, če pritisnete J, medtem ko je kot privzeti številčni sistem nastavljen binarni, osmični, decimalni ali šestnajstični sistem.
- Glede na model kalkulatorja nekateri elementi menija morda niso vključeni.
- Podrobnosti o ukazih, vključenih v meni spremenljivih podatkov (VARS), najdete v točki „Tipka J“ v „Seznam ukazov v načinu PRGM“ (stran 8-41).
- Elementi, označeni z zvezdico (*), niso vključeni v fx-7400GIII.

u **V-WIN — priklic vrednosti V-Window**

- {**X**}/{**Y**}/{**T,&**} ... {meni x-osi}/{meni y-osi}/{meni T,θ}
- {**R-X**}/{**R-Y**}/{**R-T,&**} ... {meni x-osi}/{meni y-osi}/{meni T,θ} za desno stran dvojnega grafa
  - {**min**}/{**max**}/{**scal**}/{**dot**}/{**ptch**} ... {minimalna vrednost}/{maksimalna vrednost}/{lestvica}/{vrednost pike*1 }/{razmik}

  *1 Vrednost pike označuje razpon prikaza (vrednost Xmax – vrednost Xmin), deljeno z razmakom pik na zaslonu (126). Vrednost pike se običajno izračuna samodejno iz minimalne in maksimalne vrednosti. Sprememba vrednosti pike povzroči samodejni izračun maksimalne vrednosti.

u **FACT — Ponovni priklic faktorjev povečave**

- {**Xfct**}/{**Yfct**} ... {faktor osi x}/{faktor osi y}

u **STAT — Ponovni prikaz statističnih podatkov**

- {**X**} … {enovariabilni, parni variabilni x-podatki}
  - {n}/{$\bar{x}$}/{Σx}/{Σx^2}/{σx}/{sx}/{**minX**}/{**maxX**} ... {število podatkov}/{povprečje}/{vsota}/{vsota kvadratov}/{standardni odmik populacije}/{standardni odmik vzorca}/{minimalna vrednost}/{maksimalna vrednost}

- **{Y}** ... {podatki o parnih spremenljivkah y}
  - {$\bar{y}$}/{Σ ***ni y***}/{Σ ***ni y***^{2} }/{Σ ***ni xy***}/{σx}/{sy}/{**minY**}/{**maxY**} ... {povprečje}/{vsota}/{vsota kvadratov}/{vsota produktov x-podatkov in y-podatkov}/{standardni odmik populacije}/{standardni odmik vzorca}/{minimalna vrednost}/{maksimalna vrednost}
- **{GRPH}** ... {meni podatkov grafa}
  - {a}/{b}/{c}/{d}/{e} ... {regresijski koeficient in polinomske koeficiente}
  - {r}/{r^2 } ... {korelacijski koeficient}/{koeficient determinacije}
  - {**MSe**} ... {povprečna kvadratna napaka}
  - {Q_1}/{Q_3} ... {prvi kvartil}/{tretji kvartil}
  - {**Med**}/{**Mod**} ... {mediana}/{modus} vhodnih podatkov
  - {**Strt**}/{**Pitch**} ... histogram {začetna delitev}/{korak}
- **{PTS}** ... {povzetek podatkovnega menija}
  - {x_1}/{y_1}/{x_2}/{y_2}/{x_3}/{y_3} ... {koordinate povzetih točk}
- **{INPT}*** ... {vhodne vrednosti statističnega izračuna}
  - {n}/{$\bar{x}$ }/{sx}/{n_1}/{n_2}/{$\bar{x}_1$}/{$\bar{x}_2$}/{sx_1}/{sx_2}/{sp} ... {velikost vzorca}/{povprečje vzorca}/{standardni odmik vzorca}/{velikost vzorca 1}/{velikost vzorca 2}/{povprečje vzorca 1}/{povprečje vzorca 2}/{standardni odmik vzorca 1}/{standardni odmik vzorca 2}/{standardni odmik vzorca p}
- **{RESLT}*** ... {statistične izračunske izhodne vrednosti}
  - {**TEST**} ... {rezultati testnega izračuna}
    - {p}/{z}/{t}/{**Chi**}/{F}/{ $\hat{p}$ }/{ $\hat{p}_1$}/{ $\hat{p}_2$}/{df}/{se}/{r}/{r^2 }/{**pa**}/{**Fa**}/{**Adf**}/{**SSa**}/{**MSa**}/{**pb**}/{**Fb**}/

      ... {p-vrednost}/{z-vrednost}/{t-vrednost}/{$\chi^{\text{na (2)}}$ vrednost}/{F-vrednost}/{ocenjeni delež vzorca}/
      {ocenjeni delež vzorca 1}/{ocenjeni delež vzorca 2}/{stopnje svobode}/{standardna napaka}/{korelacijski koeficient}/{koeficient determinacije}/
      {p-vrednost faktorja A}/{F-vrednost faktorja A}/{stopnje svobode faktorja A}/{vsota kvadratov faktorja A
      kvadratov}/{faktor A srednji kvadrati}/{faktor B p-vrednost}/{faktor B F vrednost}/{faktor B stopnje svobode}/{faktor B vsota kvadratov}/ {srednji kvadrat faktorja B}/{p-vrednost faktorja AB}/{F-vrednost faktorja AB}/{stopnje svobode faktorja AB}/{vsota kvadratov faktorja AB}/{srednji kvadrat faktorja AB}/{stopnje svobode napake}/{vsota kvadratov napake}/{srednji kvadrat napake}
  - {**INTR**} ... {rezultati izračuna intervala zaupanja}
    - {**Levo**}/{**Desno**}/{ $\hat{p}$ }/{ $\hat{p}_1$}/{ $\hat{p}_2$}/{df} ... {spodnja meja intervala zaupanja (levi rob)}/ {zgornja meja intervala zaupanja (desni rob)}/{ocenjeni delež vzorca}/ {ocenjeni delež vzorca 1}/{ocenjeni delež vzorca 2}/{stopnje svobode}
  - {**DIST**} ... {rezultati izračuna porazdelitve}
    - {p}/{**xInv**}/{**x1Inv**}/{**x2Inv**}/{**zLow**}/{**zUp**}/{**tLow**}/{**tUp**} ... {rezultat izračuna verjetnostne porazdelitve ali kumulativne porazdelitve (p-vrednost)}/{obratna *Student-t*,χ^2, F,
      rezultat izračuna binomske, Poissonove, geometrične ali hipergeometrične kumulativne porazdelitve}/{obratna zgornja meja (desni rob) ali spodnja meja (levi rob) normalne kumulativne porazdelitve}/{obratna zgornja meja (desni rob) normalne kumulativne porazdelitve}/{spodnja meja (levi rob) normalne kumulativne porazdelitve}/{zgornja meja (desni rob) normalne kumulativne porazdelitve}/{spodnja meja kumulativne porazdelitve *Student-t* (levi rob)}/{zgornja meja kumulativne porazdelitve *Student-t* (desni rob)}

u **GRPH — Ponovni priklic grafičnih funkcij**

- {**Y**}/{***r***} ... {pravokotna koordinata ali neenakostna funkcija}/{polarna koordinatna funkcija}
- {**Xt**}/{**Yt**} ... parametrična grafična funkcija {Xt}/{Yt}

- {**X**} ... {X=konstantna grafična funkcija}
- Pred vnosom vrednosti pritisnite te tipke, da določite pomnilniški prostor.

u DYNA* — priklic podatkov dinamične grafične nastavitve

- {**Strt**}/{**End**}/{**Pitch**} ... {začetna vrednost območja koeficienta}/{končna vrednost območja koeficienta}/ {povečanje vrednosti koeficienta}

u TABL — Ponovni priklic podatkov o nastavitvah in vsebini tabele

- {**Strt**}/{**End**}/{**Pitch**} ... {začetna vrednost razpona tabele}/{končna vrednost razpona tabele}/{povečanje vrednosti tabele}
- {Rezultat*1 } ... {matrika vsebine tabele}

*1 Element Reslt se prikaže samo, ko je v načinu **RUN • MAT** (ali **RUN**) **in PRGM**.

u RECR* — Ponovni prikaz rekurzivne formule*1 , obsega tabele in podatkov o vsebini tabele

- {**FORM**} ... {meni podatkov rekurzivne formule}
-
  {c_{n+1}}/{c_{n+2}} izrazi
- {**RANG**} ... {meniju podatkov razpona tabele}
  - {**Strt**}/{**End**} ... razpon tabele {začetna vrednost}/{končna vrednost}
  -
  - {**anSt**}/{**bnSt**}/{**cnSt**} ... izvor {a_n}/{b_n}/{c_n} rekurzivna formula konvergenca/divergenca graf (WEB graf)
- {Reslt*2 }* ... {matrika vsebine tabele*3 }

*1 Napaka se pojavi, ko v pomnilniku ni funkcije ali numerične tabele rekurzivne formule.

*2 „Reslt“ je na voljo samo v načinih **RUN • MAT** in **PRGM**.

*3 Vsebina tabele se samodejno shrani v pomnilnik odgovorov matrike (MatAns).

u EQUA* — Priklic koeficientov enačb in rešitev*1 *2

- {**S-Rlt**}/{**S-Cof**} ... matrika {rešitev}/{koeficientov} za linearne enačbe z dvema do šestimi neznankami*3
- {**P-Rlt**}/{**P-Cof**} ... matrika {rešitev}/{koeficientov} za kvadratno ali kubično enačbo

*1 Koeficienti in rešitve se samodejno shranijo v pomnilnik odgovorov matrike (MatAns).

*2 Naslednji pogoji povzročijo napako.

- Ko za enačbo ni vnesenih koeficientov
- Ko za enačbo ni rešitev

*3 Podatki iz pomnilnika koeficientov in rešitev za linearno enačbo se ne morejo hkrati priklicati.

u TVM* — Priklic podatkov finančnih izračunov

- {n}/{I%}/{PV}/{PMT}/{FV} ... {plačilna obdobja (obroki)}/{letna obrestna mera}/ {sedanja vrednost}/{plačilo}/{prihodnja vrednost}
- {P/Y}/{C/Y} ... {obročno obdobje na leto}/{obdobje obrestovanja na leto}

u Str — ukaz Str

- {**Str**} ... {pomnilnik nizov}

7. Programski meni (PRGM)

Za prikaz menija programa (PRGM) najprej v glavnem meniju vnesite način **RUN • MAT** (ali **RUN**) ali **PRGM** in nato pritisnite (PRGM). V meniju programa (PRGM) so na voljo naslednje možnosti.

• Menijske postavke programa (PRGM) se ne prikažejo, če je v nastavitvenem zaslonu za način „Vnos/iznos“ izbrana možnost „Matematika“.

• {**COM**} ....{meni ukazov programa}
• {**CTL**}.........{programski nadzorni ukazni meni}
• {**SKOK**} .....{meni ukazov za skok}
• {**?**} ....{ukaz za vnos}
• {**^**} ....{ukaz za izhod}
• {**CLR**} ....{izbriši ukazni meni}
• {**DISP**} ....{prikaži ukazni meni}
• {**REL**}.........{meni pogojnega skoka relacijskega operatorja}
• {**I/O**}...........{I/O nadzor/prenos ukazni meni}
• {**:**}...............{ukaz z več stavki}
• {**STR**} ....{niz ukazov}

Če v načinu **RUN • MAT** (ali **RUN**) ali v načinu **PRGM** pritisnete (PRGM), se prikaže naslednje menü funkcijskih tipk, če je kot privzeti številčni sistem nastavljen binarni, osmični, decimalni ali šestnajstični sistem.

• {**Prog**}........{ponovni priklic programa}
•

Funkcije, dodeljene funkcijskim tipkam, so enake kot v načinu Comp.

Podrobnosti o ukazih, ki so na voljo v različnih menijih, do katerih lahko dostopate iz menija programa, najdete v „Poglavju 8 Programiranje“.

8. Uporaba zaslona za nastavitve

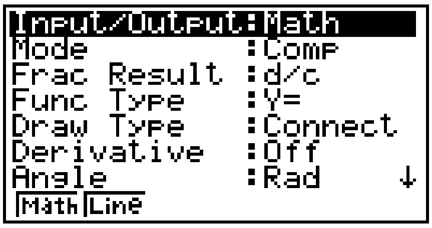
Na zaslonu Nastavitve načina je prikazan trenutni stanje nastavitev načina in omogoča izvedbo želenih sprememb. V nadaljevanju je opisano, kako spremeniti nastavitve.

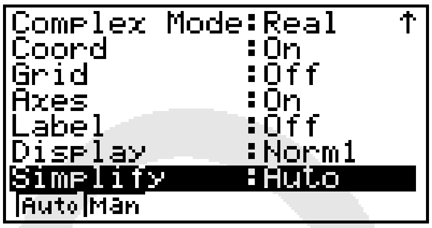
---

u Za spremembo nastavitev načina

1. Izberite želeno ikono in pritisnite w, da vstopite v način in prikažete njegov začetni zaslon. Tukaj bomo vstopili v način **RUN • MAT** (ali **RUN**).

2. Pritisnite !m(SET UP), da prikažete zaslon za nastavitev načina.
   - Ta zaslon za nastavitve je le eden od možnih primerov. Dejanska vsebina zaslona za nastavitve se razlikuje glede na način, v katerem ste, in trenutne nastavitve tega načina.





3. S puščičnima tipkama f in ② premaknite označbo na element, katerega nastavitev želite spremeniti.
4. Pritisnite funkcijska tipka (1 do 6), ki je označena z nastavitvijo, ki jo želite izvesti.
5. Ko končate z želenimi spremembami, pritisnite J, da zaprete zaslon Nastavitve.

■ Nastavitve zaslona Funkcijske tipke Meniji

V tem poglavju so podrobno opisane nastavitve, ki jih lahko izvedete s pomočjo funkcijskih tipk na zaslonu za nastavitve. označuje privzeto nastavitev.

Imena elementov, označena z zvezdico (*), niso vključena v fx-7400GIII.

u Vhod/izhod* (način vhoda/izhoda)

- {**Math**}/{**Line**}/{**M/M**} ... {Math}/{Linear}/{Mth/Mix}*1 način vnosa/izpisa

*1 {Mth/Mix} je namenjen samo za fx-9750GIII. V načinu fx-9750GIII Examination Mode je začetna privzeta nastavitev {Mth/Mix}.

u Način (izračun/binarni, osemštevni, decimalni, šestnajstični način)

- {**Comp**} ... {aritmetični način izračuna}
- {**Dec**}/{**Hex**}/{**Bin**}/{**Oct**} ... {decimalni}/{heksadecimalni}/{binarni}/{osmiški}

u Frac Result (format prikaza rezultata ulomka)

- {**d/c**}/{**ab/c**} ... {nepravilen}/{mešani} ulomek

u Func Type (tip grafične funkcije)

S pritiskom na eno od naslednjih funkcijskih tipk se spremeni tudi funkcija tipke v.

- {**Y=**}/{**r=**}/{**Parm**}/{**X=**} ... {pravokotna koordinata (tip Y= $f(x)$)}/{polarna koordinata}/ {parametrični}/{pravokotni koordinati (tip X= $f(y)$)} graf
- {**Y>**}/{**Y<**}/{Yt}/{Ys} ... {y>$f(x)$}/{y<$f(x)$}/{$y\geq f(x)$}/{$y\leq f(x)$} graf neenakosti
- {**X>**}/{**X<**}/{Xt}/{Xs} ... {x>$f(y)$}/{x<$f(y)$}/{$x\geq f(y)$}/{$x\leq f(y)$} graf neenakosti

u Vrsta risanja (metoda risanja grafov)

- {**Con**}/{**Plot**} ... {povezane točke}/{nepovezane točke} u **Derivata (prikaz vrednosti derivate)**

- {**Vklopljeno**}/{**Izklopljeno**} ... {prikaz vklopljen}/{prikaz izklopljen}, medtem ko se uporabljajo Grafični prikaz v tabelo, Tabela in graf ter Sledenje

u **Kot (privzeta enota kota)**

- {**Deg**}/{**Rad**}/{**Gra**} ... {stopinje}/{radiani}/{gradi}

u **Kompleksni način**

- {**Real**} ... {izračun samo v območju realnih števil}
- {$a+bi$}/{$r\angle$ &} ... {pravokotni format}/{polarni format} prikaz kompleksnega izračuna

u **Coord (prikaz koordinat grafičnega kazalca)**

- {**On**}/{**Off**} ... {prikaz vklopljen}/{prikaz izklopljen}

u **Grid (prikaz grafične mreže)**

- {**Vklopljeno**}/{**Izklopljeno**} ... {prikaz vklopljen}/{prikaz izklopljen}

u **Axes (prikaz osi grafa)**

- {**Vklopljeno**}/{**Izklopljeno**} ... {prikaz vklopljen}/{prikaz izklopljen}

u **Oznaka (prikaz oznake osi grafa)**

- {**Vklopljeno**}/{**Izklopljeno**} ... {prikaz vklopljen}/{prikaz izklopljen}

u **Prikaz (format prikaza)**

- {**Fix**}/{**Sci**}/{**Norm**}/{**Eng**} ... {določitev fiksnega števila decimalnih mest}/{določitev števila pomembnih mest}/{nastavitev normalnega prikaza}/{inženirski način}

u **Stat Wind (statistični grafikon, metoda nastavitve V-Window)**

- {**Auto**}/{**Man**} ... {avtomatsko}/{ročno}

u **Resid List (izračun ostankov)**

- {**None**}/{**LIST**} ... {brez izračuna}/{specifikacija seznama za izračunane preostale podatke}

u **List File (nastavitve prikaza seznama datotek)**

- {**FILE**} ... {nastavitve datoteke seznama na zaslonu}

u **Pod ime (imenovanje seznama)**

- {**Vklopljeno**}/{**Izklopljeno**} ... {prikaz vklopljen}/{prikaz izklopljen}

u **Graph Func (prikaz funkcije med risanjem grafa in sledenjem)**

- {**Vklopljeno**}/{**Izklopljeno**} ... {prikaz vklopljen}/{prikaz izklopljen}

u **Dual Screen (stanje načina dvojnega zaslona)**

- {**G+G**}/{**GtoT**}/{**Off**} ... {risanje grafa na obeh straneh dvojnega zaslona}/{graf na eni strani in numerična tabela na drugi strani dvojnega zaslona}/{dvojni zaslon izklopljen}

u **Simul Graph (način sočasnega risanja grafov)**

- {**Vklopljeno**}/{**Izklopljeno**} ... {simultano risanje grafikonov vklopljeno (vsi grafikoni se rišejo simultano)}/{simultano risanje grafikonov izklopljeno (grafikoni se rišejo v numeričnem zaporedju)}

u **Ozadje (ozadje grafičnega prikaza)**

• {**None**}/{**PICT**} ... {brez ozadja}/{specifikacija slike ozadja grafa}

u **Sketch Line (vrsta prekrivne črte)**

• {── }/{━━ }/{····· }/{······ } ... {normal}/{thick}/{broken}/{dotted}

u **Dinamični tip* (dinamični tip grafa)**

• {**Cnt**}/{**Stop**} ... {brez ustavitve (neprekinjeno)}/{avtomatska ustavitev po 10 risbah}

u **Locus* (dinamični grafični locus način)**

• {**On**}/{**Off**} ... {locus narisan}/{locus ni narisan}

u **Y=Hitrost risanja* (dinamična hitrost risanja grafa)**

• {**Norm**}/{**High**} ... {normalna}/{visoka hitrost}

u **Spremenljivka (nastavitve za ustvarjanje tabel in risanje grafikonov)**

• {**RANG**}/{**LIST**} ... {uporabi razpon tabele}/{uporabi podatke seznama}

Σ **Display* (prikaz vrednostiΣ v rekurzivni tabeli)**

• {**On**}/{**Off**} ... {prikaz vklopljen}/{prikaz izklopljen}

u **Slope* (prikaz odvodne funkcije na trenutni lokaciji kazalca v grafu koničnega odseka)**

• {**On**}/{**Off**} ... {prikaz vklopljen}/{prikaz izklopljen}

u **Payment* (nastavitev plačilnega obdobja)**

• {**BGN**}/{**END**} ... {začetek}/{konec} nastavitev plačilnega roka

u **Način datuma* (nastavitev števila dni na leto)**

• {**365**}/{**360**} ... izračun obresti z uporabo {365}*2 /{360} dni na leto

*2 Za izračun datuma v načinu **TVM** je treba uporabiti 365-dnevno leto. V nasprotnem primeru pride do napake.

u **Obdobja/YR. * (določitev plačilnega intervala)**

• {**Annu**}/{**Semi**} ... {letno}/{polletno}

u **Ineq Type (določitev izpolnitve neenakosti)**

• {**IN**}/{**ALI**} ... Pri grafičnem prikazu več neenakosti {izpolnite področja, kjer so izpolnjeni vsi pogoji neenakosti}/{izpolnite področja, kjer je izpolnjen vsak pogoj neenakosti}

u **Poenostavi (avtomatska/ročno zmanjšanje izračuna)**

• {**Avt.**/**Roč.**} ... {avt. zmanjšanje in prikaz}/{prikaz brez zmanjšanja}

u **Tip Q1Q3 (formule za izračun Q1/Q3)**

• {**Std**}/{**OnData**} ... {Razdelite celotno populacijo na njenem središču med zgornjo in spodnjo skupino, pri čemer je mediana spodnje skupine Q1 in mediana zgornje skupine Q3}/
{Naredite vrednost elementa, katerega kumulativno frekvenčno razmerje je večje od 1/4 in najbližje 1/4 Q1, in vrednost elementa, katerega kumulativno frekvenčno razmerje je večje od 3/4 in najbližje 3/4 Q3}

u **Imp Multi* (Spreminjanje implicitne prednostne vrstne rednosti množenja)**

- {**Vklopljeno**} ... Izvaja izračune enako kot „Zaporedje prednosti izračuna“ na strani 2-2.
- {**Izklopljeno**} ... Zaporedje prednosti izračuna implicitnega množenja (⑤ in ⑦ iz „Zaporedje prednosti izračuna“ na strani 2-2) je enako kot množenje in deljenje z uporabo eksplicitnih operatorjev (% iz „Zaporedje prednosti izračuna“).

u **Auto Calc* (avtomatsko izračunavanje v preglednici)**

- {**Vklopljeno**}/{**Izklopljeno**} ... {izvedi}/{ne izvedi} formule samodejno

u **Prikaži celico* (način prikaza celice v preglednici)**

- {**Oblika**}/{**Vrednost**} ... {formula}*3 /{vrednost}

u **Premakni* (smer kurzorja celice preglednice)*4**

- {**Dol**}/{**Desno**} ... {premakni navzdol}/{premakni desno}

*3 Izbiranje „Oblika“ (formula) povzroči, da se formula v celici prikaže kot formula. „Oblika“ ne vpliva na nobene podatke v celici, ki niso formule.

*4 Določa smer premikanja kazalca celice, ko pritisnete tipko w za vnos v celico, ko ukaz Sequence ustvari tabelo števil in ko prikličete podatke iz pomnilnika List.

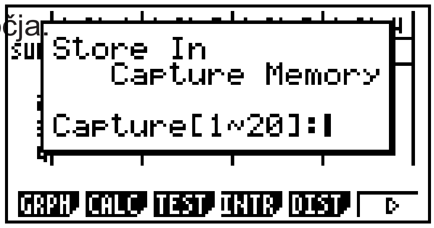
9. Uporaba zajema zaslona

Med delovanjem kalkulatorja lahko kadarkoli zajamete sliko trenutnega zaslona in jo shranite v pomnilnik zajetih slik.

---

u **Za zajem slike zaslona**

1. Uporabite kalkulator in prikažite zaslon, ki ga želite zajeti.
2. Pritisnite ! h(CAPTURE).
   - Prikaže se pogovorno okno za izbiro pomnilniškega območja.



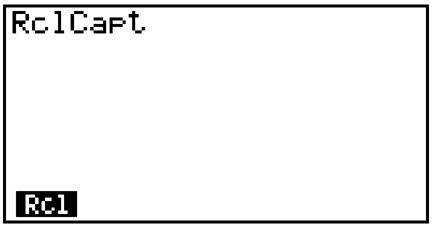
3. Vnesite vrednost od 1 do 20 in nato pritisnite w.
   - S tem boste zajeli sliko zaslona in jo shranili v pomnilniški prostor za zajemanje z imenom »Capt n« (n = vrednost, ki ste jo vnesli).

- Slike zaslona s sporočilom, da je v teku operacija ali prenos podatkov, ni mogoče zajeti.
- Če v glavnem pomnilniku ni dovolj prostora za shranjevanje zajete slike zaslona, se bo pojavila napaka pomnilnika.

u **Za prikaz slike zaslona iz pomnilnika zajetih slik**

Ta operacija je mogoča samo, če je izbran linearni vhodno-izhodni način.

1. V načinu **RUN • MAT** (ali **RUN**) pritisnite K6(g)
   6(g)5(CAPT)(4(CAPT) fx-7400GIII)
   1(RCL).



2. Vnesite številko pomnilnika zajema v območju od 1 do 20 in nato pritisnite w.
   - Prikaže se slika, shranjena v pomnilniku zajema, ki ste ga določili.
3. Če želite zapreti prikaz slike in se vrniti na zaslon, s katerega ste začeli v koraku 1, pritisnite J.

- Za prikaz slike iz pomnilnika zajema lahko uporabite tudi ukaz RclCapt v programu.

10. Če težave še vedno obstajajo...

Če imate še vedno težave pri izvajanju operacij, poskusite naslednje, preden sklenete, da je z računskim strojem nekaj narobe.

■ Vrnitev kalkulatorja v prvotne nastavitve načina

1. V glavnem meniju vstopite v način **SYSTEM**.
2. Pritisnite 5(RSET).
3. Pritisnite 1(STUP) in nato 1(Yes).
4. Pritisnite Jm, da se vrnete v glavni meni.

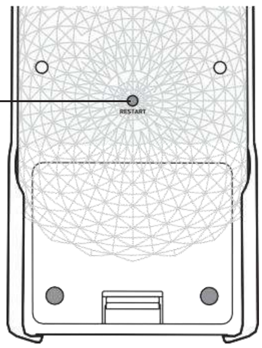
Sedaj vstopite v pravilni način in ponovno izvedite izračun, pri čemer spremljajte rezultate na zaslonu.

■ Ponovni zagon in ponastavitev

u **Ponovni zagon**

Če kalkulator začne delovati nenormalno, ga lahko ponovno zaženete s pritiskom na gumb RESTART. Upoštevajte pa, da gumb RESTART uporabite le v skrajnem primeru. Običajno pritisk na gumb RESTART ponovno zažene operacijski sistem kalkulatorja, tako da se programi, grafične funkcije in drugi podatki v pomnilniku kalkulatorja ohranijo.

Gumb RESTART



Pomembno!

Kalkulator ob izklopu napajanja naredi varnostno kopijo uporabniških podatkov (glavni pomnilnik) in ob ponovnem vklopu napajanja naloži varnostno kopijo podatkov.

Ko pritisnete gumb RESTART, se kalkulator ponovno zažene in naloži varnostno kopijo podatkov. To pomeni, da če po urejanju programa, grafične funkcije ali drugih podatkov pritisnete gumb RESTART, se bodo vsi podatki, ki niso bili varnostno kopirani, izgubili.

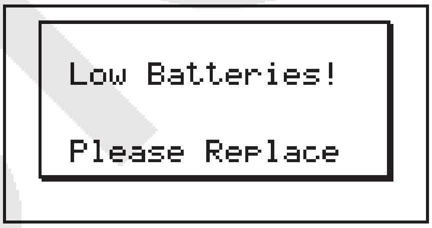
u **Ponastavitev**

Ponastavitev uporabite, če želite izbrisati vse podatke, ki so trenutno v pomnilniku kalkulatorja, in vrniti vse nastavitve načina na privzete vrednosti.

Pred ponastavitvijo najprej naredite pisno kopijo vseh pomembnih podatkov. Podrobnosti najdete v poglavju „Ponastavitev“ (stran 12-3).

■ Sporočilo o izpraznjeni bateriji

Če se na zaslonu prikaže naslednje sporočilo, takoj izklopite kalkulator in zamenjajte baterije v skladu z navodili.



Če boste kalkulator še naprej uporabljali brez zamenjave baterij, se bo napajanje samodejno izklopilo, da se zaščiti vsebina pomnilnika. Ko se to zgodi, napajanja ne boste mogli ponovno vklopiti, obstaja pa nevarnost, da bo vsebina pomnilnika poškodovana ali popolnoma izgubljena.

• Po pojavu sporočila o izpraznjenih baterijah ne boste mogli izvajati operacij za prenos

Poglavje 2 Ročni izračuni

1. Osnovni izračuni

2

■ Aritmetični izračuni

- Aritmetične izračune vnesite tako, kot so zapisani, od leve proti desni.
- Za vnos znaka minus pred negativno vrednostjo uporabite tipko -.
- Izračuni se izvajajo notranje s 15-mestno mantiso. Rezultat se zaokroži na 10-mestno mantiso, preden se prikaže.
- Pri mešanih aritmetičnih izračunih imajo množenje in deljenje prednost pred seštevanjem in odštevanjem.

Primer	Operacija
56 × (–12) ÷ (–2,5) = 268,8	56*-12/-2,5w
(2 + 3) × 10^2 = 500	(2+3)*152w
2 + 3 × (4 + 5) = 29	2+3*(4+5w*1
$\frac{(6)}{4 \times 5}$ = 0,3	6/(4*5)w

*1 Končne zaprte oklepaje (neposredno pred uporabo tipke w) se lahko izpustijo, ne glede na to, koliko jih je potrebnih.

■ Število decimalnih mest, število pomembnih števk, normalni razpon prikaza

[SET UP] – [redacted] – [Fix] / [Sci] / [Norm]

- Tudi po tem, ko določite število decimalnih mest ali število pomembnih števk, se notranji izračuni še vedno izvajajo z 15-mestno mantiso, prikazane vrednosti pa se shranijo z 10-mestno mantiso. Uporabite Rnd v meniju za numerične izračune (NUM) (stran 2-13) za zaokroževanje prikazane vrednosti na število decimalnih mest in nastavitve pomembnih številk.
- Nastavitve števila decimalnih mest (Fix) in pomembnih mest (Sci) običajno ostanejo veljavne, dokler jih ne spremenite ali dokler ne spremenite nastavitve normalnega prikaznega območja (Norm).

Primer 1 100÷ **6 = 16,66666666...**

Pogoj	Delovanje	Prikaz
	100/6w	16,66666667
4 decimalna mesta	!m(SET UP) ff 1(Fix)4 wJw	16,6667*1
5 pomembnih števk	!m(SET UP) ff 2(Sci)fwJw	1,6667E+01*1
Prekliče specifikacijo	!m(SET UP) ff 3(Norm)Jw	16,66666667

*[1] Prikazane vrednosti so zaokrožene na mesto, ki ga določite.

Primer 2 200÷ 7× 14 = 400

Pogoj	Operacija	Prikaz
	200/7*14w	**400**
3 decimalna mesta	!m(NASTAVITE) ff 1(Fix)dwJw	**400,00**
Izračun se nadaljuje z uporabo	200/7w	**28,571**
zaslon s kapaciteto 10 številk	*	Odgovor× I
	14w	**400.000**

• Če se isti izračun opravi z uporabo navedenega števila številk:

	200/7w	**28,571**
Notranje shranjena vrednost je	K6(g)4(NUM)*4(Rnd)w	**28,571**
zaokroženo na število	*	Odgovor× I
decimalnih mest, kot je določeno v	14w	**399,994**
na zaslonu Nastavitve.	200/7w	**28,571**
Lahko tudi določite	6(g)1 (RndFi) ! — (Ans) , 2)	**RndFix(Ans,2)**
število decimalnih mest za	w	**28,570**
zaokroževanje notranjih vrednosti	*	Odgovor× I
za določen izračun.	14w	**399,980**
(Primer: Za določitev zaokroževanje na dve decimalni mest)		

* fx-7400GIII: 3(NUM)

■ Zaporedje prednosti izračunov

Ta kalkulator uporablja pravo algebrsko logiko za izračun delov formule v naslednjem vrstnem redu:

① Funkcije tipa A

- Koordinatna transformacija Pol (x, y), Rec (r,θ)
- Funkcije, ki vključujejo oklepaje (kot so derivati, integracije,Σ itd.)
  d/dx, d^2/dx^2,$\int dx$,Σ , Solve, FMin, FMax, List→ Mat, Fill, Seq, SortA, SortD, Min, Max, Median, Mean, Augment, Mat→ List, DotP, CrossP, Angle, UnitV, Norm, P(, Q(, R(, t(, RndFix, $\log_a b$
- Sestavljene funkcije*[1] , List, Mat, Vct, fn, Yn, rn, Xtn, Ytn, Xn

2 Funkcije tipa B
Pri teh funkcijah se vnese vrednost in nato pritisne funkcijsko tipko.
x^2 , x^{-1} , $x!$, ° ’ ”, simboli ENG, enota kota °, ʳ , ᵍ

3 Potenciranje/koren ^(x^y),

4 Ulomki $a\,{}^{b}/_{c}$

⑤*[2] Okrajšani format množenja predπ , ime pomnilnika ali ime spremenljivke.

2π , 5A, Xmin, F Start itd.

Ⓐ Funkcije tipa C

Pri teh funkcijah se pritisne funkcijsko tipko in nato vnese vrednost.

• • log, In, e^x , 10^x , sin, cos, tan, sin^{-1} , cos^{-1}, tan^{-1} , sinh, cosh, tanh, $sinh^{-1}$, $cosh^{-1}$, tanh^{-1} , (–), d, h, b, o, Neg, Not, Det, Trn, Dim, Identity, Ref, Rref, Sum, Prod, Cuml, Percent, AList, Abs, Int, Frac, Intg, Arg, Conjg, ReP, ImP

⑦*2 Okrajšani format množenja pred funkcijami tipa A, funkcijami tipa C in oklepaji.
2'3, A log2 itd.

8 Permutacija, kombinacija *nPr*, *nCr*

9 Ukazi za pretvorbo merskih enot

× , ÷, Int÷, Rnd

! +, –

@ Relacionalni operaterji =,≠ , >, <,≥ , ≤

And (logični operator), and (bitni operator)

$ Or, Xor (logični operator), or, xor, xnor (bitni operator)

*1 Vsebino več lokacij funkcijskega pomnilnika (fn) ali grafičnega pomnilnika (Yn, rn, Xtn, Ytn, Xn) lahko združite v sestavljene funkcije. Če na primer določite fn1(fn2), dobite sestavljeno funkcijo fn1°fn2 (glejte stran 5-7). Sestavljena funkcija lahko vsebuje do pet funkcij.

*2 fx-9750GIII: Zaporedje prednosti izračuna, ko je na zaslonu Nastavitve izbrana možnost „Vklopljeno“ za „Imp Multi“ (Implicitno množenje, stran 1-34). Ko je za „Imp Multi“ izbrana možnost „Izklopljeno“, je zaporedje prednosti izračuna ⑤ in ④ enako kot %. Posledično je celotno zaporedje prednosti izračuna od a do l, kot je prikazano spodaj.

●: Zaporedje prednosti izračuna, ko je za »Imp Multi« izbrana možnost »Off«.
O: Zaporedje prednosti izračuna, ko je za „Imp Multi“ izbrana možnost „On“.

a ① Funkcije tipa A

b ② Funkcije tipa B

❸ ③ na potenca/koren

❹ d Deleži

e ⑥ Funkcije tipa C

f ⑧ Permutacija, kombinacija

g ⑨ Ukazi za pretvorbo merskih enot

h ⑤ Okrajšani format množenja pred imenom pomnilnika (π), imenom pomnilnika ali imenom spremenljivke. 2π , 5A, Xmin, F Start itd.

④ Okrajšani format množenja pred funkcijami tipa A, funkcijami tipa C in oklepaji. 2'3 , A log2 itd.

% ×, ÷, Int÷, Rnd

i k +, –

j l Relacionalni operaterji

k m And (logični operator), and (bitni operator)

l % Ali, Xor (logični operator), ali, xor, xnor (bitni operator)

Primer

- **fx-9860GIII, fx-9750GIII, fx-7400GIII**

  2 + 3× (log sin2π² + 6,8) = 22,07101691 (enota kota = Rad)

  1
  2
  3
  4
  5
  6

- **fx-9750GIII (Imp Multi: Vklopljeno)**
- **fx-9860GIII, fx-7400GIII**

  6 ÷ 2 (1 + 2) = 1

  1
  2
  3

  6 ÷ 2π = 0,9549296586

  1
  2

- **fx-9750GIII (Imp Multi: Off)**

  6 ÷ 2 (1 + 2) = 9

  1
  2
  3

  6 ÷ 2π = 3π (Vnos/izhod: matematika)

  1
  2

- V izrazu za izračun RndFix ne morete uporabiti diferenciala, kvadratnega diferenciala, integracije,Σ , največje/najmanjše vrednosti, Solve, RndFix ali $\log_a b$.
- Ko se funkcije z enako prioriteto uporabljajo v seriji, se izvajanje izvede od desne proti levi.

  e^x V√120→ e^x {ln(√120)}

  V nasprotnem primeru se izvajanje izvaja od leve proti desni.
- Sestavljene funkcije se izvajajo od desne proti levi.
- Vse, kar je v oklepajih, ima najvišjo prioriteto.

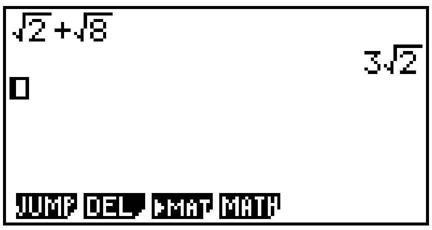
■ Prikaz izračuna iracionalnega števila

(samo fx-9860GIII/fx-9750GIII)

Kalkulator lahko nastavite tako, da prikazuje rezultate izračuna v obliki iracionalnih števil (vključno z ' aliπ), tako da na zaslonu Nastavitve izberete »Matematika« za nastavitev načina »Vnos/iznos«.

Primer '2 + '8 = 3'2 (Vnos/iznos: Math)

!x(-)ce+!x(-)iw



u **Razpon prikaza rezultatov izračuna z '**

Prikaz rezultata izračuna v formatu ' je podprt za rezultate z največ dvema členoma.
Rezultati izračuna v formatu ' so v eni od naslednjih oblik.

± ab ,± d± ±de

ab ,± f

ab

c

- Spodaj so navedena območja za vsakega od koeficientov (a, b, c, d, e, f), ki se lahko prikažejo v formatu izračuna .

  1 < a < 100, 1 < b < 1000, 1 < c < 100

  0 < d < 100, 0 < e < 1000, 1 < f < 100

- V spodaj prikazanih primerih je mogoče izračunani rezultat prikazati v formatu ' tudi, če so njihovi koeficienti (a, c, d) zunaj zgornjih območij.

  Rezultat izračuna v formatu ' uporablja skupni imenovalec.

  $\frac{a'b}{c}$ + $\frac{d'e}{f}$ → $\frac{a'b + d''e}{c'}$ * c´ je najmanjši skupni večkratnik c in f.

Ker izračun uporablja skupni imenovalec, se izračun lahko še vedno prikaže v formatu ' tudi, če so koeficienti (a´, c´, d´) zunaj ustreznega območja koeficientov (a, c, d).

Primer: 3 (+) 11 10 110

Primeri izračunov

Ta izračun:	**Prikaže naslednje:**
2× (3 – 2'5) = 6 – 45	format
35'2 × 3 = 148,492424 (= 105'2)*1	Desetiški format
150'2 / 25 = 8,485281374*1	
99√999 = 3129,089165 (= 297√111)*1	
23× (5 – 2'3) = 35,32566285 (= 115 – 46'3)*1	Decimalni format
'2 + '3 + '8 = '3 + 3'2	format
'2 + '3 + '6 = 5,595754113*2	Desetiški format

*1 Desetiški format, ker so vrednosti zunaj območja.

*2 Desetiški format, ker ima rezultat izračuna tri člene.

- Rezultat izračuna se prikaže v decimalnem formatu, tudi če je vmesni rezultat večji od dveh členov.

  Primer: (1 + '2 + '3) (1 – '2 – '3) (= – 4 –

  = –8,898979486

- Če ima izračunska formula člen ' in člen, ki ga ni mogoče prikazati kot ulomek, se rezultat izračuna prikaže v decimalnem formatu.

Primer: log3 + [illegible]= 1,891334817

u Prikaz rezultatov izračuna z π

Rezultat izračuna se prikaže v formatuπ v naslednjih primerih.

- Ko se rezultat izračuna lahko prikaže v obliki $n\pi$ n je celo število do $|10^6|$.
- Ko se rezultat izračuna lahko prikaže v obliki $a\frac{b}{c}\pi$ ali $\frac{(b)}{c}\pi$

  Vendar mora biti {število a-številk + število b-številk + število c-številk} 9 ali manj, ko se zgoraj navedeno $a\frac{b}{c}$ ali $\frac{b}{c}$ zmanjša.*1 *2 Poleg tega je največje dovoljeno število c-mestnih številk tri.*2

  *1 Ko je $c < b$, se število a, b in c števk upošteva, ko se ulomek pretvori. iz nepravilnega ulomka ($\frac{b}{c}$) v mešani ulomek ($a\frac{b}{c}$).

  *2 Če je v nastavitvenem zaslonu za nastavitev „Poenostavi“ izbrana možnost „Ročno“, se lahko izračunani rezultat prikaže v decimalnem formatu, tudi če so izpolnjeni ti pogoji.

Primeri izračunov

Ta izračun:	**Prikaže naslednji izpis:**
78 π× 2 = 156π	π format
123456 π× 9 = 3490636,164 (= 1111104π)*3	Desetiški format
$105\frac{568}{824}\pi = 105\frac{71}{103}\pi$	π format
$2\frac{258}{3238}\pi$ = 6,533503684 $\left(2\frac{129}{1619}\pi\right)$ *4	Decimalni format

*3 Decimalni format, ker je celoštevilčni del izračuna $|10^6|$ ali večji.

*4 Decimalni format, ker je število mest v imenovalcu štiri ali več za $a\frac{b}{c}\pi$.

■ Množenje brez znaka za množenje

V kateri koli od naslednjih operacij lahko izpustite znak za množenje (×).

- Pred funkcijami tipa A (① na strani 2-2) in funkcijami tipa C (Ⓐ na strani 2-2), razen pri negativnih znakih

Primer 1 **2sin30, 10log1.2, , 2Pol(5, 12) itd.**

- Pred konstantami, imeni spremenljivk, imeni pomnilnika

Primer 2 **2π , 2AB, 3Ans, 3Y1 itd.**

- Pred odprto oklepajem

Primer 3 **3(5 + 6), (A + 1)(B – 1) itd.**

Če izvedete izračun, ki vključuje tako deljenje kot množenje, pri čemer je znak za množenje izpuščen, se bodo oklepaji vstavili samodejno, kot je prikazano v spodnjih primerih.

- Ko je znak za množenje izpuščen neposredno pred odprto oklepaj ali za zaprto oklepaj.

Primer 1 6 ÷ 2(1 + 2) → 6 ÷ (2(1 + 2))

6 ÷ A(1 + 2) → 6 ÷ (A(1 + 2))

1 ÷ (2 + 3)sin30 → 1 ÷ ((2 + 3)sin30)

- Ko je znak za množenje izpuščen neposredno pred spremenljivko, konstanto itd.*

Primer 2 6 ÷ 2π → 6 ÷ (2π)

2 ÷ 2'2 → 2 ÷ (2'2)

4π ÷ 2π → 4π ÷ (2π)

* fx-9750GIII: Te oklepaje se ne vnašajo samodejno, če je na zaslonu Nastavitve izbrana možnost „Off“ za „Imp Multi“.

Če izvedete izračun, v katerem je bil znak za množenje izpuščen neposredno pred ulomkom (vključno z mešanimi ulomki), se bodo oklepaji vstavili samodejno, kot je prikazano v spodnjih primerih.

Primer $(2 \times \frac{1}{3})$: 3 $\frac{2}{1}$ 3 → $2\left(\frac{1}{3}\right)$

Primer $(\sin 2 \times \frac{4}{5})$: $\underline{\sin}$ $2\frac{4}{5}$ → $\sin 2\left(\frac{4}{5}\right)$

■ Prepolnitev in napake

Če presežete določeno območje vnosa ali izračuna ali poskušate vnesti nezakonit vnos, se na zaslonu prikaže sporočilo o napaki. Dokler je prikazano sporočilo o napaki, kalkulator ne deluje. Podrobnosti najdete v „Tabeli sporočil o napakah“ na straniα -1.

- Večina tipk kalkulatorja ne deluje, dokler je prikazano sporočilo o napaki. Pritisnite J , da izbrišete napako in se vrnete v normalno delovanje.

■ Zmogljivost pomnilnika

Vsakič, ko pritisnete tipko, se porabi en ali dva bajta. Nekatere funkcije, ki zahtevajo en bajt, so: b, c, d, sin, cos, tan, log, In, ˉ inπ .
Nekatere funkcije, ki zahtevajo dva bajta, so *d/dx*(, Mat, Vct, Xmin, If, For, Return, DrawGraph, SortA(, PxlOn, Sum in $_{an+1}$.

- Število bajtov, potrebnih za vnos funkcij in ukazov, se razlikuje v linearni in matematični načinu vnosa/izpisa. Podrobnosti o številu bajtov, potrebnih za vsako funkcijo v matematičnem načinu vnosa/izpisa, najdete na strani 1-12.

2. Posebne funkcije

■ Izračuni s spremenljivkami

Primer	Operacija	Prikaz
	193,2aav(A)w	193,2
193,2 ÷ 23 = 8,4	av(A)/23w	8,4
193,2 ÷ 28 = 6,9	av(A)/28w	6,9

■ Pomnilnik

u Spremenljivke (spomin Alpha)

Ta kalkulator ima standardno 28 spremenljivk. Spremenljivke lahko uporabite za shranjevanje vrednosti, ki jih želite uporabiti v izračunih. Spremenljivke so označene z enoznačnimi imeni, ki so sestavljena iz 26 črk abecede ter črk r in θ. Največja velikost vrednosti, ki jih lahko dodelite spremenljivkam, je 15 mest za mantiso in 2 mesti za eksponent.

• Vsebina spremenljivk se ohrani tudi po izklopu napajanja.

u Dodelitev vrednosti spremenljivki

[vrednost] a [ime spremenljivke] w

Primer 1 **Da spremenljivki A dodelimo vrednost 123**

AC bcdaav(A)w

```
123→A
                123
```

Primer 2 **Če želite spremenljivki A dodati 456 in rezultat shraniti v spremenljivki B**

AC av(A)+4 f□a
a l (B)w

```
A+456→B
                579
```

u Da bi več spremenljivkam dodelili isto vrednost

[vrednost]a [ime prve spremenljivke]a3(~) [ime zadnje spremenljivke]w

• Kot ime spremenljivke ne morete uporabiti „r“ ali „θ“.

Primer **Da spremenljivkam od A do F dodelimo vrednost 10**

AC b0aav(A)
a3(~)at(F)w

```
10→A~F
                 10
```

u Spominska vrstica

V spominu za nize lahko shranite do 20 nizov (imenovanih Str 1 do Str 20). Shranjene nize lahko izpišete na zaslon ali uporabite v funkcijah in ukazih, ki podpirajo uporabo nizov kot argumentov.

Podrobnosti o operacijah z nizi najdete v poglavju „Nizi“ (stran 8-20).

Primer **Če želite niz „ABC“ dodeliti Str 1 in nato Str 1 izpisati na zaslon**

AC!a(A-LOCK)5(”)v(A)
l (B) l (C) 5 (”)a(Sproži Alpha Lock.)
aJ6(g)5(Str)*bw

```
"ABC"→Str 1
               Done
```

5(Str)*bw

```
"ABC"→Str 1
               Done
Str 1
ABC
```

* fx-7400GIII: 6(Str)

Niz se prikaže poravnan levo.

- Zgoraj navedeno operacijo izvedite v linearni vnosni/iznosni način. V matematičnem vnosnem/iznosnem načinu je ni mogoče izvesti.

u Funkcijski pomnilnik **[OPTN]-[FMEM]**

Pomnilnik funkcij je primeren za začasno shranjevanje pogosto uporabljanih izrazov. Za dolgoročno shranjevanje priporočamo, da za izraze uporabite način **GRAPH**, za programe pa način **PRGM**.

- {**STO**}/{**RCL**}/{**fn**}/{**SEE**} ... {shranjevanje funkcije}/{ponovni priklic funkcije}/{določitev območja funkcije kot ime spremenljivke znotraj izraza}/{seznam funkcij}

u Shranjevanje funkcije

Primer **Shranjevanje funkcije (A+B) (A–B) kot funkcijski spomin številka 1**

(av(A)+al(B))
(av(A)-al(B))

```
(A+B)(A-B)▮
```

K6(g)6(g)3(FMEM)*
1(STO)bw

```
== Function Memory ==
 f1:(A+B)(A-B)
```

* fx-7400GIII: 2(FMEM)

JJJ

- Če številka pomnilnika funkcije, v katero shranite funkcijo, že vsebuje funkcijo, se prejšnja funkcija nadomesti z novo.
- Funkcijo lahko shranite v pomnilnik funkcij v programu tudi z uporabo a. V tem primeru morate funkcijo zapisati v dvojne narekovaje.

```
"(A+B)(A-B)"→fn1▮
```

u Za priklic funkcije

Primer **Za priklic vsebine funkcijskega pomnilnika številka 1**

AC K6(g)6(g)3(FMEM)*
2(RCL)bw

```
(A+B)(A-B)▮
```

* fx-7400GIII: 2(FMEM)

- Povrnjena funkcija se prikaže na trenutni lokaciji kurzorja na zaslonu.

u Za priklic funkcije kot spremenljivke

AC daav(A)w
baal(B)w
K6(g)6(g)3(FMEM)*3(fn)
b+cw

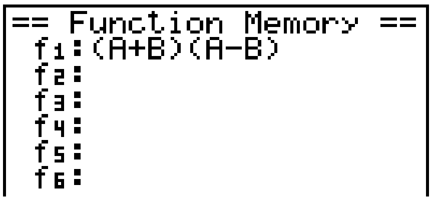
```
3→A
                   3
1→B
                   1
fn1+2
                  10
```

* fx-7400GIII: 2(FMEM)

u Za prikaz seznama razpoložljivih funkcij

K6(g)6(g)3(FMEM)*
4(SEE)

* fx-7400GIII: 2(FMEM)



u Za izbris funkcije

Primer **Za izbris vsebine pomnilnika funkcij številka 1**

AC

K6(g)6(g)3(FMEM)*
1(STO)bw

* fx-7400GIII: 2(FMEM)

- Izvedba operacije shranjevanja, medtem ko je zaslon prazen, izbriše funkcijo v pomnilniku funkcij, ki ga določite.

■ Funkcija odgovora

Odgovorna funkcija samodejno shrani zadnji izračunani rezultat, ki ste ga izračunali s pritiskom na tipko w (razen če tipka w povzroči napako). Rezultat se shrani v odgovorni pomnilnik.

- Največja vrednost, ki jo lahko shrani pomnilnik odgovorov, je 15 mest za mantiso in 2 mesti za eksponent.
- Vsebina pomnilnika odgovorov se ne izbriše, ko pritisnete tipko AC ali ko izklopite napajanje.

u Uporaba vsebine pomnilnika odgovorov v izračunu

Primer **123 + 456 = 579**
789 – 579 = 210

AC bcd+4 f6w
hij-!-
(Ans)w

Uporabniki fx-7400GIII...

- Vsebina pomnilnika odgovorov se ne spremeni z operacijo, ki dodeli vrednosti pomnilniku Alpha (na primer: faal(B)w).

Uporabniki fx-9860GIII, fx-9750GIII...

- V matematičnem načinu vnosa/izpisa se postopek za priklic vsebine pomnilnika odgovorov razlikuje od postopka v linearni načinu vnosa/izpisa. Podrobnosti najdete v poglavju „Funkcija zgodovine“ (stran 1-19).
- Pri izvedbi operacije, ki dodeli vrednost pomnilniku Alpha (npr. faal(B)w), se vsebina pomnilnika odgovorov posodobi v matematičnem načinu vnosa/izpisa, vendar ne v linearni načinu vnosa/izpisa.

■ Izvajanje neprekinjenih izračunov

Odgovorni pomnilnik vam omogoča tudi, da rezultat enega izračuna uporabite kot enega od argumentov v naslednjem izračunu.

Primer **1÷ 3 =**
1÷ 3× 3 =

[AC] b/dw
(Nadaljevanje)*dw

```
1÷3
         0.3333333333
Ans×3
                    1
```

Neprekinjene izračune je mogoče uporabiti tudi s funkcijami tipa B (x^2 , x^{-1} , $x!$, na strani 2-2), +, –, ^(x^y), , ° ’ ”, itd.

3. Določanje enote kota in oblike prikaza

Preden prvič izvedete izračun, morate na zaslonu Nastavitve določiti enoto kota in format prikaza.

■ Nastavitev enote kota

[SET UP] ([Kot]ve)

1. Na zaslonu Nastavitve označite »Kot«.
2. Pritisnite funkcijska tipka za enoto kota, ki jo želite določiti, nato pa pritisnite J
   - {**Deg**}/{**Rad**}/{**Gra**} ... {stopinje}/{radiani}/{gradi}
   - Razmerje med stopinjami, gradi in radiani je prikazano spodaj. 360°
     = 2π radiani = 400 gradov
     90° =π /2 radianov = 100 gradov

■ Nastavitev formata prikaza

[NASTAVIT[Prikaz]

1. Na zaslonu Nastavitve označite »Prikaz«.
2. Pritisnite funkcijska tipka za element, ki ga želite nastaviti, nato pa pritisnite J
   - {**Fix**}/{**Sci**}/{**Norm**}/{**Eng**} ... {določitev fiksnega števila decimalnih mest}/
     {število pomembnih mest}/{normalni prikaz}/{inženirski način}

u Za določitev števila decimalnih mest (Fix)

Primer **Za določitev dveh decimalnih mest**

1(Fix)cw

Display :Fix2

Pritisnite številčno tipko, ki ustreza številu decimalnih mest, ki jih želite določiti (n = 0 do 9).

- Prikazane vrednosti so zaokrožene na število decimalnih mest, ki ga določite.

u Za določitev števila pomembnih mest (Sci)

Primer **Za določitev treh pomembnih števk**

2(Sci)dw

Display :Sci3

Pritisnite številčno tipko, ki ustreza številu pomembnih števk, ki ga želite določiti (n = 0 do 9).
Če določite 0, je število pomembnih števk 10.

- Prikazane vrednosti so zaokrožene na število pomembnih mest, ki jih določite.

u Za določitev normalnega prikaza (Norm 1/Norm 2)

Pritisnite 3(Norm), da preklopite med Norm 1 in Norm 2.

Norm 1: 10^{-2} (0,01) > |x|, |x| > 10^{10}

Norm 2: 10^{-9} (0,000000001) > |x|, |x| > 10^{10}

u Za določitev prikaza v inženirskem zapisu (način Eng)

Pritisnite 4(Eng), da preklopite med inženirsko in standardno notacijo. Medtem ko je inženirska notacija aktivna, je na zaslonu prikazan indikator „/E“.

Za pretvorbo vrednosti v inženirsko notacijo lahko uporabite naslednje simbole, na primer 2.000 (= 2 × 10^3)→ 2k.

E (Exa)	$\times 10^{(18)}$	m (mili)	$\times 10^{(-3)}$
P (peta)	$\times 10^{(15)}$	μ (mikro)	$\times 10^{(-6)}$
T (tera)	$\times 10^{(12)}$	n (nano)	$\times 10^{(-9)}$
G (giga)	$\times 10^{(9)}$	p (piko)	$\times (10)^{-12}$
M (mega)	$\times 10^{(6)}$	f (femto)	$\times (10)^{-15}$
k (kilo)	$\times 10^{(3)}$		

- Inženirski simbol, ki mantiso spremeni v vrednost od 1 do 1000, se samodejno izbere v kalkulatorju, ko je v veljavi inženirska notacija.

4. Izračuni funkcij

■ Meniji funkcij

Ta kalkulator vključuje pet menijev funkcij, ki omogočajo dostop do znanstvenih funkcij, ki niso natisnjene na tipkovnici.

- Vsebina menija funkcij se razlikuje glede na način, ki ste ga izbrali v glavnem meniju, preden ste pritisnili tipko K. Naslednji primeri prikazujejo menije funkcij, ki se prikažejo v načinu **RUN • MAT** (ali **RUN**) ali **PRGM**.

u Hiperbolični izračuni (HYP) **[OPTN]-[HYP]**

- {**sinh**}/{**cosh**}/{**tanh**} ... hiperbolični {sinus}/{kosinus}/{tangenta}
- {**sinh**$^{-1}$ }/{**cosh**$^{-1}$ }/{**tanh**$^{-1}$ } ... inverzni hiperbolični {sinus}/{kosinus}/{tangenta}

u Verjetnostni/porazdelitveni izračuni (PROB) **[OPTN]-[PROB]**

- {$x!$} ... {po vnosu vrednosti pritisnite, da dobite faktorial vrednosti}
- {nPr}/{nCr} ... {permutation}/{combination}
- {**RAND**} ... {generiranje naključnih številk}
  - {**Ran#**}/{**Int**}/{**Norm**}/{**Bin**}/{**List**} ... {generiranje naključnih številk (od 0 do 1)}/{generiranje naključnih celih številk}/{generiranje naključnih številk v skladu z normalno porazdelitvijo na podlagi srednje *vrednosti* μ in standardnega odklona σ}/{generiranje naključnih številk v skladu z binomialno porazdelitvijo na podlagi števila poskusov n in verjetnosti p}/{generiranje naključnih številk (od 0 do 1) in shranjevanje rezultata v ListAns}
- {**P**(}/{**Q**(}/{**R**(} ... normalna verjetnost {P(t)}/{Q(t)}/{R(t)}
- {t(} ... {vrednost normalizirane spremenljivke $t(x)$}

u Numerični izračuni (NUM) **[OPTN]-[NUM]**

- {**Abs**} ... {izberite to postavko in vnesite vrednost, da dobite absolutno vrednost vrednosti}
- {**Int**}/{**Frac**} ... izberite element in vnesite vrednost, da izločite {celo število}/{ulomek}.
- {**Rnd**} ... {zaokroži vrednost, uporabljeno za notranje izračune, na 10 pomembnih mest (da se ujema z vrednostjo v pomnilniku odgovorov) ali na število decimalnih mest (Fix) in število pomembnih mest (Sci), ki ste jih določili}
- {**Intg**} ... {izberite to možnost in vnesite vrednost, da dobite največje celo število, ki ni večje od vrednosti}
- {**RndFi**} ... {zaokroži vrednost, uporabljeno za notranje izračune, na določeno število mest (0 do 9) (glej stran 2-2).}
- {**GCD**} ... {največji skupni delitelj za dve vrednosti}
- {**LCM**} ... {najmanjši skupni večkratnik za dve vrednosti}
- {**MOD**} ... {ostanek deljenja (ostanek, ki nastane, ko n delimo z m)}
- {**MOD · E**} ... {ostanek pri deljenju s potenco (ostanek, ki nastane, ko se n povzdigne na p potenco in nato deli z m)}

u **Enote kota, pretvorba koordinat, šestdesetiške operacije (ANGL)**

[OPTN]-[ANGL]

- {**°**}/{**r**}/{**g**} ... {stopinje}/{radiani}/{gradi} za določeno vneseno vrednost
- {**° ’ ”**} ... {določa stopinje (ure), minute, sekunde pri vnosu vrednosti v stopinjah/minutah/sekundah}
- {**°’”** } ... {pretvori decimalno vrednost v vrednost stopinj/minut/sekund}
  - Menijska funkcija {°’” } je na voljo le, če je na zaslonu prikazan rezultat izračuna.
- {**Pol(**}/{**Rec(**} ... {pretvorba koordinat iz pravokotnih v polarne}/{pretvorba koordinat iz polarnih v pravokotne}
- {'DMS} ... {pretvori decimalno vrednost v šestdesetiško vrednost}

u **Inženirski simbol (ESYM)** **[OPTN]-[ESYM]**

- {**m**}/{**μ**}/{**n**}/{**p**}/{**f**} ... {mili (10^{-3})}/{mikro (10^{-6})}/{nano (10^{-9})}/{piko (10^{-12})}/{femto (10^{-15})}
- {**k**}/{**M**}/{**G**}/{**T**}/{**P**}/{**E**} ... {kilo (10^{3})}/{mega (10^{6})}/{giga (10^{9})}/{tera (10^{12})}/{peta (10^{15})}/{eksa (10^{18})}
- {**ENG**}/{**ENG**} ... premakne decimalno mesto prikazane vrednosti za tri številke v {levo}/{desno} in {zmanjša}/{poveča} eksponent za tri.

  Pri uporabi inženirske notacije se ustrezno spremeni tudi inženirski simbol.
  - Menijske operacije {ENG} in {ENG} so na voljo le, če je na zaslonu prikazan rezultat izračuna.

Enote kota

- V nastavitvenem zaslonu obvezno določite Comp za Mode.

Primer	Operacija
Za pretvorbo 4,25 rad v stopinje:	!m(SET UP)②②②②②②* 1 (Deg) J
243,5070629	
47,3° + 82,5rad = 4774,20181	
2°20´30˝ + 39´30˝ = 3°00´00˝	2K6(g)5(ANGL)**4(° ’ ”) 204(° ’ ”) 30 4(° ’ ”)+04(° ’ ”)394(° ’ ”) 304(° ’ ”)w 5(°’”)
2,255° = 2°15´18˝	

* fx-7400GIII: ②②②②② ** fx-7400GIII: 4(ANGL)

Trigonometrične in inverzne trigonometrične funkcije

- Pred izvedbo trigonometričnih in inverznih trigonometričnih funkcij je treba nastaviti enoto kota.

(90° = $\frac{\pi}{2}$ radianov = 100 stopinj)

• V nastavitvenem zaslonu obvezno določite Comp za Mode.

Primer	Operacija
cos ($\frac{\pi}{3}$ rad) = 0,5	!m(SET UP)②②②②②②*2(Rad)J c(!5(π)/3)w
2 • sin 45°× cos 65° = 0,5976724775	!m(SET UP)②②②②②②*1 (Deg)J 2*s45*c65w*1
$\sin^{-1} 0,5 = 30°$ (x, ko je $\sin x$ = 0,5)	! s (sin⁻¹) 0,5*2 w

*1 × se lahko izpusti.

*2 Vnos vodilne ničle ni potreben.

* fx-7400GIII: ②②②②②

■ Logaritemske in eksponentne funkcije

• V nastavitvenem zaslonu obvezno določite Comp za

Primer	Operacija
log 1,23 (log101,23) = 0,08990511144	l1,23w
log28 = 3	K4(CALC)*6(g)4(loga b)2,8)w
$10^{1,23}$ = 16,98243652 (Za pridobitev antilogaritma navadnega logaritma 1,23)	! l (10ˣ) 1,23w
$e^{4,5}$ = 90,0171313 (Za pridobitev antilogaritma naravnega logaritma 4,5)	! I (e^x) 4,5w
$(–3)^4$ = (–3)× (–3)× (–3)× (–3) = 81	(-3)M4w
$\sqrt[7]{123}$ (= $123^{\frac{1}{7}}$) = 1,988647795	7!M($\sqrt[x]{\ }$)123w

* fx-7400GIII: 3(CALC)

• Linearni način vnosa/iznosa in matematični način vnosa/iznosa dajejo različne rezultate, ko sta v seriji vneseni dve ali več potenc, na primer: 2 M 3 M 2.

Linearni način vnosa/iznosa: 2^3^2 = 64 **Način matematičnega vnosa/iznosa:** 2^{3^2} = 512

To je zato, ker matematični način vnosa/iznosa notranje obravnava zgornji vnos kot:

■ Hiperbolične in obratne hiperbolične funkcije

• V nastavitvenem zaslonu obvezno določite Comp za Mode.

Primer	Delovanje

sinh 3,6 = 18,28545536	K6(g)2(HYP)*1(sinh) 3,6w
$\cosh^{-1}\left(\frac{20}{15}\right)$ = 0,7953654612	K6(g)2(HYP)*5(cosh^{-1}) (20/15) w

* fx-7400GIII: 1(HYP)

■ Druge funkcije

• V nastavitvenem zaslonu obvezno določite Comp za Mode.

Primer	Operacija
$\sqrt{2}+\sqrt{5}$ = 3,65028154	!x(√)2+!x(√)5w*1
$(-3)^2$ = (–3)× (–3) = 9	(-3)xw (3!)(x^{-1})
$\dfrac{1}{\dfrac{1}{3}-\dfrac{1}{4}}$ = 12	)-4!)(x^{-1}))!)(x^{-1})w
8! (= 1× 2× 3×........ × 8) = 40320	8K6(g)3(PROB)*1(x!)w
$\sqrt[3]{36 \times 42 \times 49}$ = 42	!(($\sqrt[3]{\ }$))(36*42*49)w*2
Kakšna je absolutna vrednost logaritma s podlago $\frac{3}{4}$? $\left\vert \log \frac{3}{4} \right\vert$ = 0,1249387366	K6(g)4(NUM)**1(Abs)l(3/4)w*3
Kakšen je celoštevilčni del – 3,5? – 3	
Kakšen je decimalni del – 3,5? – 0,5	
Katero je najbližje celo število, ki ne presega – 3,5? 4	

* fx-7400GIII: 2(PROB) ** fx-7400GIII: 3(NUM)

*1 fx-9860GIII/fx-9750GIII: Delovanje v linearni vnosni/izhodni način. V matematičnem vnosnem/izhodnem načinu uporabite naslednjo operacijo:
!x(√)2e+!x(√)5wf

*2 fx-9860GIII/fx-9750GIII: Delovanje v linearni vnosni/izhodni način. V matematičnem vnosnem/izhodnem načinu uporabite naslednjo operacijo: !(($\sqrt[3]{\ }$))36*42*49w

*3 fx-9860GIII/fx-9750GIII: Delovanje v linearni vnosni/iznosni način. V matematičnem vnosnem/iznosnem načinu uporabite naslednjo operacijo:
4(MATH)3(Abs)l'3②4w

■ Generiranje naključnih števil (RAND)

u Generiranje naključnih števil (0 do 1) (Ran#, RanList#)

Ran# in RanList# naključno ali zaporedno generirajo 10-mestna naključna števila od 0 do 1. Ran# vrne eno naključno število, RanList# pa vrne več naključnih števil v obliki seznama. Spodaj je prikazana sintaksa Ran# in RanList#.

Ran# [a] $\quad 1 < a < 9$

RanList# (n [,a]) $\quad 1 < n < 999$

• n je število poskusov. RanList# generira število naključnih števil, ki ustreza n, in jih prikaže na zaslonu ListAns. Za n je treba vnesti vrednost.

• „a” je zaporedje naključnosti. Če za „a” ni vneseno nič, se vrnejo naključna števila. Če za a vnesete celo število od 1 do 9, se vrne ustrezno zaporedno naključno število.

• Izvedba funkcije Ran# 0 inicializira zaporedja Ran# in RanList#. Zaporedje se inicializira tudi, ko se z Ran# ali RanList# generira zaporedno naključno število z drugačnim zaporedjem od prejšnje izvedbe ali ko se generira naključno število.

Primeri Ran#

Primer	Operacija
Ran# (Generira naključno število.)	K6(g)3(PROB)*4(RAND) 1(Ran#)w
(Vsaka pritisk na w ustvari novo naključno število.)	w w
Ran# 1 (Ustvari prvo naključno število v zaporedju 1.)	K6(g)3(PROB)*4(RAND) 1(Ran#)1w
(Generira drugo naključno število v zaporedju 1.)	w
Ran# 0 (Inicializira zaporedje.)	1(Ran#)0w
Ran# 1 (Generira prvo naključno število v zaporedju 1.)	1(Ran#)1w

* fx-7400GIII: 2(PROB)

RanList# Primeri

Primer	Operacija
RanList# (4) (Generira štiri naključna števila in prikaže rezultat na zaslonu ListAns.)	K6(g)3(PROB)*4(RAND)5(List) 4)w
RanList# (3, 1) (Generira prvo do tretje naključno število zaporedja 1 in prikaže rezultat na zaslonu ListAns.)	JK6(g)3(PROB)*4(RAND) 5(Seznam)3,1)w
(Nato generira od četrtega do šestega naključnega števila zaporedja 1 in prikaže rezultat na zaslonu ListAns.)	Jw
Ran# 0 (Inicializira zaporedje.)	J1(Ran#) 0w
RanList# (3, 1) (Ponovno generira od prvega do tretjega naključnega števila zaporedja 1 in prikaže rezultat na zaslonu ListAns.)	5(List)3,1)w

* fx-7400GIII: 2(PROB)

u Naključno generiranje celih števil (RanInt#)

RanInt# generira naključna cela števila, ki ležijo med dvema določenima

celima številoma. RanInt# (A, B [,n]) A < B |A|,|B| <

1E10 B – A < 1E10 1 < n < 999

- A je začetna vrednost, B pa končna vrednost. Če vrednost n ni navedena, se vrne naključno generirano
številko. Če določite vrednost za n, se vrne določeno število naključnih vrednosti v obliki seznama.

Primer	Operacija
RanInt# (1, 5) (Generira eno naključno celo število med 1 in 5.)	K6(g)3(PROB)*4(RAND)2(Int) 1,5)w
RanInt# (1, 10, 5) (Generira pet naključnih celih števil od 1 do 10 in prikaže rezultat na zaslonu ListAns.)	K6(g)3(PROB)*4(RAND)2(Int) 1,10,5)w * fx-7400GIII: 2(PROB)

u Generiranje naključnih številk v skladu z normalno porazdelitvijo (RanNorm#)

Ta funkcija generira 10-mestno naključno število v skladu z normalno porazdelitvijo na podlagi določenih vrednosti srednje vrednosti μ in standardnega odklona σ.

RanNorm# (σ, μ [,n]) $\sigma > 0$ 1 < n < 999

- Če vrednost za n ni navedena, se vrne naključno število, kot je bilo ustvarjeno. Če je vrednost za n navedena

Primer	Operacija
RanNorm# (8, 68) (Naključno ustvari vrednost telesne dolžine, pridobljeno v skladu z normalno porazdelitvijo skupine dojenčkov, mlajših od enega leta, s povprečno telesno dolžino 68 cm in standardnim odklonom 8.)	K6(g)3(PROB)*4(RAND)3(Norm) 8,68)w
RanNorm# (8, 68, 5) (Naključno generira dolžine teles petih dojenčkov v zgornjem primeru in jih prikaže v seznamu.)	K6(g)3(PROB)*4(RAND)3(Norm) 8,68,5)w * fx-7400GIII: 2(PROB)

u Generiranje naključnih številk v skladu z binomialno porazdelitvijo (RanBin#)

Ta funkcija generira naključna cela števila v skladu z binomialno porazdelitvijo na podlagi vrednosti, določenih za število poskusov n in verjetnost p.

RanBin# (n, p [,m]) $1 < n < 100000$ $1 < m < 999$ $0 < p < 1$

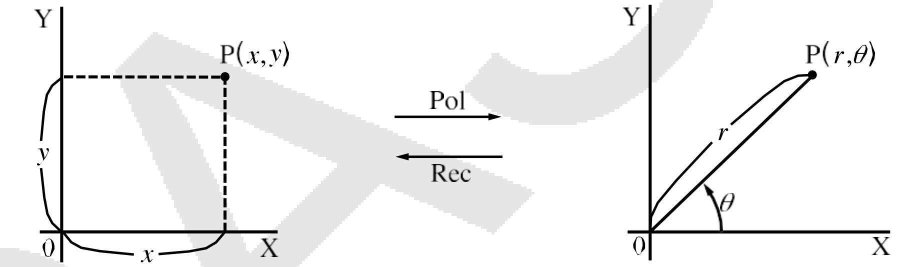
- Če vrednost za m ni navedena, se vrne naključno generirano število takšno, kot je. Če je vrednost za m navedena
  vrne določeno število naključnih vrednosti v obliki seznama.

Primer	Operacija
RanBin# (5, 0,5) (Naključno proizvede število glav, ki se lahko pričakuje v skladu z binomialno porazdelitvijo za pet metov kovanca, pri čemer je verjetnost glave 0,5.)	K6(g)3(PROB)*4(RAND)4(Bin) 5, 0,5) w
RanBin# (5, 0,5, 3) (Trikrat izvede isto zaporedje metov kovanca, kot je opisano zgoraj, in prikaže rezultate v seznamu.)	K6(g)3(PROB)*4(RAND)4(Bin) 5, 0,5, 3) w

* fx-7400GIII: 2(PROB)

■ Pretvorba koordinat

u **Pravokotne koordinate** u **Polarne**



- S polarnimi koordinatami je mogoče izračunati in prikazati 8 v območju
  –180°< 8 < 180° (radiani in gradi imajo enak razpon).
  - V nastavitvenem zaslonu obvezno določite Comp za

Primer	Delovanje
Izračunajte r in 8°, ko je x = 14 in y = 20,7. 1 [24,989] → 24,98979792 (r) 2 55,928 → 55,92839019 (θ)	!m(SET UP)②②②②②②* 1 (Deg) J K6(g)5(ANGL)**6(g)1(Pol() 14, 20.7) wJ
Izračunajte x in y, če je r = 25 in 8 = 56°. 1 [13,979] → 13,97982259 (x) 2 20,725 → 20,72593931 (y)	2(Rec() 25, 56) w

* fx-7400GIII: ②②②②② ** fx-7400GIII: 4(ANGL)

■ Permutacija in kombinacija

u **Permutacija**

$$nPr = \frac{n!}{(n-r)!}$$

u **Kombinacija**

$$nCr = \frac{n!}{r!\,(n-r)!}$$

• V nastavitvenem oknu obvezno določite Comp za Mode.

Primer 1 **Za izračun možnega števila različnih razporeditev z uporabo 4 elementov, izbranih izmed 10 elementov**

Formula	Operacija
$_{10}P_4$ = 5040	10K6(g)3(PROB)*2(*nPr*) 4w

* fx-7400GIII: 2(PROB)

Primer 2 **Izračun možnega števila različnih kombinacij 4 elementov, ki jih je mogoče izbrati med 10 elementi**

Formula	Operacija
$_{10}C_4$ = 210	10K6(g)3(PROB)*3(*nCr*) 4w

* fx-7400GIII: 2(PROB)

■ Največji skupni delitelj (GCD), najmanjši skupni večkratnik (LCM)

Primer	Operacija
Za določitev največjega skupnega delitelja številk 28 in 35 (GCD (28, 35) = 7)	K6(g)4(NUM)*6(g)2(GCD)28, 35)w
Za določitev najmanjšega skupnega večkratnika števil 9 in 15 (LCM (9, 15) = 45)	K6(g)4(NUM)*6(g)3(LCM)9,15)w

* fx-7400GIII: 3(NUM)

■ Ostanek deljenja (MOD), ostanek eksponentnega deljenja (MOD Exp)

Primer	Operacija
Določitev ostanka, ko je 137 deljeno z 7 (MOD (137, 7) = 4)	K6(g)4(NUM)*6(g)4(MOD)137,7)w
Za določitev ostanka, ko je 5^3 je deljeno s 3 (MOD・E (5, 3, 3) = 2)	K6(g)4(NUM)*6(g)5(MOD・E) 5,3,3)w

* fx-7400GIII: 3(NUM)

■ Ulomki

- V načinu matematičnega vnosa/izpisa se način vnosa ulomkov razlikuje od tistega, ki je opisano spodaj. Za operacije vnosa ulomkov v načinu matematičnega vnosa/izpisa glejte stran 1-12.
- V nastavitvenem zaslonu obvezno določite Comp za Mode.

Primer	Operacija
$\frac{2}{5} + 3\frac{1}{4} = \frac{73}{20}$	2'*5+3'*1'*4w
= 3,65 (Pretvorba v decimalno število)*1	f**
$\frac{1}{2578} + \frac{1}{4572} = 6{,}066202547 \times 10^{-4}$ *2	1'*2578+1'*4572w
$\frac{1}{2} \times 0{,}5 = 0{,}25$*3	1'*2*.5w

* fx-7400GIII: v ** fx-7400GIII: F

*1 Ulomke je mogoče pretvoriti v decimalne vrednosti in obratno.

*2 Kadar skupno število znakov, vključno s celim številom, številčnikom, imenovalcem in ločilom v vmesnem ali končnem izračunu, presega 10, se ulomek samodejno prikaže v decimalnem formatu. (10-mestni primer: 1{1{123456)

*3 Izračuni, ki vsebujejo ulomke in decimalne vrednosti, se izračunajo v decimalnem formatu.

- S pritiskom na tipko !< lahko preklopite med prikazom mešanega ulomka in nepravilnega ulomka.

  * fx-7400GIII: F

■ Izračuni v inženirski notaciji

Vnesite inženirske simbole z uporabo menija inženirske notacije.

- V nastavitvenem zaslonu obvezno določite Comp za Mode.

Primer	Operacija
999k (kilo) + 25k (kilo) = 1,024M (mega)	!m(SET UP)ff4(Eng)J999K6(g)6(g)
9÷ 10 = 0,9 = 900 m (mili) = 0,9	9/10w K6(g)6(g)1(ESYM)*6(g)6(g)3(ENG)*1
= 0,0009k (kilo) = 0,9 = 900m	3(ENG)*1 2(ENG)*2 2(ENG)*2

* fx-7400GIII: 5(ESYM)

*1 Prenese prikazano vrednost v naslednjo višjo inženirsko enoto, tako da decimalno vejico premakne za tri mesta v desno.

*2 Pretvori prikazano vrednost v naslednjo nižjo inženirsko enoto, tako da decimalno vejico premakne za tri mesta v levo.

■ Logični operaterji (AND, OR, NOT, XOR) **[OPTN]-[LOGIC]**

Meniju logičnih operatorjev ponuja izbiro logičnih operatorjev.

- {**And**}/{**Or**}/{**Not**}/{**Xor**} ... {logični AND}/{logični OR}/{logični NOT}/{logični XOR}
- V nastavitvenem zaslonu obvezno določite Comp za Mode.

Primer **Kaj je logični AND A in B, če je A = 3 in B = 2?**
A AND B = 1

Operacija	Prikaz
3aav(A)w 2aal(B)w av(A)K6(g)6(g) 4(LOGIC)*1(And)al(B)w	1

* fx-7400GIII: 3(LOGIC)

u O logičnih operacijah

- Logična operacija vedno da kot rezultat 0 ali 1.
- V naslednji tabeli so prikazani vsi možni rezultati, ki jih lahko proizvedejo operacije AND, OR in XOR.

Vrednost ali izraz A	Vrednost ali izraz B	A IN B	A ALI B	A XOR B
A≠ 0	B≠ 0	1	1	0
A≠ 0	B = 0	0	1	1
A = 0	B≠ 0	0	1	1
A = 0	B = 0	0	0	0

- Naslednja tabela prikazuje rezultate, ki jih ustvari operacija NOT.

Vrednost ali izraz A	NE A
≠ 0	0
A = 0	1

5. Numerični izračuni

V nadaljevanju so pojasnjene numerične računske operacije, vključene v meniju funkcij, ki se prikaže, ko pritisnete K4(CALC) (3(CALC) na fx-7400GIII). Izvesti je mogoče naslednje izračune.

- {**Int÷**}/{**Rmdr**}/{**Simp**} ... {kvocient}/{ostanek}/{poenostavitev}
- {**Solve**}/{***d/dx***}/{***d*² */dx*²** }/{∫ ***dx***}/{**SolvN**} ... {enakovredna rešitev}/{diferencialna funkcija}/{kvadratna diferencialna funkcija}/
  {integracija}/{rešitev funkcije $f(x)$}
- {**FMin**}/{**FMax**}/{Σ **(**}/{**log$_a$b**} ... {minimalna vrednost}/{maksimalna

vrednost}/{vsota}/{logaritem $\log_a b$}

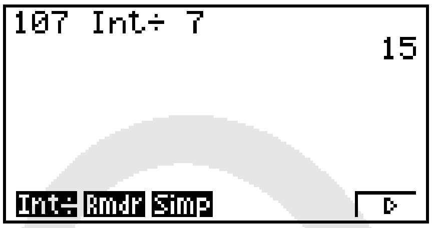
■ Kvocient celega števila ÷ celo število [OPTN]-[CALC]-[Int÷]

Funkcijo „Int÷“ lahko uporabite za določitev količnika, ko eno celo število delite z drugim celim številom.

Primer **Za izračun količnika 107 ÷ 7**

AC b 0 hK4(CALC)*6(g)
6(g)1(Int÷)h
w

* fx-7400GIII: 3(CALC)



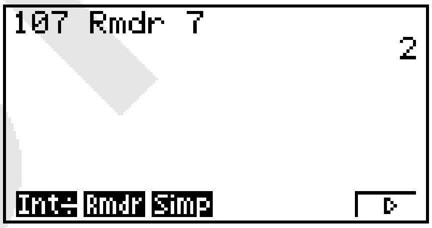
■ Ostanek celega števila ÷ celo število [OPTN]-[CALC]-[Rmdr]

Funkcijo „Rmdr“ lahko uporabite za določitev ostanka, ko eno celo število delite z drugim celim številom.

Primer **Za izračun ostanka 107 ÷ 7**

AC b 0 hK4(CALC)*6(g)
6(g)2(Rmdr)h
w

* fx-7400GIII: 3(CALC)



■ Poenostavitev [OPTN]-[CALC]-[Simp]

Funkcijo „Simp“ lahko uporabite za ročno poenostavitev ulomkov. Naslednje operacije lahko uporabite za poenostavitev, ko je na zaslonu prikazan nepoenostavljen izračun.

- {**Simp**} w ... Ta funkcija samodejno poenostavi prikazani izračunani rezultat z uporabo najmanjšega razpoložljivega praštevilskega števila. Uporabljeno praštevilsko število in poenostavljeni rezultat sta prikazana na zaslonu.
- {**Simp**} n w ... Ta funkcija izvede poenostavitev v skladu z določenim deliteljem n.

V začetnih privzetih nastavitvah ta kalkulator samodejno poenostavi rezultate izračuna ulomkov, preden jih prikaže. Preden izvedete naslednje primere, v nastavitvenem zaslonu spremenite nastavitev „Poenostavi“ iz „Samodejno“ v „Ročno“ (stran 1-33).

- Ko je v nastavitvah zaslona »Complex Mode« (Kompleksni način) določeno »a+bi« ali »r$\angle\theta$«, se rezultati izračuna ulomkov vedno poenostavijo, preden se prikažejo, tudi če je nastavitev »Simplify« (Poenostavi) »Manual« (Ročno).
- Če želite ročno poenostaviti ulomke (Poenostavi: Ročno), se prepričajte, da je za nastavitev „Kompleksni način“ izbrana možnost „Realno“.

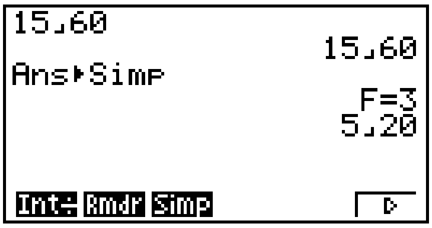
Primer 1 **Za poenostavitev** $\frac{15}{60}$ $\left(\frac{15}{60}=\frac{5}{20}=\frac{1}{4}\right)$

AC b f' * 6 0 w

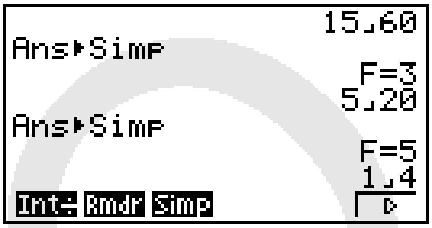
K4(CALC)**6(g)6(g)3(Simp)w

* fx-7400GIII: v

** fx-7400GIII: 3(CALC)



3(Simp)w



Vrednost „F=” je delitelj.

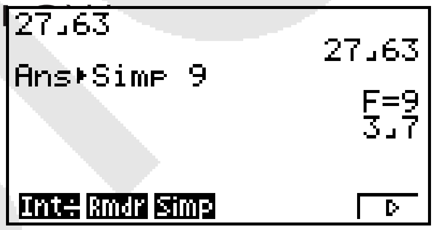
Primer 2 **Za poenostavitev** $\frac{27}{63}$ **določitev delitelja 9** $\left(\frac{27}{63}=\frac{3}{7}\right)$

AC c h ' * 6 dwK4(CALC)**

6(g)6(g)3(Simp)jw

* fx-7400GIII: v

** fx-7400GIII: 3(CALC)



- Če poenostavitev ni mogoča z uporabo navedenega delitelja, se pojavi napaka.
- Če izvedete 'Simp, medtem ko je prikazana vrednost, ki je ni mogoče poenostaviti, se vrne prvotna vrednost, brez prikaza „F=“.

■ Rešite izračune

Spodaj je navedena sintaksa za uporabo funkcije Solve v programu.

Solve($f(x)$, n, a, b) (a: spodnja meja, b: zgornja meja, n: začetna ocenjena vrednost)

Za izračune Solve lahko uporabite dve različni metodi vnosa: neposredno dodelitev in vnos tabele spremenljivk.

Pri metodi neposrednega dodeljevanja (ki je opisana tukaj) vrednosti dodeljujete neposredno spremenljivkam. Ta vrsta vnosa je enaka tisti, ki se uporablja pri ukazu Solve v načinu **PRGM**.

Vnos tabele spremenljivk se uporablja s funkcijo Solve v načinu **EQUA**. Ta metoda vnosa je priporočljiva za večino običajnih vnosov funkcije Solve.

Napaka (Time Out) se pojavi, ko rešitev ni konvergentna. Za informacije

o izračunih Solve glejte stran 4-4.

- V nobeni od zgornjih funkcij ne morete uporabiti kvadratnega diferenciala, Σ , največje/najmanjše vrednosti ali izraza Solve.
  izraz znotraj katere koli od zgornjih funkcij.
- Če med izračunom Solve pritisnete AC (ko kurzor ni prikazan na zaslonu), se izračun prekine.

■ Reševanje funkcije $f(x)$

SolvN lahko uporabite za reševanje funkcije $f(x)$ z numerično analizo. Spodaj je navedena sintaksa vnosa.

SolveN (leva stran [=desna stran] [,spremenljivka] [, spodnja meja, zgornja meja])

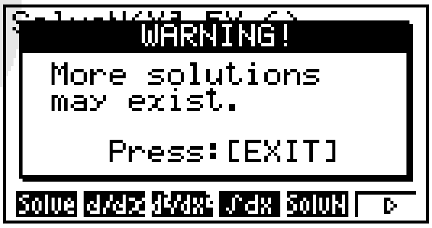
- Desno stran, spremenljivko, spodnjo mejo in zgornjo mejo je mogoče izpustiti.
- „Leva stran [= desna stran]” je izraz, ki ga je treba rešiti. Podprte spremenljivke so A do Z, r in θ . Kadar je desna stran izpuščena, se rešitev izvede z desno stranjo = 0.
- Spremenljivka določa spremenljivko znotraj izraza, ki ga je treba rešiti (od A do Z, r, θ). Če se spremenljivka izpusti, se kot spremenljivka uporabi X.
- Spodnja in zgornja meja določata območje rešitve. Kot območje lahko vnesete vrednost ali izraz.
- Naslednje funkcije ni mogoče uporabiti v nobenem od argumentov.
  Solve(, d^2/dx^2 (, FMin(, FMax(,Σ (

Hkrati se lahko prikaže do 10 rezultatov izračuna v formatu ListAns.
- Če rešitev ne obstaja, se prikaže sporočilo »No Solution« (Ni rešitve).
- Če obstajajo še druge rešitve poleg tistih, ki jih prikaže SolvN, se prikaže sporočilo »More solutions may exist.« (Obstajajo lahko še druge rešitve).

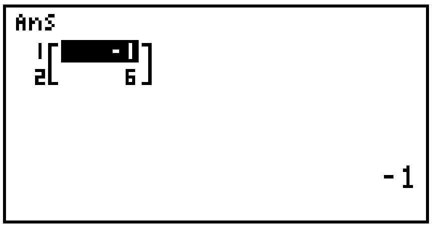
Primer **Rešitev $x^2 - 5x - 6 = 0$**

K4(CALC)*5(SolvN)
vx-fv-6)w

* fx-7400GIII: 3(CALC)



J



■ Diferencialni izračuni

[OPTN]-[CALC]-[d/dx]

Za izvedbo diferencialnih izračunov najprej prikažite meni za analizo funkcij, nato pa vnesite vrednosti z uporabo spodnje sintakse.

K4(CALC)* 2(d/dx) $f(x)$, a, tol) * fx-7400GIII: 3(CALC)

(a: točka, za katero želite določiti odvod, tol: toleranca)

$$d/dx\,(f(x), a) \Rightarrow \frac{d}{dx} f(a)$$

Diferencial za ta tip izračuna je definiran kot:

$$f'(a) = \lim_{Ax \to 0} \frac{f(a + Ax) - f(a)}{Ax}$$

V tej definiciji je *infinitezimal* nadomeščen z *dovolj majhnim* Ax, pri čemer je vrednost v okolici $f'(a)$ izračunana kot:

$$f'(a)\ 6\ \frac{f(a + Ax) - f(a)}{Ax}$$

Da bi zagotovili največjo možno natančnost, ta enota uporablja centralno razliko za izvajanje diferencialnih izračunov.

Primer **Za določitev odvodne funkcije v točki x = 3 za funkcijo $y = x^3 + 4x^2 + x - 6$, s toleranco „tol“ = 1E – 5**

Vnesite funkcijo $f(x)$.

AC K4(CALC)* 2(*d*/*dx*)vMd4 □vx+v-6 ,

* fx-7400GIII: 3(CALC)

Vnesite točko $x = a$, za katero želite določiti odvod.

d,

Vnesite vrednost tolerance.

b5-f)w

Uporaba diferencialnega izračuna v grafični funkciji

- Če pri uporabi diferencialnega ukaza znotraj grafične funkcije izpustite vrednost tolerance (*tol*), se poenostavi izračun za risanje grafa. V takem primeru se natančnost žrtvuje za hitrejše risanje. Če je vrednost tolerance določena, se graf riše z enako natančnostjo, kot jo dobite pri običajnem izračunu diferenciala.
- Vnos derivativne točke lahko izpustite tudi z uporabo naslednjega formata za diferencialni graf: *Y2=d/dx*(Y1). V tem primeru se kot derivativna točka uporabi vrednost spremenljivke X.

Previdnostni ukrepi pri diferencialnem izračunu

- V funkciji $f(x)$ se v izrazih kot spremenljivka lahko uporablja samo X. Druge spremenljivke (A do Z, razen X, r, 8) se obravnavajo kot konstante, pri izračunu pa se uporabi vrednost, ki je trenutno dodeljena tej spremenljivki.
- Vnos vrednosti tolerance (*tol*) in zapirnega oklepaja se lahko izpusti. Če izpustite vrednost tolerance (*tol*), kalkulator samodejno uporabi vrednost za *tol* kot 1E–10.
- Določite vrednost tolerance (*tol*) 1E–14 ali več. Napaka (Time Out) se pojavi, kadar ni mogoče dobiti rešitve, ki ustreza vrednosti tolerance.
- S pritiskom na tipko AC med izračunom diferenciala (ko kurzor ni prikazan na zaslonu) se izračun prekine.
- Netočni rezultati in napake lahko nastanejo zaradi naslednjih vzrokov:
  - prekinjene točke v vrednostih x
  - ekstremne spremembe vrednosti x
  - vključitev lokalne maksimalne točke in lokalne minimalne točke v vrednostih x
  - vključitev prelomne točke v vrednostih x
  - vključitev nediferenciabilnih točk v vrednostih x
  - rezultati diferencialnega izračuna, ki se približujejo ničli
- Pri izvajanju trigonometričnih diferencialov vedno uporabljajte radiane (način Rad) kot enoto kota.

- V diferencialnem izračunskem členu ne morete uporabiti diferenciala, kvadratnega diferenciala, integracije, funkcijeΣ , največje/najmanjše vrednosti, funkcije Solve, RndFix ali $\log_a b$.
- V načinu vnosa/izpisa Math je vrednost tolerance fiksna na 1E–10 in je ni mogoče spremeniti.

■ Kvadratni diferencialni izračuni [OPTN]-[CALC]-[d^2/dx^2]

Po prikazu menija za analizo funkcij lahko vnesete kvadratne diferenciale z naslednjo sintakso.

K4(CALC)*3(d^2/dx^2) $f(x)$, a, tol) * fx-7400GIII: 3(CALC)

(a: točka diferencialnega koeficienta, tol: toleranca)

$$\frac{d^2}{dx^2}(f(x), a) \Rightarrow \frac{d^2}{dx^2} f(a)$$

Kvadratni diferencialni izračuni dajejo približno diferencialno vrednost z uporabo naslednje diferencialne formule drugega reda, ki temelji na Newtonovi polinomska interpretacija.

$$f''(a) = \frac{2\,f(a+3h) - 27\,f(a+2h) + 270\,f(a+h) - 490\,f(a) + 270\,f(a-h) - 27\,f(a-2h) + 2\,f(a-3h)}{180h^2}$$

V tem izrazu se uporabijo vrednosti za „dovolj majhne povečanje h“, da se dobi vrednost, ki se približuje $f''(a)$.

Primer **Za določitev kvadratnega diferencialnega koeficienta v točki, kjer $x = 3$ za funkcijo $y = x^3 + 4x^2 + x - 6$**
Tukaj bomo uporabili toleranco tol = 1E – 5

Vnesite funkcijo $f(x)$.

AC K4(CALC)* 3(d(2) /dx(2))vMd+4 vx+v-6 ,

* fx-7400GIII: 3(CALC)

Vnesite 3 kot točko a, ki je točka diferencialnega koeficienta.

d,

Vnesite vrednost tolerance.

b5–f)

w

```
d²/dx²(X^3+4X²+X−6,3,
1E−5)
                    26
```

Kvadratni diferencialni izračun Previdnostni ukrepi

- V funkciji $f(x)$ se v izrazih kot spremenljivka lahko uporablja samo X. Druge spremenljivke (od A do Z, razen X, r, θ) se obravnavajo kot konstante, pri izračunu pa se uporabi vrednost, ki je trenutno dodeljena tej spremenljivki.
- Vnos vrednosti tolerance (tol) in zapiranje oklepaja se lahko izpustita.
- Določite vrednost tolerance (tol) 1E–14 ali več. Napaka (Time Out) se pojavi, kadar ni mogoče dobiti rešitve, ki ustreza vrednosti tolerance.
- Pravila, ki veljajo za linearni diferencial, veljajo tudi pri uporabi kvadratnega diferencialnega izračuna za grafično formulo (glej stran 2-25).

- Netočni rezultati in napake lahko nastanejo zaradi naslednjih vzrokov:
  - diskontinuirane točke v vrednostih x
  - ekstremne spremembe vrednosti x
  - vključitev lokalne maksimalne točke in lokalne minimalne točke v vrednostih x
  - vključitev prelomne točke v vrednostih x
  - vključitev nediferenciabilnih točk v vrednostih x
  - rezultati diferencialnega izračuna, ki se približujejo ničli
- Tekoči kvadratni diferencialni izračun lahko prekinete s pritiskom na tipko AC .
- Pri izvajanju trigonometričnih kvadratnih diferencialov vedno uporabljajte radiante (način Rad) kot enoto kota.
- V kvadratnem diferencialnem izračunu ne morete uporabiti diferenciala, kvadratnega diferenciala, integracije, funkcije »Σ «, največje/najmanjše vrednosti, funkcije »Solve«, funkcije »RndFix« ali $\log_a b$.
- Pri kvadratnem diferencialnem izračunu je natančnost izračuna do pet mest za mantiso.
- V načinu vnosa/izpisa Math je vrednost tolerance fiksna na 1E–10 in je ni mogoče spremeniti.

■ Izračuni integracije

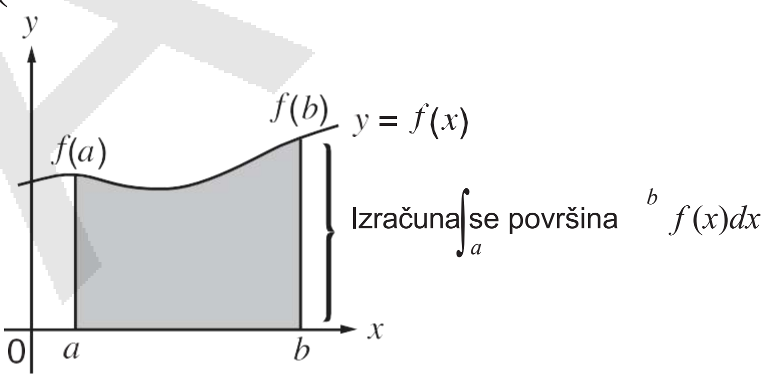
[OPTN]-[CALC]-[∫ *dx*]

Za izvedbo integracijskih izračunov najprej prikažite meni za analizo funkcij in nato vnesite vrednosti z uporabo spodnje sintakse.

K4(CALC)* 4(∫ *dx*) *f*(*x*) , *a* , *b* , *tol*) * fx-7400GIII: 3(CALC)

(a: začetna točka, b: končna točka, tol: toleranca)

$$\int(f(x), a, b, tol) \Rightarrow \int_a^b f(x)dx$$



Kot je prikazano na zgornji sliki, se integracijski izračuni izvedejo z izračunom integralnih vrednosti od a do b za funkcijo $y = f(x)$, kjer je $a < x < b$ in $f(x) > 0$. S tem se izračuna površina senčene površine na sliki.

Primer 1 **Za izvedbo integracijskega izračuna za spodaj prikazano funkcijo, s toleranco „tol“ = 1E – 4**

$$\int_1^5 (2x^2 + 3x + 4)\, dx$$

Vnesite funkcijo $f(x)$.

AC K4(CALC)* 4(∫ *dx*) cvx+dv+4 ,

* fx-7400GIII: 3(CALC)

Vnesite začetno in končno točko.

b,f,

Vnesite vrednost tolerance.

b5-4)w

```
∫(2X²+3X+4,1,5,1E-4)
                404⌟3
```

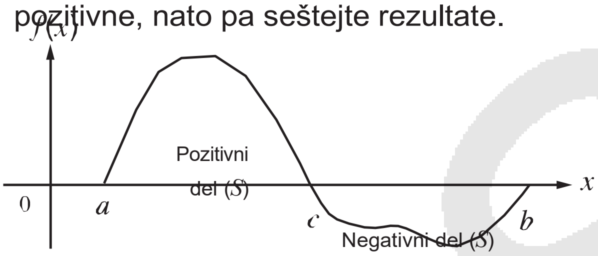
Primer 2 **Ko je nastavljena enota kota v stopinjah, se izračun integracije trigonometrične funkcije izvede z uporabo radianov (enota kota = stopinje).**

```
∫(cos Xʳ,π÷2,π)
                   -1
```

Primeri Prikaz rezultata izračuna Za

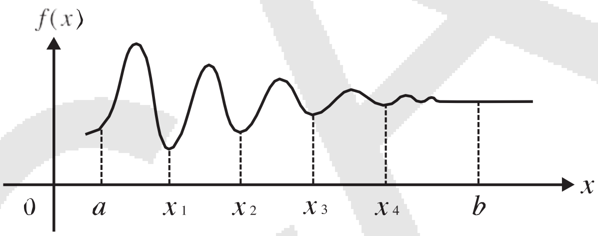
zagotovitev pravilnih vrednosti integracije upoštevajte naslednje točke.

(1) Ko ciklične funkcije za integracijske vrednosti postanejo pozitivne ali negativne za različne delitve, izvedite izračun za posamezne cikle ali razdelite med negativne in pozitivne, nato pa seštejte rezultate.



$$\int_a^b f(x)dx = \underbrace{\int_a^c f(x)dx}_{\textit{Pozitivni del (S)}} + \underbrace{\int_c^b f(x)dx}_{\textit{Negativni del (S)}}$$

(2) Ko majhna nihanja v integracijskih delitvah povzročijo velika nihanja v integracijskih vrednostih, izračunajte integracijske delitve ločeno (velika nihanja razdelite na manjše delitve) in nato seštejte rezultate.



$$\int_a^b f(x)dx = \int_a^{x_1} f(x)dx + \int_{x_1}^{x_2} f(x)dx + \ldots..$$
$$+ \int_{x_4}^b f(x)dx$$

- Če med izračunavanjem integrala pritisnete AC (ko kurzor ni prikazan na zaslonu), se izračun prekine.
- Pri izvajanju trigonometričnih integracij vedno uporabljajte radiante (način Rad) kot enoto kota.
- Napaka (Time Out) se pojavi, kadar ni mogoče dobiti rešitve, ki bi ustrezala tolerančni vrednosti.

Previdnostni ukrepi pri izračunu integracije

- Ker se uporablja numerično integracijo, lahko pride do velikih napak v izračunanih integracijskih vrednostih zaradi vsebine $f(x)$, pozitivnih in negativnih vrednosti znotraj integracijskega intervala ali intervala, ki se integrira. (Primeri: kadar obstajajo deli z diskontinuiteto
točk ali nenadnih sprememb. Kadar je interval integracije preširok.) V takih primerih lahko razdelitev intervala integracije na več delov in nato izvedba izračunov izboljša natančnost izračuna.

- V funkciji $f(x)$ se v izrazih kot spremenljivka lahko uporablja samo X. Druge spremenljivke (od A do Z, razen X, r, θ) se obravnavajo kot konstante, pri izračunu pa se uporabi vrednost, ki je trenutno dodeljena tej spremenljivki.
- Vnos »tol« in zapiranje oklepaja se lahko izpustita. Če izpustite *»tol«*, kalkulator samodejno uporabi privzeto vrednost 1E–5.
- Izračuni integracije lahko trajajo dolgo.
- V izrazu za integracijo ni mogoče uporabiti diferenciala, kvadratnega diferenciala, integracije, funkcije Σ , največje/najmanjše vrednosti, funkcije Solve, RndFix ali $\log_a b$.
- V načinu vnosa/izpisa Math je vrednost tolerance fiksna na 1E–5 in je ni mogoče spremeniti.

■ Σ Izračuni **[OPTN]-[CALC]-[Σ (]**

Za izvedbo izračunov Σ najprej prikažite meni za analizo funkcij, nato pa vnesite vrednosti z uporabo spodnje sintakse.

K4(CALC)* 6(g)3(Σ ( ) a_k , k , α , β , n) * fx-7400GIII: 3(CALC)

$$\Sigma\,(a_k, k, \alpha, \beta, n) = \sum_{k=\alpha}^{\beta} a_k = a_\alpha + a_{\alpha+1} + ... + a_\beta$$

(n: razdalja med particijami)

Primer **Za izračun naslednjega:**

$$\sum_{k=2}^{6}(k^2 - 3k + 5)$$

Uporabite n = 1 kot razdaljo med particijami.

AC K4(CALC)*6(g)3(Σ ( )a , (K) x - d a , (K) + f , a , (K) , c , 6 , b) w

```
Σ(K²-3K+5,K,2,6,1)
                55
```

* fx-7400GIII: 3(CALC)

Σ Previdnostni ukrepi pri izračunih

- Vrednost določene spremenljivke se spremeni med izračunom Σ . Pred izračunom poskrbite, da imate ločene pisne zapise vrednosti določenih spremenljivk, ki jih boste morda potrebovali kasneje.
- V funkciji za vhodno zaporedje a_k lahko uporabite samo eno spremenljivko.
- Vnesite celoštevilčne vrednosti samo za začetni člen (α) zaporedja a_k in zadnji člen (β) zaporedja a_k.
- Vnos n in zapirnih oklepajev se lahko izpusti. Če izpustite n, kalkulator samodejno uporabi n = 1.
- Prepričajte se, da je vrednost, uporabljena kot končni člen β , večja od vrednosti, uporabljene kot začetni člen α . V nasprotnem primeru bo prišlo do napake.
- ΣČe želite prekiniti tekoče izračunavanje n-tega člena (kar je označeno, ko kurzor ni na zaslonu), pritisnite tipko AC .
- V izračunskem členu Σ ne morete uporabiti izraza za diferencial, kvadratni diferencial, integracijo, Σ , največjo/najmanjšo vrednost, Solve, RndFix ali $\log_a b$.
- V načinu matematičnega vnosa/iznosa je razdalja med particijami (n) fiksna in znaša 1, spreminjati je ni mogoče.

Izračuni največje/najmanjše vrednosti

Po prikazu menija za analizo funkcij lahko vnesete izračune največje/najmanjše vrednosti v spodnjih oblikah in izračunate največjo in najmanjšo vrednost funkcije v intervalu $a < x < b$.

u **Minimalna vrednost**

K4(CALC)* 6(g)1(FMin) $f(x)$, a , b , n) * fx-7400GIII: 3(CALC)

(a: začetni točki intervala, b: končni točki intervala, n: natančnost (n = 1 do 9))

u **Največja vrednost**

K4(CALC)* 6(g)2(FMax) $f(x)$, a , b , n) * fx-7400GIII: 3(CALC)

(a: začetna točka intervala, b: končna točka intervala, n: natančnost (n = 1 do 9))

Primer **Za določitev minimalne vrednosti za interval, opredeljen z začetkom točka a = 0 in končna točka b = 3, z natančnostjo n = 6 za funkcijo $y = x^2 - 4x + 9$**

Vnesite $f(x)$.

AC K4(CALC)* 6(g)1(FMin)vx-4 v+j,

* fx-7400GIII: 3(CALC)

Vnesite interval a = 0, b = 3.

0 ,d,

Vnesite natančnost n = 6.

6)w

- V funkciji $f(x)$ se v izrazih kot spremenljivka lahko uporablja samo X. Druge spremenljivke (od A do Z, razen X, r, θ) se obravnavajo kot konstante, pri izračunu pa se uporabi vrednost, ki je trenutno dodeljena tej spremenljivki.
- Vnos n in zapirni oklepaj se lahko izpustita.
- Prekinjene točke ali odseki z drastičnimi nihanji lahko negativno vplivajo na natančnost ali celo povzročijo napako.
- Vnos večje vrednosti za n poveča natančnost izračuna, vendar tudi podaljša čas, potreben za izvedbo izračuna.
- Vrednost, ki jo vnesete za končno točko intervala (b), mora biti večja od vrednosti, ki jo vnesete za začetno točko (a). V nasprotnem primeru pride do napake.
- Tekoči izračun največje/najmanjše vrednosti lahko prekinete s pritiskom na tipko AC .
- Za vrednost n lahko vnesete celo število v območju od 1 do 9. Uporaba katere koli vrednosti zunaj tega območja povzroči napako.
- ΣV izrazu za izračun največje/najmanjše vrednosti ne morete uporabiti izraza za izračun diferenciala, kvadratnega diferenciala, integracije, največje/najmanjše vrednosti, rešitve, RndFix ali $\log_a b$.

6. Izračuni kompleksnih števil

Z kompleksnimi številkami lahko izvajate seštevanje, odštevanje, množenje, deljenje, izračune v oklepajih, izračune funkcij in izračune iz pomnilnika, tako kot pri ročnih izračunih, opisnih na straneh 2-1 do 2-16.

Način izračuna kompleksnih števil lahko izberete tako, da na zaslonu Nastavitve spremenite postavko Kompleksni način na eno od naslednjih nastavitev.

- {**Real**} ... Izračun samo v območju realnih števil*1
- {***a*+*bi***} ... Izvede izračun kompleksnih števil in prikaže rezultate v pravokotni obliki
- {*r*∠ *8*} ... Izvede izračun kompleksnih števil in prikaže rezultate v polarni obliki*2

*1 Kadar je v argumentu imaginarno število, se izvede izračun kompleksnega števila in rezultat se prikaže v pravokotni obliki.

Primeri:

ln ***2i*** = 0,6931471806 + 1,***570796327i***

ln ***2i*** + ln (– 2) = (Nerealna NAPAKA)

*2 Prikazni razpon *8* je odvisen od enote kota, nastavljene za element Kot na zaslonu Nastavitve.

- Stopinje ... –180 < *8* < 180
- Rad ... –π < 8< π
- Gra ... –200 < *8* < 200

Pritisnite K3(CPLX) (K2(CPLX) na fx-7400GIII), da prikažete meni za kompleksne izračune, ki vsebuje naslednje elemente.

- {***i***} ... {vnos imaginarne enote ***i***}
- {**Abs**}/{**Arg**} ... pridobi {absolutno vrednost}/{argument}
- {**Conj**} ... {pridobi konjugat}
- {**ReP**}/{**ImP**} ... izvleče {realni}/{imaginaren} del
- {'*r*∠ *8*}/{***'a*+*bi***} ... pretvori rezultat v {polarno}/{pravokotno} obliko

- Namesto K3(CPLX) (K2(CPLX) na fx-7400GIII) lahko uporabite tudi ! 0 (***i***). 1(***i***).
- Rešitve, dobljene z načini Real, ***a*+*bi*** in *r*∠ *8*, se razlikujejo pri izračunih potenčnega korena, kadar je *x* < 0 in *y* = *m/n,* kadar je *n* liho število.

  Primer: (– 8) = – 2 (Real)
  = 1 + 1,***732050808i*** (***a*+*bi***)
  = 2∠ 60 (*r*∠ *8*)
- Za vnos operatorja „ ∠ " v polarni koordinatni izraz (*r*∠ *8*) pritisnite !v(∠).

■ Aritmetične operacije **[OPTN]-[CPLX]-[*i*]**

Aritmetične operacije so enake tistim, ki jih uporabljate za ročne izračune. Uporabljate lahko celo oklepaje in pomnilnik.

Primer **(1 + 2*i*) + (2 + 3*i*)**

A K3(CPLX)*
(b+c1 (*i*))
+(c+d1 (*i*))w
* fx-7400GIII: 2(CPLX)

```
(1+2i)+(2+3i)
                3+5i
```

■ Obratne vrednosti, kvadratni koreni in kvadrati

Primer $\sqrt{(3 + i)}$

A K3(CPLX)*
!x(')(d+1 (*i*))w
* fx-7400GIII: 2(CPLX)

```
√(3+i)
         1.755317302
       +0.2848487846i
```

■ Oblika kompleksnih števil v polarni obliki

Primer **2∠ 30× 3∠ 45 = 6∠ 75**

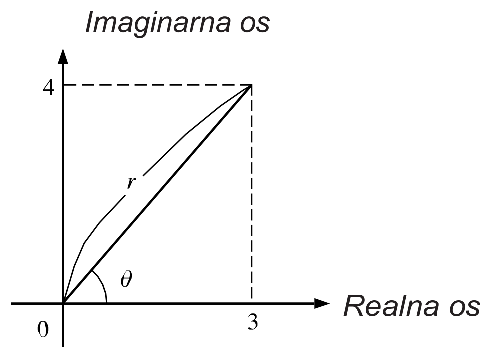
!m(SET UP)②②②②②②*
1(Deg)②3(*r*∠ *θ*)J
A c!v(∠)d0 *d
!v(∠)4 fw
* fx-7400GIII: ②②②②②

```
2∠30×3∠45
                6∠75
```

■ Absolutna vrednost in argument

Enota obravnava kompleksno število v obliki a + ***bi*** kot koordinato na Gaussovi ravnini in izračuna absolutno vrednost | Z | in argument (arg).

Primer **Izračun absolutne vrednosti (*r*) in argumenta (θ) za kompleksno število 3 + 4*i*, pri čemer je enota kota nastavljena na stopinje**

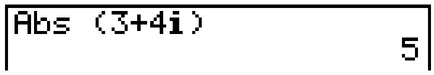


AC K3(CPLX)*2(Abs)

(d+□4 1 (i))w

(Izračun absolutne vrednosti)

* fx-7400GIII: 2(CPLX)



AC K3(CPLX)*3(Arg)

(d+□4 1 (i))w

(Izračun argumenta)

* fx-7400GIII: 2(CPLX)

- Rezultat izračuna argumenta se razlikuje glede na trenutno nastavitev enote kota (stopinje, radiani, gradi).

■ Konjugirana kompleksna števila [OPTN]-[CPLX]-[Conj]

Kompleksno število v obliki $a + \boldsymbol{bi}$ postane konjugirano kompleksno število v obliki $a - \boldsymbol{bi}$.

Primer **Za izračun konjugirane kompleksne števila za kompleksno število 2 + *4i***

AC K3(CPLX)*4(Conj)

(c+□4 1 (i))w

* fx-7400GIII: 2(CPLX)

■ Izločanje realnih in imaginarnih delov

Uporabite naslednji postopek za izločitev realnega dela a in imaginarne dele b iz kompleksnega števila v obliki $a + \boldsymbol{bi}$.

Primer **Za izločitev realnega in imaginarne dele kompleksnega števila 2 + *5i***

AC K3(CPLX)*6(g)1(ReP)

(c+f6(g)1 (i))w

(Izvleček realnega dela)

* fx-7400GIII: 2(CPLX)

AC K3(CPLX)*6(g)2(ImP)

(c+f6(g)1 (i))w

(izločanje imaginarne komponente)

* fx-7400GIII: 2(CPLX)

■ Polarna in pravokotna transformacija [OPTN]-[CPLX]-['r∠ &]/['a+bi]

Uporabite naslednji postopek za pretvorbo kompleksnega števila, prikazanega v pravokotni obliki, v polarno obliko in obratno.

Primer **Za pretvorbo pravokotne oblike kompleksnega števila 1 + *i* v polarno obliko**

!m(SET UP)②②②②②②*
1 (Deg)②2 (*a*+*bi*)J
AC b+(!x(')d)
K3(CPLX)**1(*i*)6(g)3('*r*∠*θ*
)w

1+(√3)i▸r∠θ
2∠60

* fx-7400GIII: ②②②②②
** fx-7400GIII: 2(CPLX)

AC c!v(∠) 60
K3(CPLX)*6(g)4('*a*+*bi*)w

2∠60▸a+bi
1+1.732050808i

* fx-7400GIII: 2(CPLX)

- Vnosno/izhodno območje kompleksnih števil je običajno 10 mest za mantiso in dve mesti za eksponent.
- Ko ima kompleksno število več kot 21 mest, se realni in imaginarni del prikažeta v ločenih vrsticah.
- Z kompleksnimi številkami se lahko uporabljajo naslednje funkcije.

  ' x^2, x^{-1}, ^(x^y), (, (, ln, log, log(a) b, 10(x), e(x), Int, Frac, Rnd, Intg, RndFix(, Fix, Sci, ENG, ENG, ° ' ", ° ' ", a(b)/c, d/c

7. Binarni, osemštevni, decimalni in šestnajstiški izračuni s celimi števili

Za izvajanje izračunov, ki vključujejo binarne, osemštevilske, decimalne in šestnajstiške vrednosti, lahko uporabite način **RUN • MAT** (ali **RUN**) in nastavitve za binarne, osemštevilske, decimalne in šestnajstiške vrednosti. Prav tako lahko pretvarjate med številskimi sistemi in izvajate bitne operacije.

- V binarnih, osmiških, decimalnih in šestnajstičnih izračunih ne morete uporabljati znanstvenih funkcij.
- V binarnih, osmiških, decimalnih in šestnajstiških izračunih lahko uporabljate samo cela števila, kar pomeni, da ulomki niso dovoljeni. Če vnesete vrednost, ki vključuje decimalni del, kalkulator samodejno odreže decimalni del.
- Če poskušate vnesti vrednost, ki ni veljavna za številčni sistem (binarni, osemštevni, decimalni, šestnajstični), ki ga uporabljate, kalkulator prikaže sporočilo o napaki. V nadaljevanju so prikazane številke, ki jih je mogoče uporabljati v posameznem številčnem sistemu.

  Binarni: 0, 1

  Osmiški: 0, 1, 2, 3, 4, 5, 6, 7

  Desetični: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

  Šestnajstični: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

- Negativne binarne, osemštevilske in šestnajstiške vrednosti se ustvarijo z uporabo dopolnila do dveh izvirne vrednosti.

• V nadaljevanju so navedene zmogljivosti prikazovanja za vsak številčni sistem.

Številčni sistem	Binarni	Osmiški	Decimalni	Šestnajstični
Zmogljivost zaslona	16 številk	11 številk	10 številk	8 številk

- Črke, uporabljene v šestnajstiškem številu, se na zaslonu prikazujejo drugače, da se jih lahko loči od besedilnih znakov.

Običajno besedilo	A	B	C	D	E	F
Šestnajstiške vrednosti	u	v	w	x	y	z
Tipke	v	I	I	s	c	t

- V nadaljevanju so navedena območja izračuna za vsak številčni sistem.

Binarne vrednosti

Pozitivne: 0 < x < 111111111111111

Negativne: 1000000000000000 < x < 1111111111111111

Osemštevilske vrednosti

Pozitivne: 0 < x < 17777777777

Negativne: 20000000000 < x < 37777777777

Decimalne vrednosti

Pozitivne: 0 < x < 2147483647

Negativne: –2147483648 < x < –1

Šestnajstične vrednosti

Pozitivne: 0 < x < 7FFFFFFF

Negativne: 80000000 < x < FFFFFFFF

---

u **Za izvedbo binarnega, osemštevnega, decimalnega ali šestnajstičnega izračuna**

1. V glavnem meniju izberite **RUN • MAT** (ali **RUN**).
2. Pritisnite !m(SET UP). Premaknite označitev na „Mode“ in nato določite privzeti številčni sistem s pritiskom na 2(Dec), 3(Hex), 4(Bin) ali 5(Oct) za nastavitev Mode.
3. Pritisnite J, da preklopite na zaslon za vnos izračuna. S tem se prikaže funkcijski meni z naslednjimi postavkami.
   - {**d~o**}/{**LOG**}/{**DISP**} ... {določitev številskega sistema}/{bitna operacija}/ {desetiško/šestnajstiško/binarno/osmiško pretvorbo}

■ Izbiranje številskega sistema

Na zaslonu Nastavitve lahko kot privzeti številčni sistem določite decimalni, heksadecimalni, binarni ali osemštevni sistem.

---

u **Določitev številskega sistema za vneseno vrednost**

Številčni sistem lahko določite za vsako posamezno vrednost, ki jo vnesete. Pritisnite 1(d~o), da prikažete meni simbolov številčnega sistema. Pritisnite funkcijska tipka, ki ustreza simbolu, ki ga želite izbrati, in nato vnesite vrednost.

- {**d**}/{**h**}/{**b**}/{**o**} ... {decimal}/{hexadecimal}/{binary}/{octal}

u Za vnos vrednosti mešanih številskih

Primer **Za vnos 123_{10}, ko je privzeti številčni sistem šestnajstiški**

!m(SET UP)

Premaknite označitev na „Mode“ in nato pritisnite 3(Hex)J.

A1(d~o)1(d)bcdw

```
d123
        0000007B
```

■ Negativne vrednosti in bitne operacije

Pritisnite 2(LOG), da prikažete meni negacijskih in bitnih operatorjev.

- {**Neg**} ... {negativni}*1
- {**Not**}/{**and**}/{**or**}/{**xor**}/{**xnor**} ... {NOT}*2 /{AND}/{OR}/{XOR}/{XNOR}*3

*1 dvojiški dopolnilo

*2 enojni dopolnilo (bitno dopolnilo)

*3 bitno AND, bitno OR, bitno XOR, bitno XNOR

u Negativne vrednosti

Primer **Za določitev negativne vrednosti 110010_2**

!m(SET UP)

Premaknite označitev na „Mode“ in nato pritisnite 4(Bin)J.

A2(LOG)1(Neg)

bb00 b0w

```
Neg 110010
  1111111111001110
```

- Negativne binarne, osemštevilske in šestnajstiške vrednosti se dobijo tako, da se vzame binarni komplement dveh in se rezultat vrne v prvotno številska osnova. Pri decimalni številska osnova se negativne vrednosti prikažejo z minusom.

u Bitne operacije

Primer **Za vnos in izvedbo „120_{16} in AD16“**

!m(NASTAVITEV)

Premaknite označitev na „Mode“ in nato pritisnite 3(Hex)J.

A bc02(LOG)
3(in)ADw

```
120andAD
        00000020
```

■ Pretvorba številskega sistema

Pritisnite 3(DISP), da prikažete meni funkcij pretvorbe številskega sistema.

- {'**Dec**}/{'**Hex**}/{'**Bin**}/{'**Oct**} ... pretvorba prikazane vrednosti v njen {decimalni}/{šestnajstični}/{binarni}/{osmični} ekvivalent u **Pretvorba prikazane vrednosti iz enega številskega sistema v**

Primer **Za pretvorbo 22_{10} (privzeti številčni sistem) v binarno ali osmično vrednost**

A!m(SET UP)

Premaknite označitev na „Mode“ in nato pritisnite 2(Dec)J.

1(d~o)1(d)ccw

```
d22
                22
```

J3(DISP)3('Bin)w

```
Ans▸Bin
    0000000000010110
```

4('Oct)w

```
Ans▸Oct
         00000000026
```

8. Matrični izračuni

Pomembno!

• Matrični izračuni niso mogoči na fx-7400GIII.

V glavnem meniju vstopite v način **RUN • MAT** in pritisnite 1('MAT), da izvedete matrične izračune.

26 pomnilnikov matrik (Mat A do Mat Z) in pomnilnik odgovorov matrik (MatAns) omogočajo izvajanje naslednjih operacij z matrikami.

• Seštevanje, odštevanje, množenje
• Izračuni skalarnega množenja
• Izračuni determinant
• Transponiranje matrike
• Inverzija matrike
• Kvadrat matrike
• Povzdignjenje matrike na določeno potenco
• Absolutna vrednost, izločanje celega dela, izločanje ulomljenega dela, izračun največjega celega števila
• Vnos kompleksnih števil v matrične elemente in uporaba funkcij, povezanih s kompleksnimi številkami
• Sprememba matrike z uporabo matričnih ukazov

Največje število vrstic, ki jih je mogoče določiti za matriko, je 999, največje število stolpcev pa 999.

O pomnilniku odgovorov matrike (MatAns)

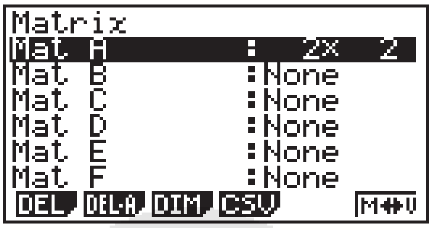
• Kalkulator samodejno shrani rezultate izračunov matrike v pomnilnik odgovorov matrike. Upoštevajte naslednje točke o pomnilniku odgovorov matrike.
• Vsakič, ko izvedete matrični izračun, se trenutna vsebina pomnilnika matričnih odgovorov nadomesti z novim rezultatom. Prejšnja vsebina se izbriše in je ni mogoče obnoviti.
• Vnos vrednosti v matriko ne vpliva na vsebino pomnilnika odgovorov matrike.
• Ko je rezultat matričnega izračuna m (vrstice) × 1 (stolpec) ali 1 (vrstica) × n (stolpci), se rezultat izračuna shrani tudi v pomnilnik vektorskih odgovorov (VctAns).

■ Vnašanje in urejanje matrik

S pritiskom na 1('MAT) se prikaže zaslon urejevalnika matrik. Urejevalnik matrik uporabite za vnos in urejanje matrik.

$m \times n$ … m (vrstica)$\times$ n (stolpec)

matrika None… brez prednastavljene matrike



- {**DEL**}/{**DEL•A**} ... izbriše {določeno matriko}/{vse matrike}
- {**DIM**} ... {določi dimenzije matrike (število celic)}
- {**CSV**} ... shrani matriko kot CSV datoteko in uvozi vsebino CSV datoteke v enega od pomnilnikov matrik (Mat A do Mat Z in MatAns) (stran 2-43)
- {**M↔ V**} ... prikaže zaslon urejevalnika vektorjev (stran 2-52)

u Ustvarjanje matrike

Da bi ustvarili matriko, morate najprej v urejevalniku matrik določiti njene dimenzije (velikost). Nato lahko v matriko vnesete vrednosti.

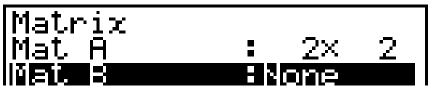
u Določanje dimenzij (velikosti) matrike

Primer **Za ustvarjanje matrike z 2 vrsticami× in 3 stolpci v območju z imenom Mat B**

Poudarite Mat B.

②

3(DIM) (Ta korak se lahko izpusti.)



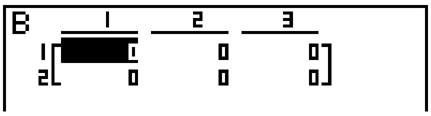
Določite število vrstic.

cw

Določite število stolpcev.

dw

w



- Vse celice nove matrike vsebujejo vrednost 0.
- Spreminjanje dimenzij matrike izbriše njeno trenutno vsebino.
- Če po vnosu dimenzij ob imenu matričnega območja ostane napis »Memory ERROR« (Napaka pomnilnika), to pomeni, da ni dovolj prostega pomnilnika za ustvarjanje želene matrice.

u Vnos vrednosti celic

Primer **Za vnos naslednjih podatkov v matriko B:**

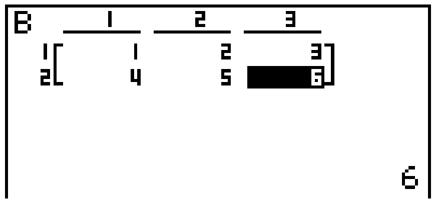
$\begin{bmatrix} 1 & 2 & 3 \\ & & \end{bmatrix}$

4 5 6

Naslednja operacija je nadaljevanje primerjalnega izračuna na prejšnji strani.

bwcwd
w4 wfw
6 w

(Podatki se vnašajo v označeno celico. Vsakič, ko pritisnete w, se označitev premakne na naslednjo celico desno.)



• V prikazanih celicah so prikazana pozitivna cela števila do šestih mest in negativna cela števila do petih mest (eno mesto je namenjeno negativnemu predznaku). Eksponentne vrednosti so prikazane z eksponentom do dveh mest. Deležne vrednosti niso prikazane.

u Brisanje matrik

Lahko izbrišete določeno matriko ali vse matrike v pomnilniku.

u Izbris določene matrike

1. Ko je na zaslonu prikazan urejevalnik matrike, s tipkama f in ② označite matriko, ki jo želite izbrisati.
2. Pritisnite 1(DEL).
3. Pritisnite 1 (Da), da izbrišete matriko, ali 6 (Ne), da prekinete postopek, ne da bi kaj izbrisali.

u Za izbris vseh matrik

1. Ko je na zaslonu prikazan urejevalnik matrik, pritisnite 2(DEL • A).
2. Pritisnite 1(Yes), da izbrišete vse matrike v pomnilniku, ali 6(No), da prekinete postopek, ne da bi kaj izbrisali.

■ Matrične celice

Za pripravo matrike za operacije s celicami uporabite naslednji postopek.

1. Ko je na zaslonu prikazan urejevalnik matrik, z uporabo f in ② označite ime matrike, ki jo želite uporabiti.
   Na določeno matriko lahko preskočite z vnosom črke, ki ustreza imenu matrike. Z vnosom a i (N) na primer preskočite na Mat N.
   S pritiskom na ! –(Ans) preskočite na trenutni pomnilnik matrike.
2. Pritisnite w in prikaže se funkcijski meni z naslednjimi postavkami.
   - {**R • OP**} ... {meni operacij vrstic}
   - {**ROW**}
     - {**DEL**}/{**INS**}/{**ADD**} ... vrstica {izbriši}/{vstavi}/{dodaj}
   - {**COL**}
     - {**DEL**}/{**INS**}/{**ADD**} ... stolpec {izbriši}/{vstavi}/{dodaj}
   - {**EDIT**} ... {zaslon za urejanje celic}

Vsi naslednji primeri uporabljajo matriko A.

u Izračuni vrstic

Naslednji meni se prikaže, ko pritisnete 1(R • OP), medtem ko je na zaslonu prikazana priklicana matrika.

- {**Swap**} ... {zamenjava vrstic}
- {× **Rw**} ... {produkt določene vrstice in skalarja}
- {× **Rw+**} ... {dodajanje ene vrstice in zmnožek določene vrstice s skalarnim faktorjem}
- {**Rw+**} ... {dodajanje določene vrstice k drugi vrstici}

u Za zamenjavo

Primer **Za zamenjavo vrstic dve in tri naslednje matrike:**

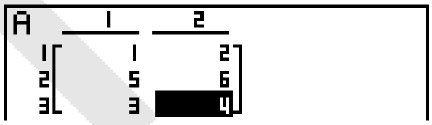
Vsi primeri operacij so izvedeni z uporabo naslednje matrike.

Matrika A $\begin{bmatrix} \mathbf{1} & \mathbf{2} \\ \mathbf{3} & \mathbf{4} \\ \mathbf{5} & \mathbf{6} \end{bmatrix}$

1(R • OP)1(Zamenjava)

Vnesite število vrstic, ki jih želite zamenjati.

cwdww



u Za izračun skalarnega množenja vrstice

Primer **Za izračun produkta vrstice 2 in skalarja 4**

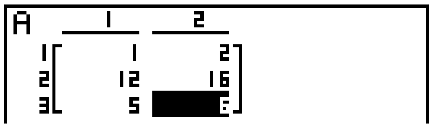
1(R • OP)2(× Rw)

Vnesite vrednost množitelja.*

4 w

Določite številko vrstice.

cww



* Kot vrednost množitelja (k) je mogoče vnesti tudi

u Za izračun skalarnega množenja vrstice in dodajanje rezultata k drugi vrstici

Primer **Izračunajte produkt vrstice 2 in skalarja 4, nato dodajte rezultat k vrstici 3**

1(R • OP)3(× Rw+)

Vnesite vrednost množitelja.*

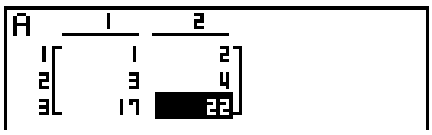
4 w

Določite številko vrstice, katere produkt želite izračunati.

cw

Določite številko vrstice, v katero naj se doda rezultat.

dww



* Kot množiteljsko vrednost (k) je mogoče vnesti tudi kompleksno število.

u Za seštevanje dveh vrstic

Primer **Za seštevanje vrstice 2 in vrstice 3**

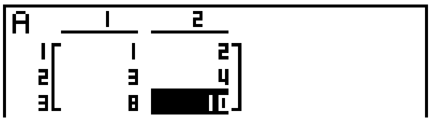
1(R • OP)4(Rw+)

Določite številko vrstice, ki jo želite dodati.

cw

Določite številko vrstice, ki jo želite dodati.

dww

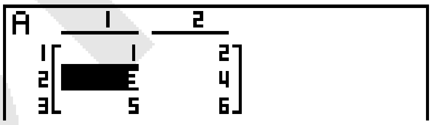


u Operacije z vrsticami

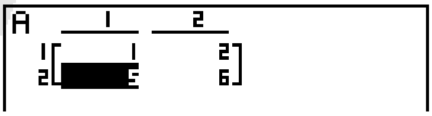
- {**DEL**} ... {izbriši vrstico}

u Za izbris

Primer **Za izbris vrstice 2**



1(DEL)

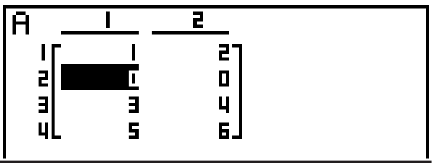


u Vstavljanje

Primer **Vstavljanje nove vrstice med vrstico 1 in 2**

2(ROW)②

2(INS)

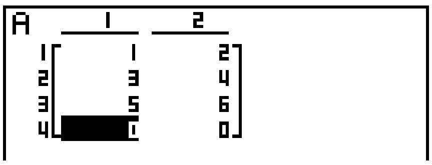


u Dodajanje

Primer **Dodajanje nove vrstice pod**

2(ROW)②②

3(ADD)



u **Operacije s stolpci**

- {**DEL**} ... {izbriši stolpec}
- {**INS**} ... {vstavi stolpec}
- {**ADD**} ... {dodaj stolpec}

u **Za izbris stolpca**

Primer **Za izbris stolpca 2**

3(COL)e
1(DEL)

■ Prenos podatkov med matrikami in CSV datotekami

Vsebino CSV datoteke, shranjene v tem kalkulatorju ali prenesene iz računalnika, lahko uvozite v enega od matričnih pomnilnikov (Mat A do Mat Z in MatAns). Vsebino enega od matričnih pomnilnikov (Mat A do Mat Z in MatAns) lahko shranite tudi kot CSV datoteko.

u **Uvoz vsebine CSV datoteke v matrični pomnilnik**

1. Pripravite CSV datoteko, ki jo želite uvoziti.
   - Glejte „Zahteve za uvoz CSV datoteke“ (stran 3-14).
2. Ko je na zaslonu prikazan urejevalnik matrik, s tipkama f in ② označite ime matrike, v katero želite uvoziti vsebino datoteke CSV.
   - Če izbrana matrika že vsebuje podatke, bodo sledeči koraki nadomestili njeno trenutno vsebino z novo uvoženimi podatki iz CSV datoteke.
3. Pritisnite 4(CSV)1(LOAD).
4. V pogovornem oknu za izbiro datoteke, ki se prikaže, uporabite f in ②, da označite datoteko, ki jo želite uvoziti, in nato pritisnite w.
   - S tem uvozite vsebino CSV datoteke, ki ste jo določili, v pomnilnik matrike.

Pomembno!

Poskus uvoza naslednjih vrst CSV datotek bo povzročil napako.

- CSV datoteka, ki vsebuje podatke, ki jih ni mogoče pretvoriti. V tem primeru se prikaže sporočilo o napaki, ki prikazuje mesto v CSV datoteki (primer: vrstica 2, stolpec 3), kjer se nahajajo podatki, ki jih ni mogoče pretvoriti.
- CSV datoteka z več kot 999 stolpci ali 999 vrsticami. V tem primeru se bo pojavila napaka »Neveljavna velikost podatkov«.

u **Shranjevanje vsebine matrike kot CSV datoteke**

1. Ko je na zaslonu prikazan urejevalnik matrike, z gumboma f in ② označite ime matrike, katere vsebino želite shraniti kot CSV datoteko.
2. Pritisnite 4(CSV)2(SV • AS).
   • Prikaže se zaslon za izbiro mape.
3. Izberite mapo, v katero želite shraniti CSV datoteko.
   • Če želite CSV datoteko shraniti v korenski imenik, označite »ROOT«.
   • Če želite CSV datoteko shraniti v mapo, s tipkama f in ② premaknite označitev na želeno mapo in nato pritisnite 1(OPEN).
4. Pritisnite 1(SV • AS).
5. Vnesite do osem znakov za ime datoteke in nato pritisnite w.

Pomembno!

• Pri shranjevanju matričnih podatkov v datoteko CSV se nekateri podatki pretvorijo, kot je opisano spodaj.
  - Podatki o kompleksnih številkah: Izvleče se samo del realnih številk.
  - Podatki o ulomkih: pretvorjeni v format izračunske vrstice (primer: 2{3{4→ =2+3/4)
  - Podatki ' in π : pretvorjeni v decimalno vrednost (primer: '3→ 1,732050808)

u **Za določitev ločevalnega simbola in decimalne vejice v datoteki CSV**

Ko je na zaslonu prikazan urejevalnik matrik, pritisnite 4(CSV)3(SET), da prikažete zaslon za nastavitev formata CSV. Nato izvedite postopek iz koraka 3 v poglavju »Določanje ločevalnega znaka in decimalne vejice v datoteki CSV« (stran 3-16).

■ Spreminjanje matrik z uporabo ukazov za matrike [OPTN]-[MAT]

u **Za prikaz matričnih ukazov**

1. V glavnem meniju vstopite v način **RUN • MAT**.
2. Pritisnite K, da prikažete meni možnosti.
3. Pritisnite 2(MAT), da prikažete meni ukazov matrike.

V nadaljevanju so opisane samo postavke menija ukazov matrike, ki se uporabljajo za ustvarjanje matrik in vnos podatkov matrike.

• {**Mat**} ... {Mat ukaz (specifikacija matrike)}
• {**M→ L**} ... {Mat→ ukaz za seznam (dodelitev vsebine izbranega stolpca datoteki s seznamom)}
• {**Aug**} ... {Augment ukaz (povezava dveh matrik)}
• {**Iden**} ... {Identity ukaz (vnos identitne matrike)}
• {**Dim**} ... {Dim ukaz (preverjanje dimenzije)}
• {**Fill**} ... {Fill ukaz (enake vrednosti celic)}

• Namesto K2(MAT)1(Mat) lahko uporabite tudi !c(Mat).

u Format vnosa podatkov matrike **[OPTN]-[MAT]-[Mat]**

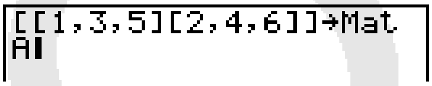
Spodaj je prikazan format, ki ga morate uporabiti pri vnosu podatkov za ustvarjanje matrike z ukazom Mat.

$$\begin{bmatrix} a11 & a12 \dots & a1n \\ a21 & a22 \dots & a2n \\ \vdots & \vdots & \vdots \\ am1 & am2 & \dots \ amn \end{bmatrix} = [\,[a11, a12, \dots, a1n]\,[a21, a22, \dots, a2n] \dots [am1, am2, \dots, amn]\,]$$

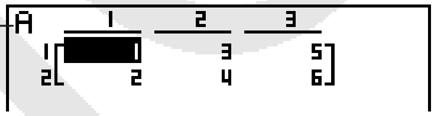
→ Mat [črke od A do Z]

Primer **Za vnos naslednjih podatkov kot matrika A:** $\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix}$

!+([) !+([)b,d,f
!—(]) !+([)c,4,6
!—(]) !—(])aK2(MAT)
1(Mat)av(A)



w *Ime matrike*



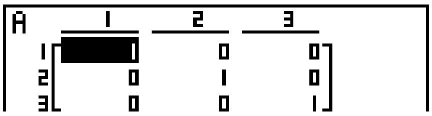
- Največja vrednost m in n je 999.
- Če se med vnašanjem podatkov spominsko mesto zapolni, pride do napake.
- Zgornji format lahko uporabite tudi v programu, ki vnaša matrične podatke.

u Za vnos identitne matrike **[OPTN]-[MAT]-[Iden]**

Za ustvarjanje identitne matrike uporabite ukaz Identiteta.

Primer **Za ustvarjanje identitne matrike 3× 3 kot matrika A**

K2(MAT)6(g)1(Iden)
da6(g)1(Mat)av(A)w
Število vrstic/stolpcev



u Za preverjanje dimenzij matrike **[OPTN]-[MAT]-[Dim]**

Uporabite ukaz Dim, da preverite dimenzije obstoječe matrike.

Primer 1 **Za preverjanje dimenzij matrike A**

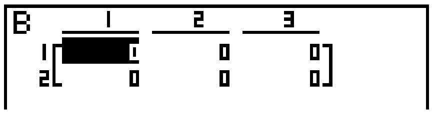
K2(MAT)6(g)2(Dim)
6(g)1(Mat)av(A)w

Na zaslonu je prikazano, da matrika A sestavlja dve vrstici in tri stolpce.
Ker je rezultat ukaza Dim podatki tipa seznam, se shrani v pomnilnik ListAns.

Za določitev dimenzij matrike lahko uporabite tudi {Dim}.

Primer 2 **Za določitev dimenzij 2 vrstic in 3 stolpcev za matriko B**

! *({)c,d ! /(})a
K2(MAT)6(g)2(Dim)
6(g)1 (Mat)al(B)w



• Ukaz „Dim“ se lahko uporabi za preverjanje in konfiguriranje nastavitev dimenzij vektorja.

u Spreminjanje matrik z uporabo ukazov za matrike

Uporabite lahko tudi matrične ukaze, da dodelite vrednosti obstoječi matrici in jih iz nje prikličete, da vse celice obstoječe matrice napolnite z enako vrednostjo, da združite dve matrici v eno samo matrico in da vsebino stolpca matrice dodelite datoteki seznama.

u Dodeljevanje vrednosti in priklic vrednosti iz obstoječe matrike

[OPTN]-[MAT]-[Mat]

Uporabite naslednji format s ukazom Mat, da določite celico za dodelitev in priklic vrednosti.

Mat X [m, n]

X = ime matrike (od A do Z ali Ans)

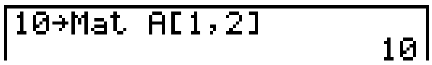
m = številka vrstice

n = številka stolpca

Primer **Če želite celici v vrstici 1, stolpcu 2 naslednje matrike dodeliti vrednost 10:**

Matrika A = $\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$

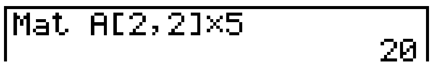
b□aK2(MAT)1(Mat)
av(A) ! +([ )b,c
! −( ])w



• Ukaz „Vct“ se lahko uporabi za dodelitev vrednosti obstoječim vektorjem.

Primer 2 **Pomnožite vrednost v celici v vrstici 2, stolpcu 2 zgornje matrike s 5.**

K2(MAT)1(Mat)
av(A) ! +([ )c,c
! −( ])*fw



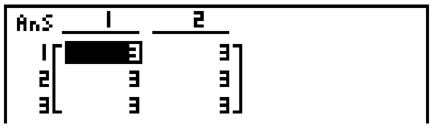
• Ukaz „Vct“ se lahko uporabi za priklic vrednosti iz obstoječih vektorjev.

u Za izpolnitev matrike z identičnimi vrednostmi in združitev dveh matrik v eno matriko

Uporabite ukaz Fill, da vse celice obstoječe matrike napolnite z enako vrednostjo, in ukaz Augment, da združite dve obstoječi matrici v eno samo matriko.

Primer 1 **Za izpolnitev vseh celic matrike A z vrednostjo 3**

K2(MAT)6(g)3(Fill)
d,6(g)1(Mat)av(A)w
1(Mat)av(A)w

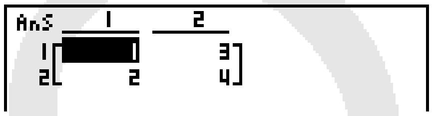


- Ukaz »Fill« se lahko uporabi za vpis iste vrednosti v vse vektorske elemente.

Primer 2 **Za združitev naslednjih dveh matrik:**

$$\mathbf{A} = \begin{bmatrix} \mathbf{1} \\ \mathbf{2} \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} \mathbf{3} \\ \mathbf{4} \end{bmatrix}$$

K2(MAT)5(avgust)
1(Mat)av(A),
1(Mat)al(B)w



- Obe matrici, ki ju združujete, morata imeti enako število vrstic. Če poskušate združiti dve matrici z različnim številom vrstic, se pojavi napaka.
- Matrični odgovorni pomnilnik lahko uporabite za dodelitev rezultatov zgornjih matričnih vnosov in urejanja matrični spremenljivki. Za to uporabite naslednjo sintakso.

  Fill (n, Matα)

  Augment (Matα, Matβ)→ Mat γ

  V zgornjem primeru so α, β in γ katerakoli imena spremenljivk od A do Z, n pa je katerakoli vrednost. Zgornje ne vpliva na vsebino pomnilnika odgovorov matrike.
- Ukaz „Augment“ se lahko uporabi za združitev dveh vektorjev v eno matriko.

---

u Dodelitev vsebine stolpca matrike seznamu [OPTN]-[MAT]-[M→ L]

Uporabite naslednji format s ukazom Mat→ List, da določite stolpec in seznam.

Mat→ List (Mat X, m)→ List n

X = ime matrike (A do Z)

m = številka stolpca

n = številka seznama

Primer **Če želite vsebino stolpca 2 naslednje matrike dodeliti seznamu 1:**

$$\textbf{Matrika A} = \begin{bmatrix} \mathbf{1} & \mathbf{2} \\ \mathbf{3} & \mathbf{4} \\ \mathbf{5} & \mathbf{6} \end{bmatrix}$$

K2(MAT)2(M→ L)
1(Mat)av(A),c)
aK1(LIST)1(List)bw
1(List)bw

■ Matrični izračuni [OPTN]-[MAT]

Za izvajanje matričnih izračunov uporabite meni matričnih ukazov.

u Za prikaz matričnih ukazov

1. V glavnem meniju vstopite v način **RUN • MAT**.
2. Pritisnite K, da prikažete meni možnosti.
3. Pritisnite 2(MAT), da prikažete meni ukazov matrike.

V nadaljevanju so opisane samo matrične ukaze, ki se uporabljajo za matrične aritmetične operacije.

- {**Mat**} ... {Mat ukaz (matrična specifikacija)}
- {**Det**} ... {Det ukaz (ukaz determinant)}
- {**Trn**} ... {Trn ukaz (ukaz za transponiranje matrike)}
- {**Iden**} ... {Identity ukaz (vnos identitne matrike)}
- {**Ref**} ... {Ref ukaz (ukaz za vrstno ešelonsko obliko)}
- {**Rref**} ... {Rref ukaz (ukaz zmanjšane vrstne ešelonske oblike)}

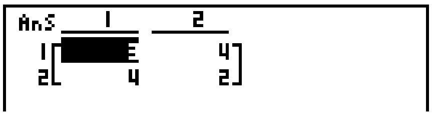
Vsi naslednji primeri predpostavljajo, da so podatki matrike že shranjeni v pomnilniku.

u Matrične aritmetične operacije [OPTN]-[MAT]-[Mat]/[Iden]

Primer 1 **Za seštevanje naslednjih dveh matrik (matrika A + matrika B):**

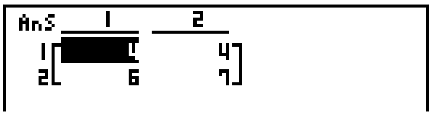
$$A=\begin{bmatrix}1 & 1\\ 2 & 1\end{bmatrix} \quad B=\begin{bmatrix}2 & 3\\ 2 & 1\end{bmatrix}$$

AC K2(MAT)1(Mat)av(A)+
1 (Mat)a I (B)w



Primer 2 **Za množenje dveh matrik iz primera 1 (matrika A× matrika B)**

AC K2(MAT)1(Mat)av(A)*
1 (Mat)a I (B)w



- Da bi lahko matrici sešteli ali odšteli, morata imeti enake dimenzije. Če poskušate sešteti ali odšteti matrici različnih dimenzij, se pojavi napaka.
- Pri množenju (matrika 1× matrika 2) mora število stolpcev v matriko 1 ustrezati številu vrstic v matriko 2. V nasprotnem primeru pride do napake.

u **[OPTN]-[MAT]-[Det]**

Primer **Izračunajte determinant za naslednjo matriko:**

$$\text{Matrika A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ -1 & -2 & 0 \end{bmatrix}$$

K2(MAT)3(Det)1(Mat)
av(A)w

- Determinante je mogoče dobiti samo za kvadratne matrike (enako število vrstic in stolpcev). Poskus pridobitve determinante za matriko, ki ni kvadratna, povzroči napako.
- Determinanta 2× 2 matrike se izračuna, kot je prikazano spodaj.

$$|A| = \begin{bmatrix} a11\ a12 \\ a22 \end{bmatrix} = a11a22 - a12a21\ a21$$

- Determinanta matrike 3× 3 se izračuna, kot je prikazano spodaj.

$$|A| = \begin{bmatrix} a11\ a12\ a13 \\ a21\ a22\ a23\ a31 \\ a32\ a33 \end{bmatrix} = a11a22a33 + a12a23a31 + a13a21a32 - a11a23a32 - a12a21a33 - a13a22a31$$

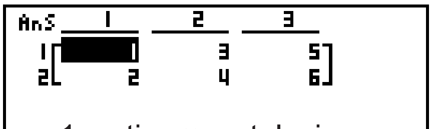
u Transpozicija matrike **[OPTN]-[MAT]-[Trn]**

Matrika je transponirana, ko se njene vrstice spremenijo v stolpce in stolpci v vrstice.

Primer **Za transponiranje naslednje matrike:**

$$\text{Matrika A} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

K2(MAT)4(Trn)1(Mat)
av(A)w



- Ukaz „Trn“ se lahko uporablja tudi z vektorjem. Pretvori vektor z 1 vrstico × n stolpci v vektor z n vrsticami × 1 stolpci ali vektor z m vrsticami × 1 stolpci v vektor z 1 vrstico × m stolpci.

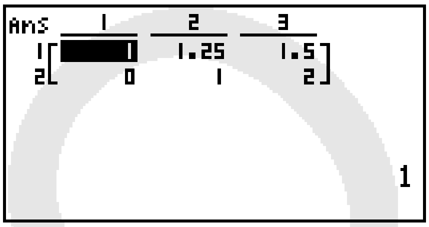
u Vrstna ešelonska **[OPTN]-[MAT]-[Ref]**

Ta ukaz uporablja Gaussov eliminacijski algoritem za iskanje vrstne ešelonske oblike matrike.

Primer **Da bi našli vrstno stopničasto obliko naslednje matrike:**

$$\textbf{Matrika A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$$

K2(MAT)6(g)4(Ref)
6(g)1(Mat)av(A)w



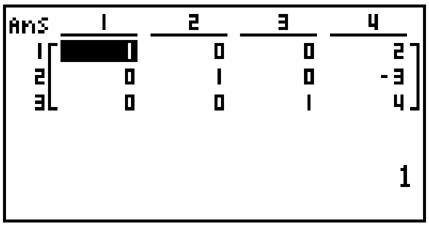
u Zmanjšana vrstna ešelonska oblika **[OPTN]-[MAT]-[Rref]**

Ta ukaz poišče zmanjšano vrstno stopničasto obliko matrike.

Primer **Za iskanje zmanjšane vrstne ešelonske oblike naslednje matrike:**

$$\textbf{Matrika A} = \begin{bmatrix} 2 & -1 & 3 & 19 \\ 1 & 1 & -5 & -21 \\ 0 & 4 & 3 & 0 \end{bmatrix}$$

K2(MAT)6(g)5(Rref)



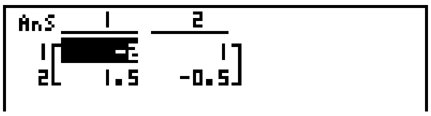
- Operacija vrstne ešelonske oblike in zmanjšane vrstne ešelonske oblike morda ne bo dala natančnih rezultatov zaradi izpuščenih števk.

u Inverzija **[x^{-1}**

Primer **Invertiranje naslednje**

$$\textbf{Matrika A} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

K2(MAT)1(Mat)
av(A) !)(x^{-1})w



- Invertirati je mogoče samo kvadratne matrike (enako število vrstic in stolpcev). Poskus invertiranja matrike, ki ni kvadratna, povzroči napako.
- Matrika z determinantom nič ne more biti inverzna. Poskus inverzije matrike z determinantom nič povzroči napako.

- Natančnost izračuna je prizadeta za matrike, katerih determinant je blizu nič.
- Matrika, ki se invertira, mora izpolnjevati spodaj navedene pogoje.

$$A\,A^{-1} = A^{-1}\,A = E = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Spodaj je prikazana formula, ki se uporablja za inverzijo matrike A v inverzno matriko A^{-1} .

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$A^{-1} = \frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

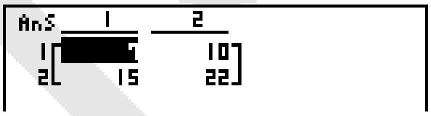
Upoštevajte, da je $ad - bc \neq 0$.

u Kvadrat matrike [x^2]

Primer **Za kvadratiranje naslednje matrike:**

$$\text{Matrika A} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

K2(MAT)1(Mat)av(A)xw

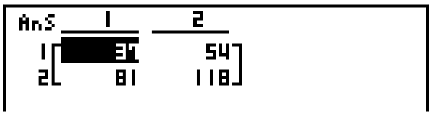


u Potenciranje matrike [^]

Primer **Če želite naslednjo matriko dvigniti na tretjo potenco:**

$$\text{Matrika A} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

K2(MAT)1(Mat)av(A)
Mdw



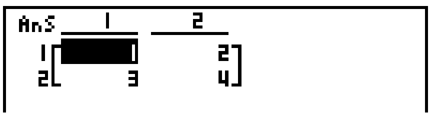
- Za izračun moči matrike je mogoč izračun do moči 32766.

u Določanje absolutne vrednosti, celega dela, ulomka in največjega celega števila matrike

Primer **Za določitev absolutne vrednosti naslednje matrike:**

$$\text{Matrika A} = \begin{bmatrix} 1 & -2 \\ -3 & 4 \end{bmatrix}$$

K6(g)4(NUM)1(Abs)
K2(MAT)1(Mat)av(A)w



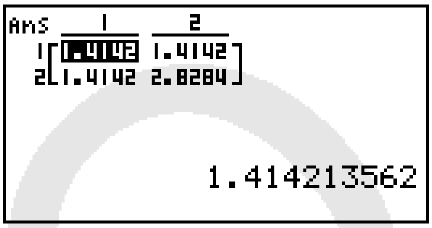
- Z ukazom „Abs“ lahko dobite absolutno vrednost elementa vektorja.

u Izračuni kompleksnih števil z matriko

Primer **Določite absolutno vrednost matrike z naslednjimi kompleksnimi številskimi elementi:**

$$\text{Matrika D} = \begin{bmatrix} -1 + i & 1 + i \\ 1 + i & -2 + 2i \end{bmatrix}$$

AC K6(g)4(NUM)1(Abs)
K2(MAT)1(Mat)as(D)w



- V matrikah in vektorjih so podprte naslednje funkcije kompleksnih števil.
  i, Abs, Arg, Conjg, ReP, ImP

Previdnostni ukrepi pri izračunavanju matrik

- Determinante in inverzne matrike so podvržene napakam zaradi izpuščenih števk.
- Matrične operacije se izvajajo posamično na vsaki celici, zato lahko izračuni trajajo precej časa.
- Natančnost prikazanih rezultatov za matrične izračune je ± 1 na najmanj pomembni številki.
- Če je rezultat matričnega izračuna prevelik, da bi se zmestil v pomnilnik odgovorov matrike, pride do napake.
- Z naslednjo operacijo lahko prenesete vsebino pomnilnika odgovorov matrike v drugo matriko (ali če pomnilnik odgovorov matrike vsebuje determinant spremenljivke).

  MatAns→ Mat α

  V zgornjem primeru je α katero koli ime spremenljivke od A do Z. Zgornje navedbe ne vplivajo na vsebino pomnilnika odgovorov matrike.

9. Vektorski izračuni

Pomembno!

- Vektorski izračuni niso mogoči na fx-7400GIII.

Za izvajanje vektorskih izračunov uporabite glavni meni, da vstopite v način **RUN • MAT**, nato pa pritisnite 1('MAT)6(M↔ V).

Vektor je definiran kot matrika, ki ima eno od naslednjih oblik: m (vrstice)× 1 (stolpec) ali 1 (vrstica)× n (stolpci).

Največja dovoljena vrednost, ki jo je mogoče določiti za m in n, je 999.

Za izvedbo spodaj navedenih vektorskih izračunov lahko uporabite 26 vektorskih pomnilnikov (Vct A do Vct Z) in vektorski pomnilnik odgovorov (VctAns).

- Seštevanje, odštevanje, množenje
- Skalarni večkratni izračuni
- Izračuni skalarnega produkta
- Izračuni vektorskega produkta

• Določanje vektorske norme (velikosti)

- Določanje kota, ki ga tvorita dva vektorja
- Določanje enotskega vektorja

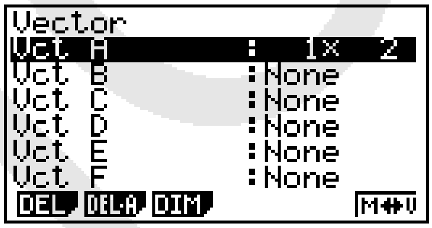
O pomnilniku odgovorov vektorjev (VctAns)

Kalkulator samodejno shrani rezultate vektorskega izračuna v pomnilnik vektorskih odgovorov. Upoštevajte naslednje previdnostne ukrepe v zvezi s pomnilnikom vektorskih odgovorov.

- Vsakič, ko izvedete vektorski izračun, se trenutna vsebina pomnilnika vektorskih odgovorov nadomesti z novim rezultatom. Prejšnja vsebina se izbriše in je ni mogoče obnoviti.
- Vnos vrednosti v vektor ne vpliva na vsebino pomnilnika vektorskih odgovorov.
- Rezultati vektorskega izračuna se shranijo tudi v pomnilnik matričnih odgovorov (MatAns).

■ Vnos in urejanje vektorja

S pritiskom na 1('MAT)6(M↔ V) se prikaže zaslon urejevalnika vektorjev. Urejevalnik vektorjev uporabite za vnos in urejanje vektorjev.



$m\times n$ ... m (vrstica)$\times$ n (stolpec)

vektor None ... ni vektorske prednastavitve

- {**DEL**}/{**DEL・A**} ... izbriše {določen vektor}/{vse vektorje}
- {**DIM**} ... določi dimenzije vektorja (m vrstic$\times$ 1 stolpec ali 1 vrstica$\times$ n stolpcev)
- {**M↔ V**} ... prikaže zaslon Matrix Editor (stran 2-39)

Vnos in urejanje vektorjev ter operacije z vektorskimi celicami (elementi) so enake kot operacije z matričnimi izračuni. Za več informacij glejte „Vnos in urejanje matrik“ (stran 2-39) in „Operacije z matričnimi celicami“ (stran 2-40). Upoštevajte pa, da se vektorski izračuni razlikujejo od matričnih izračunov, kot je opisano spodaj.

- Na zaslonu za vnos elementov vektorskega pomnilnika v meniju funkcij ni 1(R・OP).
- Pri urejanju vektorjev je dimenzija vedno omejena na m vrstic$\times$ 1 stolpec ali 1 vrstico$\times$ n stolpcev.

■ Vektorski izračuni **[OPTN]-[MAT]**

Za izvajanje vektorskih izračunov uporabite meni vektorskih ukazov.

u **Za prikaz vektorskih ukazov**

1. V glavnem meniju vstopite v način **RUN・MAT**.
2. Pritisnite K, da prikažete meni možnosti.
3. Pritisnite 2(MAT)6(g)6(g), da prikažete meni vektorskih ukazov.
   - {**Vct**} ... {ukaz Vct (vektorska specifikacija)}
   - {**DotP**} ... {DotP ukaz (ukaz za skalaren produkt)}
   - {**CrsP**} ... {CrossP ukaz (ukaz za vektorski produkt)}

- {**Kot**} ... {Ukaz za kot (izračunaj kot, ki ga tvorita dva vektorja)}
- {**UntV**} ... {ukaz UnitV (izračunaj enotski vektor)}
- {**Norm**} ... {Povelj Norm (izračunaj normo vektorja (velikost))}

Varnostni ukrepi pri izračunu vektorjev

- Pri izračunu skalarnega produkta, vektorskega produkta in kota, ki ga tvorita dva vektorja, morajo biti dimenzije obeh vektorjev enake. Poleg tega morajo biti dimenzije vektorskega produkta 1× 2, 1× 3, 2× 1 ali 3× 1.
- Vektorski izračuni se izvajajo neodvisno za vsak element, zato lahko traja nekaj časa, preden se prikažejo rezultati izračunov.
- Natančnost izračuna prikazanih rezultatov za vektorske izračune je ±1 na najmanj pomembni številki.
- Če je rezultat vektorskega izračuna prevelik, da bi se prilegal v pomnilnik vektorskih odgovorov, pride do napake.
- Z naslednjo operacijo lahko prenesete vsebino pomnilnika vektorskih odgovorov v drug vektor.

  VctAns→ Vct a

  V zgornjem primeru je a katero koli ime spremenljivke od A do Z. Zgornje ne vpliva na vsebino pomnilnika vektorskih odgovorov.
- Vektorski pomnilnik in matrični pomnilnik sta med seboj združljiva, zato lahko vsebino vektorskega pomnilnika dodelite matričnemu pomnilniku, če želite.

  Vct a→ Mat β

  V zgornjem primeru sta a in β kateri koli imeni spremenljivk od A do Z.

---

u Format vnosa vektorskih podatkov **[OPTN]-[MAT]-[Vct]**

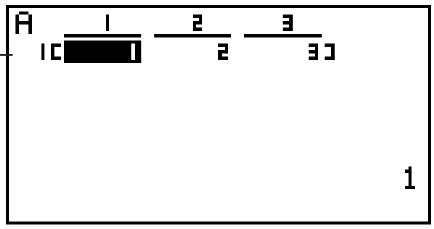
Spodaj je prikazan format, ki ga morate uporabiti pri vnosu podatkov za ustvarjanje vektorja z ukazom Vct.

$\begin{bmatrix} a_{11} \\ a_{21} \\ \vdots \\ a_{m1} \end{bmatrix}$ → Vct [A do Z] [a_{11} a_{12} ... a_{1n}]→ Vct [A do Z]

Primer **Za vnos naslednjih podatkov v Vct A: [1 2 3]**

! +([) ! +([)b,c,d
! -(]) ! -(])a
K2(MAT)6(g)6(g)1(Vct)
av(A)w

Ime vektorja



- Največja vrednost m in n je 999.
- Če se med vnosom podatkov spominsko mesto zapolni, pride do napake.
- Zgornji format lahko uporabite tudi v programu, ki vnaša vektorske podatke.

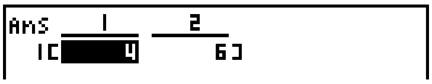
Vsi naslednji primeri predpostavljajo, da so vektorski podatki že shranjeni v pomnilniku.

u Seštevanje, odštevanje in množenje vektorjev [OPTN]-[MAT]-[Vct]

Primer 1 **Za določitev vsote dveh vektorjev, prikazanih spodaj (Vct A + Vct B):**

Vct A = [1 2] Vct B = [3 4]

K2(MAT)6(g)6(g)1(Vct)
av(A)+1 (Vct)aI(B)w



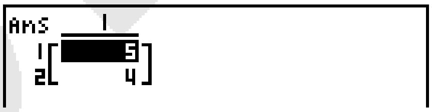
Primer 2 **Določite produkt dveh vektorjev, prikazanih spodaj (Vct A× Vct B): 3**
Vct A = [1 2] Vct B = $\begin{bmatrix} 4 \end{bmatrix}$

K2(MAT)6(g)6(g)1(Vct)
av(A)*1 (Vct)aI(B)w

Primer 3 **Za določitev produkta matrike in vektorja, prikazanega spodaj (Mat A × Vct B):**

Mat A = $\begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ **Vct B =** 1 $\begin{bmatrix} 2 \end{bmatrix}$

K2(MAT)1(Mat)
av(A)*6(g)6(g)
1 (Vct)aI(B)w



- Pri seštevanju ali odštevanju dveh vektorjev morata imeti oba enake dimenzije.
- Pri množenju Vct A ($1\times n$) in Vct B ($m\times 1$) morata biti n in m enaka.

u Skalarni produkt [OPTN]-[MAT]-[DotP]

Primer **Za določitev skalarnega produkta dveh vektorjev**

spodaj Vct A = [1 2] Vct B = [3 4]

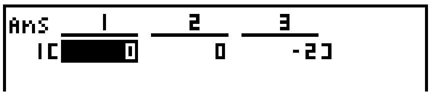
K2(MAT)6(g)6(g)
2(DotP)1 (Vct)av(A),
1 (Vct)aI(B))w

u Križni produkt [OPTN]-[MAT]-[CrsP]

Primer **Za določitev vektorskega produkta dveh vektorjev**

spodaj Vct A = [1 2] Vct B = [3 4]

K2(MAT)6(g)6(g)
3(CrsP)1 (Vct)av(A),
1 (Vct)aI(B))w

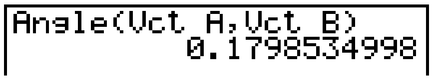


u **Kot, ki ga tvorita dva vektorja** **[OPTN]-[MAT]-[Kot]**

Primer **Za določitev kota, ki ga tvorita dva vektorja**

Vct A = [1 2] Vct B = [3 4]

K2(MAT)6(g)6(g)
4(kot)1(Vct)av(A),
1(Vct)al(B))w



u **Enotni vektor** **[OPTN]-[MAT]-[UntV]**

Primer **Določite enotski vektor spodnjega vektorja**

Vct A = [5 5]

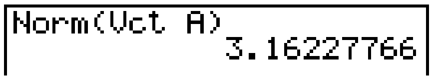
K2(MAT)6(g)6(g)
5(UntV)1(Vct)av(A))w

u **Vektorska norma (velikost)** **[OPTN]-[MAT]-[Norm]**

Primer **Za določitev vektorske norme (velikosti)**

Vct A = [1 3]

K2(MAT)6(g)6(g)6(g)
1(Norm)6(g)6(g)6(g)
1(Vct)av(A))w



• Za izračun norme matrike lahko uporabite ukaz „Norm“.

10. Izračuni pretvorbe merskih enot

Vrednosti lahko pretvorite iz ene merske enote v drugo. Merske enote so razvrščene v naslednjih 11 kategorij. Kazalniki v stolpcu „Ime prikaza“ prikazujejo besedilo, ki se prikaže v meniju funkcij kalkulatorja.

Ime	Kategorija	Ime na zaslonu	Kategorija	Ime na zaslonu	Kategorija
LENG	Dolžina	TMPR	Temperatura	PRES	Tlak
POVRŠINA	Površina	VELO	Hitrost	ENGY	Energija/delo
VLUM	Obseg	MASA	Masa	PWR	Moč
ČAS	Čas	FORC	Sila/Teža		

Lahko pretvorite katero koli enoto v kategoriji v katero koli drugo enoto v isti kategoriji.

• Poskus pretvorbe iz enote v eni kategoriji (npr. „POVRŠINA“) v enoto v drugi kategoriji (npr. „ČAS“) povzroči NAPAKO pretvorbe.

• Za informacije o enotah, vključenih v vsako kategorijo, glejte „Seznam ukazov za pretvorbo enot“ (stran 2-58).

■ Izvedba pretvorbe enot [OPTN]-[CONV]

Vnesite vrednost, ki jo pretvarjate, in ukaze za pretvorbo z uporabo spodaj prikazane sintakse, da izvedete izračun pretvorbe enot.

{vrednost, ki jo pretvarjate}{ukaz za pretvorbo 1} ' {ukaz za pretvorbo 2}

• Uporabite {ukaz za pretvorbo 1}, da določite enoto, iz katere pretvarjate, in {ukaz za pretvorbo 2}, da določite enoto, v katero pretvarjate.

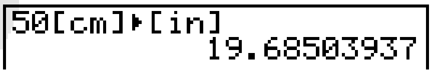
• ' je ukaz, ki povezuje dva ukaza za pretvorbo. Ta ukaz je vedno na voljo v meniju Pretvorba pod 1 (').

• Kot vrednost, ki se pretvarja, se lahko uporabijo realna števila ali seznam, ki vsebuje samo realna števila. Ko se vrednosti, ki se pretvarjajo, vnesejo v seznam (ali ko je določen spomin seznama), se pretvorbeni izračun izvede za vsak element v seznamu, rezultati izračuna pa se vrnejo v obliki seznama (zaslon ListAns).

• Kompleksno število ni mogoče uporabiti kot vrednost, iz katere se pretvarja. Napaka se pojavi, če tudi samo en element seznama, ki se uporablja kot vrednost, iz katere se pretvarja, vsebuje kompleksno število.

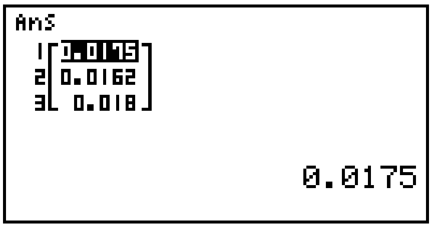
Primer 1 **Pretvorba 50 cm v palce**

AC f□K6(g)1(CONV)*2(LENG)
f(cm)1(')2(LENG)ec(in)w
* fx-7400GIII: 5(CONV)



Primer 2 **Pretvorba {175, 162, 180} kvadratnih metrov v hektarje**

AC!*({)bhf,bg c,
bi0!/(})
K6(g)1(CONV)*3(AREA)c(m(2))
1(')3(AREA)d(ha)w
* fx-7400GIII: 5(CONV)



■ Seznam ukazov za pretvorbo enot

Kat.	Ime na zaslonu	Enota	Kategorija	Prikazano ime	Enota
Dolžina	fm	fermi	Prostornina	cm^3	kubični centimeter
	Å	angstrom		mL	mililiter
	μm	mikrometer		L	liter
	mm	milimeter		m^3	kubični meter
	cm	centimeter		in^3	kubični palec
	m	meter		ft^3	kubični čevelj
	km	kilometer		fl_oz(UK)	unci
	AU	astronomsko enoto		fl_oz(ZDA)	tekoča unča (ZDA)
	l.y.	svetlobno leto		gal(US)	galona
	pc	parsek		gal(UK)	britanski galon
	Mil	1/1000 palca		pt	pint
	in	palec		qt	kvart
	ft	stop		tsp	čajna žlička
	yd	jard		tbsp	žlica
	fath	fathom		skodelica	skodelica
	rd	palica	Čas	ns	nanosekunda
	milja	milja		μs	mikrosekunda
	n milja	navtična milja		ms	milisekunda
Površina	cm^2	kvadratni centimeter		s	sekunda
	m^2	kvadratni meter		min	minuta
	ha	hektar		h	ura
	km^2	kvadratni kilometer		dan	dan
	in^2	kvadratni palec		teden	teden
	ft^2	kvadratni čevelj		leto	leto
	yd^2	kvadratni jard		s-leto	siderično leto
	akr	akr		t-yr	tropsko leto
	milja^2	kvadratna milja			

Kat.	Prikazno ime	Enota
Temperatura	°	stopinje Celzija
	K	Kelvin
	°F	stopinje Fahrenheita
	°R	stopinje Rankine
Hitrost	m/s	meter na sekundo
	km/h	kilometer na uro
	voz	vozel
	ft/s	čevljev na sekundo
	milja/h	milja na uro
masa	u	atomna masna enota
	mg	miligram
	g	gram
	kg	kilogram
	mton	metrska tona
	oz	avoirdupois unča
	lb	masa v funtih
	slug	slug
	tona (kratka)	tona, kratka (2000 lbm)
	tona (dolga)	tona, dolga (2240 lbm)
Sila/Teža	N	newton
	lbf	funt sile
	tonf	tona sile
	dina	dina
	kgf	kilogram sile

Kategorija	Prikazano ime	Enota
Tlak	Pa	Pascal
	kPa	Kilopascal
	mmH2O	milimeter vode
	mmHg	milimeter živega srebra
	atm	atmosfera
	inH2O	palec vode
	inHg	palec živega srebra
	lbf/in^2	funt na kvadratni palec
	bar	bar
	kgf/cm^2	kilogram sile na kvadratni centimeter
Energija/delo	eV	elektronvolt
	J	joule
	kalorija $_{th}$	kalorija$_{th}$
	cal(15)	kalorija (15 °C)
	cal$_{IT}$	kalorija $_{IT}$
	kcal$_{th}$	kilokalorija $_{th}$
	kcal$_{15}$	kilokalorija (15 °C)
	kcal$_{IT}$	kilokalorija $_{IT}$
	l-atm	liter atmosfere
	kW•h	kilovatna ura
	ft•lbf	funt-stopala
	Btu	britanska toplotna enota
	erg	erg
	kgf•m	kilogram sile meter
Moč	W	vat
	kalorija $_{th}$ /s	kalorija na sekundo
	hp	konjska moč
	ft•lbf/s	funt-stopalka na sekundo
	Btu/min	britanska termična enota na minuto

Poglavje 3 Funkcija seznama

Seznam je mesto za shranjevanje več podatkovnih elementov.
Ta kalkulator omogoča shranjevanje do 26 seznamov v eni datoteki, v pomnilniku pa lahko shranite do šest datotek. Shranjeni seznami se lahko uporabljajo za aritmetične in statistične izračune ter za risanje grafikonov.

Številka elementa *Območje prikaza* *Celica* *Stolpec*

	Seznam 1	Seznam 2	Seznam 3	Seznam 4	Sezn	Sezna
SUB						
1	56	1	107	3,5	4	0
2	37	2	75	6	0	0
3	21	4	122	2,1	0	0
4	69	8	87	4,4	2	0
5	40	16	298	3	0	0
6	48	32	48	6,8	3	0
7	93	64	338	2	9	0
8	30	128	49	8,7	0	0
:	:	:	:	:	:	:

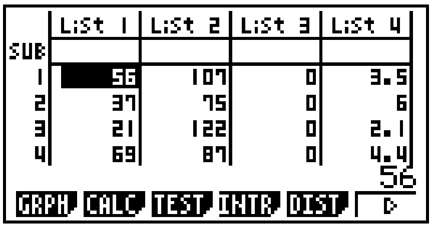
Ime seznama
Podime
Vrstica

1. Vnos in urejanje seznama

Ko vstopite v način **STAT**, se najprej prikaže »Urejevalnik seznama«. Urejevalnik seznama lahko uporabite za vnos podatkov v seznam in za izvajanje različnih drugih operacij s podatki seznama.

u Za vnos vrednosti eno po eno

S pomočjo tipk za premikanje kurzorja premaknite označitev na ime seznama, podimen ali celico, ki jo želite izbrati. Upoštevajte, da ② ne premakne označitve na celico, ki ne vsebuje vrednosti.

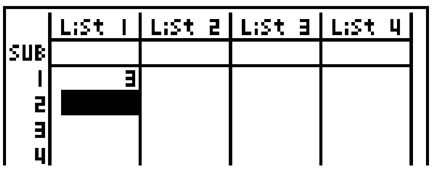


Zaslon se samodejno pomika, ko je označitev na enem od robov zaslona. V naslednjem primeru je označitev na celici 1 seznama 1.

1. Vnesite vrednost in pritisnite w, da jo shranite v seznam.

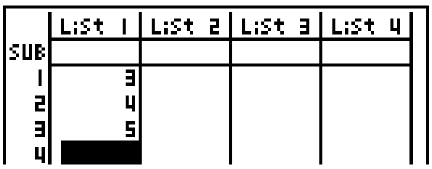
   dw

   • Označitev se samodejno premakne navzdol na naslednjo celico za vnos.



2. Vnesite vrednost 4 v drugo celico, nato pa vnesite rezultat 2 + 3 v naslednjo celico.

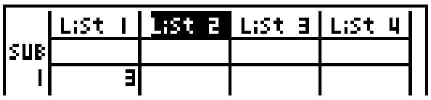
   4 wc+dw



- V celico lahko vnesete tudi rezultat izraza ali kompleksno število.
- V en sam seznam lahko vnesete vrednosti do 999 celic.

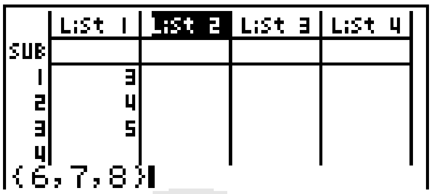
u **Za vnos serije vrednosti**

1. S pomočjo tipk za premikanje kurzorja premaknite označitev na drug seznam.



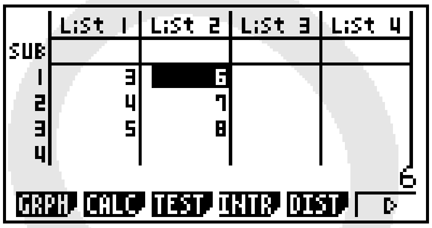
2. Pritisnite !*{) in vnesite želene vrednosti, med vsako pa pritisnite . Po vnosu zadnje vrednosti pritisnite !/}).

!*({)6,h,i!/(})



3. Pritisnite w, da shranite vse vrednosti na seznamu.

w



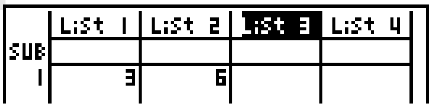
- Ne pozabite, da vrednosti ločuje vejica, zato ne vnašajte vejice za zadnjo vrednost niza, ki ga vnašate.

  Pravilno: {34, 53, 78}

  Napačno: {34, 53, 78,}

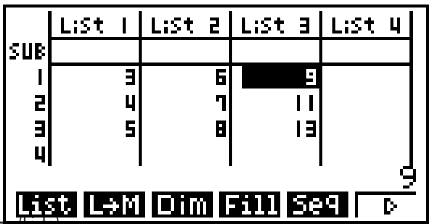
Imena seznamov lahko uporabite tudi znotraj matematičnega izraza za vnos vrednosti v drugo celico. Naslednji primer prikazuje, kako seštejemo vrednosti v vsaki vrstici seznama 1 in seznama 2 ter rezultat vnesemo v seznam 3.

1. S puščičnimi tipkami premaknite označitev na ime seznama, v katerega želite vnesti rezultate izračuna.



2. Pritisnite K in vnesite izraz.

K1(LIST)1(Seznam)b+
K1(LIST)1(Seznam)cw



- Namesto K1(LISTA)1(Lista) lahko uporabite tudi !b(Lista).

■ Urejanje vrednosti seznama

u **Če želite spremeniti vrednost celice**

S pomočjo tipk za premikanje kurzorja premaknite označitev na celico, katere vrednost želite spremeniti. Vnesite novo vrednost in pritisnite w, da nadomestite stare podatke z novimi.

u **Urejanje vsebine celice**

1. S pomočjo tipk za premikanje kurzorja premaknite označbo na celico, katere vsebino želite urediti.
2. Pritisnite 6(g)2(EDIT).
3. Spremenite podatke, kot želite.

u Za izbris celice

1. S puščičnimi tipkami premaknite označitev na celico, ki jo želite izbrisati.
2. Pritisnite 6(g)3(DEL), da izbrišete izbrano celico in vse, kar je pod njo, premaknete navzgor.

• Izbris celice ne vpliva na celice v drugih seznamih. Če so podatki v seznamu, iz katerega izbrišete celico, na kakršen koli način povezani s podatki v sosednjih seznamih, lahko izbris celice povzroči neskladje povezanih vrednosti.

u Če želite izbrisati vse celice v seznamu

Uporabite naslednji postopek, da izbrišete vse podatke v seznamu.

1. S puščično tipko premaknite označitev na katero koli celico seznama, katere podatke želite izbrisati.
2. S pritiskom na 6(g)4(DEL・A) se prikaže potrditveno sporočilo.
3. Pritisnite 1(Da), da izbrišete vse celice na izbranem seznamu, ali 6(Ne), da prekinete postopek brisanja, ne da bi kaj izbrisali.

u Vstavljanje nove celice

1. S puščičnimi tipkami premaknite označitev na mesto, kamor želite vstaviti novo celico.
2. Pritisnite 6(g)5(INS), da vstavite novo celico, ki vsebuje vrednost 0, zaradi česar se vse pod njo premakne navzdol.

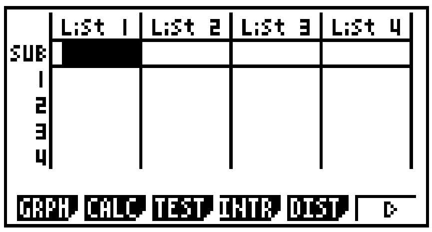
• Vstavljanje celice ne vpliva na celice v drugih seznamih. Če so podatki v seznamu, v katerega vstavljate celico, na kakršen koli način povezani s podatki v sosednjih seznamih, lahko vstavljanje celice povzroči, da se povezane vrednosti ne ujemajo več.

■ Poimenovanje seznama

Seznamom od 1 do 26 lahko dodelite „podimena“ z največ osmimi bajti.

u Poimenovanje seznama

1. Na zaslonu Nastavitve označite „Podimen“ in nato pritisnite 1.
2. S pomočjo tipk za premikanje kurzorja premaknite označitev na celico SUB seznama, ki ga želite poimenovati.

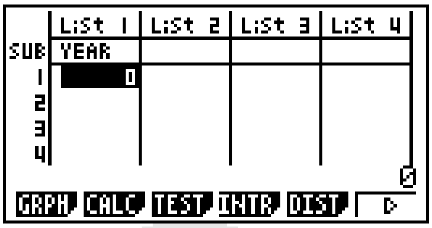


3. Vnesite ime in pritisnite w.

- Če želite vnesti ime z uporabo črk, pritisnite !a, da vstopite v način ALPHA-LOCK.

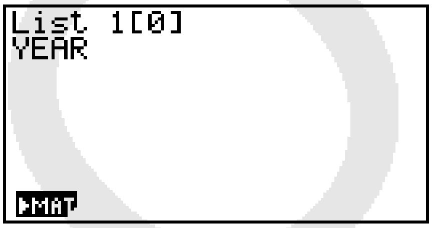
Primer: YEAR

—(Y)c(E)v(A)$\boxed{6}$ (R)w



- Naslednja operacija prikaže podime v načinu **RUN • MAT** (ali **RUN**).

! b(Seznam) *n* ! +([ )$\boxed{0}$! —( ])w (*n* = številka seznama od 1 do 26)



- Čeprav lahko za ime podskupine vnesete do 8 bajtov, se prikažejo samo znaki, ki se lahko prilegajo v celico urejevalnika seznama.
- Celica SUB urejevalnika seznama se ne prikaže, če je na zaslonu nastavitev za »Ime podprograma« izbrana možnost »Izklopljeno«.

■ Razvrščanje vrednosti seznama

Sezname lahko razvrstite v naraščajočem ali padajočem vrstnem redu. Označitev je lahko v kateri koli celici seznama.

u Razvrščanje posameznega seznama

Vzpenjajoči red

1. Ko so seznami na zaslonu, pritisnite 6(g)1(TOOL)1(SRT • A).
2. Pojavi se vprašanje »How Many Lists?« (Koliko seznamov?), s katerim vas sprašuje, koliko seznamov želite razvrstiti. Tukaj vnesemo 1, da označimo, da želimo razvrstiti le en seznam.

   bw

3. V odgovor na vprašanje »Izberite številko seznama:« vnesite številko seznama, ki ga želite razvrstiti.

   bw

Padajoči red

Uporabite enak postopek kot za razvrščanje v naraščajočem vrstnem redu. Edina razlika je, da morate namesto 1 (SRT • A) pritisniti 2 (SRT • D).

u Razvrščanje več seznamov

Za razvrščanje lahko povežete več seznamov, tako da se vse njihove celice prerazporedijo v skladu z razvrščanjem osnovnega seznama. Osnovni seznam je razvrščen v naraščajočem ali padajočem vrstnem redu, medtem ko so celice povezanih seznamov razporejene tako, da se ohrani relativno razmerje med vsemi vrsticami.

Vzpenjajoči se

1. Ko so seznami na zaslonu, pritisnite 6(g)1(TOOL)1(SRT • A).
2. Pojavi se vprašanje »Koliko seznamov?«, ki vas vpraša, koliko seznamov želite razvrstiti. Tukaj bomo razvrstili en osnovni seznam, povezan z enim drugim seznamom, zato moramo vnesti 2.

   cw

3. V odgovor na vprašanje »Izberite osnovni seznam št.« vnesite številko seznama, ki ga želite razvrstiti v naraščajočem vrstnem redu. Tukaj bomo določili seznam 1.

   bw

4. V odgovor na poziv »Izberite drugi seznam št.:« vnesite številko seznama, ki ga želite povezati z osnovnim seznamom. Tukaj bomo navedli seznam 2.

   cw

Padajoči red

Uporabite enak postopek kot za razvrščanje po naraščajočem vrstnem redu. Edina razlika je, da morate namesto 1(SRT • A) pritisniti 2(SRT • D).

- Kot število seznamov za razvrščanje lahko določite vrednost od 1 do 6.
- Če za eno razvrščanje določite več kot en seznam, se pojavi napaka.
  Napaka se pojavi tudi, če seznami, določeni za razvrščanje, nimajo enakega števila vrednosti (vrstic).

2. Manipuliranje s podatki seznama

Podatke seznama je mogoče uporabiti v aritmetičnih in funkcionalnih izračunih. Poleg tega različne funkcije za manipulacijo podatkov seznama omogočajo hitro in enostavno manipulacijo podatkov seznama.

Funkcije za manipulacijo podatkov na seznamu lahko uporabljate v načinih **RUN • MAT** (ali **RUN**), **STAT**, **TABLE**, **EQUA** in **PRGM**.

■ Dostop do menija funkcij za manipulacijo podatkov na seznamu

Vsi naslednji primeri se izvedejo po vstopu v način **RUN • MAT** (ali **RUN**).

Pritisnite K in nato 1(LIST), da prikažete meni za upravljanje podatkov seznama, ki vsebuje naslednje elemente.

- →
  {**%**}/{A}

Upoštevajte, da se lahko vse zapiralne oklepaje na koncu naslednjih operacij izpustijo.

u **Za prenos vsebine seznama v pomnilnik odgovorov matrike** **[OPTN]-[LIST]-[L→ M]**
(Ni vključeno v fx-7400GIII)

K1(LIST)2(L→ M)1(List) <številka seznama 1-26> , 1 (List) <številka seznama 1-26> ... , 1 (Seznam) <številka seznama 1-26>)w

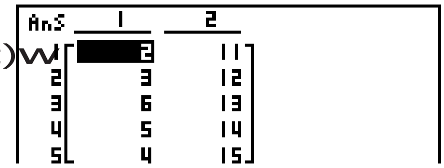
- V zgornjem postopku lahko preskočite vnos 1(Seznam).
- Vsi seznami morajo vsebovati enako število podatkovnih elementov. Če jih ne vsebujejo,

Vzpenjajoči se

pride do napake. Primer: Seznam$\rightarrow$ Mat (1, 2)w

Primer **Če želite prenesti vsebino seznama 1 (2, 3, 6, 5, 4) v stolpec 1 in vsebina seznama 2 (11, 12, 13, 14, 15) v stolpec 2 matričnega pomnilnika odgovorov**

AC K1(LIST)2(L→ M)
1(Seznam)b,1(Seznam)c)w



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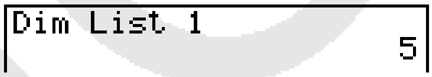
u **Za štetje števila podatkovnih elementov v seznamu** **[OPTN]-[LIST]-[Dim]**

K1(SEZNAM)3(Dim)1(Seznam) <številka seznama 1 - 26> w

• Število celic, ki jih vsebuje seznam, je njegova „dimenzija“.

Primer **Štetje vrednosti v seznamu 1 (36, 16, 58, 46, 56)**

AC K1(SEZNAM)3(Dim)
1(Seznam)bw



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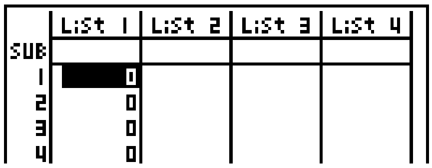
u **Ustvarjanje seznama z določitvijo števila podatkovnih elementov** **[OPTN]-[LIST]-[Dim]** Uporabite naslednji postopek, da določite število podatkov v izjavi dodelitve in ustvarite seznam.

<število podatkov n> aK1(LIST)3(Dim)1(List) <številka seznama 1 - 26> w (*n* = 1 - 999)

Primer 1 **Za ustvarjanje petih podatkovnih elementov (vsak od njih vsebuje 0) v seznamu**

AC faK1(LIST)3(Dim)
1(Seznam)bw



Novo ustvarjeni seznam si lahko ogledate z vnosom načina **STAT**
.

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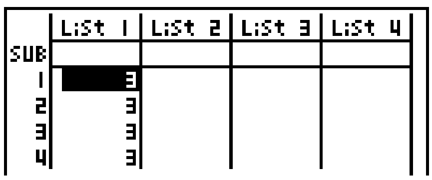
u **Za zamenjavo vseh podatkovnih elementov z enako vrednostjo** **[OPTN]-[LIST]-[Fill]**

K1(LIST)4(Fill) <vrednost> , 1 (List) <številka seznama 1 - 26>)w

Primer **Za zamenjavo vseh podatkovnih elementov v seznamu 1 s številko 3**

AC K1(LIST)4(Fill)
d,1(Seznam)b)w

Spodaj je prikazana nova vsebina seznama 1.



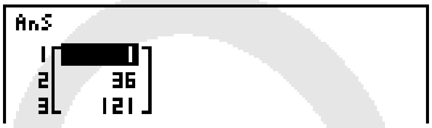
u Za ustvarjanje zaporedja številk **[OPTN]-[LIST]-[Seq]**

K1(LIST)5(Seq) <izraz> , <ime spremenljivke> , <začetna vrednost> , <končna vrednost>
, <povečanje>)w

- Rezultat te operacije je shranjen v pomnilniku ListAns.

Primer **Vnesite številčno zaporedje 1^2 , 6^2, 11^2 v seznam z uporabo funkcije $f(x) = X^2$. Uporabite začetno vrednost 1, končno vrednost 11 in povečanje 5.**

AC K1(LIST)5(Seq)vx,
v,b,bb,f)w



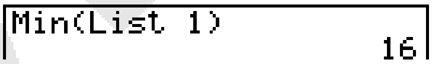
Določitev končne vrednosti 12, 13, 14 ali 15 da enak rezultat kot zgoraj, saj so te vrednosti manjše od vrednosti, ki jo da naslednje povečanje (16).

u Za iskanje najmanjše vrednosti v seznamu **[OPTN]-[LIST]-[Min]**

K1(LIST)6(g)1(Min)6(g)6(g)1(List) <seznam številka 1 - 26>)w

Primer **Za iskanje najmanjše vrednosti v seznamu 1 (36, 16, 58, 46, 56)**

AC K1(LIST)6(g)1(Min)
6(g)6(g)1(Seznam)b)w



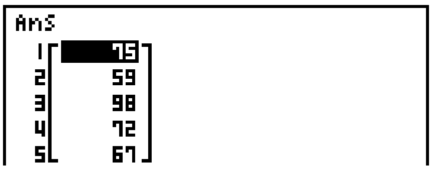
u Da bi našli, kateri od dveh seznamov vsebuje največjo vrednost **[OPTN]-[LIST]-[Max]**

K1(SEZNAM)6(g)2(Max)6(g)6(g)1(Seznam) <seznam številka 1 - 26> , 1 (Seznam)
<seznam številka 1 - 26>)w

- Oba seznama morata vsebovati enako število podatkovnih elementov. Če to ni tako, pride do napake.
- Rezultat te operacije je shranjen v pomnilniku ListAns.

Primer **Da bi ugotovili, ali seznam 1 (75, 16, 98, 46, 56) ali seznam 2 (35, 59, 58, 72, 67) vsebuje največjo vrednost**

K1(LIST)6(g)2(Max)
6(g)6(g)1(List)b,
1(List)c)w

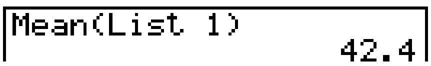


u Izračun povprečja podatkovnih elementov **[OPTN]-[LIST]-[Mean]**

K1(LIST)6(g)3(Mean)6(g)6(g)1(List) <številka seznama 1 - 26>)w

Primer **Izračun povprečja podatkovnih elementov v seznamu 1 (36, 16, 58, 46, 56)**

AC K1(LIST)6(g)3(Povprečje)
6(g)6(g)1(Seznam)b)w



u **Izračun mediane podatkovnih elementov z določeno**

[OPTN]-[SEZNAM]-[Med]

Ta postopek uporablja dva seznama: enega, ki vsebuje vrednosti, in drugega, ki navaja pogostost (število pojavitev) vsake vrednosti. Pogostost podatkov v celici 1 prvega seznama je navedena z vrednostjo v celici 1 drugega seznama itd.

- Oba seznama morata vsebovati enako število podatkovnih elementov. Če to ni tako, pride do napake.

K1(LIST)6(g)4(Med)6(g)6(g)1(List) <seznam številka 1 - 26 (podatki)> , 1 (List) <seznam številka 1 - 26 (pogostost)>)w

Primer **Za izračun mediane vrednosti v seznamu 1 (36, 16, 58, 46, 56), katerega pogostost je navedena v seznamu 2 (75, 89, 98, 72, 67)**

AC K1(SEZNAM)6(g)4(Med)
6(g)6(g)1(Seznam)
b, 1(Seznam)c)w

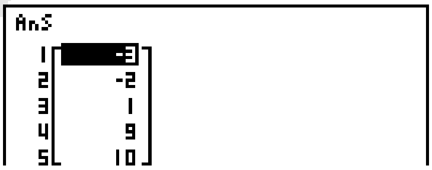
u **Za združevanje seznamov** **[OPTN]-[LIST]-[Aug]**

- Dva različna seznama lahko združite v enega. Rezultat združevanja seznamov se shrani v pomnilnik ListAns.

K1(SEZNAM)6(g)5(avgust)6(g)6(g)1(Seznam) <seznam številka 1 - 26> , 1 (Seznam) <seznam številka 1 - 26>)w

Primer **Za združitev seznama 1 (–3, –2) in seznama 2 (1, 9, 10)**

AC K1(LIST)6(g)5(avgust)
6(g)6(g)1(Seznam)
b, 1(Seznam)c)w

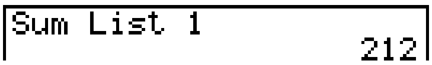


u **Izračun seštevka podatkovnih elementov na seznamu** **[OPTN]-[SEZNAM]-[Vsota]**

K1(SEZNAM)6(g)6(g)1(Vsota)6(g)1(Seznam) <seznam številka 1 - 26> w

Primer **Za izračun vsote podatkovnih elementov v seznamu 1 (36, 16, 58, 46, 56)**

AC K1(LIST)6(g)6(g)1(Sum)
6(g)1(Seznam)bw

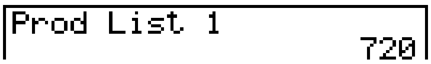


u **Za izračun produkta vrednosti v seznamu** **[OPTN]-[SEZNAM]-[Prod]**

K1(SEZNAM)6(g)6(g)2(Produkt)6(g)1(Seznam) <seznam številka 1 - 26> w

Primer **Za izračun produkta vrednosti v seznamu 1 (2, 3, 6, 5, 4)**

AC K1(SEZNAM)6(g)6(g)2(Prod)
6(g)1(Seznam)bw



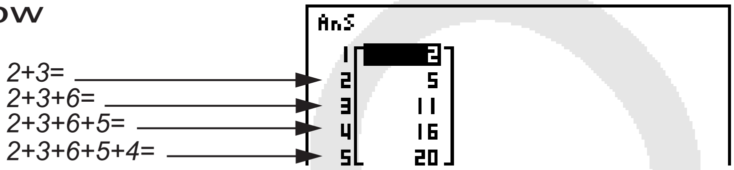
u **Izračun kumulativne frekvence vsakega podatkovnega elementa** **[OPTN]-[LIST]-**

K1(SEZNAM)6(g)6(g)3(Cuml)6(g)1(Seznam) <seznam številka 1 - 26> w

• Rezultat te operacije je shranjen v pomnilniku ListAns.

Primer **Za izračun kumulativne frekvence vsakega podatka v seznamu 1 (2, 3, 6, 5, 4)**

AC K1(LIST)6(g)6(g)3(Cuml)
6(g)1(Seznam)bw



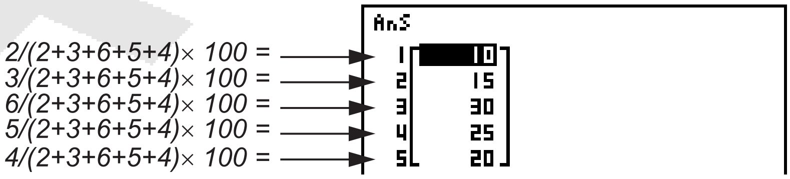
u **Za izračun odstotka, ki ga predstavlja vsak podatek** **[OPTN]-[LIST]-[%]**

K1(LIST)6(g)6(g)4(%)6(g)1(Seznam) <številka seznama 1 - 26> w

• Zgoraj navedena operacija izračuna, kolikšen odstotek celotnega seznama predstavlja vsak posamezni podatkovni element.
• Rezultat te operacije se shrani v pomnilnik ListAns.

Primer **Za izračun odstotka, ki ga predstavlja vsak podatek v seznamu 1 (2, 3, 6, 5, 4)**

AC K1(SEZNAM)6(g)6(g)4(%)
6(g)1(Seznam)bw



u **Za izračun razlik med sosednjimi podatki znotraj seznama**

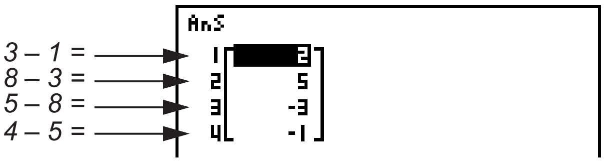
[OPTN]-[LIST]-[A]

K1(LIST)6(g)6(g)5(A) <seznam številka 1 - 26> w

• Rezultat te operacije je shranjen v pomnilniku ListAns.

Primer **Za izračun razlike med podatkovnimi elementi v seznamu 1 (1, 3, 8, 5, 4)**

AC K1(LIST)6(g)6(g)5(A)
bw



- Lokacijo shranjevanja v pomnilniku seznama lahko določite za rezultat izračuna, ki je bil pridobljen z izračunom seznama, katerega rezultat je shranjen v pomnilniku ListAns. Če na primer določite „AList 1→ List 2“, bo rezultat AList 1 shranjen v List 2.
- Število celic v novem AList je za eno manjše od števila celic v izvirnem seznamu.
- Če izvedete AList za seznam, ki nima podatkov ali ima le en podatek, se pojavi napaka.

3. Aritmetični izračuni z uporabo seznamov

Aritmetične izračune lahko izvedete z uporabo dveh seznamov ali enega seznama in številčne vrednosti.

■ Sporočila o napakah

- Izračun, ki vključuje dva seznama, izvede operacijo med ustreznimi celicami. Zaradi tega pride do napake, če dva seznama nimata enakega števila vrednosti (kar pomeni, da imata različne „dimenzije“).
- Napaka se pojavi, kadar katera koli operacija, ki vključuje dve celici, povzroči matematično napako.

■ Vnos seznama v izračun

Seznam lahko vnesete v izračun na tri načine.

- Določitev številke seznama, ustvarjenega z urejevalnikom seznamov.
- Določitev podimenja seznama, ustvarjenega z urejevalnikom seznamov.
- Neposredno vnašanje seznama vrednosti.

u Za določitev številke seznama, ustvarjenega z urejevalnikom seznamov

1. V načinu **RUN • MAT** (ali **RUN**) izvedite naslednjo tipko.

   AC K1(LIST)1(Seznam)

   - Vnesite ukaz „List“.

2. Vnesite številko seznama (celo število od 1 do 26), ki jo želite določiti.

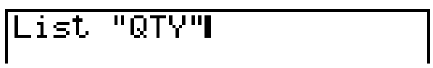
u Za določitev podimenika seznama, ustvarjenega z urejevalnikom seznamov

1. V načinu **RUN • MAT** (ali **RUN**) izvedite naslednjo tipko.

   AC K1(LIST)1(Seznam)

   - Vnesite ukaz „Seznam“.

2. Vnesite podimeznico seznama, ki ga želite določiti, v dvojnih narekovajih (" ").



Primer: "QTY"

u Za neposredno vnos seznama

Seznam vrednosti lahko vnesete tudi neposredno z uporabo {, } in ,

Primer **Za vnos seznama: 56, 82, 64**

! *({)f6 ,ic,
64 !/(})

{56,82,64}

u Da dodelite vsebino enega seznama drugemu seznamu

Uporabite a, da dodelite vsebino enega seznama drugemu seznamu.

Primer **Če želite dodeliti vsebino seznama 3 (41, 65, 22) seznamu 1**

K1(LIST)1(List)da1(List)bw

Namesto operacije 1(LIST)1(List)d v zgornjem postopku lahko vnesete
! *({)4 b,6 f,cc!/(}).

u Za priklic vrednosti v določeni celici seznama

Vrednost lahko prikličete v določeno celico seznama in jo uporabite v izračunu. Številko celice navedite tako, da jo vstavite v oglje.

Primer **Za izračun sinus vrednosti, shranjene v celici 3 seznama 2**

sK1 (LIST) 1 (Seznam)c ! +([ )d ! -( ])w

u Za vnos vrednosti v določeno celico seznama

V določeno celico seznama lahko vnesete vrednost. Ko to storite, se vrednost, ki je bila prej shranjena v celici, nadomesti z novo vrednostjo, ki ste jo vnesli.

Primer **Za vnos vrednosti 25 v celico 2 seznama 3**

cfaK1 (LIST) 1 (List)d ! +([ )c ! -( ])w

■ Povzemanje vsebine seznama

Primer **Za priklic vsebine seznama 1**

K1(LIST)1(Seznam)bw

- Zgoraj navedena operacija prikaže vsebino seznama, ki ga določite, in jo shrani v pomnilnik ListAns. Vsebino pomnilnika ListAns lahko nato uporabite v izračunu.

u **Uporaba vsebine seznama v pomnilniku ListAns v**

Primer **Za pomnožitev vsebine seznama v pomnilniku ListAns z 36**

K1 (LIST) 1 (List) ■ —(Ans)*d6w

- Operacija K1 (LIST) 1 (List) ■ — (Ans) prikliče vsebino pomnilnika ListAns.
- Ta operacija nadomesti trenutno vsebino pomnilnika ListAns z rezultatom zgornjega izračuna.

■ Grafični prikaz funkcije z uporabo seznama

Pri uporabi grafičnih funkcij tega kalkulatorja lahko vnesete funkcijo, kot je Y1 = Seznam 1X. Če Seznam 1 vsebuje vrednosti 1, 2, 3, bo ta funkcija ustvarila tri grafe: Y = X, Y = 2X, Y = 3X.

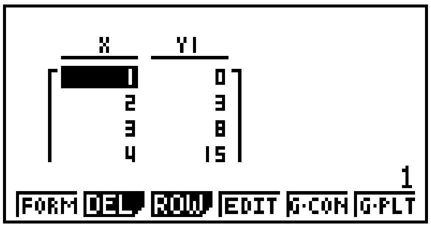
Pri uporabi seznamov s funkcijami za risanje grafikonov obstajajo določene omejitve.

■ Vnašanje znanstvenih izračunov v seznam

V načinu **TABLE** lahko uporabite funkcije za ustvarjanje numeričnih tabel, da vnesete vrednosti, ki so rezultat določenih znanstvenih funkcijskih izračunov, v seznam. Za to najprej ustvarite tabelo, nato pa uporabite funkcijo kopiranja seznama, da vrednosti iz tabele kopirate v seznam.

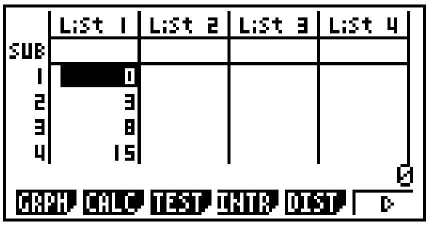
Primer **Če želite v načinu TABLE ustvariti številčno tabelo za formulo (Y1 = x^2 –1) in nato kopirate tabelo v seznam 1 v načinu STAT**

1. V načinu **TABLE** vnesite formulo Y1 = x^2 –1.
2. Ustvarite tabelo številk.



3. Z e premaknite označitev v stolpec Y1.
4. Pritisnite K1(LMEM).

5. Pritisnite bw.
6. Vstopite v način **STAT,** da potrdite, da je bil stolpec Y1 v načinu **TABLE** kopiran v seznam 1.



■ Izvedba znanstvenih funkcionalnih izračunov z uporabo seznama

Sezname lahko uporabljate enako kot številčne vrednosti v znanstvenih funkcionalnih izračunih. Ko izračun kot rezultat ustvari seznam, se ta shrani v pomnilnik ListAns.

Primer seznama 3 **Za uporabo** $\begin{bmatrix} 41 \\ 65 \\ 22 \end{bmatrix}$ **za izvedbo sin (Seznam 3)**

Uporabite radiante kot enoto za kot.

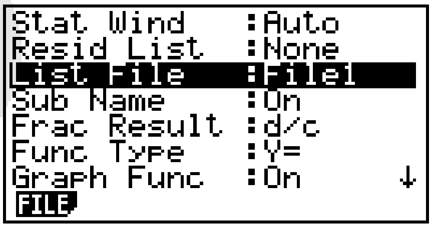
sK1(LIST)1(Seznam)dw

4. Preklapljanje med datotekami s seznami

V vsaki datoteki (Datoteka 1 do Datoteka 6) lahko shranite do 26 seznamov (Seznam 1 do Seznam 26). Med seznamskimi datotekami lahko preklapljate s preprostim postopkom.

u **Preklapljanje med datotekami s seznami**

1. V glavnem meniju vstopite v način **STAT**.
   Pritisnite !m(SET UP), da prikažete zaslon nastavitev načina **STAT**.



2. Z ② označite »List File« (Seznam datotek).
3. Pritisnite 1 (FILE) in nato vnesite številko datoteke seznama, ki jo želite uporabiti.

Primer **Za izbiro datoteke 3**

1(FILE)d

w

Vse nadaljnje operacije s seznami se uporabijo za sezname, ki so vsebovani v izbrani datoteki (v zgornjem primeru datoteka s seznamom 3).

5. Uporaba datotek CSV

Vsebino CSV datoteke, shranjene v tem kalkulatorju ali prenesene iz računalnika, lahko uvozite v urejevalnik seznamov. Vsebino vseh podatkov seznama v urejevalniku seznamov lahko shranite tudi kot CSV datoteko. Te operacije se izvajajo s pomočjo menija CSV funkcije, ki se prikaže, ko pritisnete 6(g)6(g)1(CSV), medtem ko je na zaslonu urejevalnik seznamov.

■ Zahteve za uvoz CSV datoteke

Za uvoz lahko uporabite CSV datoteko, ki je bila izvožena iz urejevalnika seznamov, urejevalnika matrik (stran 2-39) ali preglednice (stran 9-3), ali CSV datoteko, preneseno iz računalnika v pomnilnik. Za uvoz so podprte naslednje vrste CSV datotek.

- CSV datoteka, ki kot ločilo uporablja vejico (,) ali podpičje (;) in kot decimalno vejico piko (.) ali vejico (,). CSV datoteka, ki kot ločilo uporablja tabulator, ni podprta.
- Za kodo preloma vrstice so podprti CR, LF in CRLF.
- Pri uvozu datoteke CSV v kalkulator, če podatki v vrstici 1 vsakega stolpca datoteke (ali vrstici 1 stolpca 1 datoteke) vsebujejo dvojne narekovaje (") ali enojne narekovaje ('), bo vrstica 1 vseh stolpcev datoteke CSV prezrta, podatki pa se bodo vnašali od vrstice 2 dalje.

Za informacije o prenosu datotek iz računalnika v kalkulator glejte „Poglavje 13 Podatkovna komunikacija”.

■ Prenos podatkov med seznami in CSV datotekami

u Uvoz vsebine CSV datoteke v urejevalnik seznamov

1. Pripravite CSV datoteko, ki jo želite uvoziti.
   - Glejte »Zahteve za uvoz CSV datoteke«, opisane zgoraj.
2. Ko je na zaslonu urejevalnik seznamov, pritisnite 6(g)6(g)1(CSV), da prikažete meni funkcij CSV.
3. Kaj morate storiti naslednje, je odvisno od vrste uvoza CSV datoteke, ki ga želite izvesti.

Za začetek uvoza iz določene vrstice:	**Če želite prepisati celotno vsebino urejevalnika seznama:**
S puščičnimi tipkami premaknite označitev na vrstico, iz katere želite začeti uvažati podatke, in nato pritisnite 1(LOAD)1(LIST).	Pritisnite 1(LOAD)2(FILE).

4. V pogovornem oknu za izbiro datoteke, ki se prikaže, uporabite f in ②, da označite datoteko, ki jo želite uvoziti, in nato pritisnite w.
   - S tem uvozite vsebino CSV datoteke, ki ste jo določili, v urejevalnik seznamov.
   - Če ste v koraku 3 pritisnili 1(LOAD)1(LIST), se uvoz začne z vrstico, v kateri se nahaja označena celica, in prepiše vrstice urejevalnika seznamov samo z enakim številom vrstic, kot jih vsebuje CSV datoteka.

   Primeri

   Urejevalnik seznamov Izvirna vsebina

Seznam 1	Seznam 2	Seznam 3	Seznam 4	Seznam 5
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4

   Označitev

   Uvoz podatkov iz

20	20	20
30	30	30
40	40	40

   Vsebina urejevalnika seznamov

Seznam 1	Seznam 2	Seznam 3	Seznam 4	Seznam 5
1	20	20	20	1
2	30	30	30	2
3	40	40	40	3
4				4

Pomembno!

Poskus uvoza naslednjih vrst CSV datotek bo povzročil napako.

- CSV datoteka, ki vsebuje podatke, ki jih ni mogoče pretvoriti. V tem primeru se prikaže sporočilo o napaki, ki prikazuje mesto v CSV datoteki (primer: vrstica 2, stolpec 3), kjer se nahajajo podatki, ki jih ni mogoče pretvoriti.
- CSV datoteka z več kot 26 stolpci ali 999 vrsticami. V tem primeru se prikaže napaka »Neveljavna velikost podatkov«.

u **Shranite vsebino vseh podatkov seznama v urejevalniku seznamov kot eno CSV datoteko.**

1. Ko je na zaslonu prikazan urejevalnik seznama, pritisnite 6(g)6(g)1(CSV), da prikažete meni funkcije CSV.
2. Pritisnite 2(SV・AS).
   - Prikaže se zaslon za izbiro mape.
3. Izberite mapo, v katero želite shraniti datoteko CSV.
   - Če želite CSV datoteko shraniti v korenski imenik, označite »ROOT«.
   - Če želite CSV datoteko shraniti v mapo, uporabite f in ②, da označite želeno mapo, nato pa pritisnite 1(OPEN).
4. Pritisnite 1(SV・AS).
5. Vnesite do osem znakov za ime datoteke in nato pritisnite w.

Pomembno!

- Podnaslov v urejevalniku seznamov se ne shrani v datoteko CSV.
- Pri shranjevanju podatkov seznama v datoteko CSV se nekateri podatki pretvorijo, kot je opisano spodaj.
  - Podatki o kompleksnih številkah: Izpisuje se samo realni del števila.
  - Podatki o ulomkih: pretvorjeni v format izračunske vrstice (primer: 2{3{4→ =2+3/4)
  - Podatki inπ : pretvorjeni v decimalno vrednost (primer: '3→ 1,732050808)

■ Določanje ločevalnega simbola in decimalne vejice v datoteki CSV

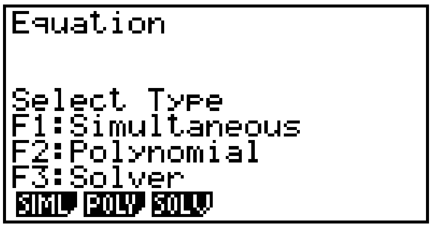
Pri uvozu CSV datoteke, ki je bila prenesena iz računalnika v kalkulator, določite ločevalni znak in decimalno vejico v skladu z nastavitvami, ki ste jih določili v aplikaciji pri izvozu CSV datoteke. Za ločevalni znak lahko določite vejico (,) ali podpičje (;), za decimalno vejico pa lahko določite piko (.) ali vejico (,).

u **Za določitev ločevalnega znaka in decimalne vejice v datoteki CSV**

1. Ko je na zaslonu prikazan urejevalnik seznama, pritisnite 6(g)6(g)1(CSV), da prikažete meni funkcij CSV.
2. Pritisnite 3(SET).
   - Prikaže se zaslon za nastavitev formata CSV.
3. S tipkama f in ② premaknite označitev na »CSV Separator« in nato pritisnite 1(,) ali 2(;).
4. S tipkama f in ② premaknite označitev na »CSV Decimal Symbol« (Desetiški simbol CSV) in nato pritisnite 1(.) ali 2(,).
   - Če ste v koraku 3 izbrali 1(,), tukaj ne boste mogli izbrati 2(,).
5. Ko je nastavitev takšna, kot želite, pritisnite J

Poglavje 4 Izračuni enačb

V glavnem meniju vstopite v način **EQUA**.



- {**SIML**} ... {linearna enačba z 2 do 6 neznankami}
- {**POLY**} ... {enakacija stopnje 2 do 6}
- {**SOLV**} ... {rešitev izračuna}

1. Simultane linearne enačbe

Rešite lahko simultane linearne enačbe z dvema do šestimi neznankami.

- Hkratna linearna enačba z dvema neznankama:

  $a1x + b1y =$

  c1 $a2x + b2y =$

  c2

- Hkratna linearna enačba s tremi neznankami:

  $a1x + b1y + c1z =$

  d1 $a2x + b2y + c2z$

  $=$ d2 $a3x + b3y +$

  $c3z =$ d3 ⋮

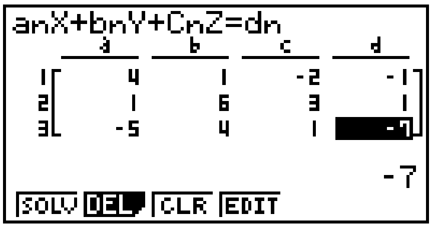
1. V glavnem meniju vstopite v način **EQUA**.
2. Izberite način SIML (Simultaneous) in določite število neznank (spremenljivk). Določite lahko od 2 do 6 neznank.
3. Zaporedno vnesite koeficiente.
   - Celica, ki je trenutno izbrana za vnos, je označena. Vsakič, ko vnesete koeficient, se označitev premakne v zaporedju:

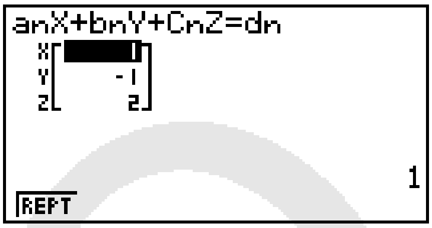
     a1→ b1→ c1→ … an→ bn→ cn→ (n = 2 do 6)
   - Kot koeficiente lahko vnesete tudi ulomke in vrednosti, dodeljene spremenljivkam.
   - Vrednost, ki jo vnašate za trenutni koeficient, lahko kadarkoli prekličete s pritiskom na tipko J, preden pritisnete tipko w za shranjevanje vrednosti koeficienta. S tem se koeficient vrne na vrednost, ki je bila pred vnosom. Nato lahko vnesete drugo vrednost, če želite.
   - Če želite spremeniti vrednost koeficienta, ki ste ga že shranili s pritiskom na tipko w, premaknite kurzor na koeficient, ki ga želite urediti. Nato vnesite vrednost, na katero želite spremeniti.
   - S pritiskom na 3(CLR) se vsi koeficienti izbrišejo na nič.
4. Rešite enačbe.

Primer **Rešite naslednje simultane linearne enačbe za x, y in z**

$$\begin{aligned} 4x + y - 2z &= -1 \\ x + 6y + 3z &= 1 \\ -5x + 4y + z &= -7 \end{aligned}$$

① m EQUA
2 1(SIML)
2(3)
3 4 wbw-cw-bw
bw6 wdwbw
-fw4 wbw-hw
4 1(SOLV)





- Notranji izračuni se izvajajo z 15-mestno mantiso, rezultati pa se prikažejo z 10-mestno mantiso in 2-mestnim eksponentom.
- Hkratne linearne enačbe se rešujejo z inverzijo matrike, ki vsebuje koeficiente enačb. Na primer, naslednje prikazuje rešitev (x, y, z) hkratne linearne enačbe s tremi neznankami.

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} a1 & b1 & c1 \\ a2 & b2 & c2 \\ a3 & b3 & c3 \end{bmatrix}^{-1} \begin{bmatrix} d1 \\ d2 \\ d3 \end{bmatrix}$$

Zaradi tega se natančnost zmanjša, ko se vrednost determinante približuje ničli. Poleg tega lahko reševanje simultanih enačb s tremi ali več neznankami traja zelo dolgo.

- Če kalkulator ne more najti rešitve, se pojavi napaka.
- Po končanem izračunu lahko pritisnete 1(REPT), spremenite vrednosti koeficientov in nato ponovno izračunate.

2. Enakovrednosti visokega reda od 2. do 6. stopnje

Vaš kalkulator lahko uporabite za reševanje enačb visokega reda od 2. do 6. stopnje.

- Kvadratna enačba: $ax^2 + bx + c = 0$ (a C 0)
- Kubična enačba: $ax^3 + bx^2 + cx + d = 0$ (a C 0)
- Kvadratna enačba: $ax^4 + bx^3 + cx^2 + dx + e = 0$ (a C 0)

⋮

1. V glavnem meniju vstopite v način **EQUA**.
2. Izberite način POLY (Polinom) in določite stopnjo enačbe. Določite lahko stopnjo od 2 do 6.
3. Zaporedno vnesite koeficiente.
   - Celica, ki je trenutno izbrana za vnos, je označena. Vsakič, ko vnesete koeficient, se označitev premakne v zaporedju:

     $a \rightarrow b \rightarrow c \rightarrow \ldots$

   - Kot koeficiente lahko vnesete tudi ulomke in vrednosti, dodeljene spremenljivkam.
   - Vrednost, ki jo vnašate za trenutni koeficient, lahko kadarkoli prekličete s pritiskom na tipko J, preden pritisnete tipko w za shranjevanje vrednosti koeficienta. S tem se koeficient vrne na vrednost, ki je bila pred vnosom. Nato lahko vnesete drugo vrednost, če želite.

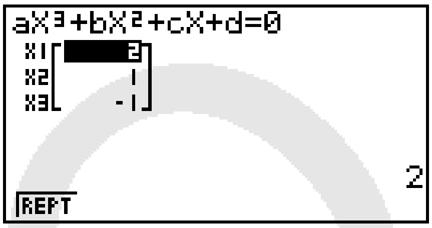
• Če želite spremeniti vrednost koeficienta, ki ste ga že shranili s pritiskom na tipko w, premaknite kurzor na koeficient, ki ga želite urediti. Nato vnesite vrednost, na katero želite spremeniti.

• S pritiskom na 3(CLR) se vsi koeficienti izbrišejo na nič.

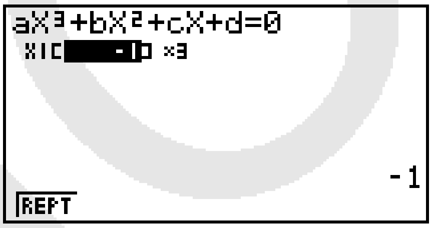
4. Rešite enačbe.

Primer **Rešite kubično enačbo (enota kota = Rad)**
$x^3 - 2x^2 - x + 2 = 0$

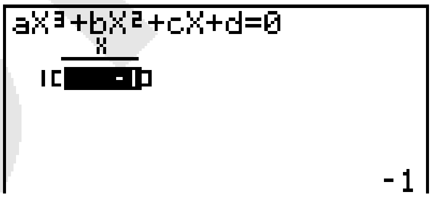
① m EQUA
2 2(POLY)
  2(3)
3 bw-cw-bwcw
4 1(SOLV)



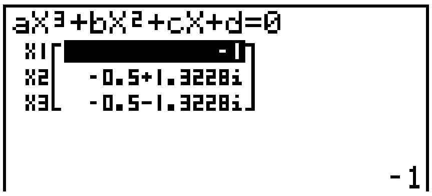
Več rešitev (Primer: $x^3 + 3x^2 + 3x + 1 = 0$)



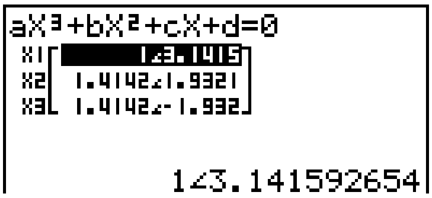
Rešitev s kompleksnimi številkami (primer: $x^3 + 2x^2 + 3x + 2 = 0$)



Kompleksni način: a +



Kompleksni način:



• Notranji izračuni se izvajajo z 15-mestno mantiso, rezultati pa se prikazujejo z 10-mestno mantiso in 2-mestnim eksponentom.

• Prikaz izračuna visokega reda enačbe tretje stopnje ali višje na zaslonu lahko traja precej časa.

• Če kalkulator ne more najti rešitve, se pojavi napaka.

• Izračuni enačb višjega reda morda ne dajejo natančnih rezultatov, če ima enačba več rešitev.

• Po končanem izračunu lahko pritisnete 1(REPT), spremenite vrednosti koeficientov in ponovno izračunate.

3. Reševanje izračunov

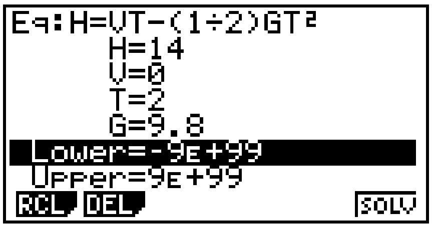
Način reševanja izračunov vam omogoča, da določite vrednost katere koli spremenljivke v formuli, ne da bi morali rešiti enačbo.

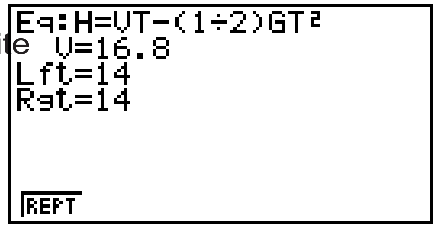
1. V glavnem meniju vstopite v način **EQUA**.
2. Izberite način SOLV (Reševalec) in vnesite enačbo, kot je zapisana.
   - Če ne vnesete znaka za enako, kalkulator predpostavlja, da je izraz levo od znaka za enako, desno pa je ničla.
   - Če vnesete več kot en znak za enako, se pojavi napaka.
3. V tabeli spremenljivk, ki se prikaže na zaslonu, vnesite vrednosti za vsako spremenljivko.
   - Lahko tudi določite vrednosti za Zgornjo in Spodnjo, da opredelite zgornjo in spodnjo mejo območja rešitev.
   - Če rešitev ne sodi v območje, ki ste ga določili, se pojavi napaka.
4. Izberite spremenljivko, za katero želite rešitev, da dobite rešitev.
   „Lft“ in „Rgt“ označujeta levo in desno stran, ki se izračunata z uporabo rešitve.*1

*1 Rešitve so približne in izračunane z Newtonovo metodo. Vrednosti Lft in Rgt so prikazane za potrditev, saj Newtonova metoda lahko da rezultate, ki so prava rešitev. Čim bližje je razlika med vrednostmi Lft in Rgt ničli, tem manjša je stopnja napake v rezultatu.

Primer **Predmet, ki je bil vržen v zrak s začetno hitrostjo V, potrebuje čas T, da doseže višino H. Uporabite naslednjo formulo, da izračunate začetno hitrost V, če je H = 14 (metrov), T = 2 (sekundi) in gravitacijsko pospešitev G =**
9,8 (m/s^2).
H = VT – 1/2 GT^2

① m EQUA
2 3(SOLV)
af*(H) ! .(=)ac(V)a/(T)-
(b/c)a'**(G)a/(T)xw
3 b□w4(H = 14)
0 w(V = 0)
cw(T = 2)
j .iw(G = 9,8)
4 Pritisnite fff, da označite V = 0, nato pa pritisnite 6(SOLV).
* fx-7400GIII: F
** fx-7400GIII: v





- Na zaslonu se prikaže sporočilo „Ponovi“, če kalkulator oceni, da konvergenca ni zadostna za prikazane rezultate.
- Operacija reševanja bo dala eno rešitev. Uporabite POLY, če želite dobiti več rešitev za enačbo visokega reda (kot je $ax^2 + bx + c = 0$).

Poglavje 5 Grafični prikaz

V glavnem meniju izberite ikono, ki ustreza vrsti grafa, ki ga želite narisati, ali vrsti tabele, ki jo želite ustvariti.

- **GRAF** … Splošno risanje grafikonov
- **RUN • MAT** (ali **RUN**) … Ročno risanje grafikonov (strani 5-12 do 5-16)
- **TABLE** … Ustvarjanje številčne tabele (strani 5-16 do 5-20)
- **DYNA*** … Dinamično risanje grafikonov (strani 5-21 do 5-23)
- **RECUR*** … Risanje rekurzivnih grafikonov ali ustvarjanje številčnih tabel (strani 5-23 do 5-27)
- **CONICS*** … Grafični prikaz koničnih odsekov (stran 5-28)

* Ni vključeno v fx-7400GIII.

5

1. Primeri grafikonov

■ Kako narisati preprost graf (1)

Za risanje grafa preprosto vnesite ustrezno funkcijo.

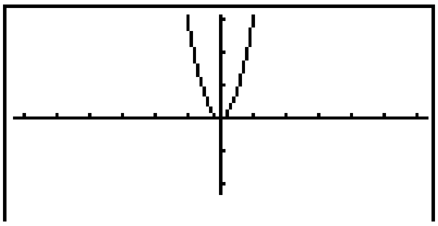
1. V glavnem meniju vstopite v način **GRAPH**.
2. Vnesite funkcijo, ki jo želite prikazati v grafu.
   Tukaj uporabite V-okno, da določite obseg in druge parametre grafa. Glejte stran 5-3.
3. Narišite graf.

Primer **Grafični prikaz $y = 3x^2$**

① m GRAF

2 dvxw

3 6(RISANJE) (ali w)



- Pritisnite AC , da se vrnete na zaslon iz koraka 2 (Seznam grafičnih odnosov). Po narisanju grafa lahko preklapljate med seznamom grafičnih odnosov in grafičnim zaslonom s pritiskom na !6(G↔ T).

■ Kako narisati preprost graf (2)

V pomnilniku lahko shranite do 20 funkcij in nato izberete tisto, ki jo želite narisati.

1. V glavnem meniju vstopite v način **GRAPH**.
2. Določite tip funkcije in vnesite funkcijo, katere graf želite narisati.
   V načinu **GRAPH** lahko narišete graf za naslednje vrste izrazov: izraz s pravokotnimi koordinatami ($Y=f(x)$), izraz s polarnimi koordinatami, parametrična funkcija, izraz s pravokotnimi koordinatami ($X=f(y)$), neenakost.

3(TIP)1(Y=) .... pravokotne koordinate (tip $Y=f(x)$)
2(r=) .... polarne koordinate
3(Parm)....... parametrična funkcija
4(X=)....... pravokotne koordinate (tip $X=f(y)$)

5(CONV)1('Y=) do 5('Y≤)
6(g)1('X=) do 5('X≤) ... spremeni tip funkcije
6(g)1(Y>) v 4(Y≤)..........Y neenakost na levi strani
6(g)6(g)1(X>) na 4(X≤)............X neenakost na levi strani

Ponovite ta korak tolikokrat, kolikor je potrebno, da vnesete vse želene funkcije.

Nato morate določiti, katere od funkcij, shranjenih v pomnilniku, želite prikazati v grafu (glejte stran 5-6). Če tukaj ne izberete določenih funkcij, bo grafična funkcija narisala grafe vseh funkcij, ki so trenutno shranjene v pomnilniku.

3. Narišite graf.

- V meniju funkcij, ki se prikaže, ko v koraku 2 zgornjega postopka pritisnete 4(STYL), lahko za vsak graf izberete enega od naslednjih stilov črt.

  1(—).....Normalno (začetna privzeta nastavitev)

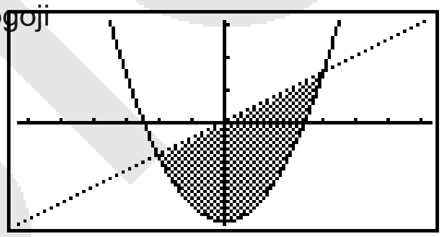
  2(━) ... Debel (dvakrat debelejši od normalnega)

  3(·····) ... Prekinjen (debel prekinjen)

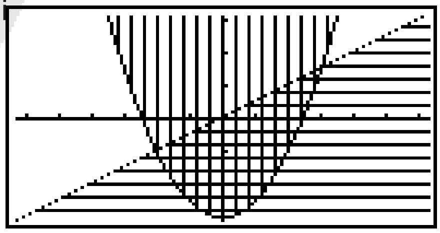
  4(······) ... Pike (pikčasta)

- Pri hkratnem grafičnem prikazovanju več neenakosti lahko v nastavitvenem zaslonu (!m(SETUP)) z nastavitvijo „Ineq Type“ določite eno od dveh območij polnjenja.

  1(AND).........Izpolni le tista območja, kjer so izpolnjeni pogoji vseh grafično prikazanih neenakosti. To je začetna privzeta nastavitev.



  2(OR) ....Izpolni vsa območja, kjer so izpolnjeni pogoji grafično prikazanih neenakosti.

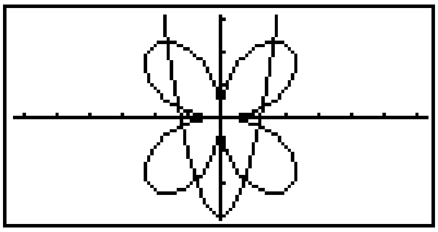


Primer 1 **Vnesite spodaj prikazane funkcije in narišite njihove grafe.**
Y1 = $2x^2$ – 3, r2 = 3sin2θ

① m GRAF

2 3(TIP)1(Y=)cvx-dw
3(TIP)2(r=)dscvw

3 6(RISANJE)

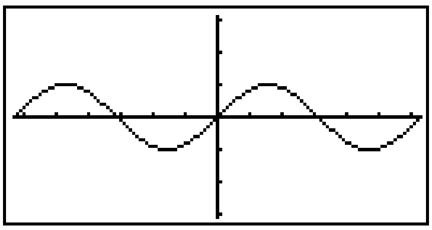


Primer 2 **Za grafično prikazovanje trigonometrične funkcije z uporabo radianov, ko je nastavljena enota kota stopinje (enota kota = Deg)**
Y1=sin x^r

① m GRAPH

2 svK6(g)5(ANGL)2(r)w

3 6(DRAW)



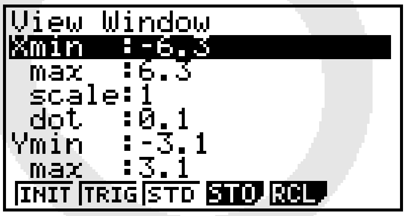
2. Nadzorovanje prikaza na grafičnem zaslonu

■ Nastavitve okna V (okno pogleda)

V oknu View Window določite obseg osi x in y ter nastavite razmik med koraki na vsaki osi. Pred risanjem grafa vedno nastavite parametre V-Window, ki jih želite uporabiti.

u Nastavitev okna V

1. V glavnem meniju vstopite v način **GRAPH**.
2. Pritisnite !3(V-WIN), da prikažete zaslon za nastavitev V-Window.



Parametri pravokotnih koordinat

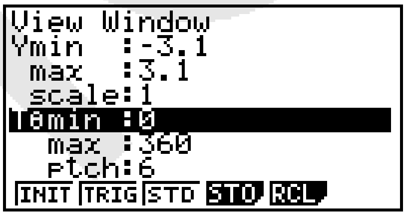
Xmin/Xmax … Najmanjša/največja vrednost osi x

Xscale … Razmik med povečanji osi x

Xdot … Vrednost, ki ustreza eni točki osi x

Ymin/Ymax … Najmanjša/največja vrednost osi y

Yscale … Razmik med povečanji osi y



Parameter polarnih koordinat

Tθmin/Tθmax ... Najmanjša/največja vrednost T,θ

Tθptch ... Korak T,θ

3. Pritisnite ②, da premaknete označitev in vnesite ustrezno vrednost za vsak parameter, po vsakem pa pritisnite w.

- {**INIT**}/{**TRIG**}/{**STD**} … V-Window {začetne nastavitve}/{začetne nastavitve z uporabo določene enote kota}/{standardizirane nastavitve}
- {**STO**}/{**RCL**} … Nastavitev V-okna {shranjevanje}/{ponovno priklicanje}

Ko so nastavitve takšne, kot želite, pritisnite J ali !J(QUIT), da zaprete zaslon za nastavitve V-Window.

u Varnostni ukrepi pri nastavitvah V-Window

- Vnos ničle za Tθptch povzroči napako.
- Vsak nezakonit vnos (vrednost izven območja, negativni znak brez vrednosti itd.) povzroči napako.
- Če je Tθmax manjši od Tθmin, postane Tθptch negativen.
- Kot parametre V-Window lahko vnesete izraze (npr. 2π).
- Ko nastavitev V-Window ustvari os, ki ne ustreza zaslonu, se merilo osi prikaže na robu zaslona, ki je najbližje izhodišču.
- S spreminjanjem nastavitev V-Window se izbriše trenutni graf na zaslonu in nadomesti samo z novimi osmi.
- Spreminjanje vrednosti Xmin ali Xmax povzroči samodejno prilagajanje vrednosti Xdot. Spreminjanje vrednosti Xdot povzroči samodejno prilagajanje vrednosti Xmax.
- Polarna koordinata (r =) ali parametrični graf bo videti grob, če bodo nastavitve, ki jih izberete v oknu V-Window, povzročile, da bo vrednost Tθptch prevelika v primerjavi z razliko med nastavitvama Tθmin in Tθmax. Če pa bodo nastavitve, ki jih izberete, povzročile, da bo vrednost Tθptch premajhna v primerjavi z razliko med nastavitvama Tθmin in Tθmax, bo risanje grafa trajalo zelo dolgo.

• Spodaj je navedeno območje vrednosti za parametre V-Window. –9,999999999E 97 do 9,999999999E 97

■ Pomnilnik V-Window

V pomnilniku V-Window lahko shranite do šest naborov nastavitev V-Window, ki jih lahko prikličete, ko jih potrebujete.

u Shranjevanje nastavitev V-Window

1. V glavnem meniju vstopite v način **GRAPH**.
2. Pritisnite !3(V-WIN), da prikažete zaslon nastavitev V-Window, in vnesite želene vrednosti.
3. Pritisnite 4(STO), da prikažete pojavno okno.
4. Pritisnite številčno tipko, da določite pomnilnik V-Window, v katerega želite shraniti nastavitve, nato pa pritisnite w. S pritiskom na bw se nastavitve shranijo v pomnilnik V-Window 1 (V-Win1).

u Za priklic nastavitev pomnilnika V-Window

1. V glavnem meniju vstopite v način **GRAPH**.
2. Pritisnite !3(V-WIN), da prikažete zaslon nastavitev V-Window.
3. Pritisnite 5(RCL), da prikažete pojavno okno.
4. Pritisnite številčno tipko, da določite številko pomnilnika V-Window za nastavitve, ki jih želite priklicati, nato pa pritisnite w. S pritiskom na bw prikličete nastavitve v pomnilniku V-Window 1 (V-Win1).

■ Določanje obsega grafa

Pred grafičnim prikazom funkcije lahko določite območje (začetno točko, končno točko).

1. V glavnem meniju vstopite v način **GRAPH**.
2. Nastavite V-Window.
3. Določite tip funkcije in vnesite funkcijo. Spodaj je navedena sintaksa za vnos funkcije.

   Funkcija , ! +([ ) Začetna točka , Končna točka ! —( ])
4. Narišite graf.

Primer **Graf $y = x^2 + 3x - 2$ v območju $-2 < x < 4$.**

Uporabite naslednje nastavitve okna V.

Xmin = –3, Xmax = 5, Xscale = 1

Ymin = –10, Ymax = 30, Yscale = 5

① m GRAPH

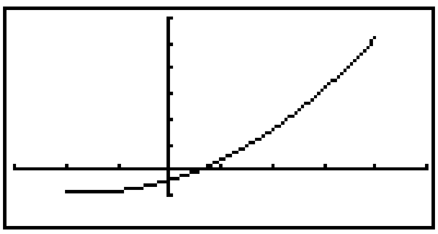
2 !3(V-WIN)-dwfwbw②

-b□wd□wfwJ

3 3(TIP)1(Y=)vx+dv-c,

! +([)—c,4□ ! —(])w

4 6(RISANJE)



• Pri risanju pravokotnih izrazov, polarnih izrazov, parametričnih funkcij in neenakosti lahko določite območje.

■ Povečava

Ta funkcija omogoča povečanje in pomanjšanje grafa na zaslonu.

1. Narišite graf.
2. Določite vrsto povečave.

!2(ZOOM)1(BOX) ... Povečava okvirja

Narišite okvir okoli prikaznega področja in to področje se poveča, da zapolni celoten zaslon.

2(FACT)

Določa faktorje povečave osi x in osi y za faktor povečave.

3(IN)/4(OUT) ... Faktor povečave

Graf se poveča ali pomanjša v skladu z določenim faktorjem, središčem pa je trenutna lokacija kazalca.

5(AUTO) ... Samodejno povečanje

Nastavitve osi y okna V se samodejno prilagodijo, tako da graf zapolni zaslon vzdolž osi y.

6(g)1(ORIG) ... Originalna velikost

Po povečanju ali pomanjšanju graf vrne v prvotno velikost.

6(g)2(SQR) ... Popravek grafa

Vrednosti osi x okna V so popravljene, tako da so enake vrednostim osi y.

6(g)3(RND) ... Zaokroževanje koordinat

Zaokroži vrednosti koordinat na trenutni lokaciji kazalca.

6(g)4(INTG) ... Celo število

Vsaka točka dobi širino 1, kar pomeni, da so koordinatne vrednosti celoštevilčne.

6(g)5(PRE) ... Prejšnje

Parametri V-okna se vrnejo na vrednosti, ki so bile pred zadnjim povečanjem.

Določitev obsega povečave okna

3. S puščičnimi tipkami premaknite kazalec (✚) v sredini zaslona na mesto, kjer želite imeti en kot okvirja, in nato pritisnite w.
4. Uporabite tipke za premikanje kazalca. Na zaslonu se prikaže okvir. Premikajte kazalec, dokler območje, ki ga želite povečati, ni v okviru, nato pritisnite w, da ga povečate.

Primer **Graf $y = (x + 5)(x + 4)(x + 3)$ in nato izvedite povečavo okvirja.**

Uporabite naslednje nastavitve okna V.

Xmin = –8, Xmax = 8, Xscale = 2

Ymin = –4, Ymax = 2, Yscale = 1

① m GRAF

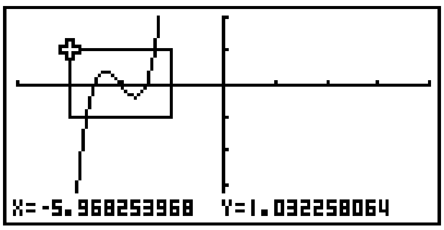
!3(V-WIN)

-4wcwbwJ

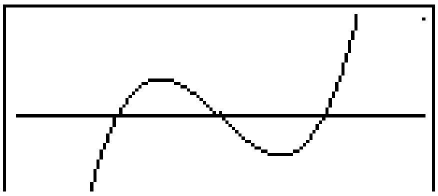
3(TYPE)1(Y=) (v+f)(v+4)

(v+d)w

6(RISANJE)



2 !2(ZOOM)1(BOX)
3 d~dw
4 d~d,f~fw



- Za povečavo okvirja morate določiti dve različni točki, ki ne smeta ležati na isti premici, niti navpično niti vodoravno.

3. Risba grafa

V pomnilniku lahko shranite do 20 funkcij. Funkcije v pomnilniku lahko urejate, prikličete in grafično prikažete.

■ Določanje vrste grafa

Preden lahko shranite grafično funkcijo v pomnilnik, morate najprej določiti njen tip grafa.

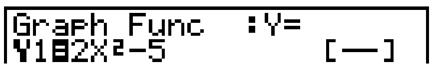
1. Ko je na zaslonu prikazan seznam grafičnih odnosov, pritisnite 3(TYPE), da prikažete meni tipa grafa, ki vsebuje naslednje elemente.
   - {**Y=**}/{**r=**}/{**Parm**}/{**X=**} ... {pravokotne koordinate (tip $Y=f(x)$)}/{polarne koordinate}/{parametrični}/{pravokotni koordinati (tip $X=f(y)$)} graf
   - {**Y>**}/{**Y<**}/{Yt}/{Ys} ... {Y>$f(x)$}/{Y<$f(x)$}/{$Ytf(x)$}/{$Ysf(x)$} graf neenakosti
   - {**X>**}/{**X<**}/{Xt}/{Xs} ... {X>$f(y)$}/{X<$f(y)$}/{$Xtf(y)$}/{$Xsf(y)$} graf neenakosti
   - {**CONV**}
     -
       ... {spremeni tip funkcije izbranega izraza}
2. Pritisnite funkcijska tipka, ki ustreza tipu grafa, ki ga želite določiti.

■ Shranjevanje grafičnih funkcij

u **Shranjevanje pravokotne koordinatne funkcije (Y=)**

Primer **Za shranjevanje naslednjega izraza v pomnilniškem območju Y1:** $y = 2x^2 - 5$

3(TYPE)1(Y=) (Določa izraz pravokotnih koordinat.)
cvx-f(Vnese izraz.)
w (Shrani izraz.)



- Funkcije ni mogoče shraniti v pomnilniški prostor, ki že vsebuje funkcijo drugačnega tipa od tiste, ki jo želite shraniti. Izberite pomnilniški prostor, ki vsebuje funkcijo istega tipa kot tista, ki jo želite shraniti, ali izbrišite funkcijo v pomnilniškem prostoru, v katerega želite shraniti.

u Shranjevanje parametrične funkcije

Primer **Za shranjevanje naslednjih izrazov v pomnilniška območja Xt3 in Yt3:**

x = 3 sinT

y = 3 cosT

3(TYPE)3(Parm) (Določa parametrični izraz.)

dsvw(Vnese in shrani izraz x.) dcvw(Vnese in shrani izraz y.)

u Ustvarjanje sestavljene funkcije

Primer **Uporaba relacij v Y1 in Y2 za ustvarjanje sestavljenih funkcij za Y3 in Y4**

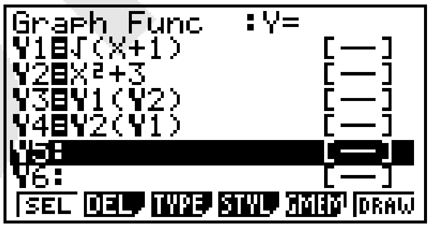
Y1 = $\sqrt{(X + 1)}$, Y2 = X^2 + 3

Dodelite Y1∘ Y2 v Y3 in Y2∘ Y1 v Y4.

(Y1∘ Y2 = $\sqrt{((x^2 + 3) + 1)} = \sqrt{(x^2 + 4)}$ Y2∘ Y1 = $(\sqrt{(X + 1)})^2$ + 3 = X + 4 (X > −1))

Vnesite odnose v Y3 in Y4.

3(TIP)1(Y=)J4(GRPH)
1(Y)b(1(Y)c)w
J4(GRPH)1(Y)c
(1(Y)b)w

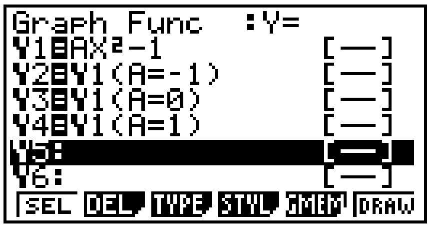


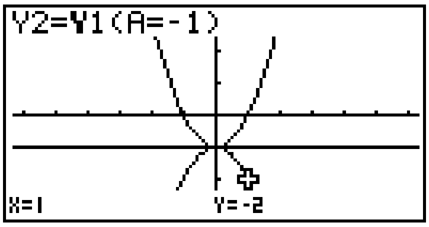
• Sestavljena funkcija lahko vsebuje do pet funkcij.

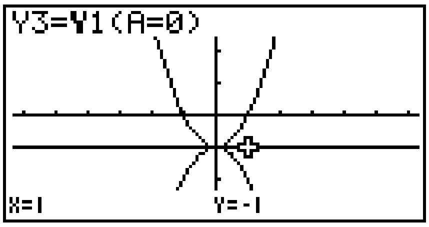
u Dodelitev vrednosti koeficientom in spremenljivkam grafične funkcije

Primer **Dodelitev vrednosti −1, 0 in 1 spremenljivki A v Y = AX^2 −1 in risanje grafa za vsako vrednost**

3(TYPE)1(Y=)
av(A)vx-bw
J4(GRPH)1(Y)b(av(A)
!.(=)-b)w
J4(GRPH)1(Y)b(av(A)
!.(=)0)w
J4(GRPH)1(Y)b(av(A)
!.(=)b)w
ffff1(SEL)
6(DRAW)







Zgornje tri zaslone so ustvarjeni s funkcijo Trace. Za več informacij glejte „Analiza funkcij“ (stran 5-30).

■ Urejanje in brisanje funkcij

u Urejanje funkcije v pomnilniku

Primer **Če želite spremeniti izraz v pomnilniškem območju Y1 iz $y = 2x^2 - 5$ v $y = 2x^2 - 3$**

e (Prikaže kurzor.)

eeeeeDd(Spremeni vsebino.) w(Shrani novo grafično funkcijo.)

u Če želite spremeniti slog črte grafične funkcije

1. Na zaslonu seznama grafičnih odnosov uporabite f in ②, da označite odnos, katerega slog črte želite spremeniti.
2. Pritisnite 4(STYL).
3. Izberite slog črte.

Primer **Za spremembo sloga črte $y = 2x^2 - 3$, ki je shranjena v območju Y1, v „Prekinjeno“**

4(STYL)3(·····) (Izberite „Prekinjeno”.)

u Za spremembo vrste funkcije *1

1. Ko je na zaslonu prikazan seznam grafičnih odnosov, pritisnite f ali ②, da označite področje, ki vsebuje funkcijo, katere tip želite spremeniti.
2. Pritisnite 3(TYPE)5(CONV).
3. Izberite tip funkcije, na katerega želite spremeniti.

Primer **Če želite spremeniti funkcijo v pomnilniškem območju Y1 iz $y = 2x^2 - 3$ v $y < 2x^2 - 3$**

3(TYPE)5(CONV)3('Y<) (Spremeni tip funkcije v „Y<”.)

*1 Tip funkcije je mogoče spremeniti samo za funkcije in neenakosti s pravokotnimi koordinatami.

u Izbris funkcije

1. Ko je na zaslonu prikazan seznam grafičnih odnosov, pritisnite f ali ②, da označite območje, ki vsebuje funkcijo, ki jo želite izbrisati.

2. Pritisnite 2(DEL) ali D.

3. Pritisnite 1(Yes), da izbrišete funkcijo, ali 6(No), da prekinete postopek, ne da bi kaj izbrisali.
   - Če z zgornjim postopkom izbrišete eno vrstico parametrične funkcije (na primer Xt2), se izbriše tudi ustrezna parna vrstica (v primeru Xt2 je to Yt2).

■ Izbiranje funkcij za grafično prikazovanje

u **Za določitev statusa risanja/nerisanja grafa**

1. Na seznamu grafičnih odnosov z uporabo f in ② označite odnos, ki ga ne želite prikazati v grafu.
2. Pritisnite 1(SEL).
   - Vsaka pritisk na 1(SEL) vklopi ali izklopi grafično prikazovanje.
3. Pritisnite 6(DRAW).

Primer **Za izbiro naslednjih funkcij za risanje: Y1 = $2x^2$ – 5, r2 = 5 sin3θ**

Uporabite naslednje nastavitve okna V.

Xmin = –5, **Xmax = 5,** **Xscale = 1**

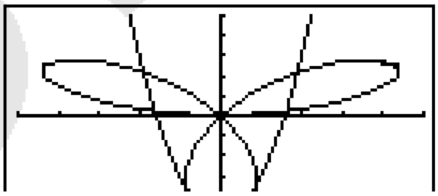
Ymin = –5, **Ymax = 5,** **Yscale = 1**

Tθ m**in = 0,** Tθ **max =**π**,** Tθ p**tch =** 2π **/60**

②f (Izberite pomnilniški prostor, ki vsebuje funkcijo, za katero želite določiti neizrisovanje.)

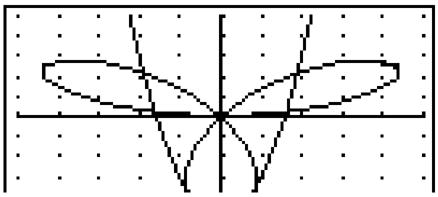
1(SEL) (Določi neizrisovanje.)

6(DRAW) ali w (Nariše grafe.)

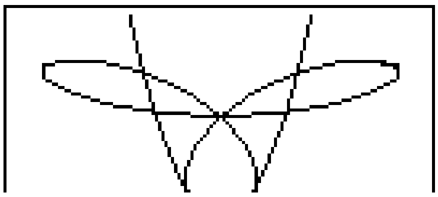


- V nastavitvah zaslona Setup lahko spremenite videz grafa, kot je prikazano spodaj.

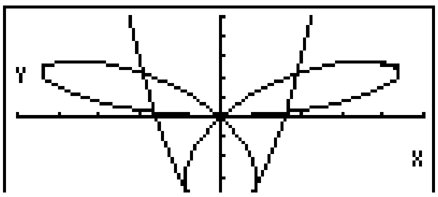
- Mreža: Vklopljena (Osi: Vklopljene Oznake: Izklopljene)
  Ta nastavitev povzroči, da se na zaslonu pojavijo pike na presečiščih mreže.



- Osi: Izklopljene (Oznake: Izklopljene Mreža: Izklopljena)
  Ta nastavitev izbriše osi iz zaslona.



- Oznaka: Vklopljena (Osi: Vklopljene Mreža: Izklopljena)
  Ta nastavitev prikaže oznake za osi x in y.



■ Pomnilnik grafa

Grafični pomnilnik omogoča shranjevanje do 20 naborov podatkov grafičnih funkcij in njihovo poznejše priklicanje, ko jih potrebujete.

Z enim samim shranjevanjem se v grafičnem pomnilniku shranijo naslednji podatki.

- Vse grafične funkcije v trenutno prikazanem seznamu grafičnih odnosov (do 20)
- Vrste grafov
- Informacije o črtah grafa funkcij
- Stanje risanja/nerisanja
- Nastavitve V-okna (1 niz)

---

u **Shranjevanje grafičnih funkcij v grafični pomnilnik**

1. Pritisnite 5(GMEM)1(STO), da se prikaže pojavno okno.
2. Pritisnite številčno tipko, da določite spomin grafa, v katerega želite shraniti grafično funkcijo, nato pa pritisnite w. S pritiskom na bw shranite grafično funkcijo v spomin grafa 1 (G-Mem1).
   - Na voljo je 20 grafičnih pomnilnikov, oštevilčenih od G-Mem1 do G-Mem20.
   - Shranjevanje funkcije v pomnilniški prostor, ki že vsebuje funkcijo, nadomesti obstoječo funkcijo z novo.
   - Če podatki presegajo preostalo zmogljivost pomnilnika kalkulatorja, se pojavi napaka.

---

u **Za priklic grafične funkcije**

1. Pritisnite 5(GMEM)2(RCL), da se prikaže pojavno okno.
2. Pritisnite številčno tipko, da določite grafični spomin za funkcijo, ki jo želite priklicati, nato pa pritisnite w. S pritiskom na bw prikličete grafično funkcijo v grafičnem spominu 1 (G-Mem1).
   - Povrnitev podatkov iz grafičnega pomnilnika povzroči izbris vseh podatkov, ki so trenutno na seznamu grafičnih odnosov.

4. Shranjevanje grafa v spominu za slike

V spominu za slike lahko shranite do 20 grafičnih slik za poznejši priklic. Graf na zaslonu lahko prekrijete z drugim grafom, shranjenim v spominu za slike.

---

u **Shranjevanje grafa v spomin za slike**

1. Po grafičnem prikazu v načinu **GRAPH** pritisnite K1(PICT)1(STO), da se prikaže pojavno okno.
2. Pritisnite številčno tipko, da določite spomin za slike, v katerega želite shraniti sliko, nato pa pritisnite w. S pritiskom na bw shranite funkcijo slike v spomin za slike 1 (Pict 1).
   - Na voljo je 20 spominov za slike, oštevilčenih od Pict 1 do Pict 20.
   - Shranjevanje grafične slike v pomnilniški prostor, ki že vsebuje grafično sliko, nadomesti obstoječo grafično sliko z novo.
   - Dvojni grafični zaslon ali kateri koli drug tip grafa, ki uporablja razdeljen zaslon, ni

mogoče shraniti v spomin za slike.

u Za prikaz shranjenega grafa

1. Po grafičnem prikazu v načinu **GRAPH** pritisnite K1(PICT)2(RCL), da se prikaže pojavno okno.
2. Pritisnite številčno tipko, da določite spomin za sliko, ki jo želite priklicati, nato pa pritisnite w. S pritiskom na bw prikličete funkcijo slike v spominu za slike 1 (Pict 1).
   - Povrnitev vsebine spomina za slike povzroči prepis trenutno prikazanega grafa.
   - Uporabite funkcijo skice Cls (stran 5-29), da izbrišete graf, ki je bil priklican iz spomina za slike.

5. Risba dveh grafikonov na istem zaslonu

■ Kopiranje grafa na podzaslon

Dual Graph vam omogoča, da zaslon razdelite na dva dela. Nato lahko v vsakem delu prikažete dve različni funkciji za primerjavo ali pa na eni strani narišete graf normalne velikosti, na drugi pa njegovo povečano različico. To Dual Graph naredi močno orodje za analizo grafov.

Pri Dual Graph se leva stran zaslona imenuje »glavni zaslon«, desna stran pa »podzaslon«.

u **Glavni zaslon**

Graf na glavnem zaslonu je dejansko narisan iz funkcije.

u **Podzaslon**

Graf na podzaslonu se ustvari s kopiranjem ali povečavo grafa na glavnem zaslonu. Za podzaslon in glavni zaslon lahko nastavite različne nastavitve V-Window.

u **Kopiranje grafa na podzaslon**

1. V glavnem meniju vstopite v način **GRAPH**.
2. Na zaslonu Nastavitve izberite „G + G“ za dvojni zaslon.
3. Nastavite V-Window za glavni zaslon.

   Pritisnite 6(DESNO), da prikažete zaslon z nastavitvami podgrafa. S pritiskom na 6(LEVO) se vrnete na zaslon z nastavitvami glavnega zaslona.
4. Shranite funkcijo in narišite graf na glavnem zaslonu.
5. Izvedite želeno operacijo dvojnega grafa.

   K1(COPY) ... Podvoji graf glavnega zaslona v podzaslonu

   K2(SWAP) ... Zamenja vsebino glavnega zaslona in vsebino podzaslona

- Kazalniki se pojavijo desno od formul v seznamu odnosov grafa, da pokažejo, kje so grafi narisani z dvojnim grafom.

Označuje graf na podzaslonu (na desni strani zaslona) Označuje graf, narisan na obeh straneh zaslona

Izvedba risanja s funkcijo, označeno z „R“ v zgornjem primeru zaslona, povzroči, da se graf nariše na desni strani zaslona. Funkcija, označena z „B“, se nariše na obeh straneh grafa.

Če pritisnete 1(SEL), medtem ko je ena od funkcij označena, se indikator „R“ ali „B“ izbriše. Funkcija brez indikatorja se prikaže kot graf na glavnem zaslonu (na levi strani zaslona).

Primer **Graf $y = x(x + 1)(x - 1)$ na glavnem zaslonu in podzaslonu.**

Uporabite naslednje nastavitve V-okna.

(Glavni zaslon)	**Xmin = –2,**	**Xmax = 2,**	**Xscale = 0,5**
	Ymin = –2,	**Ymax = 2,**	**Yscale = 1**
(Podzaslon)	**Xmin = –4,**	**Xmax = 4,**	**Xscale = 1**
	Ymin = –3,	**Ymax = 3,**	**Yscale = 1**

① m GRAPH

2 !m(SET UP)②②②②*1(G +J

*fx-7400GIII: ②②②

3 !3(V-WIN) -cwcw0 -

-cwcwbw

6(RIGHT) -4 w4 wbw②

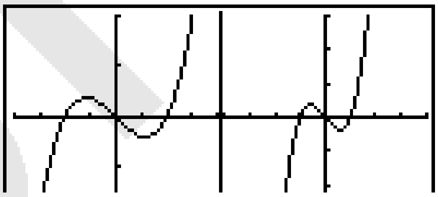
-dwdwbwJ

4 3(TYPE) 1 (Y=)v(v+b)(

v-b)w

6(DRAW)

⑤ K1(KOPIRAJ)



• Če med prikazom grafa pritisnete AC , se vrnete na zaslon iz koraka 4.

6. Ročno risanje grafikonov

■ Grafični prikaz v načinu Run-Matrix

Ko je izbran način Linear input/output, lahko ukaze vnašate neposredno v načinu **RUN · MAT** (ali **RUN**), da se nariše graf.

Za grafično prikazovanje lahko izberete tip funkcije s pritiskom na !4(SKTCH)5(GRPH) in izbiro enega od spodaj prikazanih tipov funkcij.

- **{Y=}/{r=}/{Param}/{X=}/{G · ∫ dx}** ... {pravokotne koordinate}/{polarne koordinate}/{parametrična funkcija}/{$X=f(y)$ pravokotne koordinate}/{integracija} grafično prikazovanje
- **{Y>}/{Y<}/{Y≥ }/{Y≤ }** ... Neenakost {Y>$f(x)$}/{Y<$f(x)$}/{$Y\geq f(x)$}/{$Y\leq f(x)$} grafično prikazovanje
- **{X>}/{X<}/{X≥ }/{X≤ }** ... Neenakost {X>$f(y)$}/{X<$f(y)$}/{$X\geq f(y)$}/{$X\leq f(y)$} grafično prikazovanje

u Grafični prikaz s pravokotnimi koordinatami

1. V glavnem meniju vstopite v način **RUN • MAT** (ali **RUN**).
2. fx-9860GIII, fx-9750GIII: Na zaslonu Setup spremenite nastavitev „Input/Output“ na „Linear“.

3. Nastavite V-Window.

4. Vnesite ukaze za risanje grafa s pravokotnimi koordinatami.

5. Vnesite funkcijo.

Primer **Graf $y = 2x^2 + 3x - 4$.**

Uporabite naslednje nastavitve V-Window.

Xmin = –5, Xmax = 5, Xscale = 2

Ymin = –10, Ymax = 10, Yscale = 5

① m RUN • MAT (ali RUN)

2 fx-9860GIII, fx-9750GIII: !m(SET UP)2(Line)J

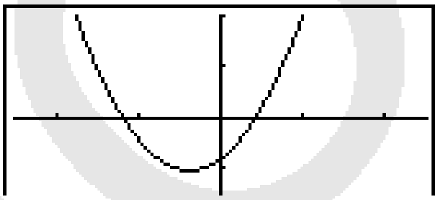
3 !3(V-WIN)

-b□wb□wfwJ

4 !4(SKTCH)1(Cls)w

5(GRPH)1(Y=)

⑤ cvx+dv-□ w



- Nekatere funkcije je mogoče enostavno grafično prikazati z vgrajenimi grafi funkcij.
- Lahko narišete grafe naslednjih vgrajenih znanstvenih funkcij.

Graf pravokotnih koordinat

• sin x	• cos x	• tan x	• $\sin^{-1} x$
• $\cos^{-1} x$	• $\tan^{-1} x$	• sinh x	• cosh x
• tanh x	• $\sinh^{-1}$	• $\cosh^{-1}$ x	• $\tanh^{-1}$ x
• 'x	• x^2	• log x	• $\ln x$
• $\frac{d}{dx}$	• $\frac{d^2}{dx^2}$	• x^{-1}	

Graf polarnih koordinat

• sinθ	• cos θ	• tan θ	• sin$^{(-1)}$ θ
• $\cos^{-1}$ θ	• tan$^{(-1)}$	• sinh θ	• cosh θ
• tanhθ	• sinh$^{(-1)}$	• cosh$^{(-1)}$ θ	• tanh$^{(-1)}$ θ
		• log θ	

- Vnos za spremenljivki x in θ ni potreben za vgrajeno funkcijo.
- Pri vnosu vgrajene funkcije ni mogoče vnesti drugih operatorjev ali vrednosti.

---

u Grafični prikaz parametrične funkcije

Vaš kalkulator lahko prikaže grafični prikaz parametrične funkcije, ki jo predstavlja (X, Y) = (f(T), g(T)).

Primer **Za grafični prikaz uporabite spodnje parametre funkcije**

x = 7cosT − 2cos3,5T **y = 7sinT − 2sin3,5T**

Uporabite naslednje nastavitve okna V.

Xmin = −20, Xmax = 20, Xscale = 5

Ymin = −12, Ymax = 12, Yscale = 5

Tθmin = 0, Tθmax = 4π, Tθ ptch = π ÷ 36

Na zaslonu Nastavitve izberite »Param« za »Func Type« in »Rad« za »Angle«.

① m RUN • MAT (ali RUN)

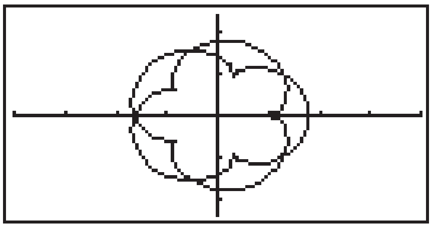
2 !m(SET UP)2(Line)②②②*3(Param)②②②2(Rad)J

* fx-7400GIII: ②②

3 !3(V-WIN)-c?wd?wfw②
-bcwbcwfw
04 !5(π)w!5(π)/d□wJ

4 !4(SKTCH)1(Cls)w
5(GRPH)3(Param)

⑤ hcv-
ccd.fv,
hsv-csd.fvw



u **Grafični prikaz integracije**

Vaš kalkulator lahko prikaže graf funkcije, ki izvaja integracijski izračun.

Rezultati izračuna so prikazani v spodnjem levem kotu zaslona, pri čemer je izpolnjeno integracijsko območje.

Primer **Za grafični prikaz integracijske formule** $\int_{-2}^{1}(x+2)(x-1)(x-3)\,dx$

Uporabite naslednje nastavitve V-okna.

Xmin = −4, Xmax = 4, Xscale = 1

Ymin = −8, Ymax = 12, Yscale = 5

Na zaslonu Nastavitve izberite „Y=” za „Func Type” (tip funkcije).

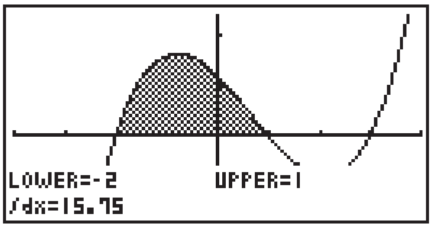
① m RUN • MAT (ali RUN)

2 !m(SET UP)2(Line)②②②*1 (Y=)J
* fx-7400GIII: ②②

3 !3(V-WIN)—4 w4 wbw②
-iwbcwfwJ

4 !4(SKTCH)1(Cls)w
5(GRPH)5(G·∫ dx)

⑤ (v+c)(v-b)
(v-d),-c,bw



■ Risba več grafikonov na istem zaslonu

Uporabite naslednji postopek, da spremenljivki v izrazu dodelite različne vrednosti in prepišete grafe, ki se prikažejo na zaslonu.

1. V glavnem meniju vstopite v način **GRAPH**.
2. Na zaslonu Nastavitve spremenite nastavitev „Dvojni zaslon“ na „Izklopljeno“.
3. Nastavite V-Window.
4. Določite tip funkcije in vnesite funkcijo. Spodaj je navedena sintaksa za vnos funkcije.

   Izraz, ki vsebuje eno spremenljivko , +([ ) spremenljivka
   _(=) vrednost , vrednost , ... , vrednost —(
   ])
5. Narišite graf.

Primer **Narišite graf $y = Ax^2 - 3$, ko se vrednost A spreminja v zaporedju 3, 1, –1**

Uporabite naslednje nastavitve okna V.

Xmin = –5, Xmax = 5, Xscale = 1

Ymin = –10, Ymax = 10, Yscale = 2

① m GRAPH

2 !m(NASTAVITEV)②②②②*3(Izklopljeno)J

*fx-7400GIII: ②②②

3 !3(V-WIN)

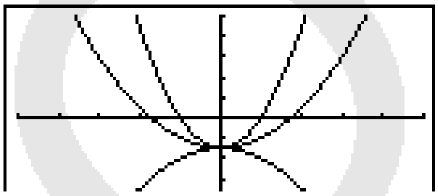
-b w b w c w J

4 3(TYPE)1(Y=)av(A)vx-d,

! +([)av(A) ! .(=)d,b,-b

! —(])w

⑤ 6(DRAW)



- Spremeniti se lahko le vrednost ene od spremenljivk v izrazu.
- Za ime spremenljivke ni mogoče uporabiti nobene od naslednjih: X, Y, r, θ, T.
- Spremenljivki znotraj funkcije ni mogoče dodeliti spremenljivke.
- Ko je Simul Graph vklopljen, se vsi grafi za določene vrednosti spremenljivk rišejo hkrati.
- Prepisovanje se lahko uporabi pri grafičnem prikazovanju pravokotnih izrazov, polarnih izrazov, parametričnih funkcij in neenakosti.

■ Uporaba kopiranja in lepljenja za grafično prikazovanje funkcije

Funkcijo lahko grafično prikažete tako, da jo kopirate v odložišče in nato prilepite v grafični zaslon.

V grafični zaslon lahko vstavite dve vrsti funkcij.

Vrsta 1 (Y= izraz)

Funkcija s spremenljivko Y na levi strani znaka za enako se prikaže kot Y= izraz.

Primer: Vstavi Y=X in prikaži graf

- Vsi presledki levo od Y se ignorirajo.

Tip 2 (izraz)

Vstaviš ta tip izraza in grafično prikažeš Y= izraz.

Primer: Vstaviš X in grafično prikažeš Y=X

- Vsi presledki levo od izraza se ignorirajo.

u Za grafično prikazovanje funkcije s kopiranjem in lepljenjem

1. Funkcijo, ki jo želite prikazati grafično, kopirajte v odložišče.
2. V glavnem meniju vstopite v način **GRAPH**.
3. Na zaslonu Nastavitve spremenite nastavitev „Dvojni zaslon“ na „Izklopljeno“.

4. Nastavite V-Window.

5. Narišite graf.

6. Prilepite izraz.

Primer **Medtem ko je trenutno prikazan graf $y = 2x^2 + 3x - 4$, vstavite prej kopirano funkcijo Y=X iz odložišča**

Uporabite naslednje nastavitve V-Window.

Xmin = –5, Xmax = 5, Xscale = 2

Ymin = –10, Ymax = 10, Yscale = 5

① m RUN • MAT (ali RUN)

a –(Y) ! .(=)v

! i(CLIP)ddd1(COPY)

2 mGRAPH

3 !m(SET UP)②②②②*3(Off)J

*fx-7400GIII: ②②②

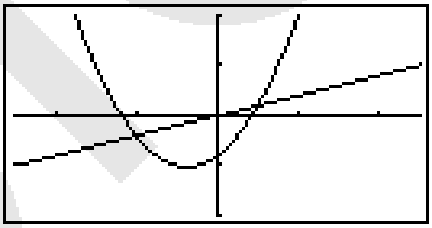
4 !3(V-WIN)

-bwbwfwJ

⑤ 3(TYPE)1(Y=)cvx+dv-w4

6(DRAW)

Ⓐ !j(PASTE)



• Poleg je podprto samo, če je v nastavitvah zaslona izbrana možnost „Off“ za nastavitev „Dual Screen“ (Dvojni zaslon).

• Čeprav ni omejitve glede števila grafikonov, ki jih lahko narišete z vstavljanjem funkcije, je skupno število grafikonov, ki jih podpirajo funkcije trace in druge funkcije, 30 (število grafikonov, narisanih z izrazi od 1 do 20, plus grafikoni, narisani z vstavljenimi funkcijami).

• Za graf prilepjene funkcije se izraz grafa, ki se prikaže pri uporabi funkcije trace ali drugih funkcij, prikaže v obliki: Y= izraz.

• Ponovno izvajanje risanja brez izbrisa pomnilnika grafa bo ponovno narisalo vse grafe, vključno s tistimi, ki so bili ustvarjeni z vstavljanjem funkcij.

7. Uporaba tabel

Za vstop v način **TABLE** izberite ikono **TABLE** v glavnem meniju.

■ Shranjevanje funkcije in ustvarjanje številčne tabele

u Shranjevanje funkcije

Primer **Shranjevanje funkcije $y = 3x^2 - 2$ v pomnilniški območje Y1**

Uporabite f in ②, da premaknete označitev v seznamu tabelskih odnosov v pomnilniški prostor, kjer želite shraniti funkcijo. Nato vnesite funkcijo in pritisnite w, da jo shranite.

u Specifikacije spremenljivk

Pri ustvarjanju numerične tabele lahko uporabite dve metodi za določitev vrednosti spremenljivke x.

- **Metoda razpona tabel**

  S to metodo določite pogoje za spremembo vrednosti spremenljivke.

- **Seznam**

  S to metodo se podatki v seznamu, ki ga določite, nadomestijo s spremenljivko x, da se ustvari številčna tabela.

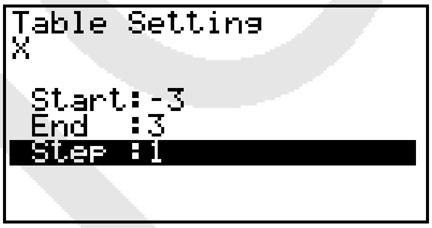
u Ustvarjanje tabele z uporabo obsega tabele

Primer **Za ustvarjanje tabele, ko se vrednost spremenljivke x spreminja od –3 do 3, v korakih po 1**

m TABLE

5(SET)

-dwdwbw



Numerični razpon tabele določa pogoje, pod katerimi se vrednost spremenljivke x spreminja med izračunom funkcije.

Začetek .... Začetna vrednost spremenljivke x

Konec.......... Končna vrednost spremenljivke x

Korak........... Sprememba vrednosti spremenljivke x (interval)

Po določitvi obsega tabele pritisnite J, da se vrnete na seznam tabelnih relacij.

u Ustvarjanje tabele s pomočjo seznama

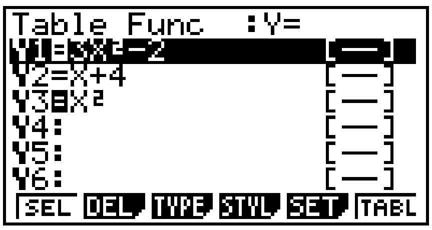
1. Ko je na zaslonu seznam razmerij tabel, prikažite zaslon Nastavitve.
2. Izberite spremenljivko in nato pritisnite 2(LIST), da se prikaže pojavno okno.
3. Izberite seznam, katerega vrednosti želite dodeliti spremenljivki x.
   - Če želite izbrati seznam 6, pritisnite $\boxed{6}$ w. S tem se nastavitev elementa Variable (Spremenljivka) na zaslonu Setup (Nastavitve) spremeni v List 6 (Seznam 6).
4. Po določitvi seznama, ki ga želite uporabiti, pritisnite J, da se vrnete na prejšnji zaslon.

u Ustvarjanje tabele

Primer **Za ustvarjanje tabele vrednosti za funkcije, shranjene v pomnilniških območjih Y1 in Y3 seznama relacij Table**

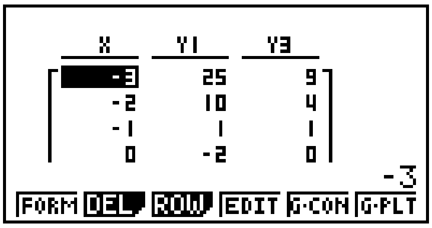
Uporabite f in 2, da premaknete označitev na funkcijo, ki jo želite izbrati za ustvarjanje tabele, in pritisnite 1(SEL), da jo izberete.

Na zaslonu se poudari znak „=” izbranih funkcij. Če želite izbrisati izbiro funkcije, premaknite kurzor nanjo in ponovno pritisnite 1(SEL).



Pritisnite 6(TABL), da ustvarite tabelo številk z uporabo izbranih funkcij. Vrednost spremenljivke x se spreminja glede na obseg ali vsebino seznama, ki ste ga določili.

Na prikazanem primeru zaslona so prikazani rezultati na podlagi vsebine seznama 6 (–3, –2, –1, 0, 1, 2, 3).

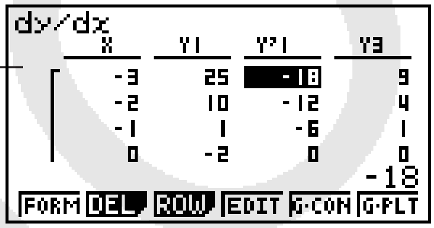


Vsaka celica lahko vsebuje do šest številk, vključno z negativnim predznakom.

u **Ustvarjanje tabele diferencialnih številk**

Če nastavite element Derivative (Derivata) na zaslonu Setup (Nastavitve) na On (Vklopljeno), se ob vsakem ustvarjanju številčne tabele prikaže številčna tabela, ki vključuje derivato.

Če kurzor postavite na diferencialni se v zgornji vrstici prikaže »dy/dx«, kar označuje diferencial.



- Napaka se pojavi, če je med grafičnimi izrazi vključen graf, za katerega je določen obseg, ali graf za prepisovanje.

u **Določanje tipa funkcije**

Funkcijo lahko določite kot eno od treh vrst.

- Pravokotne koordinate (Y=)
- Polarne koordinate (r=)
- Parametrične (Parm)

1. Pritisnite 3(TYPE), ko je na zaslonu seznam relacij.
2. Pritisnite številčno tipko, ki ustreza tipu funkcije, ki jo želite določiti.

- Številčna tabela se generira samo za tip funkcije, ki je določen na seznamu odnosov (Table Func). Številčne tabele ni mogoče generirati za mešanico različnih tipov funkcij.

■ Urejanje tabel

Ko ustvarite tabelo, lahko v meniju tabele izvedete katero koli od naslednjih operacij.

- Spremenite vrednosti spremenljivke x
- Urejanje (brisanje, vstavljanje in dodajanje) vrstic
- Izbrišete tabelo
- Narišite graf povezovalnega tipa
- Narišite graf tipa plot

- {**FORM**} ... {vrni se na seznam tabel}
- {**DEL**} ... {izbriši tabelo}
- {**ROW**}
    - {**DEL**}/{**INS**}/{**ADD**} ... {izbriši}/{vstavi}/{dodaj} vrstico
- {**G • CON**}/{**G • PLT**} ... {povezani tip}/{tip risanja grafa} risanje grafa

• Če poskušate nadomestiti vrednost z nezakonito operacijo (kot je deljenje z ničlo), se pojavi napaka in prvotna vrednost ostane nespremenjena.

• V drugih stolpcih tabele (razen *stolpca x*) ne morete neposredno spreminjati vrednosti.

■ Kopiranje stolpca tabele v seznam

Z enostavno operacijo lahko kopirate vsebino številčnega stolpca tabele v seznam.

S tipkama d in e premaknite kurzor na stolpec, ki ga želite kopirati. Kurzor je lahko v kateri koli vrstici.

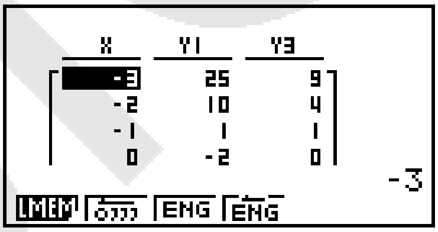
u Kopiranje tabele v

Primer **Za kopiranje vsebine stolpca x v seznam 1**

K1(LMEM)

Vnesite številko seznama, ki ga želite kopirati, in pritisnite w.

bw



■ Risba grafa iz številčne tabele

Uporabite naslednji postopek za ustvarjanje številčne tabele in nato narišite graf na podlagi vrednosti v tabeli.

1. V glavnem meniju vstopite v način **TABLE**.
2. Nastavite V-okno.
3. Shranite funkcije.
4. Določite obseg tabele.
5. Ustvarite tabelo.
6. Izberite vrsto grafa in ga narišite.

   5(G • CON) ... črtni grafikon

   6(G • PLT) ... grafikon tipa plot

• Po narisanju grafa pritisnite !6(G↔ T) ali AC se vrnete na zaslon s številčno

Primer **Shranite spodnji dve funkciji, ustvarite tabelo števil in nato narišite linijski grafikon. Določite območje od –3 do 3 in korak 1.**

Y1 = $3x^2$ – 2, Y2 = x^2

Uporabite naslednje nastavitve okna V.

Xmin = 0, Xmax = 6, Xscale = 1

Ymin = –2, Ymax = 10, Yscale = 2

① m TABELA

2 !3(V-WIN)0 w6 wbw②

-cwb0wcwJ

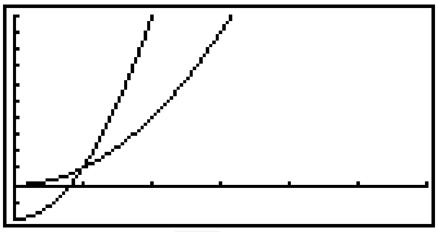
3 3(TYPE)1(Y=)dvx-cw

vxw

4 5(SET)-dwdwbwJ

⑤ 6(TABL)

⑥ 5(G • CON)



• Po risanju grafa lahko uporabite funkcije Trace, Zoom ali Sketch.

■ Hkratni prikaz številčne tabele in grafa

Z nastavitvijo T+G za dvojni zaslon na zaslonu Nastavitve je mogoče hkrati prikazati številčno tabelo in graf.

1. V glavnem meniju vstopite v način **TABLE**.
2. Nastavite V-Window.
3. Na zaslonu Nastavitve izberite T+G za dvojni zaslon.
4. Vnesite funkcijo.
5. Določite obseg tabele.
6. Tabela števil se prikaže na podzaslonu na desni strani.
7. Določite vrsto grafa in narišite graf.

 5(G • CON) ... črtni grafikon

 6(G • PLT) ... grafikon tipa plot

Primer **Shranite funkcijo Y1 = $3x^2$ – 2 in hkrati prikažite njeno številčno tabelo in črtni grafikon. Uporabite tabelo z območjem od –3 do 3 s korakom 1.**

Uporabite naslednje nastavitve okna V.

Xmin = 0, Xmax = 6, Xscale = 1

Ymin = –2, Ymax = 10, Yscale = 2

① m TABELA

2 !3(V-WIN)0 w6 wbw②

-cwb0wcwJ

3 !m(SET UP)②②②* 1 (T+G)J

*fx-7400GIII: ②②

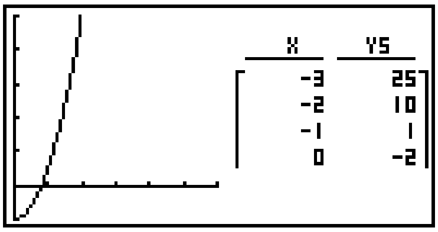
4 3(TYPE)1(Y=)dvx-cw

⑤ 5(SET)

-dwdwbwJ

⑥ 6(TABL)

⑦ 5(G • CON)



• Nastavitev „Dual Screen“ (Dvojni zaslon) na zaslonu Setup (Nastavitve) se uporablja v načinu **TABLE (TABELA)** in **RECUR (**PONOVITEV).

• Številčno tabelo lahko aktivirate s pritiskom na K1(CHNG) ali AC .

8. Dinamično grafično prikazovanje

Pomembno!

- fx-7400GIII ni opremljen z načinom **DYNA**.

■ Uporaba dinamičnega grafa

Dinamični graf vam omogoča, da določite razpon vrednosti za koeficiente v funkciji in nato opazujete, kako spremembe vrednosti koeficienta vplivajo na graf. To vam pomaga razumeti, kako koeficienti in členi, ki sestavljajo funkcijo, vplivajo na obliko in položaj grafa.

1. V glavnem meniju vstopite v način **DYNA**.
2. Nastavite V-Window.
3. Na zaslonu Nastavitve določite dinamični tip.
   1(Cnt) ... Neprekinjeno
   2(Stop) ... Samodejno ustavitev po 10 risanjih
4. S puščičnimi tipkami izberite tip funkcije na vgrajenem seznamu tipov funkcij.*1
5. Vnesite vrednosti koeficientov in določite, kateri koeficient bo dinamična spremenljivka.*2
6. Določite začetno vrednost, končno vrednost in povečanje.
7. Določite hitrost risanja.
   3 (SPEED) 1 (IID). Pavza po vsakem žrebanju (Stop&Go)
   2 (>)..... Polovična normalna hitrost (Slow)
   3(>)....... Normalna hitrost (Normal)
   4 (>>) ... Dvakratna normalna hitrost (hitro)
8. Narišite dinamični graf.

*1 Spodaj je navedenih sedem vgrajenih tipov funkcij.

- Y=AX+B
- Y=A(X+B)² +C
- Y=AX² +BX+C
- Y=AX^3+BX² +CX+D
- Y=Asin(BX+C)
- Y=Acos(BX+C)
- Y=Atan(BX+C)

Ko pritisnete 3(TYPE) in izberete želeni tip funkcije, lahko vnesete dejansko funkcijo.

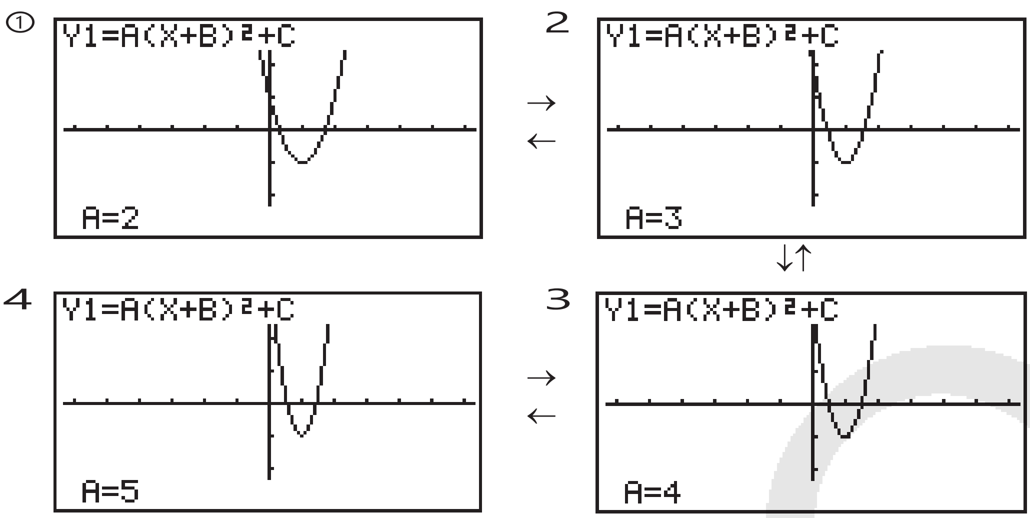
*2 Tukaj lahko pritisnete tudi w in prikažete meni za nastavitev parametrov.

- Sporočilo »Preveč funkcij« se prikaže, ko je za dinamično grafično prikazovanje izbranih več funkcij.

Primer **Uporabite dinamični graf za grafično prikazovanje y = A (x – 1)² – 1, pri čemer se vrednost koeficienta A spreminja od 2 do 5 v korakih po 1. Graf se nariše 10-krat.**

① m DYNA
2 !3(V-WIN) 1 (INIT)J
3 !m(SET UP)②2(Stop)J
4 5(B-IN)②1(SEL)
⑤ 4(VAR)cw-bw-bw
Ⓐ 2(SET)cwfwbwJ
⑦ 3(SPEED)3(>J
8 6(DYNA)

Ponovi od ① do 4.



■ Risba dinamičnega grafa

Vklop nastavitve dinamičnega grafa na zaslonu Nastavitve omogoča prekrivanje grafa, narisanega s spreminjanjem vrednosti koeficientov.

1. V glavnem meniju vstopite v način **DYNA**.
2. Nastavite V-okno.
3. Na zaslonu Nastavitve izberite „Vklopljeno“ za „Lokus“.
4. S puščičnimi tipkami izberite vrsto funkcije na vgrajenem seznamu vrst funkcij.
5. Vnesite vrednosti koeficientov in določite, kateri koeficient bo dinamična spremenljivka.
6. Določite začetno vrednost, končno vrednost in povečanje.
7. Za hitrost risanja določite Normalno.
8. Narišite dinamični graf.

Primer **Uporabite dinamični graf za risanje** ***grafa y*** **=** ***Ax*****, v katerem se vrednost koeficienta A spreminja od 1 do 4 v korakih po 1. Graf se nariše 10-krat.**

① m DYNA

2 !3(V-WIN)1(INIT)J

3 !m(SET UP)②②1(On)J

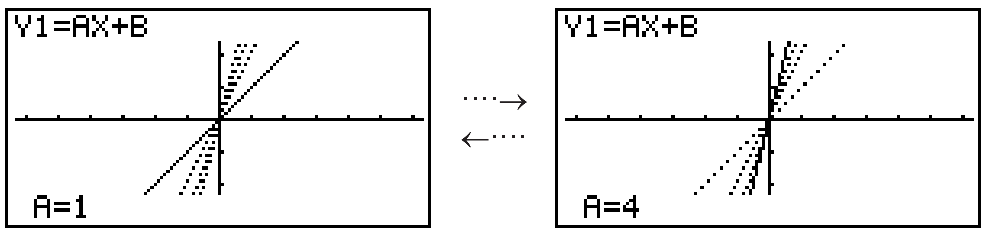
4 5(B-IN)1(SEL)

⑤ 4(VAR)bw0 w

Ⓐ 2(SET)bw4 wbwJ

⑦ 3(SPEED)3(J

8 6(DYNA)



■ Funkcija preklopa DOT za izračun grafa

To funkcijo uporabite za določitev risanja vseh točk na osi X dinamičnega grafa ali vsake druge točke. Ta nastavitev velja samo za grafiko dinamične funkcije Y=.

1. Pritisnite !m(SET UP), da prikažete zaslon nastavitev.
2. Pritisnite ②②②, da izberete Y=Draw Speed.
3. Izberite metodo risanja grafa.

   1(Norm) … Nariše vse točke osi X. (začetna privzeta nastavitev)

   2 (Visoko) … Nariše vsako drugo točko na osi X. (hitrejše risanje kot Normalno)
4. Pritisnite J.

■ Uporaba dinamičnega grafičnega pomnilnika

Pogoje dinamičnega grafa in podatke zaslona lahko shranite v dinamični grafični pomnilnik, da jih lahko pozneje prikličete, ko jih potrebujete. S tem prihranite čas, saj lahko prikličete podatke in takoj začnete risati dinamični graf. Upoštevajte, da lahko v pomnilniku hkrati shranite en niz podatkov.

u Shranjevanje podatkov v pomnilniku dinamičnega grafa

1. Med risanjem dinamičnega grafa pritisnite AC, da preklopite na meni za nastavitev hitrosti.
2. Pritisnite 5(STO). V odgovor na potrditveno okno, ki se prikaže, pritisnite 1(Da), da shranite podatke.

u Za priklic podatkov iz pomnilnika dinamičnega grafa

1. Prikaži seznam dinamičnih grafičnih odnosov.
2. S pritiskom na 6(RCL) se prikliče vsebina pomnilnika dinamičnega grafa in nariše graf.

9. Grafični prikaz rekurzivne formule

Pomembno!

- fx-7400GIII ni opremljen z načinom **RECUR**.

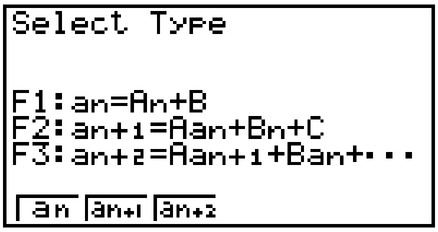
■ Ustvarjanje številčne tabele iz rekurzivne formule

Vnesete lahko do tri od naslednjih vrst rekurzivnih formul in ustvarite tabelo številk.

- Splošni izraz zaporedja $\{a_n\}$, sestavljen iz a_n, n
- Linearna dvočlenska rekurzija, sestavljena iz a_{n+1}, a_n, n
- Linearna tritermična rekurzija, sestavljena iz a_{n+2}, a_{n+1}, a_n, n

1. V glavnem meniju vstopite v način **RECUR**.

2. Določite vrsto rekurzije.



3(TYPE)1(*an*) ... {splošni člen zaporedja *an*} 2(an+1) ... {linearni dvoterminski rekurzivni izraz} 3(an+2) ... {linearni triterminski rekurzivni izraz}

3. Vnesite rekurzivno formulo.
4. Določite obseg tabele. Določite začetno in končno točko za n. Po potrebi določite vrednost za začetni člen in vrednost začetne točke kazalca, če nameravate grafično prikazati formulo.
5. Prikaži tabelo števil rekurzivne formule.

Primer **Ustvarite tabelo števil iz rekurzije med tremi členi, izraženo z an+2 = an+1 + *an*, z začetnimi členi a1 = 1, a2 = 1 (Fibonaccijeva zaporedja), ko se vrednost *n* spreminja od 1 do 6.**

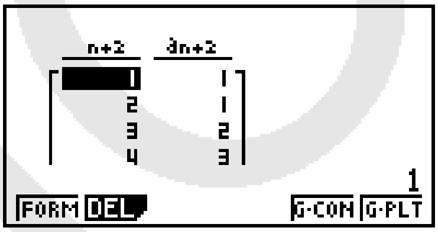
① m RECUR

2 3(TIP)3(an+2)

3 4(*n*.*an* ··)3(an+1)+2(an)w

4 5(SET)2(a1)bw6 wbwbwJ

⑤ 6(TABL)



* Prvi dve vrednosti ustrezata a1 = 1 in a2 = 1.

- S pritiskom na 1(FORM) se vrnete na zaslon za shranjevanje rekurzivnih formul.
- Če v nastavitvenem zaslonu za »Σ Display« izberete »On«, se v tabelo vključi vsota vsakega člena.

■ Grafični prikaz rekurzivne formule

Po ustvarjanju številčne tabele iz rekurzivne formule lahko vrednosti prikažete v grafu z linijami ali grafu tipa plot.

1. V glavnem meniju vstopite v način **RECUR**.
2. Nastavite V-okno.
3. Določite tip rekurzivne formule in vnesite formulo.
4. Določite obseg tabele ter začetno in končno vrednost za n. Po potrebi določite začetno vrednost člena in začetno točko kazalca.
5. Izberite slog črte za graf.
6. Prikažite tabelo števil rekurzivne formule.
7. Določite vrsto grafa in narišite graf.

   5(G • CON) ... črtni grafikon

   6(G • PLT) ... grafikon tipa plot

Primer **Iz rekurzije med dvema členoma, izraženo z an+1 = 2*an* + 1, z začetnim členom a1 = 1, ko se vrednost *n* spreminja od 1 do 6, ustvarite tabelo številk. Uporabite vrednosti iz tabele za risanje linijskega grafa.**

Uporabite naslednje nastavitve okna V.

Xmin = 0, Xmax = 6, Xscale = 1

Ymin = –15,   Ymax = 65,   Yscale = 5

① m RECUR

2 !3(V-WIN)[0] w[6] wbw②

-bfw[6] fwfwJ

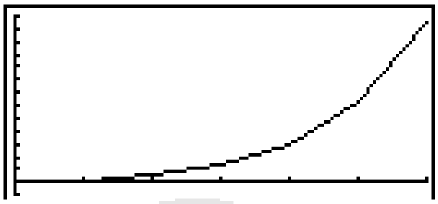
3 3(TIP)2(a_{n+1})c2(a_n)+bw

4 5(SET)2(a_1)bw[6] wbwJ

⑤ 1 (SEL+S)f2(—J

⑥ 6(TABL)

⑦ 5(G • CON)



- Po risanju grafa lahko uporabite funkcije Trace, Zoom in Sketch.
- Pritisnite[AC] , da se vrnete na zaslon s številčno tabelo. Po risanju grafa lahko preklapljate med zaslonom s številčno tabelo in zaslonom z grafom s pritiskom na !6(G↔ T).

■ Risba faznega grafa iz dveh številčnih zaporedij

Lahko narišete fazni diagram za numerične zaporedje, ki jih ustvarita dva izraza, vnesena v Način **RECUR** z eno vrednostjo na vodoravni osi in drugo vrednostjo na navpični osi. a_n (a_{n+1}, a_{n+2}), b_n (b_{n+1}, b_{n+2}), c_n (c_{n+1}, c_{n+2}) je številčna zaporedja prvega izraza po abecednem redu na vodoravni osi, naslednja številčna zaporedja pa na navpični osi.

1. V glavnem meniju vstopite v način **RECUR**.
2. Konfigurirajte nastavitve V-okna.
3. Vnesite dve rekurzivni formuli in izberite obe za ustvarjanje tabele.
4. Konfigurirajte nastavitve za ustvarjanje tabele.

   Določite začetne in končne vrednosti za spremenljivko n ter začetni člen za vsako rekurzivno formulo.
5. Prikažite tabelo števil rekurzivnih formul.
6. Narišite fazni diagram.

Primer **Vnesite dve zaporedni formuli za regresijo med dvema členoma a_{n+1} = 0,9a_n in b_{n+1} = b_n + 0,1n − 0,2 ter določite začetna člena a_1 = 1 in b_1 = 1 za vsakega. Ustvarite tabelo števil, ko vrednost spremenljivke n prehaja od 1 do 10, in jo uporabite za risanje faznega grafa.**

Uporabite naslednje nastavitve okna V.

Xmin = 0, Xmax = 2, Xscale = 1

Ymin = 0, Ymax = 4, Yscale = 1

① m RECUR

2 !3(V-WIN)[0] wcwbw②

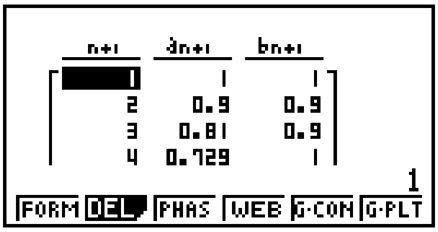
[0]w[4] wbwJ

3 3(TYPE)2(a_{n+1})[0] _j2(a_n)w

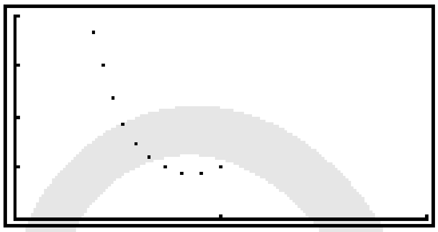
4(n.a_n ··)3(bn)+[0] .b1(n)-[0] .cw 4

5(SET)2(a1)bwb[0]wbwbwJ

⑤ 6(TABL)



Ⓐ 3(PHAS)

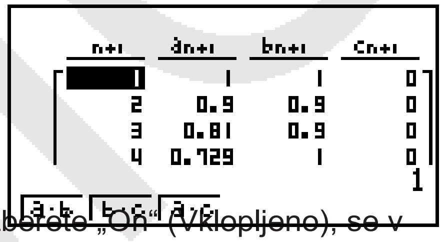


• Če vnesete tri izraze na zaslonu **RECUR** in jih vse izberete za ustvarjanje tabele, morate določiti, kateri dve od treh izrazov želite uporabiti za risanje faznega grafa. To storite s pomočjo funkcijskega menija, ki se prikaže, ko na zaslonu tabele pritisnete 3(PHAS).

1 (a • b).........Graf *z uporabo* a_n (a_{n+1}, a_{n+2}) in b_n (b_{n+1}, b_{n+2}).

2 (b • c).........Graf z uporabo b_n (b_{n+1}, b_{n+2}) in c_n (c_{n+1}, c_{n+2}).

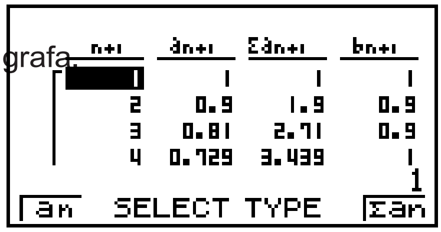
3 (a • c).........Graf z uporabo a_n (a_{n+1}, a_{n+2}) in c_n (c_{n+1}, c_{n+2}).



• Če v nastavitvenem zaslonu za „Σ Display“ (Prikaz grafa) izberete „On“ (Vklopljeno), se v tabelo vključi vsota vsakega člena. V tem trenutku lahko izberete, ali želite za risanje grafa uporabiti dve numerični zaporedji takšni, kot sta, ali vsoto obeh numeričnih zaporedij. To storite s pomočjo funkcijskega menija, ki se prikaže, ko na zaslonu tabele pritisnete 3(PHAS).

1 (a_n) ....Uporabi številčno zaporedje za risanje grafa.

6 (Σ a_n)...........Uporabi vsote številčnih zaporedij za risanje grafa.



• Ko je na zaslonu nastavitev izbrana možnost „Σ Display“ (Prikaz grafa) in so za ustvarjanje tabele izbrane vse tri izraze, ki ste jih vnesli v načinu **RECUR**, uporabite funkcijske menije, ki se prikažejo, ko pritisnete 3(PHAS) na zaslonu tabele, da določite, kateri dve izrazi želite uporabiti, in da določite, ali želite uporabiti podatke številčne zaporedje ali podatke vsote številčne zaporedje.

1 (a • b).........Graf z uporabo številčnih zaporedij i_n (a_{n+1}, a_{n+2}) in b_n (b_{n+1}, b_{n+2})

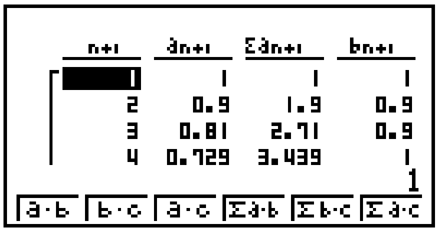
2 (b • c).........Graf z uporabo številčnih zaporedij b_n (b_{n+1}, b_{n+2}) in c_n (c_{n+1}, c_{n+2})

3 (a • c).........Graf z uporabo številskih zaporedij a_n (a_{n+1}, a_{n+2}) in c_n (c_{n+1}, c_{n+2})

4(Σ a • b) ....Graf z uporabo vsot števil zaporedja a_n (a_{n+1}, a_{n+2}) in b_n (b_{n+1}, b_{n+2})

5(Σ b • c).......Graf, ki uporablja vsote števil zaporedij b_n (b_{n+1}, b_{n+2}) in c_n (c_{n+1}, c_{n+2})

6(Σ a • c)........Graf, ki uporablja vsote številskih a_n (a_{n+1}, a_{n+2}) in c_n (c_{n+1}, c_{n+2})



■ WEB graf (konvergenca, divergenca)

$y = f(x)$ se grafično prikaže s predpostavko, da je $a_{n+1} = y$, $a_n = x$ za linearno dvočlensko regresijo $a_{n+1} = f(a_n)$, sestavljeno iz a_{n+1}, a_n. Nato se lahko ugotovi, ali je funkcija konvergentna ali divergentna.

1. V glavnem meniju vstopite v način **RECUR**.
2. Nastavite V-okno.
3. Izberite 2-členjsko rekurzijo kot tip rekurzivne formule in vnesite formulo.
4. Določite obseg tabele, začetno in končno točko n, začetno vrednost člena in začetno točko kazalca.
5. Prikaži tabelo številk rekurzivne formule.
6. Narišite graf.
7. Pritisnite w in kazalec se prikaže na začetnem mestu, ki ste ga določili. Pritisnite w večkrat.

   Če obstaja konvergenca, se na zaslonu prikažejo črte, ki spominjajo na pajkovo mrežo. Če se črte mreže ne prikažejo, to pomeni, da obstaja divergenca ali da je graf zunaj meja zaslona. V tem primeru spremenite vrednosti V-Window na večje in poskusite znova.

   Za izbiro grafa lahko uporabite f②.

Primer **Za risanje WEB grafa za rekurzivno formulo $a_{n+1} = -3(a_n)^2 + 3a_n$, $b_{n+1} = 3b_n + 0{,}2$ in preveriti divergenco ali konvergenco. Uporabite naslednji razpon tabele: Začetek = 0, Konec = 6, a_0 = 0,01, anStr = 0,01, b_0 = 0,11, bnStr = 0,11**

① m RECUR

2 !3(V-WIN)0 wbwbw②
0 wbwbwJ

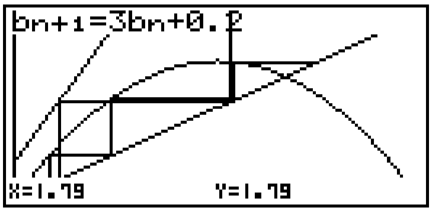
3 3(TYPE)2(a_{n+1})-d2(a_n)x+d2(a_n)w
d3(b_n)+0 .cw

4 5(SET)1(a_0)
0w6 w0 .0 bw0 .bbw②0.0
bw0 .bbwJ

⑤ 6(TABL)

Ⓐ 4(WEB)

⑦ w~w(a_n je konvergenca)
②w~w(b_n je divergenca)



- Če želite spremeniti slog črte grafa, po koraku 4 pritisnite 1(SEL+S).
- Z WEB Graph lahko določite vrsto črte za graf $y = f(x)$. Nastavitev vrste črte velja samo, če je na zaslonu Nastavitve za »Vrsta risanja« izbrana možnost »Poveži«.

10. Grafično prikazovanje koničnega preseka

Pomembno!

- fx-7400GIII ni opremljen z načinom **CONICS**.

■ Grafični prikaz koničnega preseka

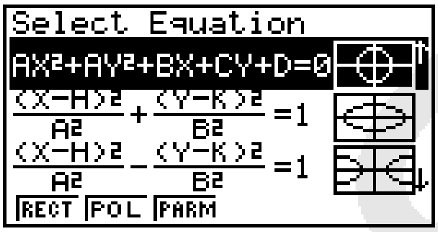
Način **CONICS** lahko uporabite za grafično prikazovanje parabole, kroga, elipse in hiperbole. Za grafično prikazovanje lahko vnesete funkcijo pravokotnih koordinat, funkcijo polarnih koordinat ali parametrično funkcijo.

1. V glavnem meniju vstopite v način **CONICS**.
2. Izberite vrsto funkcije.

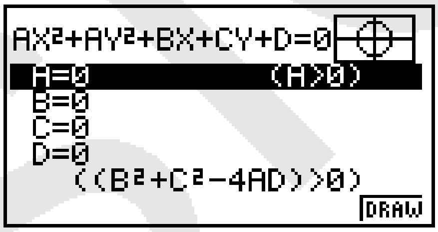
   1(RECT). ..... {pravokotne koordinate}

   2(POL). ......{polarna koordinata}

   3(PARM). .....{parametrično}
3. Izberite vzorec funkcije v skladu z vrsto grafa, ki ga želite narisati.



R
w



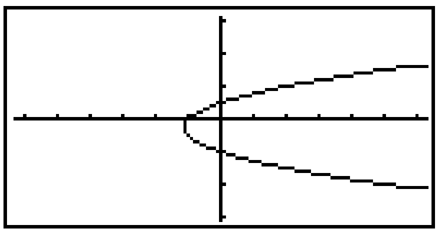
4. Vnesite koeficiente funkcije in narišite graf.

Primer **Vnesite pravokotno koordinatno funkcijo $x = 2y^2 + y - 1$ in narišite parabolo, odprto na desni strani, nato vnesite polarno koordinatno funkcijo $r = 4\cos\theta$ in narišite krožni graf.**

① mCONICS

2 1(RECT)②(X=AY² +BY+C)w

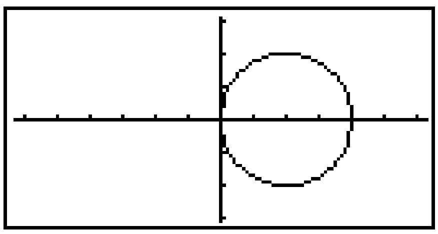
3 cwbw-bw6(DRAW)



4JJ

⑤ 2(POL)②②②②(R=2Acosθ)w

Ⓐ cw6(DRAW)



11. Spreminjanje videza grafa

■ Risba črte

Funkcija skiciranja omogoča risanje točk in črt znotraj grafikonov.

Za risanje s funkcijo skiciranja lahko izberete enega od štirih različnih stilov črt.

1. V glavnem meniju vstopite v način **GRAPH**.
2. Nastavite V-Window.
3. Na zaslonu Nastavitve uporabite nastavitev „Sketch Line“ (Risba črte), da določite željeni slog črte.
   1(—) … Normalno (začetna privzeta nastavitev)
   2(━) … Debel (dvakrat debelejši od normalnega)
   3(·····) … Prekinjena (debela prekinjena)
   4(······) … Pika (pikasta)
4. Vnesite funkcijo grafa.
5. Narišite graf.
6. Izberite funkcijo skice, ki jo želite uporabiti.*1

   !4(SKTCH)1(Cls) ... Izbriši zaslon
   2(Tang) ... Tangentna premica
   3(Norm) ... Premica, ki je
   normalna na krivuljo 4(Inv) ...
   Inverzna funkcija*2
   6(g)1(PLOT)
   {Plot}/{Pl • On}/{Pl • Off}/{Pl • Chg} ... Točka {Plot}/{On}/{Off}/{Change}
   6(g)2(LINE)
   {Line}/{F • Line} ... {povezuje 2 točki, narisani z 6(g)1(PLOT), s črto}/{za risanje črte med katerima koli 2 točkama}
   6(g)3(Crcl) ... Krog
   6(g)4(Vert) ... Navpična črta
   6(g)5(Hztl) ... Vodoravna črta
   6(g)6(g)1(PEN) … Prosta
   roka
   6(g)6(g)2(Text) … Vnos besedila

7. S puščičnimi tipkami premaknite kazalec (✥) na mesto, kjer želite risati, in pritisnite w.*3

*1 Zgoraj je prikazan meni funkcij, ki se prikaže v načinu **GRAPH**. Meni se lahko v drugih načinih nekoliko razlikuje.

*2 V primeru grafa inverzne funkcije se risanje začne takoj po izbiri te možnosti.

*3 Nekatere funkcije skiciranja zahtevajo določitev dveh točk. Po pritisku na w za določitev prve točke s pomočjo tipk za premikanje kurzorja premaknite kazalec na mesto druge točke in pritisnite w.

• Za naslednje funkcije skiciranja lahko določite tip črte: Tangenta, Normalna, Inverzna, Črta, F • Črta, Krog, Navpična, Vodoravna, Pero

Primer **Narišite črto, ki je tangencialna točki (2, 0) na grafu za $y = x(x + 2)(x - 2)$.**

① m GRAPH

2 !3(V-WIN) 1 (INIT) J

3 !m(SET UP)②②②②②②②②②*1(—J

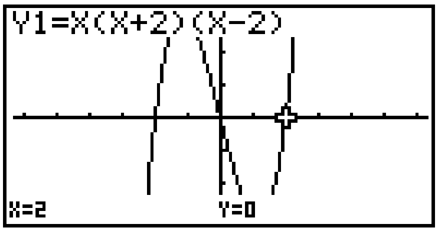
*fx-7400GIII: ②②②②②②②

4 3(TIP) 1 (Y=)v(v+c)(v
-c)w

⑤ 6(RISBA)

Ⓐ !4(SKTCH)2(Tang)

⑦ e~ew*1



*1 Tangentno črto lahko narišete zaporedoma tako, da premaknete kazalec „✥“ in pritisnete w.

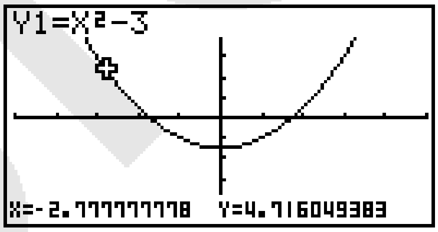
12. Analiza funkcije

■ Branje koordinat na grafu

S funkcijo Trace lahko premikate kazalec po grafu in odčitavate koordinate na zaslonu.

1. V glavnem meniju vstopite v način **GRAPH**.
2. Narišite graf.
3. Pritisnite !1(TRCE) in v sredini grafa se prikaže kazalec.*1
4. S tipkama d in e premaknite kazalec po grafu do točke, na kateri želite prikazati derivato.

   Če je na zaslonu več grafikonov, pritisnite f in ②, da se premikate med njimi vzdolž osi x trenutne lokacije kazalca.



5. Kazalec lahko premaknete tudi tako, da pritisnete v, da se prikaže pojavno okno, in nato vnesete koordinate.

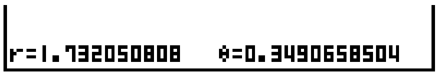
   Pojavno okno se prikaže tudi, če koordinate vnesete neposredno.

Za izhod iz sledenja pritisnite !1(TRCE).

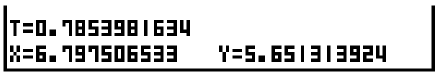
*1Kazalec ni viden na grafu, če se nahaja zunaj območja prikaza grafa ali če pride do napake brez vrednosti.

- Prikaz koordinat na mestu kazalca lahko izklopite tako, da na zaslonu Nastavitve za postavko „Coord“ izberete „Off“.
- Spodaj je prikazano, kako se koordinate prikazujejo za vsak tip funkcije.

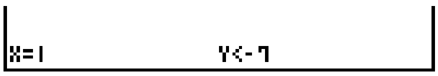
Graf polarnih koordinat



Parametrični graf Graf



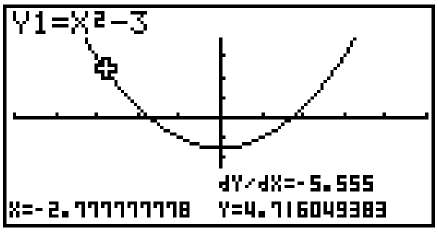
neenakosti



■ Prikaz odvodov

Poleg uporabe Trace za prikaz koordinat lahko prikažete tudi derivato na trenutni lokaciji kazalca.

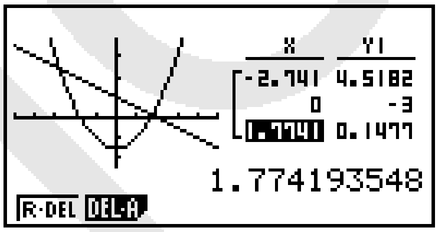
1. V glavnem meniju vstopite v način **GRAPH**.
2. Na zaslonu Nastavitve izberite Vklopljeno za Derivata.
3. Narišite graf.
4. Pritisnite !1(TRCE) in kazalec se prikaže v središču grafa. Trenutne koordinate in derivata se v tem trenutku prikažejo tudi na zaslonu.



■ Graf v tabelo

S pomočjo funkcije trace lahko preberete koordinate grafa in jih shranite v tabelo števil. Z uporabo funkcije Dual Graph lahko hkrati shranite graf in tabelo števil, kar je pomembno orodje za analizo grafov.

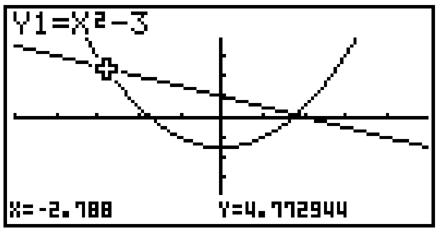
1. V glavnem meniju vstopite v način **GRAPH**.
2. Na zaslonu Setup določite GtoT za Dual Screen.
3. Nastavite V-Window.
4. Shranite funkcijo in narišite graf na glavnem (levem) zaslonu.
5. Aktivirajte Trace. Ko je na zaslonu več grafikonov, pritisnite f in ②, da izberete želeni grafikon.
6. S tipkama d in e premaknite kazalec in s tipko w shranite koordinate v tabelo števil. Ponovite ta korak, da shranite želeno število vrednosti.
7. Pritisnite K1(CHNG), da aktivirate številčno tabelo.



■ Zaokroževanje koordinat

Ta funkcija zaokroži koordinatne vrednosti, ki jih prikaže Trace.

1. V glavnem meniju vstopite v način **GRAPH**.
2. Narišite graf.
3. Pritisnite !2(ZOOM)6(g)3(RND). S tem se nastavitve V-Window samodejno spremenijo v skladu z vrednostjo Rnd.
4. Pritisnite !1(TRCE) in nato s pomočjo tipk za premikanje kazalca premikajte kazalec po grafu. Koordinate, ki se zdaj prikažejo, so zaokrožene.



■ Izračun korena

Ta funkcija ponuja več različnih metod za analizo grafikonov.

1. V glavnem meniju vstopite v način **GRAPH**.
2. Narišite grafe.
3. Izberite funkcijo analize.

!5(G-SLV)1(ROOT) ... Izračun korena
2(MAX) ... Lokalna največja vrednost
3(MIN) ... Lokalna minimalna vrednost

4(Y-ICPT) ... presečišče z osjo y

5(ISCT) ... presečišče dveh grafov

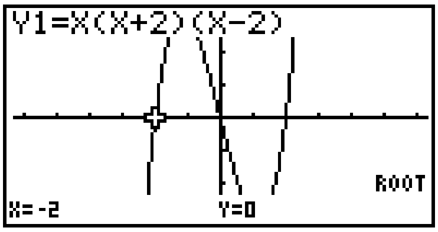
6(g)1(Y-CAL) ... y-koordinata za dano x-koordinato

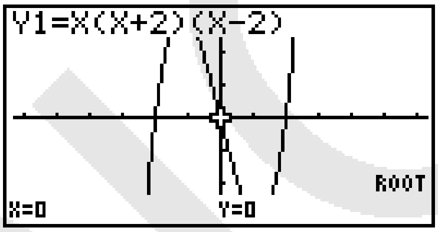
6(g)2(X-CAL) ... x-koordinata za dano y-koordinato

6(g)3($\int dx$) ... integralna vrednost za dano območje

4. Ko je na zaslonu več grafikonov, se izbirni kurzor (■) nahaja na grafikonu z najnižjo številko. Pritisnite f in ②, da kurzor premaknete na grafikon, ki ga želite izbrati.
5. Pritisnite w, da izberete graf, na katerem se nahaja kurzor, in prikažete vrednost, ki jo je izračunala analiza.

   Ko analiza prikaže več vrednosti, pritisnite e, da izračunate naslednjo vrednost. S pritiskom na d se vrnete na prejšnjo vrednost.





- Katera koli od naslednjih možnosti lahko povzroči slabo natančnost ali celo onemogoči pridobivanje rešitev.
  - Ko je graf dobljene rešitve točka dotika z osjo x
  - Ko je rešitev točka preloma

■ Izračun presečišča dveh grafikonov

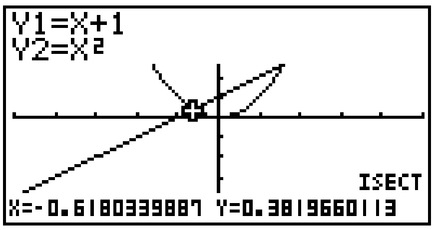
Uporabite naslednji postopek za izračun presečišča dveh grafov.

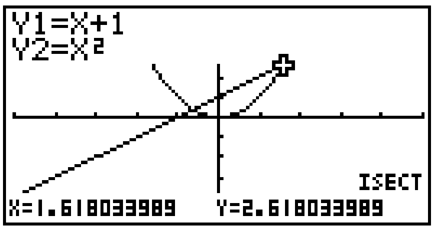
1. Narišite grafa.
2. Pritisnite !5(G-SLV)5(ISCT). Če je grafikonov tri ali več, se izbirni kurzor (■) prikaže na grafikonu z najnižjo številko.
3. Pritisnite f in ②, da premaknete kazalec na graf, ki ga želite izbrati.
4. Pritisnite w, da izberete prvi grafikon, pri čemer se oblika kazalca spremeni iz ■ v ◆ .
5. Pritisnite f in ②, da premaknete kurzor na drugi grafikon.
6. Pritisnite w, da izračunate presečišče dveh grafikonov.

   Ko analiza prikaže več vrednosti, pritisnite e, da izračunate naslednjo vrednost. S pritiskom na d se vrnete na prejšnjo vrednost.

Primer **Narišite graf dveh funkcij, prikazanih spodaj, in določite presečišče med Y1 in Y2.**

Y1 = x + 1, Y2 = x^2





- Izračunate lahko samo presečišče za grafe s pravokotnimi koordinatami (tip $Y=f(x)$) in grafe neenakosti (Y> $f(x)$, Y< $f(x)$, Y t $f(x)$ ali Y s $f(x)$).
- Katera koli od naslednjih možnosti lahko povzroči slabo natančnost ali celo onemogoči pridobivanje rešitev.
  - Ko je rešitev točka dotika med dvema grafikonoma
  - Ko je rešitev točka preloma

■ Določanje koordinat za dane točke

V nadaljevanju je opisano, kako določiti y-koordinato za dano x in x-za dano y.

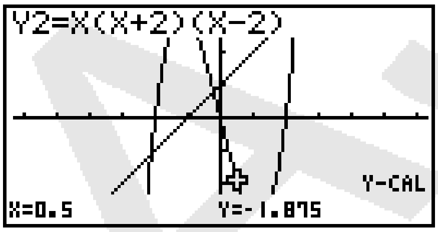
1. Narišite graf.
2. Izberite funkcijo, ki jo želite izvesti. Če je več grafov, se izbirni kurzor (■) prikaže na grafu z najnižjo številko.

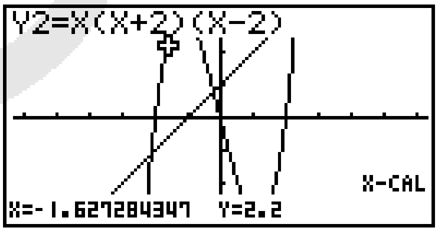
   !5(G-SLV)6(g)1(Y-CAL) ... y-koordinata za dano x
   6(g)2(X-CAL) ... x-koordinacija za dano y

3. Uporabite f②, da premaknete kurzor (■) na želeni graf, nato pa pritisnite w, da ga izberete.
4. Vnesite dano vrednost x-koordinate ali y-koordinate.
   Pritisnite w, da izračunate ustrezno vred nost y-koordinate ali x-koordinate.

Primer **Narišite graf dveh funkcij, prikazanih spodaj, in nato določite y-koordinato za x = 0,5 in x-koordinato za y = 2,2 na grafu Y2.**

Y1 = x + 1, Y2 = $x(x + 2)(x – 2)$





- Če je za zgornji postopek več rezultatov, pritisnite e, da izračunate naslednjo vrednost. S pritiskom na d se vrnete na prejšnjo vrednost.
- Vrednosti X-CAL ni mogoče dobiti za graf parametrične funkcije.

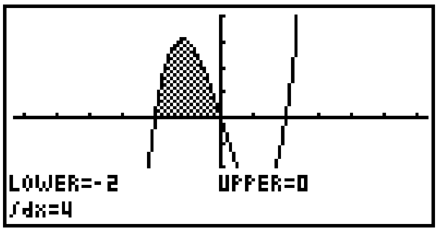
■ Izračun integralne vrednosti za dano območje

Uporabite naslednji postopek, da dobite integracijske vrednosti za dano območje.

1. Narišite graf.
2. Pritisnite !5(G-SLV)6(g)3(∫ dx). Če je grafikonov več, se izbirni kurzor (■) prikaže na grafikonu z najnižjo številko.
3. Uporabite f②, da premaknete kazalec (■) na želeni graf, nato pa pritisnite w, da ga izberete.
4. Uporabite de, da premaknete kazalec spodnje meje na želeno mesto, nato pa pritisnite w.
5. Uporabite e, da premaknete kazalec zgornje meje na želeno mesto.
6. Pritisnite w, da izračunate integralno vrednost.

Primer **Narišite graf spodnje funkcije in določite integralno vrednost na točki (–2, 0).**

Y1 = $x(x + 2)(x - 2)$



- Spodnjo in zgornjo mejo lahko določite tudi z vnosom na številčnici.
- Pri nastavljanju območja poskrbite, da je spodnja meja manjša od zgornje meje.
- Integralne vrednosti se lahko izračunajo samo za grafe s pravokotnimi koordinatami.

■ Analiza grafa koničnega preseka

Pomembno!

- Kalkulator fx-7400GIII ni opremljen z načinom **CONICS**.

Z grafi koničnih odsekov lahko določite približke naslednjih analitičnih rezultatov.

1. V glavnem meniju vstopite v način **CONICS**.
2. Izberite vrsto funkcije.
   1(RECT). ..... {pravokotne koordinate}
   2(POL). ......{polarne koordinate}
   3(PARM). .....{parametrične}
3. Z uporabo f in ② izberite konični presek, ki ga želite analizirati.
4. Vnesite konstante koničnega preseka.
5. Narišite graf.

Po narisanju grafa koničnega preseka pritisnite !5(G-SLV), da se prikažejo naslednji meniji za analizo grafa.

u Analiza paraboličnega grafa

- ....{fokus}/{vrh}/{dolžina latus rectum}/{ekscentričnost}
- {**DIR**}/{**SYM**}......{direktriča}/{os simetrije}
- {**X-IN**}/{**Y-IN**} .....{x-presek}/{y-presek}

u Analiza krožnega grafa

- {**CNTR**}/{**RADS**} ....{center}/{radius}
- {**X-IN**}/{**Y-IN**} .....{x-presek}/{y-presek}

u Analiza eliptičnega grafa

- ....{fokus}/{vrh}/{center}/{ekscentričnost}
- {**X-IN**}/{**Y-IN**} .....{x-presek}/{y-presek}

u Analiza hiperboličnega grafa

- ....{fokus}/{vrh}/{središče}/{ekscentričnost}
- {**ASYM**}.... {asimptota}
- {**X-IN**}/{**Y-IN**} .....{x-presek}/{y-presek}

u Za izračun žarišča in dolžine latus rectum **[G-SLV]-[FOCS]/[LEN]**

Primer **Za določitev fokusa in dolžine latus rectum za parabolo X = (Y – 2)^2 + 3**

Uporabite naslednje nastavitve V-okna.

Xmin = –1, Xmax = 10, Xscale = 1

Ymin = –5, Ymax = 5, Yscale = 1

m CONICS

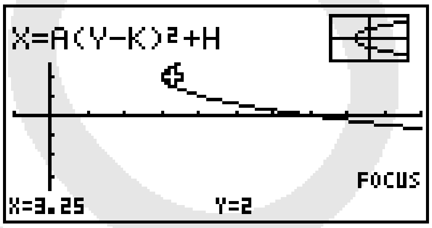
w

bwcwdw6(DRAW)

!5(G-SLV)

1(FOCS)

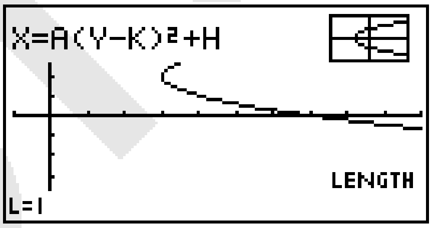
(Izračuna fokus.)



!5(G-SLV)

5(LEN)

(Izračuna dolžino latus rectum.)



- Pri izračunu dveh žarišč za elipso ali hiperbolični graf pritisnite e, da izračunate drugo žarišče. S pritiskom na d se vrnete na prvo žarišče.
- Pri izračunu dveh vrhov za hiperbolični graf pritisnite e, da izračunate drugi vrh. S pritiskom na d se vrnete na prvi vrh.
- S pritiskom na e pri izračunu vrhov elipse se izračuna naslednja vrednost. S pritiskom na d se pomaknete nazaj med prejšnjimi vrednostmi. Elipsa ima štiri vrhove.

u Za izračun središča **[G-SLV]-[CNTR]**

Primer **Za določitev središča kroga (X + 2)^2 + (Y + 1)^2 = 2^2**

m KONIKE

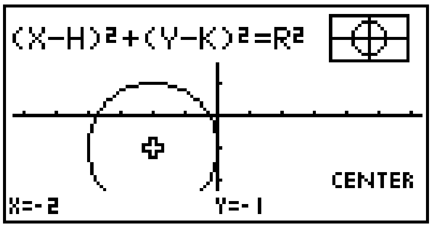
②②②②w

-cw-bwcw6(DRAW)

!5(G-SLV)

1(CNTR)

(Izračuna središče.)



Poglavje 6 Statistični grafi in izračuni

Pomembno!

To poglavje vsebuje številne posnetke grafičnih zaslonov. V vsakem primeru so bile vnesene nove vrednosti podatkov, da bi poudarili posebne značilnosti risanega grafa. Upoštevajte, da ko poskušate narisati podoben graf, naprava uporabi vrednosti podatkov, ki ste jih vnesli s funkcijo Seznam. Zaradi tega se bodo grafi, ki se prikažejo na zaslonu, ko izvedete grafično operacijo, verjetno nekoliko razlikovali od tistih, prikazanih v tem priročniku.

1. Pred izvedbo statističnih izračunov

Vstop v način **STAT** iz glavnega menija prikaže zaslon List Editor (Urejevalnik seznama).

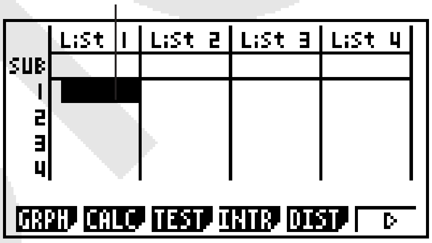
Na zaslonu urejevalnika seznama lahko vnesete statistične podatke in izvedete statistične izračune.

S tipkami f, ②, d in e lahko pre označitev po seznamih.

6

Ko vnesete podatke, jih lahko uporabite za izdelavo grafa in preverjanje trendov. Za analizo podatkov lahko uporabite tudi različne regresijske izračune.

- Za informacije o uporabi seznamov statističnih podatkov glejte „Poglavje 3 Funkcija seznama“.



■ Spreminjanje parametrov grafa

Uporabite naslednje postopke, da določite stanje risanja/nerisanja grafa, vrsto grafa in druge splošne nastavitve za vsak graf v meniju grafov (GPH1, GPH2, GPH3).

Ko je na zaslonu seznam statističnih podatkov, pritisnite 1(GRPH), da prikažete grafični meni, ki vsebuje naslednje elemente.

- {**GPH1**}/{**GPH2**}/{**GPH3**} ... graf {1}/{2}/{3} risanje*[1]
- {**SEL**} ... {izbira hkratnega grafa (GPH1, GPH2, GPH3)}
  Lahko določite več grafov.
- {**SET**} ... {nastavitve grafa (tip grafa, dodelitve seznama)}

*[1] Začetna privzeta nastavitev vrste grafa za vse grafe (graf 1 do graf 3) je razpršeni diagram, vendar jo lahko spremenite v eno od številnih drugih vrst grafov.

1. Splošne nastavitve grafa **[GRPH]-[SET]**

V tem poglavju je opisano, kako uporabiti zaslon s splošnimi nastavitvami grafa za nastavitev naslednjih parametrov za vsak graf (GPH1, GPH2, GPH3).

- **Vrsta grafa**

Začetna privzeta nastavitev vrste grafa za vse grafe je razpršen diagram. Za vsak graf lahko izberete eno od številnih drugih vrst statističnih grafov.

• **Seznam**

Začetni privzeti statistični podatki so Seznam 1 za enovariabilne podatke in Seznam 1 in Seznam 2 za parne variabilne podatke. Lahko določite, kateri seznam statističnih podatkov želite uporabiti za x-podatke in y-podatke.

• **Pogostost**

Ta nastavitev določa seznam, ki vsebuje podatke o frekvenci.
V statistiki »frekvenca« pomeni število pojavitev podatka (ali niza podatkov). Frekvenca se uporablja v »tabeli frekvenčne porazdelitve«, ki v eni stolpcu navaja vsak posamezen podatek, v stolpcu desno pa njegovo frekvenco (število pojavitev). V tem kalkulatorju sta stolpec s podatki in stolpec s frekvenco ločena seznama. Ta nastavitev določa seznam (Seznam 1, Seznam 2 itd.), ki se uporabi za stolpec s frekvenco pri risanju statističnega grafa.

- Za graf Med-Med (stran 6-12) vnesite samo pozitivna cela števila za podatke o frekvenci. Vnos katere koli druge vrste vrednosti (ulomljena vrednost itd.) bo povzročil napako.

Pomembno!

- Vrednosti v seznamu frekvenc morajo biti samo 0 ali pozitivne vrednosti. Že ena sama negativna vrednost bo povzročila napako.
- Statistični podatki s frekvenco 0 se ne uporabljajo za izračun minimalnih in maksimalnih vrednosti.

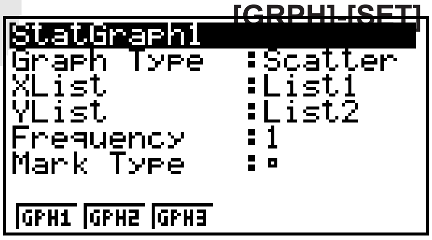
• **Vrsta oznake**

S to nastavitvijo lahko določite obliko točk na grafu.

---

u Za prikaz zaslona s splošnimi nastavitvami grafa [GRPH]-[SET]

S pritiskom na 1(GRPH)6(SET) se prikaže zaslon s splošnimi nastavitvami grafa.



- **StatGraph (statistične specifikacije grafa)**
  - {**GPH1**}/{**GPH2**}/{**GPH3**} ... graf {1}/{2}/{3}

• **Vrsta grafa (specifikacija vrste grafa)**

- {**Scat**}/{xy}/{**NPP**}/{**Pie**} ... {razpršeni diagram}/{xy črtni grafikon}/{normalni verjetnostni grafikon}/{krožni grafikon}
- {**Hist**}/{**Box**}/{**Bar**}/{**N**·Dis}/{Brkn} ... {histogram}/{med-box graf}/{stolpični graf}/{normalna porazdelitvena krivulja}/{prekinjen linijski graf}
- {**X**}/{**Med**}/{**X^2**}/{**X^3**}/{**X^4**} ... {grafikon linearne regresije}/{grafikon Med-Med}/{grafikon kvadratne regresije}/{grafikon kubične regresije}/{grafikon kvadratne regresije}
- {**Log**}/{**Exp**}/{**Pwr**}/{**Sin**}/{**Lgst**} ... {logaritmični regresijski grafikon}/{eksponentni regresijski grafikon}/{potencni regresijski grafikon}/{sinusoidni regresijski grafikon}/{logistični regresijski grafikon}

• **XList (seznam podatkov osi x)/YList (seznam podatkov osi y)**

- {**Seznam**} ... {Seznam 1 do 26}

• **Pogostost (število pojavitev vrednosti)**

- {**1**} ... {grafikon 1-do-1}
- {**Seznam**} ... {Seznam 1 do 26}

• **Vrsta oznake (vrsta oznake na grafu)**

• {□}/{× }/{•} ... razpršeni diagram točk

Ko je kot tip grafa izbrana možnost „Pie“ (krožni graf):

- **Podatki (določa seznam, ki se uporabi kot podatki za graf).**
  - {**SEZNAM**} ... {Seznam 1 do Seznam 26}

- **Prikaz (nastavitev prikaza vrednosti krožnega grafa)**
  - {**%**}/{**Podatki**} ... Za vsak podatkovni element {prikaži kot odstotek}/{prikaži kot vrednost}

- **% Sto Mem (Določa shranjevanje odstotkovnih vrednosti v seznam.)**
  - {**None**}/{**List**} ... Za odstotne vrednosti: {Ne shranjuj na seznam}/{Določi seznam 1 do 26 in shrani}

Ko je kot tip grafa izbrana možnost „Box“ (med-box graf):

- **Izstopajoče vrednosti (določitev izstopajočih vrednosti)**
  - {**Vklopljeno**}/{**Izklopljeno**} ... {prikaži}/{ne prikaži} Izstopajoče vrednosti med-box

Ko je kot tip grafa izbrana možnost „Bar“ (stolpični graf):

- **Podatek1 (prvi seznam podatkov)**
  - {**LIST**} ... {Seznam 1 do 26}

- **Podatki2 (drugi seznam podatkov)/Podatki3 (tretji seznam podatkov)**
  - {**Nič**}/{**LIST**} ... {nič}/{Seznam 1 do 26}

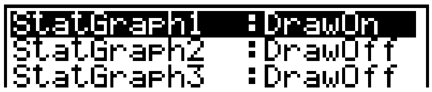
- **Stick Style (specifikacija sloga palice)**
  - {**Leng**}/{**HZtl**} ... {dolžina}/{vodoravno}

2. Stanje risanja/nerisanja grafa [GRPH]-[SEL]

Za določitev stanja risanja (Vklopljeno)/nerisanja (Izklopljeno) za vsak graf v meniju grafov lahko uporabite naslednji postopek.

u Za določitev stanja risanja/nerisanja grafa

1. S pritiskom na 1(GRPH)4(SEL) se prikaže zaslon za vklop/izklop grafa.



- Upoštevajte, da je nastavitev StatGraph1 za graf 1 (GPH1 v meniju grafov), StatGraph2 za graf 2 in StatGraph3 za graf 3.

2. S pomočjo tipk za premikanje kurzorja premaknite označitev na graf, katerega stanje želite spremeniti, in pritisnite ustrezno funkcijo za spreminjanje stanja.
   - {**On**}/{**Off**} ... {On (risanje)}/{Off (nerisanje)}
   - {**RISANJE**} ... {riše vse grafe Vklopljeno}

3. Za vrnitev v grafični meni pritisnite J

- Parametri V-Window se običajno nastavijo samodejno za statistično grafično prikazovanje. Če želite parametre V-Window nastaviti ročno, morate spremeniti postavko Stat Wind na „Manual“ (Ročno).

  Medtem ko je na zaslonu prikazan seznam statističnih podatkov, izvedite naslednji postopek.

  !m(SET UP)2(Man)

  J (Vrnitev na prejšnji meni.)

  Upoštevajte, da so parametri V-Window samodejno nastavljeni za naslednje vrste grafikonov, ne glede na to, ali je element Stat Wind nastavljen na „Manual“.

Pie, 1-Sample Z Test, 2-Sample Z Test, 1-Prop Z Test, 2-Prop Z Test, 1-Sample t Test, 2-Sample t Test, χ^2 GOF Test, χ^2 2-way Test, 2-Sample F Test (x-os se ne upošteva).

- Privzeta nastavitev samodejno uporablja podatke iz seznama 1 kot vrednosti osi x (vodoravne) in podatke iz seznama 2 kot vrednosti osi y (navpične). Vsak niz podatkov x/y je točka na razpršenem diagramu.

2. Izračunavanje in grafično prikazovanje enovariabilnih statističnih podatkov

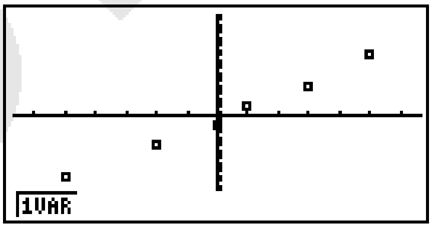
Enovariabilni podatki so podatki z eno samo spremenljivko. Če na primer izračunavate povprečno višino članov razreda, obstaja samo ena spremenljivka (višina).

Enovariabilna statistika vključuje porazdelitev in vsoto. Za enovariabilno statistiko so na voljo naslednji tipi grafikonov.

Za nastavitev želenih parametrov pred risanjem vsakega grafa lahko uporabite tudi postopke iz poglavja „Spreminjanje parametrov grafa“ na strani 6-1.

■ Normalni verjetnostni diagram

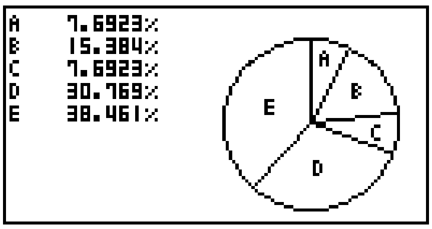
Ta graf primerja razmerje nakopičenih podatkov z razmerjem nakopičenih podatkov normalne porazdelitve. XList določa seznam, v katerega se vnašajo podatki, Mark Type pa se uporablja za izbiro med oznakami {□ /× / • }, ki jih želite prikazati na grafu.



Pritisnite AC , ali (QUIT), da se vrnete na seznam statističnih podatkov.

■ Krožni diagram

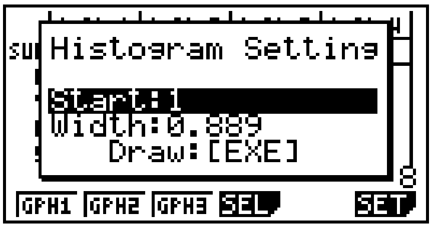
Na podlagi podatkov v določenem seznamu lahko narišete krožni diagram. Največje število elementov podatkov v diagramu (vrstic seznama) je 20. Diagram je označen z A, B, C itd., kar ustreza vrsticam 1, 2, 3 itd. seznama, uporabljenega za podatke v diagramu.



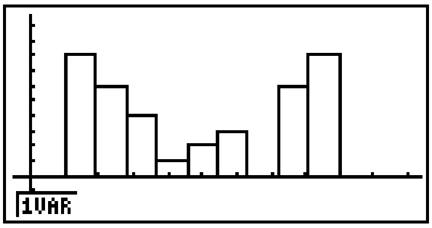
Ko je v splošnih nastavitvah grafa (stran 6-3) za nastavitev »Prikaz« izbrana možnost »%«, se za vsako črko oznake prikaže vrednost, ki prikazuje odstotek.

■ Histogram

XList določa seznam, v katerega se vnašajo podatki, medtem ko Freq določa seznam, v katerega se vnaša frekvenca podatkov. Če frekvenca ni določena, se za Freq določi 1.



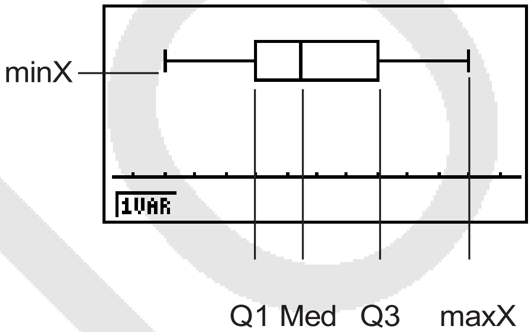
⇒
w(DRAW)



Pred risanjem grafa se prikaže zaslon, kot je prikazan zgoraj. Na tej točki lahko spremenite vrednosti Start in Width.

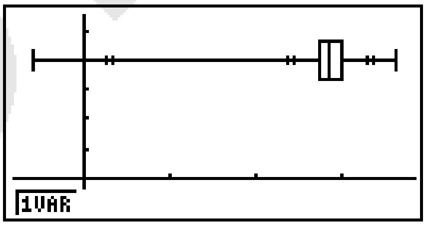
■ Graf Med-box

Ta vrsta grafa vam omogoča, da vidite, kako je veliko število podatkovnih elementov razvrščenih v določena območja. Okvir zajema vse podatke v območju od prvega kvartila (Q1) do tretjega kvartila (Q3), z črto, narisano na mediani (Med). Črte (imenovane brki) se raztezajo od obeh koncev okvira do najmanjše (minX) in največje (maxX) vrednosti podatkov.



Na seznamu statističnih podatkov pritisnite 1(GRPH), da prikažete meni grafa, pritisnite 6(SET) in nato spremenite vrsto grafa, ki ga želite uporabiti (GPH1, GPH2, GPH3), v med-box graf.

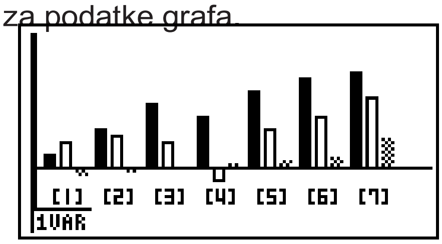
Če želite prikazati podatke, ki ne sodijo v okvir, najprej kot vrsto grafa določite „MedBox“. Nato na istem zaslonu, na katerem določate vrsto grafa, vklopite možnost „Outliers“ (Izjemni podatki) in narišite graf.



- Spreminjanje nastavitve „Q1Q3 Type“ na zaslonu Setup lahko povzroči spremembo položajev Q1 in Q3, tudi če je graf med-box narisan na podlagi enega samega seznama.

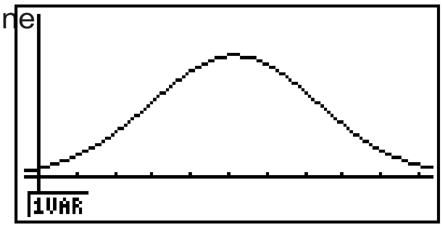
■ Stolpični grafikon

Za risanje stolpičastega grafa lahko določite do tri sezname. Graf je označen z [1], [2], [3] itd., kar ustreza vrsticam 1, 2, 3 itd. seznama, uporabljenega za podatke grafa.



- Katera koli od naslednjih možnosti povzroči napako in prekine risanje stolpčnega diagrama.
  - Napaka pogojev nastane, ko je na zaslonu Vklop/izklop grafa (stran 6-3) določeno risanje več grafov, za enega od grafov je določen stolpični graf, za drugega graf pa je določen drug tip grafa.
  - Napaka dimenzije se pojavi, ko narišete graf z dvema ali tremi določenimi seznami, ki imajo različno število elementov.
  - Napaka pogojev nastane, ko so seznami dodeljeni za Data1 in Data3, medtem ko je za Data2 določeno „None“

■ Normalna porazdelitvena krivulja



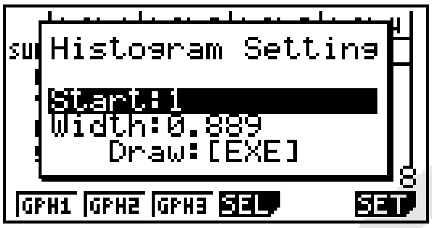
Normalna porazdelitvena krivulja se nariše z uporabo normalne porazdelitvene funkcije.

XList določa seznam, v katerega se vnašajo podatki, medtem ko Freq določa seznam, v katerega se vnaša frekvenca podatkov. 1 je določeno za Freq, kadar frekvenca ni določena.

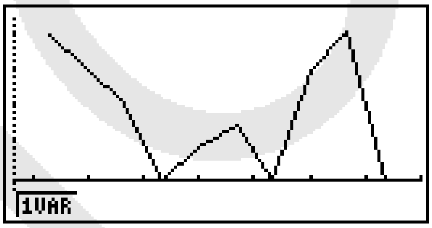
■ Prekinjena črtna graf

Črte povezujejo središča stolpcev histograma.

XList določa seznam, v katerega se vnašajo podatki, medtem ko Freq določa seznam, v katerega se vnaša frekvenca podatkov. Če frekvenca ni določena, se za Freq določi 1.



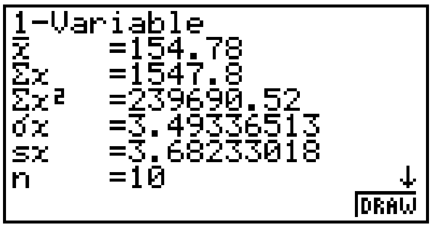
⇒
w(DRAW)



Pred risanjem grafa se prikaže zaslon, kot je prikazan zgoraj. Na tej točki lahko spremenite vrednosti Start in Width.

■ Prikaz rezultatov izračuna narisanega grafa z eno spremenljivko

Enovariabilne statistike se lahko izrazijo kot grafi in vrednosti parametrov. Ko se ti grafi prikažejo, se rezultati izračuna enovariabilne spremenljivke prikažejo, kot je prikazano na desni, ko pritisnete 1(1VAR).



• Uporabite ② za pomikanje po seznamu, da lahko vidite elemente, ki segajo pod spodnji rob zaslona. V nadaljevanju je opisano pomen posameznih parametrov.

$\bar{x}$ ....povprečje $\sqrt{\frac{\Sigma(x-o)^2}{n}}$ $\sqrt{\Sigma x^2 - (\Sigma x)^2 / n\ n}$ σ

Σx ....vsota

Σx^2 ....vsota kvadratov

σx ....populacija standard odklon

sx ....standardni odmik vzorca odklon

n ....število podatkovnih elementov

minX ....minimalna

Q1 .... prvi kvartil

Med .... mediana

Q3 .... tretji kvartil

maxX .... maksimum

Mod .... mod

Mod:n .... število elementov podatkovnega načina

Mod:F .... frekvenca podatkovnega načina

x = =

sx = =

$$\sqrt{\frac{\Sigma(x - \text{o})^2}{n - 1}} \quad \sqrt{\frac{\Sigma x^2 - (\Sigma x)^2}{/\, n\, n - 1}}$$

- Pritisnite 6(DRAW), da se vrnete na prvotni statistični graf z eno spremenljivko.
- Če ima Mod več rešitev, se prikažejo vse.
- Na zaslonu Nastavitve lahko z nastavitvijo »Tip Q1Q3« izberete »Std« (standardni izračun) ali »OnData« (francoski izračun) za način izračuna Q1 in Q3.

  Podrobnosti o načinih izračuna, ko je izbrana možnost „Std“ ali „OnData“, najdete v razdelku „Načini izračuna za nastavitvi Std in OnData“ spodaj.

■ Metode izračuna za nastavitvi Std in OnData

Q1, Q3 in Med se lahko izračunajo v skladu z nastavitvijo „Q1Q3 Type“ na zaslonu Setup, kot je opisano spodaj.

u Std

Pri tej metodi izračuna je obdelava odvisna od tega, ali je število elementov n v populaciji sodo ali liho število.

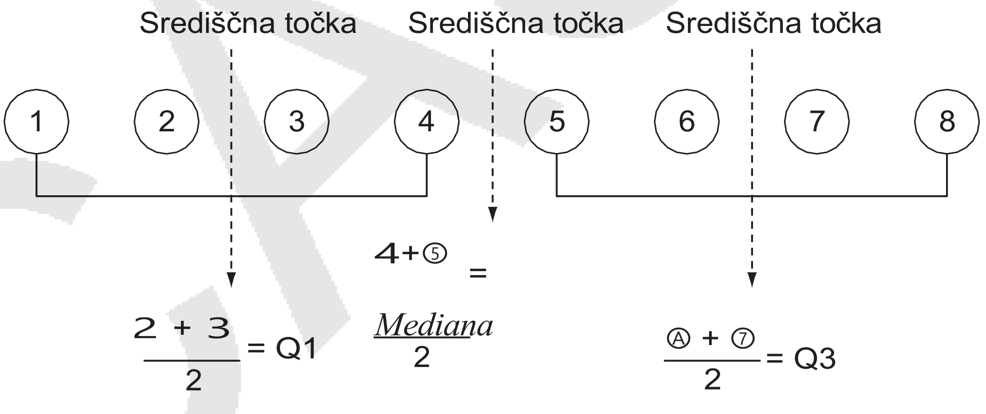
Ko je število elementov n sodo število:

Z uporabo srednje točke celotne populacije kot referenčne točke se elementi populacije razdelijo v dve skupini: spodnjo polovico in zgornjo polovico. Q1, Q3 in Med postanejo vrednosti, opisane spodaj.

Q1 = {mediana skupine $\frac{n}{2}$ elementov iz spodnjega dela populacije}

Q3 = {mediana skupine $\frac{n}{2}$ elementov iz vrha populacije}

Med = { $\frac{n}{2}$ -ti in $\frac{n}{2}$ +1-ti element povprečna vrednost}



Ko je število elementov n liho:

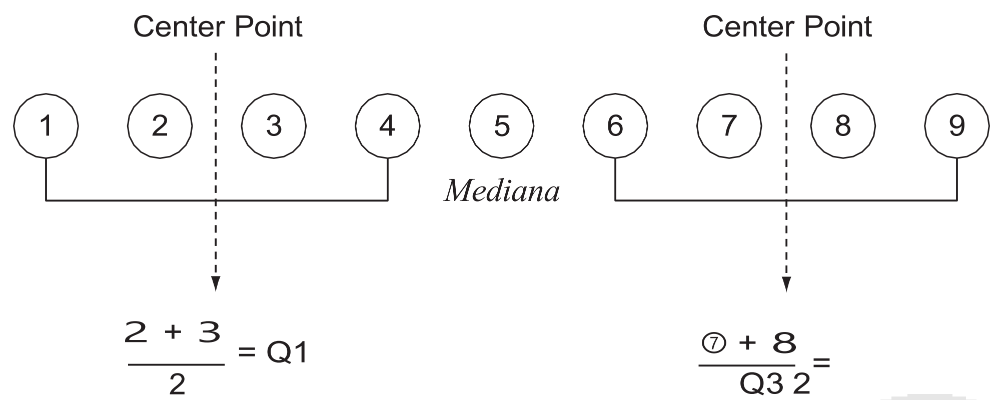
Z uporabo mediane celotne populacije kot referenčne vrednosti se elementi populacije razdelijo v dve skupini: spodnjo polovico (vrednosti manjše od mediane) in zgornjo polovico (vrednosti večje od mediane). Mediana se izključi. Q1, Q3 in Med postanejo vrednosti, opisane spodaj.

Q1 = {mediana skupine $\frac{n-1}{2}$ elementov iz spodnjega dela populacije}

Q3 = {mediana skupine $\frac{n-1}{2}$ elementov iz vrha populacije}

Med = { $\frac{n+1}{2}$ -ti element}

- Ko je n = 1, je Q1 = Q3 = Med = središče populacije.



• Ko frekvenca vključuje decimalne vrednosti

Vrednosti Q1, Q3 in Med za to metodo izračuna so opisane spodaj.

Q1 = {vrednost elementa, katerega kumulativno frekvenčno razmerje je večje od 0,25 in najbližje 0,25}

Ko je kumulativno frekvenčno razmerje za neko vrednost podatkov natanko 0,25, je Q1 povprečje te vrednosti podatkov in naslednje vrednosti podatkov.

Q3 = {vrednost elementa, katerega kumulativno frekvenčno razmerje je večje od 0,75 in najbližje 0,75}

Ko je kumulativno frekvenčno razmerje za neko vrednost podatkov natanko 0,75, je Q3 povprečje te vrednosti podatkov in naslednje vrednosti podatkov.

Med = {vrednost elementa, katerega kumulativno frekvenčno razmerje je večje od 0,5 in najbližje 0,5}

Ko je kumulativno frekvenčno razmerje za neko vrednost podatkov natanko 0,5, je Med povprečje te vrednosti podatkov in naslednje vrednosti podatkov.

Spodaj je prikazan dejanski primer zgoraj navedenega.

Vrednost podatkov	Pogostost	Kumulativna frekvenca	Kumulativno frekvenčno razmerje
1	0,1	0	0,1/1,0 = 0,1
2	0,1	0	0,2/1,0 = 0,2
3	**0,2**	**0,4**	**0,4/1,0 = 0,4**
4	0,3	0,7	0,7/1,0 = 0,7
5	**0**	**0**	**0,8/1,0 = 0,8**
6	0	0,9	0,9/1,0 = 0,9
7	0	1	1,0/1,0 = 1,0

• 3 je vrednost, katere kumulativno frekvenčno razmerje je večje od 0,25 in najbližje 0,25, torej Q1 = 3.

• 5 je vrednost, katere kumulativno frekvenčno razmerje je večje od 0,75 in najbližje 0,75, torej Q3 = 5.

• 4 je vrednost, katere kumulativno frekvenčno razmerje je večje od 0,5 in najbližje 0,5, torej Med = 4.

OnData

Vrednosti Q1, Q3 in Med za to metodo izračuna so opisane spodaj.

Q1 = {vrednost elementa, katerega kumulativno frekvenčno razmerje je večje od 0,25 in najbližje 0,25}

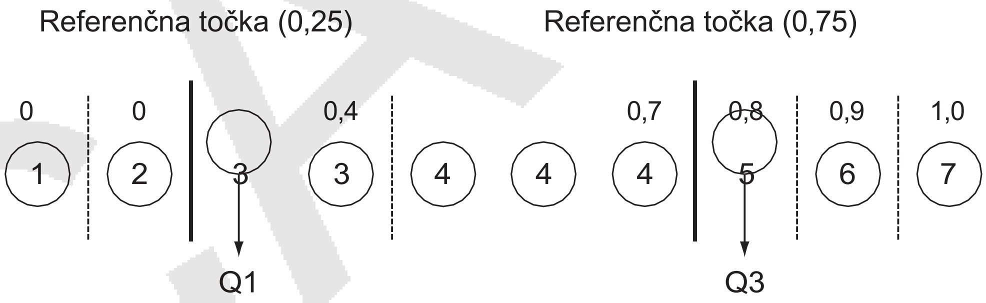
Q3 = {vrednost elementa, katerega kumulativno frekvenčno razmerje je večje od 0,75 in najbližje 0,75}

Spodaj je prikazan dejanski primer zgoraj navedenega.

(Število elementov: 10)

Vrednost podatkov	Frekvenca	Kumulativna frekvenca	Kumulativno frekvenčno razmerje
1	1	1	1/10 = 0,1
2	1	2	2/10 = 0,2
3	**2**	**4**	**4/10 = 0,4**
4	3	7	7/10 = 0,7
5	**1**	**8**	**8/10 = 0,8**
6	1	9	9/10 = 0,9
7	1	10	10/10 = 1,0

- 3 je vrednost, katere kumulativno frekvenčno razmerje je večje ali enako 0,25 in najbližje 0,25, zato je Q1 = 3.
- 5 je vrednost, katere kumulativno frekvenčno razmerje je večje ali enako 0,75 in najbližje 0,75, torej Q3 = 5.



- Med se izračuna po isti metodi, kot se uporablja, ko je za nastavitev „Q1Q3 Type“ izbrana možnost „Std“.
- Ni pomembno, ali so vrednosti frekvence celoštevilčne ali vključujejo decimalne vrednosti, če je za nastavitev „Q1Q3 Type“ izbrana možnost „OnData“.

3. Izračunavanje in grafično prikazovanje statističnih podatkov s parnimi spremenljivkami

■ Risba razpršenega diagrama in *xy*-linijskega grafa

Sledeči postopek nariše razpršeni diagram in poveže točke, da nastane xy-linijski grafikon.

1. V glavnem meniju vstopite v način **STAT**.
2. Vnesite podatke v seznam.
3. Kot tip grafa določite Scat (razpršeni diagram) ali *xy* (xy-črtni graf) in nato izvedite operacijo grafa.

Pritisnite AC , J ali ⌷J (QUIT), da se vrnete na seznam statističnih podatkov.

Primer **Vnesite dva sklopa podatkov, prikazana spodaj. Nato podatke prikažite na razpršenem diagramu in povežite točke, da dobite xy-linijski graf.**

0,5, 1,2, 2,4, 4,0, 5,2 (xList)

–2,1, 0,3, 1,5, 2,0, 2,4 (yList)

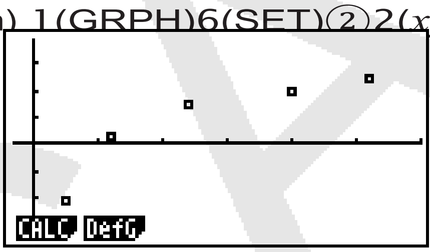
① m STAT

2⓪ .fwb.cwc.④□w④ wf.cwe

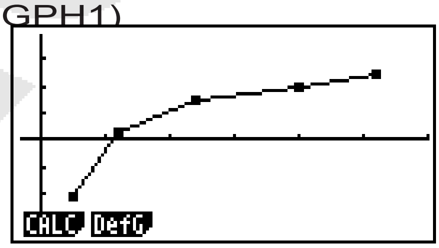
–c.bw⓪ .dwb.fwcwc.□④w

3 (razpršeni diagram)

1(GRPH)6(SET)②1(Scat)J1(GPH1) 3 (*xy* linijski grafikon) 1(GRPH)6(SET)②2(*xy*)J1(GPH1)



(razpršeni diagram)



(*xy* črtni grafikon)

■ Risba regresijskega grafa

Uporabite naslednji postopek za vnos statističnih podatkov o parnih spremenljivkah, izvedbo regresijskega izračuna na podlagi podatkov in nato grafično prikazovanje rezultatov.

1. V glavnem meniju vstopite v način **STAT**.
2. Vnesite podatke v seznam in narišite razpršeni diagram.
3. Izberite vrsto regresije, izvedite izračun in prikažite parametre regresije.
4. Narišite regresijski graf.

Primer **Vnesite dva sklopa podatkov, prikazana spodaj, in narišite razpršeni diagram. Nato izvedite logaritmično regresijo na podatkih, da prikažete parametre regresije, in nato narišite ustrezen regresijski graf.**

0,5, 1,2, 2,4, 4,0, 5,2 (xList)

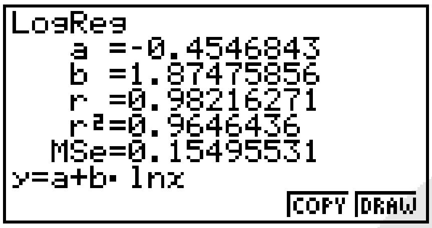
–2,1, 0,3, 1,5, 2,0, 2,4 (yList)

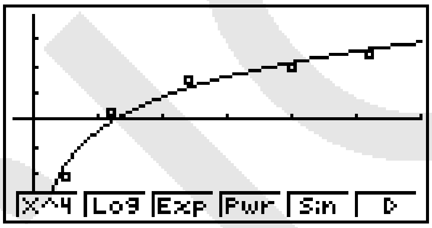
① m STAT

2 0.fwb.cwc.4lw4 wf.cwe
–c.bw0 .dwb.fwcwc.□4v
1(GRPH)6(SET)②1(Scat)J1(GPH1)

3 1(CALC)6(g)2(Log)

4 6(DRAW)





- Na regresijskem grafu lahko izvedete sledenje. Sledenje z drsenjem ni mogoče.
- Vnesite pozitivno celo število za podatke o frekvenci. Drugi tipi vrednosti (decimalne vrednosti itd.) povzročajo napako.

■ Izbiranje vrste regresije

Po grafičnem prikazu statističnih podatkov s parnimi spremenljivkami lahko v meniju funkcij na dnu zaslona izberete med različnimi vrstami regresije.

•

{linearna regresija (oblika $ax+b$)}/{linearna regresija (oblika $a+bx$)}/{Med-Med}/{kvadratna regresija}/{kubična regresija}/{kvartna regresija}/{logaritemska regresija}/{eksponentna regresija (oblika ae^{bx})}/{eksponentna regresija (oblika ab^x)}/{potencna regresija}/
{sinusoidna regresija}/{logistična regresija} izračun in grafični prikaz

- {**2VAR**}... {statistični rezultati parnih spremenljivk}

■ Prikaz rezultatov regresijskega izračuna

Vsakič, ko izvedete regresijski izračun, se na zaslonu prikažejo rezultati izračuna parametrov regresijske formule (kot sta a in b v linearni regresiji $y = ax + b$). Te lahko uporabite za pridobivanje statističnih rezultatov izračuna.

Parametri regresije se izračunajo takoj, ko pritisnete funkcijska tipka za izbiro vrste regresije, medtem ko je na zaslonu prikazan graf.

Naslednji parametri se uporabljajo za linearno regresijo, logaritmično regresijo, eksponentno regresijo in potenčno regresijo.

r............... korelacijski koeficient

r^2.......................... koeficient determinacije

MSe......... povprečna kvadratna napaka

■ Grafični prikaz rezultatov statističnih izračunov

Medtem ko je na zaslonu prikazan rezultat izračuna parametra, lahko s pritiskom na tipko 6(DRAW) grafično prikažete prikazano regresijsko formulo.

■ Graf linearne regresije

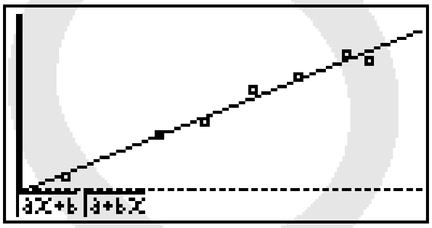
Linearna regresija uporablja metodo najmanjših kvadratov za risanje premice, ki poteka čim bližje čim večjemu številu podatkovnih točk, in vrne vrednosti za naklon in presečišče z y-osjo (y-koordinata, ko je x = 0) premice.

Grafični prikaz tega razmerja je grafični prikaz linearne regresije.

1(CALC)2(X)

1($ax+b$) ali 2($a+bx$)

6(DRAW)



Spodaj je formula linearnega regresijskega modela.

$y = ax + b$

a ....regresijski koeficient (naklon)

b ....regresijski konstantni člen (presek z y)

$y = a + bx$

a ....regresijski konstantni člen (y-presek)

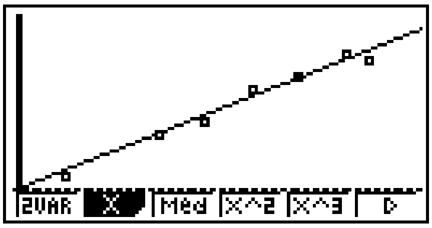
b ....regresijski koeficient (naklon)

■ Med-Med graf

Kadar obstaja sum, da je prisotnih več ekstremnih vrednosti, se namesto metode najmanjših kvadratov lahko uporabi graf Med-Med. Ta je podoben linearni regresiji, vendar zmanjšuje vpliv ekstremnih vrednosti.

1(CALC)3(Med)

6(DRAW)



Spodaj je navedena formula modela grafa Med-Med.

$y = ax + b$

a ....Naklon grafa Med-Med

b ....Med-Med graf y-presek

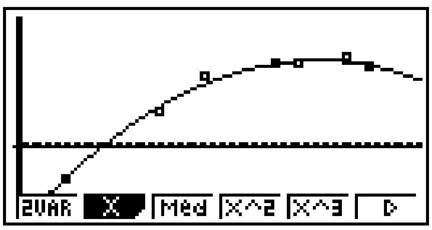
■ Kvadratni/kubični/kvadratni regresijski graf

Kvadratni/kubični/kvartni regresijski graf prikazuje povezavo med podatkovnimi točkami razpršenega diagrama. Uporablja metodo najmanjših kvadratov za risanje krivulje, ki poteka čim bližje čim večjemu številu podatkovnih točk. Formula, ki to predstavlja, je kvadratna/kubična/kvartna regresija.

Primer: kvadratna regresija

1(CALC)4(X^2)

6(DRAW)



Kvadratna regresija

Modelna formula .. $y = ax^2 + bx + c$

a .... regresijski drugi koeficient

b .... prvi koeficient regresije

c........... regresijski konstantni člen (presek z y)

Kubična regresija

Modelna formula .... $y = ax^3 + bx^2 + cx + d$

a .... tretji koeficient regresije

b........... regresijski drugi koeficient

c........... prvi koeficient regresije

d........... regresijski konstantni člen (presek z y)

Kvadratna regresija

Formula modela..... $y = ax^4 + bx^3 + cx^2 + dx + e$

a .... regresijski četrti koeficient

b .... regresijski tretji koeficient

c........... regresijski drugi koeficient

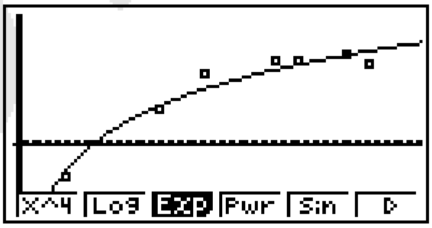
d .... prvi koeficient regresije

e........... konstanta regresije (presek z y-osjo)

■ Logaritmični regresijski graf

Logaritemska regresija izraža y kot logaritemska funkcija x. Standardna logaritemska regresijska formula je $y = a + b \times \ln x$, torej če rečemo, da je X = ln x, formula ustreza linearni regresijski formuli $y = a$ + bX.

1(CALC)6(g)2(Log)
6(DRAW)



Spodaj je formula logaritmičnega regresijskega modela.

$y = a + b \cdot \ln x$

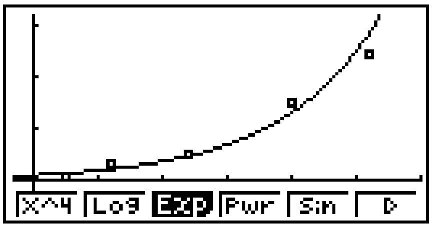
a .... regresijski konstantni člen

b .... regresijski koeficient

■ Eksponentni regresijski graf

Eksponentna regresija izraža y kot delež eksponentne funkcije x. Standardna formula eksponentne regresije je $y = a \times e^{bx}$, torej če vzamemo logaritme obeh strani, dobimo ln y = ln $a + bx$. Nato, če rečemo, da je Y = ln y in A = ln a, formula ustreza formuli linearne regresije Y = A + bx.

1(CALC)6(g)3(Exp)
1(ae^bx) ali 2(ab^x)
6(DRAW)



Spodaj je formula eksponentnega regresijskega modela.

$y = a^{\cdot e(bx)}$

a .... regresijski koeficient

b .... regresijski konstantni člen

$y = a^{\cdot b(x)}$

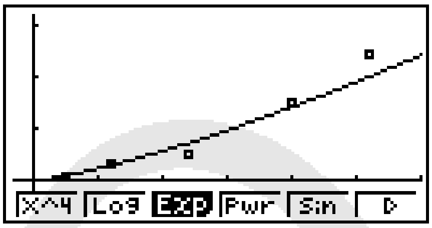
a .... regresijski konstantni člen

b .... regresijski koeficient

■ Graf potenčne regresije

Potencionalna regresija izraža y kot delež potence x. Standardna formula potencionalne regresije je $y = a \times x^b$, torej če vzamemo logaritem obeh strani, dobimo V y = In a + b × In x. Če nato rečemo, da je X = In x, Y = In y in A = In a, se formula ujema z linearno regresijsko formulo Y = A + bX.

1(CALC)6(g)4(Pwr)
6(DRAW)



Spodaj je formula modela potenčne regresije.

$y = a^{x(b)}$

a .... regresijski koeficient

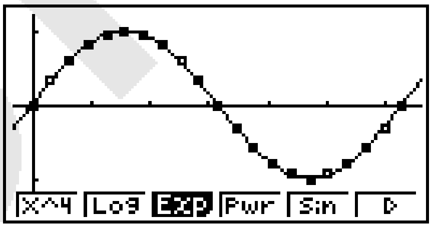
b .... regresijska moč

■ Sinusoidalni regresijski graf

Sinusoidna regresija se najbolje uporablja za ciklične podatke. Spodaj je formula sinusoidnega regresijskega modela.

$y = a \cdot \sin(bx + c) + d$

1(CALC)6(g)5(Sin)
6(DRAW)



Risba grafa sinusne regresije povzroči, da se nastavitev enote kota kalkulatorja samodejno spremeni v Rad (radiante). Enota kota se ne spremeni, če izvedete sinusno regresijsko izračunavanje brez risanja grafa.

• Izračun nekaterih vrst podatkov lahko traja dlje časa. To ne pomeni, da je prišlo do napake.

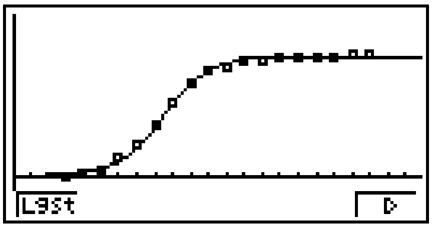
■ Graf logistične regresije

Logistična regresija se najbolje uporablja za časovne pojave, pri katerih prihaja do nenehnega povečevanja, dokler ni dosežena točka zasičenja.

Spodaj je formula logističnega regresijskega modela.

$(y) = \frac{c}{1 + ae^{-bx}}$

1(CALC)6(g)6(g)1(Lgst)
6(DRAW)



• Izračun nekaterih vrst podatkov lahko traja dlje časa. To ne pomeni, da naprava ne deluje pravilno.

■ Izračun ostanka

Dejanske točke grafa (y-koordinate) in razdalja regresijskega modela se lahko izračunajo med regresijskimi izračuni.

Medtem ko je na zaslonu prikazan seznam statističnih podatkov, odprite zaslon Nastavitve in določite SEZNAM („Seznam 1“ do „Seznam 26“) za „Seznam ostankov“. Izračunani ostanki podatkov se shranijo v določenem seznamu.

V seznamu se shrani navpična razdalja od grafikonov do regresijskega modela.

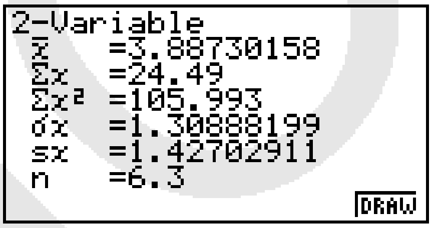
Grafi, ki so višji od regresijskega modela, so pozitivni, tisti, ki so nižji, pa negativni.

Izračun rezidualov se lahko izvede in shrani za vse regresijske modele.

Vsi podatki, ki že obstajajo na izbranem seznamu, se izbrišejo. Ostanki vsakega grafa se shranijo v enakem vrstnem redu kot podatki, uporabljeni kot model.

■ Prikaz rezultatov izračuna narisanega grafa parnih spremenljivk

Statistika parnih spremenljivk se lahko izrazi kot grafi in vrednosti parametrov. Ko se ti grafi prikažejo, se rezultati izračuna parnih spremenljivk prikažejo, kot je prikazano spodaj, ko pritisnete 1(CALC)1(2VAR).



- Uporabite ② za pomikanje po seznamu, da si lahko ogledate elemente, ki segajo pod spodnji rob zaslona.

o............... povprečje podatkov, shranjenih v xList

Σx........... vsota podatkov, shranjenih v xList

Σx^2............ vsota kvadratov podatkov, shranjenih v xList

σx............ populacijski standardni odmik podatkov, shranjenih v xList

sx............ standardni odmik vzorca podatkov, shranjenih v xList n število podatkov

ȳ............... povprečje podatkov, shranjenih v yList

Σy........... vsota podatkov, shranjenih v yList

Σy^2............ vsota kvadratov podatkov, shranjenih v yList

σy............ populacijski standardni odmik podatkov shranjenih v yList

sy............ standardni odmik vzorca podatkov shranjenih v yList

Σxy......... vsota produkta podatkov shranjenih v xList in yList

minX ...... minimalna vrednost podatkov, shranjenih v xList

maxX ..... maksimum podatkov, shranjenih v xList

minY ...... minimalna količina podatkov, shranjenih v yList

maxY ..... največja vrednost podatkov, shranjenih v yList

■ Kopiranje formule regresijskega grafa v način GRAPH

Rezultate izračuna regresijske formule lahko kopirate v seznam grafičnih odnosov v načinu **GRAPH**, kjer jih lahko shranite in primerjate.

1. Medtem ko je rezultat izračuna regresije prikazan na zaslonu (glejte „Prikaz rezultatov izračuna regresije“ na strani 6-11), pritisnite 5(COPY).

   - Tako se prikaže seznam grafičnih odnosov v načinu **GRAPH**.*1

2. Z uporabo tipk f in ② označite območje, v katerega želite kopirati regresijsko formulo prikazanega rezultata.
3. Pritisnite w, da shranite kopirano grafično formulo in se vrnete na prejšnji prikaz rezultata regresijskega izračuna.

*[1]V načinu **GRAPH** ne morete urejati regresijskih formul za grafične formule.

4. Izvedba statističnih izračunov

Vsi statistični izračuni do tega trenutka so bili izvedeni po prikazu grafa. Za izvedbo statističnih izračunov lahko uporabite naslednje postopke.

---

u Za določitev seznamov statističnih podatkov za izračun

Pred začetkom izračuna morate vnesti statistične podatke za izračun, ki ga želite izvesti, in določiti, kje se nahajajo. Prikažite statistične podatke in nato pritisnite 2(CALC)6(SET).

Spodaj je naveden pomen posameznih elementov.

1Var XList.......lokacija vrednosti enovariabilne statistike x (XList)

1Var Freq ....položaj vrednosti enovariabilne frekvence (Frequency)

2Var XList.......položaj vrednosti statističnih podatkov za pare spremenljivk x (XList)

2Var YList.......lokacija vrednosti statističnih podatkov s parnimi spremenljivkami y (YList)

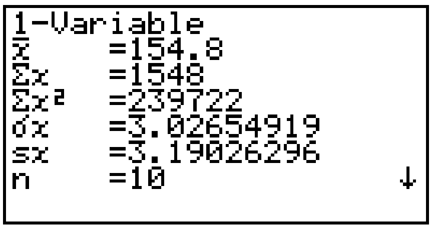
2Var Freq ....položaj vrednosti parnih spremenljivih frekvenc (frekvenca)

• Izračuni v tem poglavju so opravljeni na podlagi zgornjih specifikacij.

■ Statistični izračuni z eno spremenljivko

V prejšnjem primeru pod „Prikaz rezultatov izračuna enospremenljivega grafa“ so bili rezultati statističnih izračunov prikazani po narisanem grafu. To so bili numerični izrazi značilnosti spremenljivk, uporabljenih v grafičnem prikazu.

Te vrednosti lahko dobite tudi neposredno s prikazom seznama statističnih podatkov in pritiskom na 2(CALC)1(1VAR).



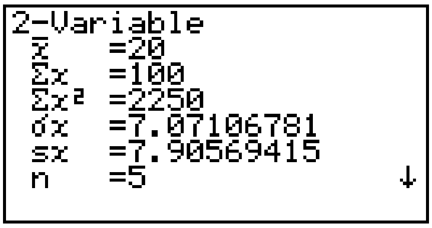
Po tem s pritiskom na f ali ② pomaknite prikaz rezultatov statističnega izračuna, da si lahko ogledate značilnosti spremenljivk.

Podrobnosti o pomenu teh statističnih vrednosti najdete v poglavju „Prikaz rezultatov izračuna enovariabilnega grafa“ (stran 6-6).

■ Statistični izračuni za pare spremenljivk

V prejšnjem primeru v poglavju „Prikaz rezultatov izračuna narisanega grafa s parnimi spremenljivkami“ so bili rezultati statističnega izračuna prikazani po narisanem grafu. To so bile številčne izraze značilnosti spremenljivk, uporabljenih v grafičnem prikazu.

Te vrednosti lahko pridobite tudi neposredno s prikazom seznama statističnih podatkov in pritiskom na 2(CALC)2(2VAR).



Po tem s pritiskom na f ali ② pomaknite prikaz rezultatov statističnega izračuna, da si lahko ogledate značilnosti spremenljivk.

Za podrobnosti o pomenu teh statističnih vrednosti glejte „Prikaz rezultatov izračuna narisanega grafa parnih spremenljivk“ (stran 6-15).

■ Regresijski izračun

V pojasnilih od „Graf linearne regresije“ do „Graf logistične regresije“ so bili rezultati regresijskega izračuna prikazani po narisanem grafu. Tukaj je vsaka vrednost koeficienta regresijske premice ali regresijske krivulje izražena kot število.

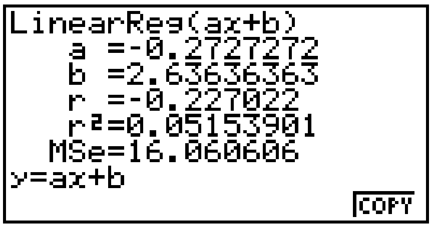
Enako izražanje lahko določite neposredno na zaslonu za vnos podatkov.

S pritiskom na 2(CALC)3(REG) se prikaže meni funkcij, ki vsebuje naslednje elemente.

- {linearna regresija ($ax+b$ oblika)}/{linearna regresija ($a+bx$ oblika)}/{Med-Med}/{kvadratna regresija}/{kubična regresija}/{kvartna regresija}/{logaritemska regresija}/{eksponentna regresija (ae^{bx} oblika)}/{eksponentna regresija (ab^x oblika)}/{potencna regresija}/
{sinusoidna regresija}/{logistična regresija} parametri

Primer **Za prikaz parametrov regresije z eno spremenljivko**

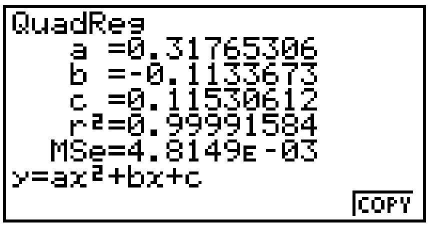
2(CALC)3(REG)1(X)1($ax+b$)



Pomeni parametrov, ki se pojavijo na tem zaslonu, so enaki kot pri „Grafu linearne regresije“ do „Grafu logistične regresije“.

u Izračun koeficienta determinacije (r^2) in MSe

V načinu **STAT** lahko izračunate koeficient determinacije (r^2) za kvadratno regresijo, kubično regresijo in kvadratno regresijo. Za vsak tip regresije so na voljo tudi naslednji tipi izračunov MSe.



- Linearna regresija ($ax + b$) .... $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(y_i-(ax_i+b))^2$

  ($a + bx$)............ $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(y_i-(a+bx_i))^2$

- Kvadratna regresija.................... $MSe = \dfrac{1}{n-3}\sum_{i=1}^{n}(y_i-(ax_i^2+bx_i+c))^2$

- Kubična regresija............................ $MSe = \dfrac{1}{n-4}\sum_{i=1}^{n}(y_i-(ax_i^3+bx_i^2+cx_i+d))^2$

- Kvadratna regresija......................... $MSe = \dfrac{1}{n-5}\sum_{i=1}^{n}(y_i-(ax_i^4+bx_i^3+cx_i^2+dx_i+e))^2$

- Logaritemska regresija .... $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(y_i-(a+b\ln x_i))^2$

- Eksponentna regresija ($a\cdot e^{bx}$)......... $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(\ln y_i-(\ln a+bx_i))^2$

  ($a\cdot b^{x}$)....... $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(\ln y_i-(\ln a+(\ln b)x_i))^2$

- Moč regresije.................................. $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(\ln y_i-(\ln a+b\ln x_i))^2$

- Sin regresija.................................... $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}(y_i-(a\sin(bx_i+c)+d))^2$

- Logistična regresija......................... $MSe = \dfrac{1}{n-2}\sum_{i=1}^{n}\left(y_i-\dfrac{C}{1+ae^{-bx_i}}\right)^2$

---

u Izračun ocenjene vrednosti za regresijske grafe

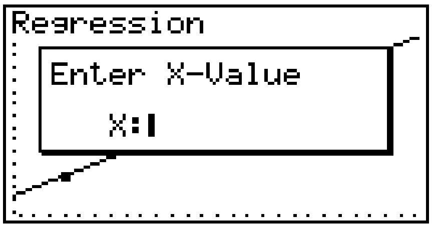
Način **STAT** vključuje tudi funkcijo Y-CAL, ki uporablja regresijo za izračun ocenjene y-vrednost za določeno x-vrednost po grafičnem prikazu statistične regresije parnih spremenljivk.

Sledi splošni postopek za uporabo funkcije Y-CAL.

1. Po narisanju regresijskega grafa pritisnite !5(G-SLV)1(Y-CAL), da vstopite v način izbire grafa, nato pa pritisnite w.

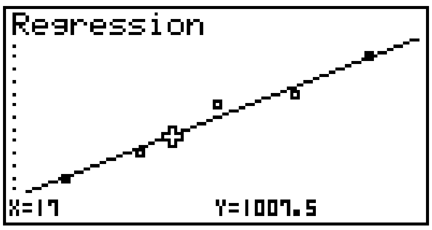
   Če je na zaslonu več grafikonov, z uporabo f in ② izberite želeni grafikon in nato pritisnite w.

   - S tem se prikaže pogovorno okno za vnos vrednosti x.



2. Vnesite želeno vrednost za x in nato pritisnite w.

   - Na dnu zaslona se prikažeta koordinati x in y, kazalec pa se premakne na ustrezno točko na grafu.

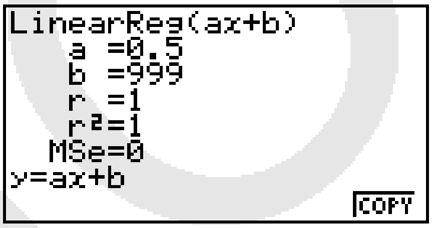


3. Če v tem trenutku pritisnete tipko v ali številčno tipko, se ponovno prikaže pogovorno okno za vnos vrednosti x, tako da lahko po želji izvedete še en izračun ocenjene vrednosti.
   - Kazalec se ne prikaže, če izračunane koordinate niso v območju prikaza.
   - Koordinate se ne prikažejo, če je v nastavitvenem zaslonu za postavko „Coord“ izbrana možnost „Off“.
   - Funkcijo Y-CAL lahko uporabite tudi z grafom, narisanim s funkcijo DefG.

---

u Funkcija kopiranja regresijske formule iz zaslona z rezultati regresijskega izračuna

Poleg običajne funkcije kopiranja regresijske formule, ki omogoča kopiranje zaslona z rezultati regresijskega izračuna po risanju statističnega grafa (npr. razpršenega grafa), ima način **STAT** tudi funkcijo, ki omogoča kopiranje regresijske formule, pridobljene kot rezultat regresijskega izračuna. Za kopiranje dobljene regresijske formule pritisnite 6(COPY).



■ Izračun ocenjene vrednosti ($\hat{x}$, $\hat{y}$)

Po risanju regresijskega grafa v načinu **STAT** lahko uporabite način **RUN • MAT** (ali **RUN**) za izračun ocenjenih vrednosti za parametre x in y regresijskega grafa.

Primer **Za izvedbo linearne regresije z uporabo bližnjih podatkov in oceno vrednosti $\hat{y}$ in $\hat{x}$, ko je xi = 20 in yi = 1000**

xi	10	15	20	25	30
yi	1003	1005	1010	1011	1014

1. V glavnem meniju vstopite v način **STAT**.
2. Vnesite podatke v seznam in narišite graf linearne regresije.
3. V glavnem meniju vstopite v način **RUN • MAT** (ali **RUN**).
4. Pritisnite tipke, kot je prikazano.

c□(vrednost xi)
K5(STAT)*2($\hat{y}$)w
* fx-7400GIII: 4(STAT)

Prikaže se ocenjena vrednost $\hat{y}$ za xi = 20.

b000(vrednost yi)
1 ($\hat{x}$)w

Ocenjena vrednost $\hat{x}$ se prikaže za yi = 1000.

- Ocenjene vrednosti ni mogoče pridobiti za graf Med-Med, kvadratno regresijo, kubično regresijo, kvadratno regresijo, sinusno regresijo ali logistično regresijo.

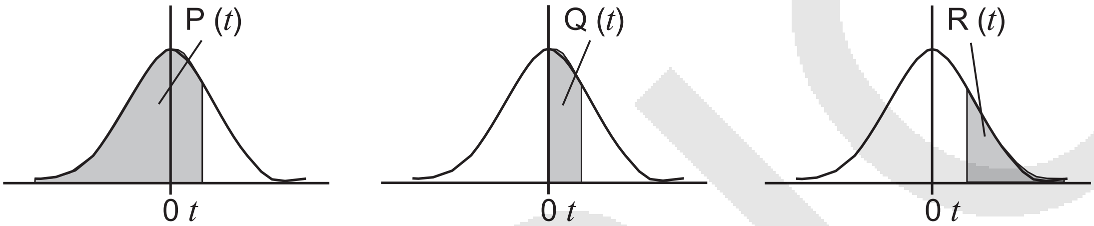
■ Izračun normalne verjetnostne porazdelitve

Normalno verjetnostno porazdelitev za enovariabilne statistične podatke lahko izračunate z načinom R**UN • MAT** (ali **RUN**).

Pritisnite K6(g)3(PROB) (2(PROB) na fx-7400GIII) 6(g), da prikažete meni funkcij, ki vsebuje naslednje elemente.

- {**P(**}/{**Q(**}/{**R(**} ... pridobi normalno verjetnostno vrednost {P(t)}/{Q(t)}/{R(t)}
- {***t*(**} ... {pridobi normalizirano vrednost spremenljivke $t(x)$}

- Normalna verjetnost P(t), Q(t) in R(t) ter normalizirana spremenljivka $t(x)$ se izračunajo z uporabo
  naslednjih formul.



$$\frac{1}{\sqrt{2\pi}}\int_{-\infty}^{t} e^{-\frac{u^2}{2}}du \qquad \frac{1}{\sqrt{2\pi}}\int_{0}^{t} e^{-\frac{u^2}{2}}du \qquad \frac{1}{\sqrt{2\pi}}\int_{t}^{+\infty} e^{-\frac{u^2}{2}}du$$

$$t(x) = \frac{x-\bar{x}}{\sigma x}$$

Primer **V naslednji tabeli so prikazani rezultati meritev višine 20 študentov. Določite, kolikšen odstotek študentov sodi v razpon od 160,5 cm do 175,5 cm. V kateri percentil sodi študent, ki je visok 175,5 cm?**

Številka razreda	Višina (cm)	Pogostost
1	158,5	1
2	160,5	1
3	163,3	2
4	167,5	2
[illegible]	[illegible]	[illegible]

Razred št.	Višina (cm)	Pogostost
6	173,3	4
7	175,5	2
8	178,6	2
9	180,4	2
10	186,7	1

1. V glavnem meniju vstopite v način **STAT**.
2. Vnesite podatke o višini v seznam 1 in podatke o frekvenci v seznam 2.

   Normalizirano spremenljivko lahko pridobite takoj po izvedbi statističnih izračunov za eno spremenljivko.

   2(CALC)6(SET)
   1(LIST)bw
   ②2(LIST)cw!J(QUIT)
   2(CALC)1(1VAR)

```
1-Variable
x̄    =172.005
Σx   =3440.1
Σx²  =592706.09
σx   =7.04162445
sx   =7.22455425
n    =20            ↓
```

4. Pritisnite m, izberite način **RUN • MAT** (ali **RUN**), pritisnite K6(g)3(PROB) (2(PROB) na fx-7400GIII), da prikličete meni za izračun verjetnosti (PROB).

3(PROB)*6(g)4(*t*() b6 0 .f)w

* fx-7400GIII: 2(PROB)

(Normalizirana varianta *t* za 160,5 cm) Rezultat: –1,633855948 (≒ –1,634)

4(*t*() bhf.f)w

(Normalizirana varianta *t* za 175,5 cm) Rezultat: 0,4963343361 (≒ 0,496)

1(P()0 .4 j6) –
1 (P()– b.6 d4)w

(Odstotek skupaj) Rezultat: 0,638921 (63,9 % skupaj)

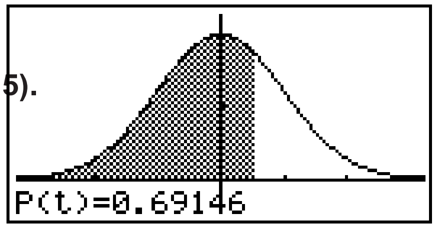
3(R()0 .4 j6)w

(Percentil) Rezultat: 0,30995 (31,0 percentil)

■ Risba grafa normalne verjetnostne porazdelitve

Normalno porazdelitev verjetnosti lahko narišete z ročnim risanjem grafa v načinu **RUN • MAT** (ali **RUN**).

1. V glavnem meniju vnesite način **RUN • MAT** (ali **RUN**).
2. Vnesite ukaze za risanje grafa s pravokotnimi koordinatami.
3. Vnesite vrednost verjetnosti.



Primer **Za risanje grafa normalne verjetnosti P (0,5).**

① m RUN • MAT (ali RUN)

2 !4(SKTCH)1(Cls)w
5(GRPH)1(Y=)

3 K6(g)3(PROB)*6(g)1(P() 0 .f)w

* fx-7400GIII: 2(PROB)

■ Izračuni z uporabo porazdelitvene funkcije

Pomembno!

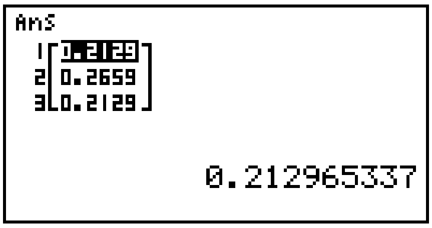
• Naslednjih operacij ni mogoče izvesti na fx-7400GIII.

V načinu **RUN • MAT** ali **PRGM** lahko uporabite posebne funkcije za izvajanje izračunov, ki so enaki izračunom porazdelitvene funkcije v načinu **STAT** (stran 6-40).

Primer **Izračunajte normalno verjetnostno porazdelitev v načinu RUN • MAT za podatke {1, 2, 3}, ko je standardni odmik** populacije σ **= 1,5 in srednja vrednost populacije** μ **= 2.**

1. V glavnem meniju vstopite v način **RUN • MAT**.
2. Pritisnite naslednje tipke.

K5(STAT)3(DIST)1(NORM)
1 (NPd) ! *({)b,c,d
! /(}), b.f, c)w



• Za podrobnosti o tem, kaj lahko storite z distribucijsko funkcijo in njeno sintakso, glejte „Izvedba distribucijskih izračunov v programu“ (stran 8-32).

■ Določanje standardnega odklona in variance iz podatkov na seznamu

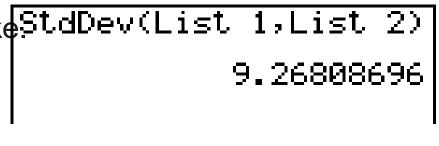
Za določanje standardnega odklona in variance za določene podatke iz seznama lahko uporabite funkcije. Ta izračun se izvede v načinu **RUN • MAT** (ali **RUN**). Izračune lahko izvedete s podatki, ki ste jih shranili v seznam (Seznam 1 do Seznam 26) z urejevalnikom seznamov v načinu **STAT**, ali s podatki iz seznama, ki ste jih vnesli neposredno na zaslonu v načinu **RUN • MAT** (ali **RUN**).

Sintaksa StdDev(Seznam *n*
[,Seznam *m*])
Variance(Seznam *n*
[,Seznam *m*]) Seznam
n ....Vzorčni
podatki
Seznam *m*Podatki o pogostosti

Primer **Shranite spodnje podatke x v seznam 1, vrednosti pogostosti v seznam 2 in določite standardno odklon in varianco**

x	60	70	80	90
Pogostost	3	5	4	1

1. V glavnem meniju vstopite v način **STAT**.
2. Uporabite urejevalnik seznama, da shranite zgornje podatke.
3. V glavnem meniju vstopite v način **RUN • MAT** (ali **RUN**).
4. Pritisnite tipke, kot je prikazano.

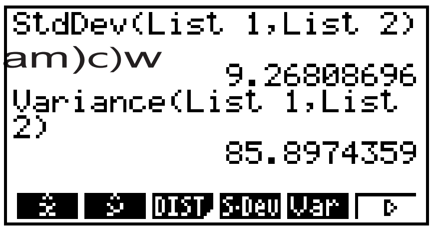


K5(STAT)4(S • Dev) *
1(LIST)1(Seznam)b,1(Seznam)c)w

* fx-7400GIII: 4(STAT)3(S • Dev)

J5(STAT)5(Var) *
1(LIST)1(List)b,1(List)c)w

* fx-7400GIII: 4(STAT)4(Var)



■ Izračuni z uporabo ukaza TEST

Pomembno!

- Naslednjih operacij ni mogoče izvesti na fx-7400GIII.

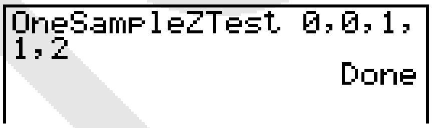
V načinu **RUN • MAT** ali **PRGM** lahko uporabite posebne funkcije za izvajanje izračunov, ki so enaki izračunom v načinu **STAT** Z Test, t Test in drugim testnim izračunom (stran 6-23).

Primer **Določitev z-vrednosti in p-vrednosti, ko se izvede Z-test za en vzorec pod naslednjimi pogoji:**
pogoj testa (pogoj μ)≠ μ0*, predpostavljena populacijska sredina μ_0 = 0, populacijski standardni odmik σ = 1, vzorčna sredina o = 1, število vzorcev n = 2

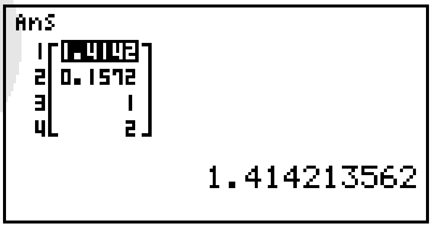
* „μ pogoj≠ μ0” se lahko določi z vnosom 0 kot začetnim argumentom ukaza enovrstnega Z-testa „OneSampleZTest”.

1. V glavnem meniju vnesite način **RUN • MAT**.
2. Izvedite naslednjo ključno operacijo.

K5(STAT)6(g)1(TEST)1(Z)
1(1-S)0,0,b,b,c
w



JJJ
1 (LIST) 1 (List) ! —(Ans)w



Naslednji rezultati izračuna so prikazani kot elementi ListAns od 1 do 4.

1: z ocena

2: p-vrednost

3: o

4: n

- Podrobnosti o funkciji podprtega ukaza TEST in njihovi sintaksi najdete v poglavju „Uporaba ukaza TEST za izvedbo ukaza v programu“ (stran 8-36).

5. Testi

Pomembno!

- Na fx-7400GIII ni mogoče izvajati testnih izračunov.

Z-test ponuja različne teste, ki temeljijo na standardizaciji. Omogočajo preverjanje, ali vzorec natančno predstavlja populacijo, kadar je standardni odmik populacije (na primer celotne populacije države) znan iz prejšnjih testov. Z-testiranje se uporablja za tržne raziskave in raziskave javnega mnenja, ki jih je treba izvajati večkrat.

1-Vzorec *Z*-testa preizkuša neznano populacijsko sredino, ko je znan populacijski standardni odmik.

2-Vzorčni Z-test preverja enakost srednjih vrednosti dveh populacij na podlagi neodvisnih vzorcev, kadar sta znana standardna odklona obeh populacij.

1-Prop *Z* test preverja neznani delež uspehov.

2-Prop *Z* Test primerja delež uspehov iz dveh populacij.

T-test preverja hipotezo, kadar standardni odmik populacije ni znan. Hipoteza, ki je nasprotna hipotezi, ki se dokazuje, se imenuje *ničelna hipoteza*, medtem ko se hipoteza, ki se dokazuje, imenuje *alternativna hipoteza*. T-test se običajno uporablja za preverjanje ničelne hipoteze. Nato se odloči, ali se bo sprejela ničelna hipoteza ali alternativna hipoteza.

1-Vzorec *t*-testa preizkuša hipotezo za eno neznano populacijsko sredino, kadar je populacijski standardni odmik neznan.

2-Vzorec *t*-test primerja populacijske srednje vrednosti, kadar populacijska standardna odstopanja niso znana.

LinearReg t-test izračuna moč linearne povezave med pari podatkov.

Pri **testu** za več neodvisnih vzorcev (χ) **(2)**se navede več neodvisnih skupin in preveri hipoteza glede verjetnosti, da bodo vzorci vključeni v vsako skupino.

χ^2 **GOF test** (χ^2 enosmerni test) preverja, ali opazovano število vzorčnih podatkov ustreza določeni porazdelitvi. Uporablja se lahko na primer za ugotavljanje skladnosti z normalno porazdelitvijo ali binomialno porazdelitvijo.

χ^2 **dvosmerni test** ustvari križno tabelo, ki strukturira predvsem dve kvalitativni spremenljivki (kot sta „Da“ in „Ne“) in oceni neodvisnost spremenljivk.

2-vzorčni F-test preverja hipotezo o razmerju med variancami vzorcev. Uporablja se lahko na primer za preverjanje rakotvornih učinkov več sumljivih dejavnikov, kot so kajenje tobaka, uživanje alkohola, pomanjkanje vitaminov, visoka poraba kave, neaktivnost, slabi življenjski navadi itd.

ANOVA preverja hipotezo, da so populacijske sredine vzorcev enake, kadar je vzorcev več. Uporablja se lahko na primer za preverjanje, ali različne kombinacije materialov vplivajo na kakovost in življenjsko dobo končnega izdelka.

Enosmerna ANOVA se uporablja, kadar obstaja ena neodvisna spremenljivka in ena odvisna spremenljivka.

Dvosmerna ANOVA se uporablja, kadar sta prisotni dve neodvisni spremenljivki in ena odvisna spremenljivka.

Na naslednjih straneh so pojasnjene različne metode statističnega izračuna, ki temeljijo na zgoraj opisanih načelih. Podrobnosti o statističnih načelih in terminologiji najdete v katerem koli standardnem učbeniku statistike.

Na začetnem zaslonu načina **STAT** pritisnite 3(TEST), da prikažete testni meni, ki vsebuje naslednje elemente.

- 3(TEST)1(Z) ... *Z* testi (stran 6-25)
  2(t) ... *t* testi (stran 6-27)
  3(CHI) ...χ^2 Test (stran 6-30)
  4(F) ... 2-vzorčni F-test (stran 6-31)
  5(ANOV) ... ANOVA (stran 6-32)

Po nastavitvi vseh parametrov s pomočjo ② premaknite označitev na »Execute« in nato pritisnite eno od spodaj prikazanih funkcijskih tipk, da izvedete izračun ali narišete graf.

- 1(CALC) ... Izvede izračun.
- 6(DRAW) ... Nariše graf.

• Nastavitve okna V se samodejno optimizirajo za risanje grafa.

■ *Z*-testi

u Z-test Skupne funkcije

Po risanju grafa rezultatov testa *Z* lahko uporabite naslednje funkcije za analizo grafov.

- 1(Z) ... Prikaže z-vrednost.

S pritiskom na 1(Z) se na dnu zaslona prikaže z-vrednost, kazalec pa se prikaže na ustrezni lokaciji v grafu (razen če je lokacija zunaj grafa).

V primeru dvostranskega testa se prikažeta dve točki. Kazalec premikajte s tipkama d in e.

- 2(P) ... Prikaže p-vrednost.

S pritiskom na 2(P) se p-vrednost prikaže na dnu zaslona, brez prikaza kazalca.

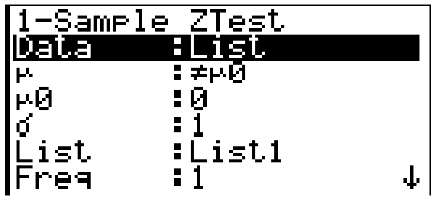
• Z izvedbo analitične funkcije se vrednosti z in p samodejno shranijo v spremenljivki alfa Z oziroma P.

u 1-vzorečni *Z*-test

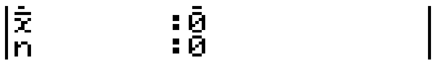
Ta test se uporablja, kadar je znano standardno odstopanje populacije, za preverjanje hipoteze. **1-Vzorčni *Z*-test** se uporablja za normalno porazdelitev.

Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

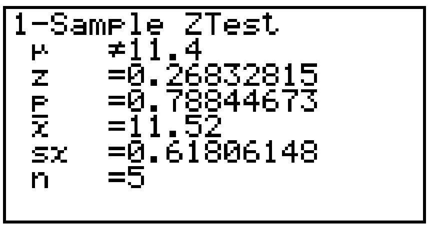
3(TEST)
1(Z)
1(1-S)

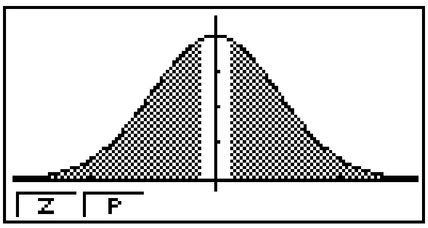


V nadaljevanju so prikazani elementi specifikacije parametrov, ki se razlikujejo od specifikacije podatkov seznama.



Primer izhoda rezultata izračuna





$\mu \neq 11.4$........... smer preskusa

sx........................... Prikazano samo za nastavitev podatkov: Seznam.

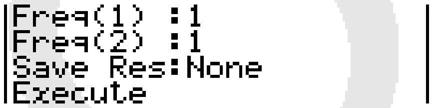
• [Shrani Res] ne shrani pogoja μ v vrstici 2.

u 2-vzorčni Z-test

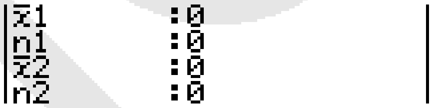
Ta test se uporablja, kadar sta znana standardna odklona za dve populaciji, da se preveri hipoteza. **2-vzorčni Z-test** se uporablja za normalno porazdelitev.

Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

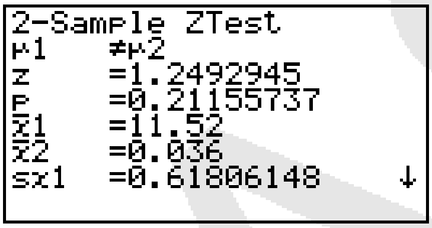
3(TEST)
1(Z)
2(2-S)

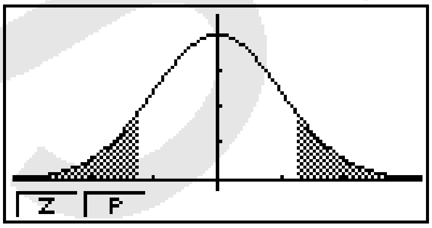


V nadaljevanju so prikazani elementi specifikacije parametrov, ki se razlikujejo od specifikacije podatkov seznama.



Primer izhoda rezultata izračuna





$\mu_1 \neq \mu_2$ ....smer preskusa

sx1 ....Prikazano samo za nastavitev podatkov: Seznam.

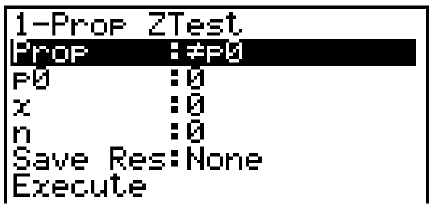
sx2 ....Prikazano samo za nastavitev Podatki: Seznam.

u 1-Prop Z Test

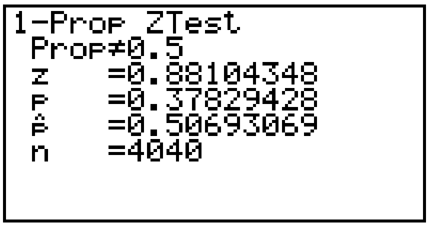
Ta test se uporablja za preverjanje neznanega deleža uspehov. **Test 1-Prop Z** se uporablja za normalno porazdelitev.

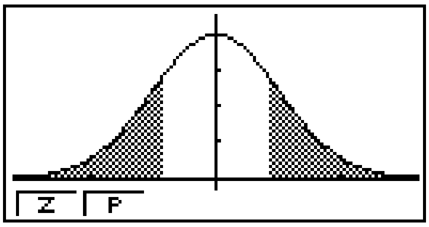
Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

3(TEST)
1(Z)
3(1-P)



Primer izhoda izračuna





≠ 0,5 .... smer testa

• [Shrani Res] ne shrani stanja Prop v vrstici 2.

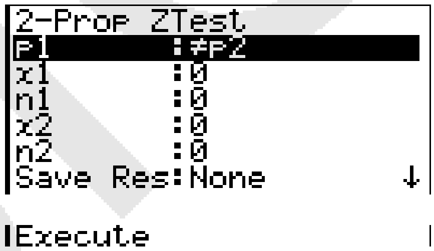
---

u **2-Prop *Z* test**

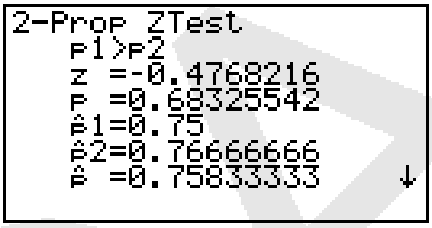
Ta test se uporablja za primerjavo deleža uspehov. **Test 2-Prop *Z*** se uporablja za normalno porazdelitev.

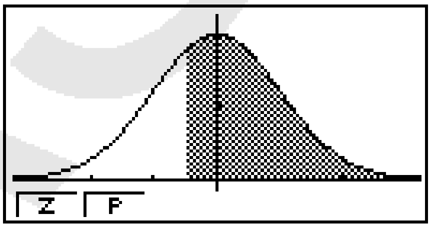
Izvedite naslednjo ključno operacijo iz seznama statističnih podatkov.

3(TEST)
1(Z)
4(2-P)



Primer izhoda izračuna





p1>p2 .... smer testa

• [Shrani Res] ne shrani p1 pogoja v vrstici 2.

■ *t*

---

u ***t* Test skupnih funkcij**

Po risanju grafa izida testa *t* lahko uporabite naslednje funkcije za analizo grafa.

• 1(T) ... Prikaže t-vrednost.

S pritiskom na 1(T) se na dnu zaslona prikaže t-vrednost, kazalec pa se prikaže na ustrezni lokaciji v grafu (razen če je lokacija zunaj grafa).

V primeru dvostranskega testa se prikažeta dve točki. Kazalec premikajte s tipkama d in e.

• 2(P) ... Prikaže p-vrednost.

S pritiskom na tipko 2(P) se na dnu zaslona prikaže p-vrednost, brez prikaza kazalca.

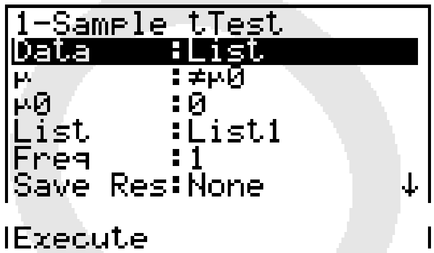
- Izvedba analitične funkcije samodejno shrani vrednosti t in p v spremenljivki alfa T oziroma P.

u 1-vzorčni *t*-test

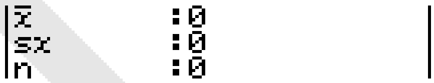
Ta test uporablja hipotezni test za eno neznano populacijsko sredino, kadar je populacijski standardni odmik neznan. **1-vzorčni t-test** se uporablja za t-porazdelitev.

Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

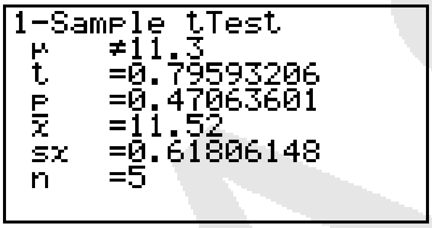
3(TEST)
2(t)
1(1-S)

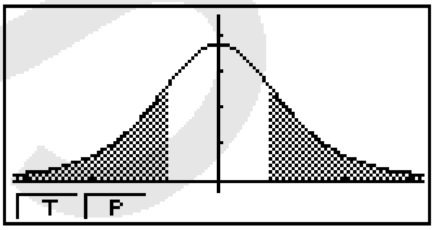


Spodaj so prikazani elementi specifikacije parametrov, ki se razlikujejo od specifikacije podatkov seznama.



Primer izhoda rezultata izračuna





$\mu \neq 11.3$........... smer testa

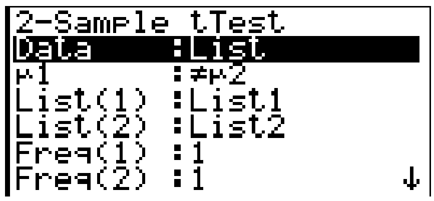
- [Shrani Res] ne shrani pogoja μ v vrstici 2.

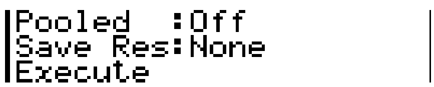
u 2-vzorčni *t*-test

2-T-test za vzorec primerja populacijske srednje vrednosti, kadar populacijska standardna odstopanja niso znana. ***T*-test za 2 vzorca** se uporablja za t-porazdelitev.

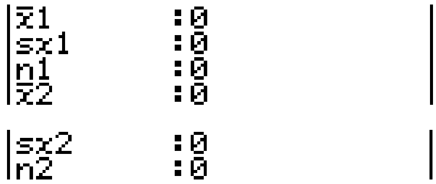
Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

3(TEST)
2(t)
2(2-S)

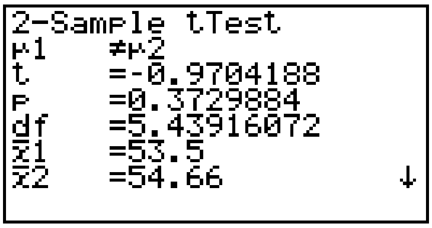


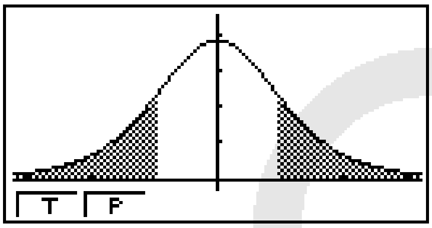


V nadaljevanju so prikazani elementi specifikacije parametrov, ki se razlikujejo od specifikacije podatkov seznama.



Primer izhoda rezultata izračuna





$\mu_1 \neq \mu_2$........................smer testa

sp............................ Prikaže se samo, če je nastavljeno Pooled: On.

---

u LinearReg *t* Test

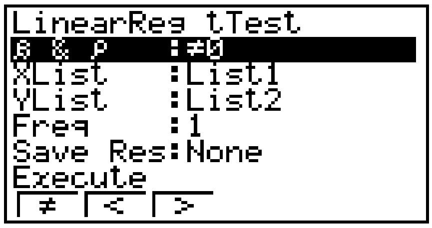
LinearReg *t* Test obravnava pare spremenljivk kot pare (x, y) in uporablja metodo najmanjših kvadratov za določitev najprimernejših koeficientov a, b podatkov za regresijsko formulo $y = a + bx$. Določi tudi korelacijski koeficient in t-vrednost ter izračuna obseg odnosa med x in y.

Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

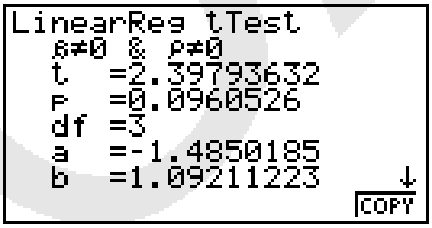
3(TEST)

2(t)

3(REG)

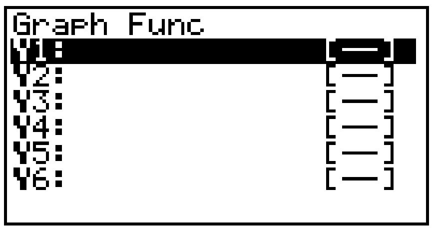


Primer izhodnega rezultata izračuna



$\beta \neq 0$ &$\rho \neq$ 0... smer testa

Če med prikazom rezultata izračuna pritisnete 6(COPY), se regresijska formula kopira v seznam grafičnih odnosov.



Ko je na zaslonu Nastavitve določen seznam za element [Seznam ostankov], regresijska ostanki podatkov se po končanem izračunu samodejno shranijo na določen seznam.

- Za test LinearReg t ni mogoče narisati grafa.
- [Save Res] ne shrani pogojev β in ρ v vrstici 2.
- Če je seznam, določen z [Shrani ostanke], enak seznamu, določenemu z [Seznam ostankov] na zaslonu Nastavitve, se v seznam shranijo samo podatki [Seznam ostankov].

■ ^{2} Test

• ^{2} Testne skupne funkcije

Po risanju grafa lahko uporabite naslednje funkcije za analizo grafa.

- 1(CHI) ... Prikaže vrednost χ^2.

S pritiskom na 1(CHI) se na dnu zaslona prikaže vrednost χ^2 in kazalec na ustrezni lokaciji v grafu (razen če je lokacija zunaj zaslona grafa).

- 2(P) ... Prikaže p-vrednost.

S pritiskom na 2(P) se p-vrednost prikaže na dnu zaslona brez kazalca.

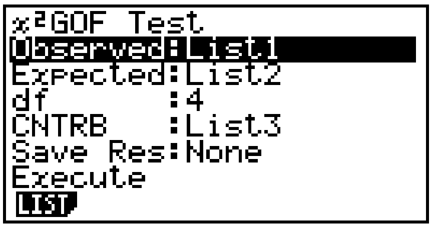
- Z izvedbo analitične funkcije se vrednosti χ^2 in p samodejno shranijo v spremenljivki alfa C in P.

• ^{2} GOF-test (^{2} enosmerni test)

χ^2 **GOF Test** (^{2} enosmerni test) preverja, ali pogostost vzorčnih podatkov ustreza določeni porazdelitvi. Uporablja se lahko na primer za ugotavljanje skladnosti z normalno porazdelitvijo ali binomialno porazdelitvijo.

Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

3(TEST)
3(CHI)
1(GOF)



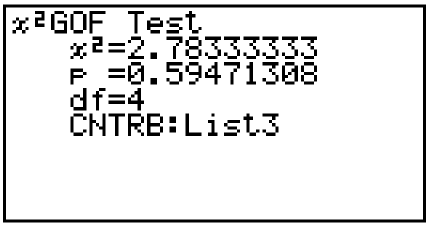
Nato določite sezname, ki vsebujejo podatke. Spodaj je prikazano pomen zgoraj navedenih elementov.

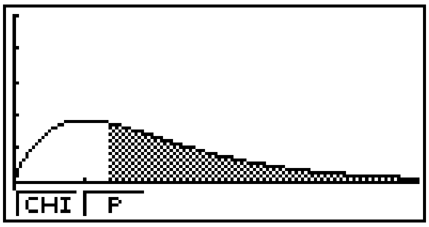
Opazovano ... ime seznama (1 do 26), ki vsebuje opazovane števce (vse celice so pozitivne cela števila)

Pričakovano .. ime seznama (1 do 26), ki je namenjen shranjevanju pričakovane pogostosti

CNTRB .... Določa seznam (seznam 1 do seznam 26) kot mesto shranjevanja prispevka vsakega opazovanega števila, pridobljenega kot rezultat izračuna.

Primeri izhodnih rezultatov izračuna





CNTRB .... seznam za izpis vrednosti prispevkov

• ^{2} dvosmerni test

χ^2 **Dvosmerni test** vzpostavi več neodvisnih skupin in preizkuša hipotezo, povezano z deležem vzorca, vključenega v vsako skupino. Test za primerjavo dveh neodvisnih spremenljivk $(\chi)^{(2)}$ se uporablja za dihotomne spremenljivke (spremenljivke z dvema možnima vrednostma, npr. da/ne).

Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

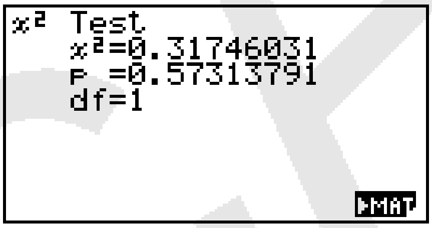
3(TEST)
3(CHI)
2(2WAY)

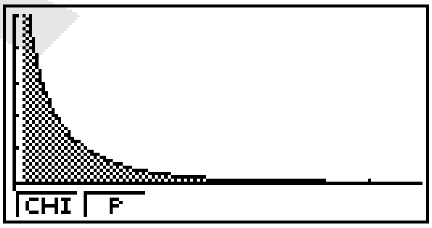
Nato določite matriko, ki vsebuje podatke. Spodaj je prikazano pomen zgornjih elementov.

Opazovano . ime matrike (A do Z), ki vsebuje opazovane števce (vse celice so pozitivna cela števila)

Pričakovano ime matrike (A do Z), ki je namenjena shranjevanju pričakovane frekvence

Primer izhodnega rezultata izračuna





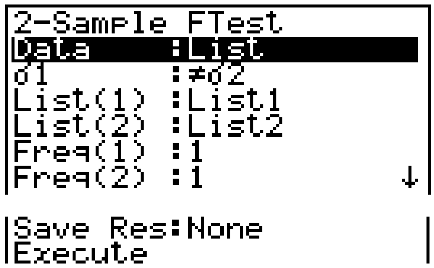
- Matrika mora imeti vsaj dve vrstici in dve stolpci. Če ima matrika samo eno vrstico ali en stolpec, se pojavi napaka.
- Če pritisnete 1(Mat), medtem ko sta označeni nastavitvi parametrov „Opazovano“ in „Pričakovano“, se prikaže zaslon za nastavitev matrike (A do Z).
- S pritiskom na tipko 2('MAT) med nastavljanjem parametrov vstopite v urejevalnik matrik, ki ga lahko uporabite za urejanje in pregledovanje vsebine matrik.
- S pritiskom na tipko 6('MAT) med prikazom rezultata izračuna vstopite v urejevalnik matrik, ki ga lahko uporabite za urejanje in pregledovanje vsebine matrik.
- Preklop iz urejevalnika matrik v urejevalnik vektorjev ni podprt.

■ 2-vzorec *F*-test

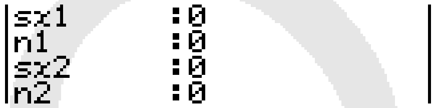
2-vzorčni *F*-test preverja hipotezo o razmerju med variancami vzorcev. F-test se uporablja za F-porazdelitev.

Izvedite naslednje ključne operacije iz seznama statističnih

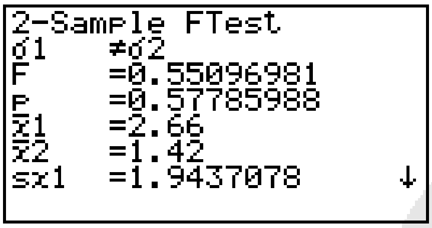
3(TEST)
4(F)

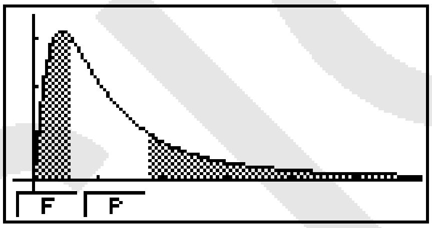


V nadaljevanju so prikazani elementi specifikacije parametrov, ki se razlikujejo od specifikacije podatkov seznama.



Primer izhoda izračuna





$\sigma_1 \neq \sigma_2$........................smer testa

$\bar{x}_1$ ....Prikazano samo za nastavitev podatkov: Seznam.

$\bar{x}_2$ ....Prikazano samo za nastavitev Podatki: Seznam.

Po risanju grafa lahko uporabite naslednje funkcije za analizo grafa.

- 1(F).......Prikaže vrednost F.

S pritiskom na 1(F) se na dnu zaslona prikaže vrednost F, kazalec pa se prikaže na ustrezni lokaciji v grafu (razen če je lokacija zunaj grafa).

V primeru dvostranskega testa se prikažeta dve točki. Kazalec premikajte s tipkama d in e.

- 2(P) ......Prikaže vrednost p.

S pritiskom na 2(P) se na dnu zaslona prikaže p-vrednost, brez prikaza kazalca.

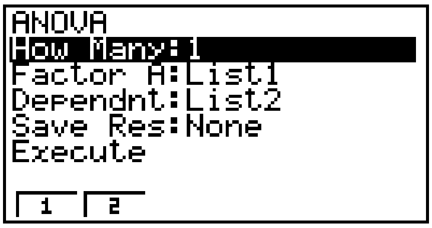
- Z izvedbo analitične funkcije se vrednosti F in p samodejno shranijo v spremenljivki alfa F in P.
- [Save Res] ne shrani pogoja σ_1 v vrstici 2.

■ ANOVA

ANOVA preverja hipotezo, da so populacijske sredine vzorcev enake, kadar je vzorcev več.
Enosmerna ANOVA se uporablja, kadar obstaja ena neodvisna spremenljivka in ena odvisna spremenljivka.
Dvosmerna ANOVA se uporablja, kadar sta prisotni dve neodvisni spremenljivki in ena odvisna spremenljivka.

Izvedite naslednje ključne operacije iz seznama statističnih

3(TEST)
5(ANOV)



V nadaljevanju je naveden pomen posameznih elementov v primeru specifikacije podatkov v obliki seznama.

Koliko .... izbere enosmerno ANOVA ali dvosmerno ANOVA (število ravni)
Faktor A .... seznam kategorij (seznam 1 do 26)
Odvisno......... seznam, ki se uporablja za vzorčne podatke (seznam 1 do 26)
Shrani Res .... prvi seznam za shranjevanje rezultatov izračunov (Nič ali Seznam 1 do 22)*1
Izvedi............. izvede izračun ali nariše graf (samo dvosmerna ANOVA)

*1[Shrani Rez] shrani vsak navpični stolpec tabele v svoj seznam. Stolpec skrajno levo se shrani v določenem seznamu, vsak naslednji stolpec desno pa se shrani v naslednjem zaporedno oštevilčen seznam. Za shranjevanje stolpcev je mogoče uporabiti do pet seznamov. Prvo številko seznama lahko določite v območju od 1 do 22.

Naslednja postavka se pojavi samo v primeru dvostranske ANOVA.

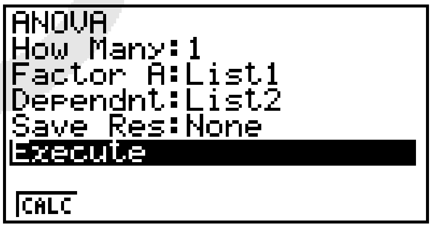
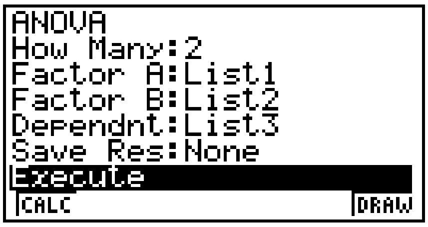
Faktor B .... seznam kategorij (seznam 1 do 26)

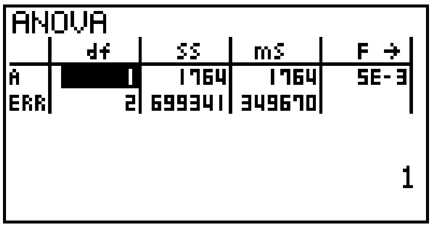
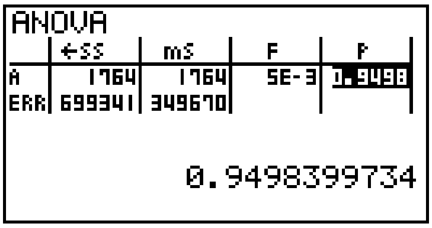
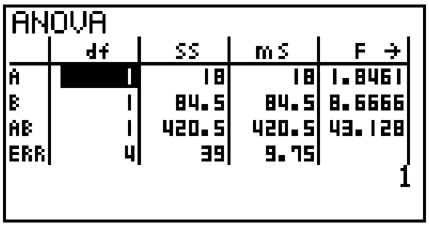
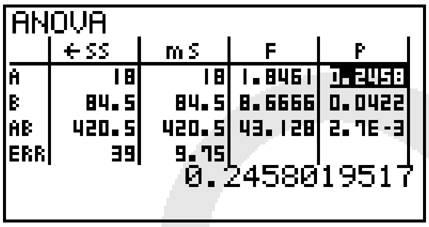
Po nastavitvi vseh parametrov uporabite 2, da premaknete označitev na »Execute« (Izvedi), nato pa pritisnite eno od spodaj prikazanih funkcijskih tipk, da izvedete izračun ali narišete graf.

- 1(CALC) ...... Izvede izračun.
- 6(DRAW)........Nariše graf (samo dvosmerna ANOVA).

Rezultati izračunov so prikazani v obliki tabele, tako kot so prikazani v znanstvenih knjigah.

Primer podatkov in rezultatov izračuna

	Enosmerna ANOVA	Dvosmerna ANOVA
Podatki	Seznam1={1,1,2,2} List2={124,913,120,1001}	List1={1,1,1,1,2,2,2,2} List2={1,1,2,2,1,1,2,2} List3={113,116,139,132,133,131,126,122}
Zaslon za nastavitve		

	Enosmerna ANOVA	Dvosmerna ANOVA
Rezultat izračuna	 	 

Enosmerna ANOVA

Vrstica 1 (A)....... Faktor A vrednost df, vrednost SS, vrednost MS, vrednost F, vrednost p

Vrstica 2 (ERR).. Napaka df vrednost, SS vrednost, MS vrednost

Dvosmerna ANOVA

Vrstica 1 (A)....... Faktor A df vrednost, SS vrednost, MS vrednost, F vrednost, p-vrednost

Vrstica 2 (B)....... Faktor B vrednost df, vrednost SS, vrednost MS, vrednost F, vrednost p

Vrstica 3 (AB) ... Faktor A vrednost $df\times$ Faktor B vrednost df, vrednost SS, vrednost MS, vrednost F, vrednost p

* Vrstica 3 se ne prikaže, če je v vsaki celici samo ena opazovanja.

Vrstica 4 (ERR).. Vrednost napake df, vrednost SS, vrednost MS

F........................ F vrednost

p........................ p-vrednost

df...................... stopnje svobode

SS...................... vsota kvadratov

MS..................... povprečni kvadrati

Z dvostransko ANOVA lahko narišete grafe interakcijskega zapleta. Število grafov je odvisno od faktorja B, število podatkov na osi X pa od faktorja A. Os Y je povprečna vrednost vsake kategorije.

Po risanju grafa lahko uporabite naslednjo funkcijo za analizo grafa.

- 1(Trace) ali !1(TRCE)......Funkcija sledenja

S pritiskom na tipko d ali e se kazalec na grafu premakne v ustrezno smer. Če je grafa več, se med njimi lahko premikate s pritiskom na tipki f in ②.

- Grafični prikaz je na voljo samo pri dvostranski ANOVA. Nastavitve V-okna se izvedejo samodejno, ne glede na nastavitve na zaslonu Nastavitve.
- Uporaba funkcije Trace samodejno shrani število pogojev v spremenljivko alfa A in srednjo vrednost v spremenljivko M.

■ ANOVA

u Opis

V bližnji tabeli so prikazani rezultati meritev za kovinski izdelek, proizveden s postopkom toplotne obdelave na podlagi dveh ravni obdelave: časa (A) in temperature (B). Poskusi so bili ponovljeni dvakrat v identičnih pogojih.

B (temperatura toplotne obdelave) A (čas)	B1	B2
A1	113 , 116	139 , 132
A2	133 , 131	126 , 122

Opravite analizo variance na naslednji ničelni hipotezi, pri čemer uporabite stopnjo pomembnosti 5 %.

H_0 : Ni spremembe v moči zaradi časa

H_0: Brez spremembe trdnosti zaradi temperature toplotne obdelave

H_0 : Brez spremembe trdnosti zaradi interakcije časa in temperature toplotne obdelave

u Rešitev

Uporabite dvostransko ANOVA za preverjanje zgornje hipoteze. Vnesite zgornje podatke, kot je prikazano spodaj.

List1={1,1,1,1,2,2,2,2}

Seznam 3 (podatki za vsako skupino) opredelite kot odvisen. Seznam 1 in seznam 2 (številke faktorjev za vsak podatek v seznamu 3) opredelite kot faktor A oziroma faktor B. Izvedba testa da naslednje rezultate.

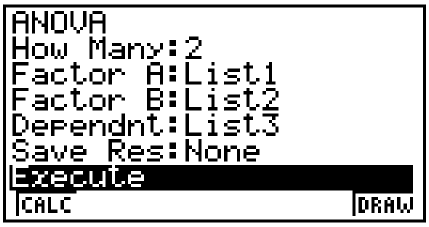
- Časovna razlika (A) stopnja pomembnosti P = 0,2458019517
  Stopnja pomembnosti (p = 0,2458019517) je večja od stopnje pomembnosti (0,05), zato hipoteza ni zavrnjena.

- Raven pomembnosti temperaturne razlike (B) P = 0,04222398836
  Stopnja pomembnosti (p = 0,04222398836) je manjša od stopnje pomembnosti (0,05), zato je hipoteza zavrnjena.

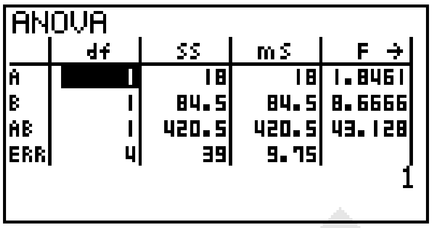
- Interakcija (A× B) stopnja pomembnosti P = 2,78169946e-3
  Stopnja pomembnosti (p = 2,78169946e-3) je manjša od stopnje pomembnosti (0,05), zato je hipoteza zavrnjena.

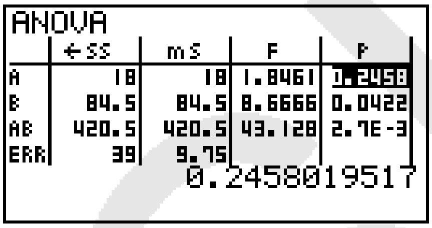
Zgornji test kaže, da časovna razlika ni pomembna, temperaturna razlika je pomembna, interakcija pa je zelo pomembna.

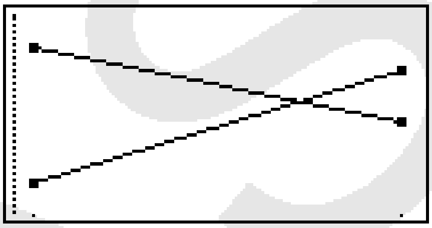
u **Primer vnosa**



u







6. Interval zaupanja

Pomembno!

- Izračun intervala zaupanja ni mogoč na fx-7400GIII.

Interval zaupanja je razpon (interval), ki vključuje statistično vrednost, običajno populacijsko sredino.

Preširok interval zaupanja otežuje oceno, kje se nahaja populacijska vrednost (resnična vrednost). Ozki interval zaupanja pa omejuje populacijsko vrednost in otežuje pridobivanje zanesljivih rezultatov. Najpogosteje uporabljeni ravni zaupanja sta 95 % in 99 %. Zvišanje ravni zaupanja razširi interval zaupanja, medtem ko znižanje ravni zaupanja interval zaupanja zoži, vendar poveča tudi verjetnost, da se populacijska vrednost naključno spregleda. Pri 95-odstotnem intervalu zaupanja na primer populacijska vrednost v 5 % primerov ni vključena v dobljene intervale.

Ko nameravate izvesti raziskavo in nato s t-testom in Z-testom preveriti podatke, morate upoštevati tudi velikost vzorca, širino intervala zaupanja in stopnjo zaupanja. Stopnja zaupanja se spreminja glede na uporabo.

1-Vzorec *Z* Interval izračuna interval zaupanja za neznano populacijsko sredino, ko je znan populacijski standardni odmik.

2-Vzorec *Z* interval izračuna interval zaupanja za razliko med dvema populacijskima srednjima vrednostma, ko sta znana populacijska standardna odklona dveh vzorcev.

1-Prop *Z* Interval izračuna interval zaupanja za neznani delež uspehov.

2-Prop *Z* Interval izračuna interval zaupanja za razliko med deležem uspehov v dveh populacijah.

1-Vzorec *t* Interval izračuna interval zaupanja za neznano populacijsko sredino, kadar je populacijski standardni odmik neznan.

2-Vzorec *t* Interval izračuna interval zaupanja za razliko med dvema populacijskima srednjima vrednostma, ko sta neznana oba populacijska standardna odklona.

Na začetnem zaslonu načina **STAT** pritisnite 4(INTR), da prikažete meni intervala zaupanja, ki vsebuje naslednje elemente.

- 4(INTR)1(Z) ... *Z* intervali (stran 6-38)
  2(t) ... *t* intervali (stran 6-39)

Po nastavitvi vseh parametrov s pomočjo ② premaknite označitev na »Execute« (Izvedi) in nato pritisnite spodaj prikazano funkcijo tipko, da izvedete izračun.

- 1(CALC) ... Izvede izračun.

- Za funkcije zaupanjskega intervala ni grafičnega prikaza.

---

u Splošni interval zaupanja Previdnostni ukrep

Vnos vrednosti v območju 0 < C-Level < 1 za nastavitev C-Level nastavi vrednost, ki jo vnesete. Vnos vrednosti v območju 1 < C-Level < 100 nastavi vrednost, enakovredno vašemu vnosu, deljeno z 100.

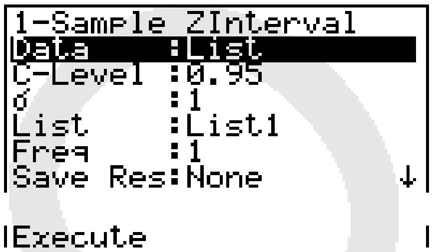
■ Z interval

u 1-vzorec Z interval

1-Vzorec Z interval izračuna interval zaupanja za neznano populacijsko sredino, ko je znan populacijski standardni odmik.

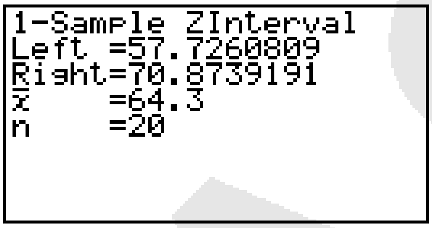
Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

4(INTR)
1(Z)
1(1-S)



V nadaljevanju so prikazani elementi specifikacije parametrov, ki se razlikujejo od specifikacije podatkov seznama.

Primer izhoda rezultata izračuna



u 2-vzorčni Z-interval

2-vzorec Z interval izračuna interval zaupanja za razliko med dvema populacijskima srednjima vrednostma, kadar sta znani populacijski standardni odmiki dveh vzorcev.

Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

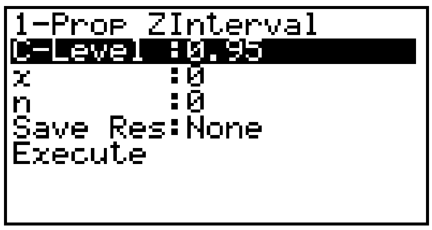
4(INTR)
1(Z)
2(2-S)

u 1-Prop Z Interval

1-Prop Z Interval uporablja število podatkov za izračun intervala zaupanja za neznani delež uspehov.

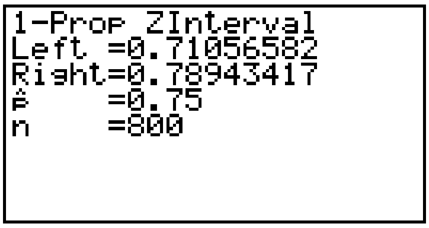
Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

4(INTR)
1(Z)
3(1-P)



Podatki so določeni s pomočjo specifikacije parametrov.

Primer izhoda izračuna



u **2-Prop *Z* interval**

2-Prop *Z* Interval uporablja število podatkovnih elementov za izračun intervala zaupanja za razliko med deležem uspehov v dveh populacijah.

Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

4(INTR)
1(Z)
4(2-P)

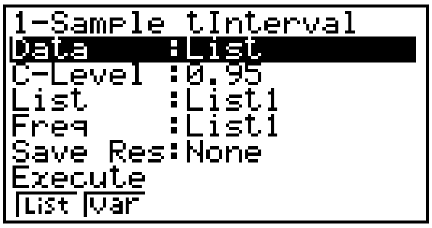
■ *t* Interval

u **1-vzorčni *t*-interval**

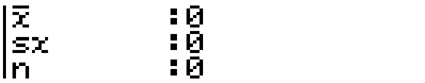
1-vzorec *t* interval izračuna interval zaupanja za neznano populacijsko sredino, kadar je populacijski standardni odmik neznan.

Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

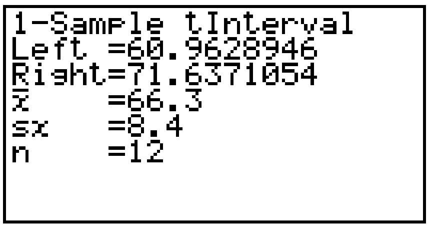
4(INTR)
2(t)
1(1-S)



Spodaj so prikazani elementi specifikacije parametrov, ki se razlikujejo od specifikacije podatkov na seznamu.



Primer izhoda rezultata izračuna



u **2-vzorec *t* interval**

2-Vzorec *t* Interval izračuna interval zaupanja za razliko med dvema populacijskima srednjima vrednostma, kadar sta obe populacijski standardni odkloni neznani. Interval *t* se uporablja za *t* porazdelitev.

Izvedite naslednje ključne operacije iz seznama statističnih podatkov.

4(INTR)
2(t)
2(2-S)

7. Porazdelitev

Pomembno!

• Izračun porazdelitve ni mogoč na fx-7400GIII.

Obstaja več različnih vrst porazdelitev, vendar je najbolj znana „normalna porazdelitev“, ki je bistvena za izvajanje statističnih izračunov. Normalna porazdelitev je simetrična porazdelitev, osredotočena na največje pojavljene povprečne podatke (najvišjo frekvenco), pri čemer se frekvenca z oddaljevanjem od središča zmanjšuje. Glede na vrsto podatkov se uporabljajo tudi Poissonova porazdelitev, geometrijska porazdelitev in različne druge oblike porazdelitev.

Ko je določena oblika porazdelitve, je mogoče določiti določene trende. Izračunate lahko verjetnost, da bodo podatki, vzeti iz porazdelitve, manjši od določene vrednosti.

Porazdelitev se lahko na primer uporabi za izračun stopnje donosa pri proizvodnji nekega izdelka. Ko je vrednost določena kot merilo, lahko izračunate normalno verjetnost pri ocenjevanju, kolikšen odstotek izdelkov izpolnjuje merila. Nasprotno pa se kot hipoteza določi ciljna stopnja uspešnosti (na primer 80 %) in normalna porazdelitev se uporabi za oceno deleža izdelkov, ki bodo dosegli to vrednost.

Normalna verjetnostna gostota izračuna verjetnostno gostoto normalne porazdelitve iz določene vrednosti *x*.

Normalna kumulativna porazdelitev izračuna verjetnost, da bodo podatki normalne porazdelitve padli med dve določeni vrednosti.

Obratna normalna kumulativna porazdelitev izračuna vrednost, ki predstavlja lokacijo znotraj normalne porazdelitve za določeno kumulativno verjetnost.

Gostota verjetnosti *Student-t* izračuna gostoto verjetnosti *t* iz določene vrednosti *x*.

Kumulativna porazdelitev *Student-t* izračuna verjetnost, da bodo podatki porazdelitve *t* padli med dve določeni vrednosti.

In**verzna kumulativna porazdelitev *Student-t*** izračuna spodnjo mejno vrednost kumulativne verjetnostne gostote *Student-t* za določeni odstotek.

Podobno kot *t* porazdelitev se lahko verjetnostna gostota (ali verjetnost), kumulativna porazdelitev in obratna kumulativna porazdelitev izračunajo tudi $^{z}\chi^{no\ (2)}$, ***F***, **binomialno**, **Poissonovo**, **geometrično** in **hipergeometrično** porazdelitvijo.

Na začetnem zaslonu **STAT** mode pritisnite 5(DIST), da prikažete meni porazdelitve, ki vsebuje naslednje elemente.

- χ5(DIST)1(NORM) ... Normalna porazdelitev (stran
  6-41) 2(t) ... *Studentova* t-porazdelitev
  (stran 6-43) 3(CHI) ... Hi-kvadrat porazdelitev^2
  (stran 6-44)
  4(F) ... *F* porazdelitev (stran 6-45)
  5(BINM) ... Binomska porazdelitev (stran 6-46)
  6(g)1(POISN) ... Poissonova porazdelitev (stran 6-48)
  6(g)2(GEO) ... Geometrična porazdelitev (stran 6-49)
  6(g)3(H.GEO) ... Hipergeometrična porazdelitev (stran 6-51)

Po nastavitvi vseh parametrov uporabite ②, da premaknete označitev na »Execute« (Izvedi), nato pa pritisnite eno od spodaj prikazanih funkcijskih tipk, da izvedete izračun ali narišete graf.

- 1(CALC) ... Izvede izračun.
- 6(DRAW) ... Nariše graf.

■ Pogoste porazdelitvene funkcije

- Nastavitve V-Window za risanje grafikonov se nastavijo samodejno, če je nastavitev „Stat Wind“ na zaslonu Setup nastavljena na „Auto“. Trenutne nastavitve V-Window se uporabijo za risanje grafikonov, če je nastavitev „Stat Wind“ nastavljena na „Manual“.
- Po risanju grafa lahko uporabite funkcijo P-CAL za izračun ocenjene p-vrednosti za določeno vrednost x. Funkcijo P-CAL lahko uporabite šele po risanju grafa normalne verjetnostne gostote, *Studentove* t-verjetnostne gostote, ^{2} verjetnostne gostote ali F-verjetnostne gostote.

Sledi splošni postopek za uporabo funkcije P-CAL.

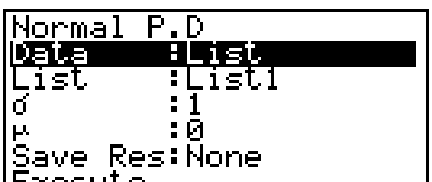
1. Po risanju porazdelitvenega grafa pritisnite !5((G-SLV) 1(P-CAL), da se prikaže pogovorno okno za vnos vrednosti x.
2. Vnesite želeno vrednost za x in pritisnite w.
   - Tako se vrednosti x in p prikažeta na dnu zaslona, kazalec pa se premakne na ustrezno točko na grafu.
3. Če v tem trenutku pritisnete tipko v ali številčno tipko, se ponovno prikaže pogovorno okno za vnos vrednosti x, tako da lahko po želji izvedete še en izračun ocenjene vrednosti.
4. Ko končate, pritisnite J, da izbrišete koordinatne vrednosti in kazalec z zaslona.

- Z izvedbo analitične funkcije se vrednosti x in p samodejno shranijo v spremenljivki alfa X oziroma P.

■ Normalna porazdelitev

• Normalna verjetnostna gostota

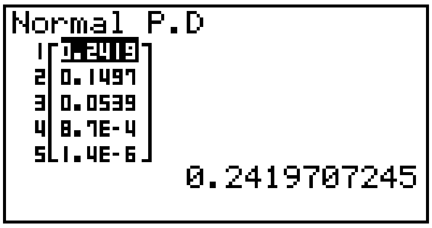
5(DIST)1(NORM)1(NPd)



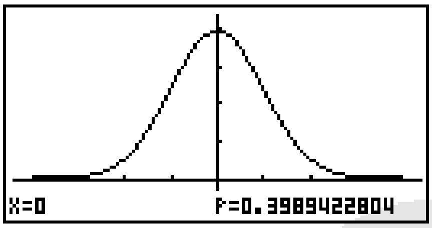
Normalna verjetnostna gostota izračuna verjetnostno gostoto (p) za določeno posamezno vrednost x ali seznam. Ko je določen seznam, se rezultati izračuna za vsak element seznama prikažejo v obliki seznama.

• Normalna verjetnostna gostota se uporablja za standardno normalno porazdelitev.
• Določitev σ = 1 in μ = 0 določa standardno normalno porazdelitev.

Primeri izhodnih rezultatov izračuna



Ko je določen seznam



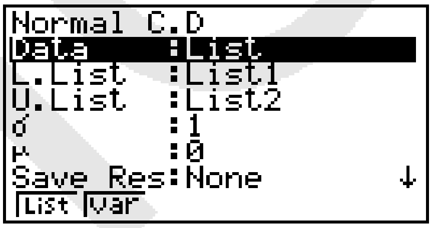
Graf, ko je določena vrednost x

• Grafični prikaz je podprt le, če je določena spremenljivka in je kot podatek vnesena ena sama vrednost x.

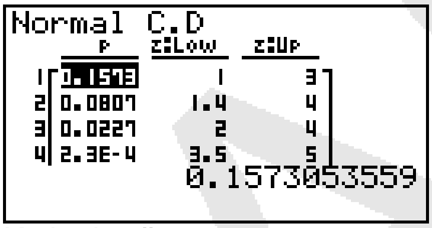
• Normalna kumulativna porazdelitev

5(DIST)1(NORM)2(NCd)

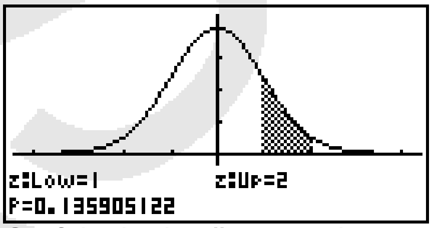
Normalna kumulativna porazdelitev izračuna normalno kumulativno verjetnost normalne porazdelitve med spodnjo in zgornjo mejo.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam



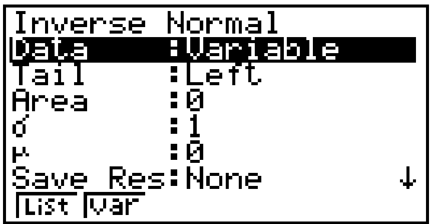
Graf, ko je določena vrednost x

• Grafični prikaz je podprt le, če je določena spremenljivka in je kot podatek vnesena ena sama vrednost x.

• Inverzna normalna kumulativna porazdelitev

5(DIST)1(NORM)3(InvN)

Inverzna normalna kumulativna porazdelitev izračuna mejne vrednosti normalne kumulativne porazdelitve verjetnosti za določene vrednosti.



Površina: verjetnostna vrednost (0 < Površina < 1)

Inverzna kumulativna normalna porazdelitev izračuna vrednost, ki predstavlja lokacijo znotraj normalne porazdelitve za določeno kumulativno verjetnost.

$$\int_{-\infty}^{Zgornja} f(x)dx = p \qquad \int_{Spodnja}^{+\infty} f(x)dx = p \qquad \int_{Spodnja}^{Zgornja} f(x)dx = p$$

Rep: Levi zgornja meja integracijskega intervala	Rep: Desna spodnja meja integracijskega intervala	Rep: Srednji zgornja in spodnja meja integracijskega intervala

Določite verjetnost in uporabite to formulo za pridobitev integracijskega intervala.

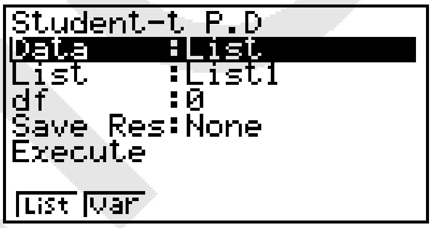
- Ta kalkulator izvede zgornji izračun z uporabo naslednjih vrednosti:∞ = 1E99, –∞ = –1E99
- Za inverzno normalno kumulativno porazdelitev ni grafa.

■ *Student-t* porazdelitev

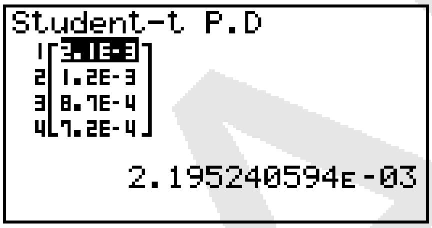
• Gostota verjetnosti *Student-t*

5(DIST)2(t)1(tPd)

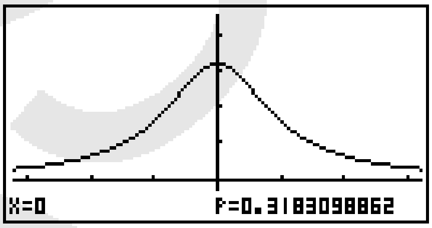
Student-t verjetnostna gostota izračuna verjetnostno gostoto (p) za določeno posamezno vrednost x ali seznam. Ko je določen seznam, se rezultati izračuna za vsak element seznama prikažejo v obliki seznama.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam



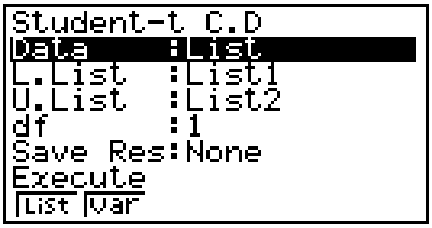
Graf, ko je določena spremenljivka (x)

- Grafični prikaz je podprt samo, če je določena spremenljivka in je kot podatek vnesena ena sama vrednost x.

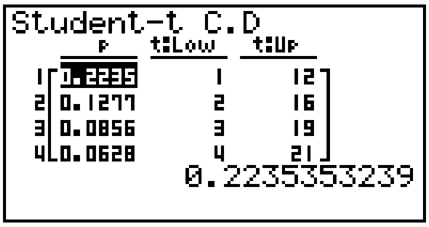
• Kumulativna porazdelitev *Student-t*

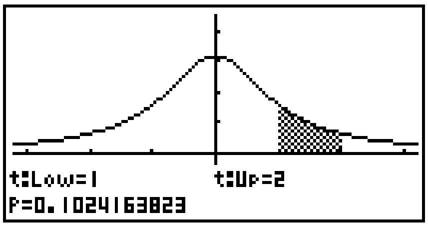
5(DIST)2(t)2(tCd)

Kumulativna porazdelitev Student-t izračuna kumulativno verjetnost *Student-t* porazdelitve med spodnjo in zgornjo mejo.



Primeri izhodnih rezultatov izračuna





Ko je določena lista

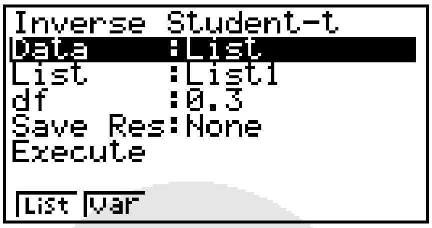
Graf, ko je določena spremenljivka (x)

- Grafični prikaz je podprt samo, če je določena spremenljivka in je kot podatek vnesena ena sama vrednost x.

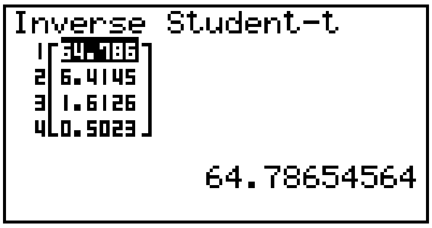
• Inverzna kumulativna porazdelitev *Student-t*

5(DIST)2(t)3(InvN)

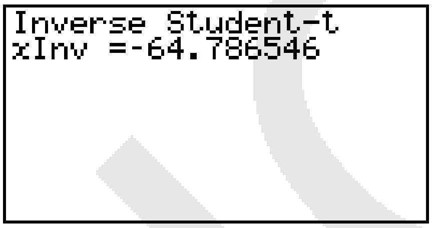
Inverzna kumulativna porazdelitev *Student-t* izračuna spodnjo mejno vrednost kumulativne porazdelitve *Student-t* za določeno vrednost df (stopnje svobode).



Primeri izhodnih rezultatov izračuna



Ko je določena lista



Ko je določena spremenljivka (x)

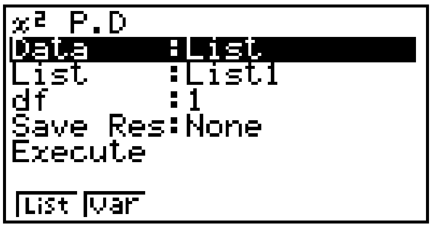
- Za inverzno kumulativno porazdelitev *Student-t* ni grafa.

■ ^{2} Porazdelitev

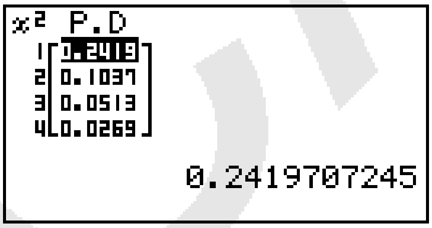
• ^{2} Verjetnostna gostota

5(DIST)3(CHI)1(CPd)

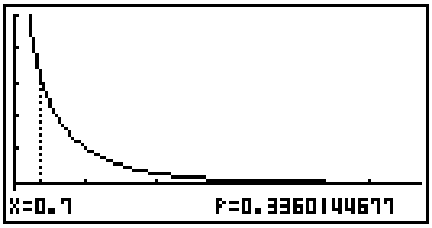
(^{2}) Verjetnostna gostota izračuna (^{2}) verjetnostno gostoto (p) za določeno posamezno vrednost x ali seznam. Ko je določen seznam, se rezultati izračuna za vsak element seznama prikažejo v obliki seznama.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam



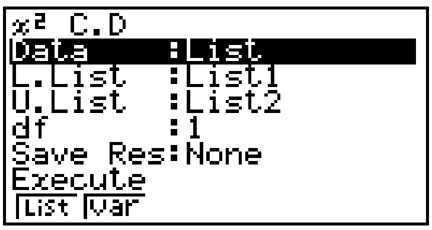
Graf, ko je določena spremenljivka (x)

- Grafični prikaz je podprt le, če je določena spremenljivka in je kot podatek vnesena ena sama vrednost x.

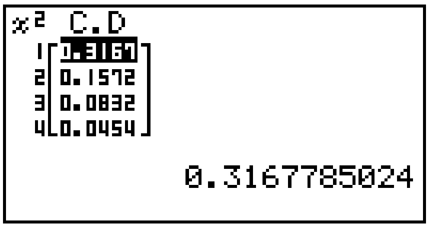
• ^{2} Kumulativna porazdelitev

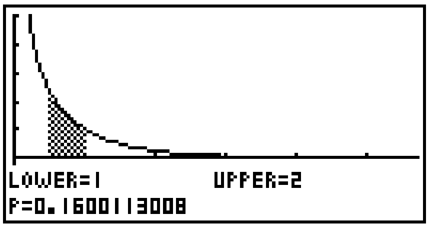
5(DIST)3(CHI)2(CCd)

(^{2}) Kumulativna porazdelitev izračuna kumulativno verjetnost (^{2}) porazdelitve med spodnjo in zgornjo mejo.



Primeri izhodnih rezultatov izračuna





Ko je določen seznam

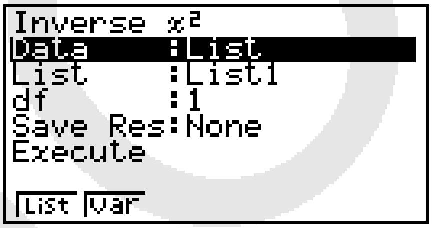
Graf, ko je določena spremenljivka (x)

- Grafični prikaz je podprt le, če je določena spremenljivka in je kot poda

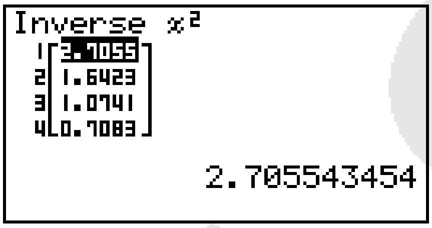
---

- Inverzna a (2) **Kumulativna porazdelitev** 5(DIST)3(CHI)3(InvC)

Inverzna ^{2} kumulativna porazdelitev izračuna spodnjo mejno vrednost ^{2} kumulativne porazdelitvene verjetnosti za določeno vrednost df (stopnje svobode).



Primeri izhodnih rezultatov izračuna



Ko je določen seznam

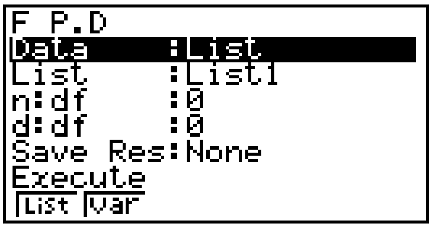
Ko je spremenljivka (x)

- Za inverzno ^{2}kumulativno porazdelitev ni grafa.

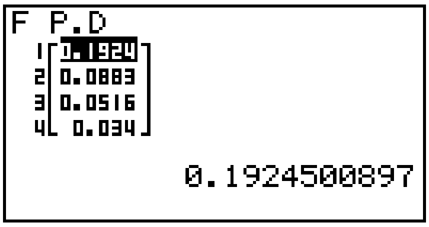
■ *F* porazdelitev

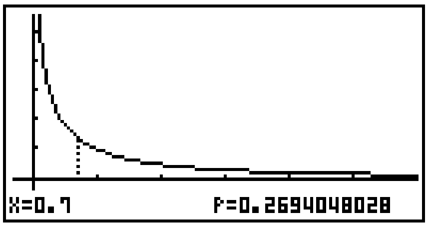
- ***F*** **Verjetnostna gostota** 5(DIST)4(F)1(FPd)

F Verjetnostna gostota izračuna F verjetnostno gostoto (p) za določeno posamezno vrednost x ali seznam. Ko je določen seznam, se rezultati izračuna za vsak element seznama prikažejo v obliki seznama.



Primeri izhodnih rezultatov izračuna





Ko je določen seznam

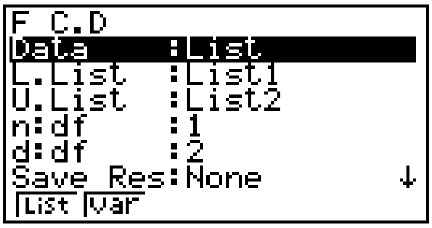
Graf, ko je določena spremenljivka (x)

- Grafični prikaz je podprt samo, če je določena spremenljivka in je kot poda
tki.

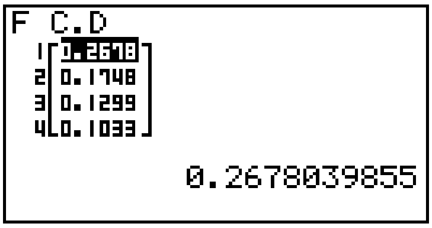
• F Kumulativna porazdelitev

5(DIST)4(F)2(FCd)

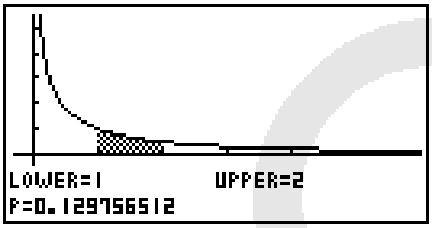
F kumulativna porazdelitev izračuna kumulativno verjetnost F porazdelitve med spodnjo in zgornjo mejo.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam



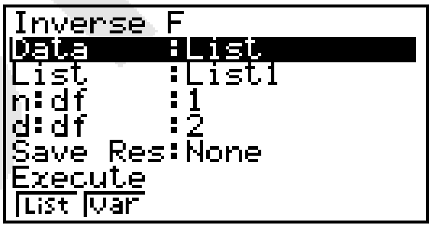
Graf, ko je določena spremenljivka

- Grafični prikaz je podprt le, če je določena spremenljivka in je kot podatki.

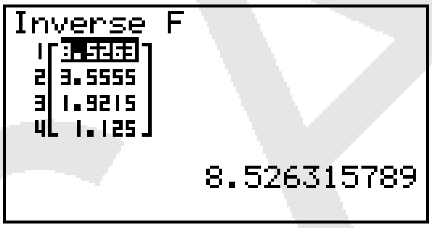
• Inverzna F kumulativna porazdelitev

5(DIST)4(F)3(InvF)

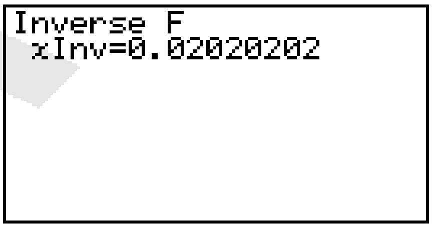
Inverzna kumulativna porazdelitev F izračuna spodnjo mejno vrednost kumulativne porazdelitve verjetnosti F za določene vrednosti n:df in d:df (stopnje svobode števílčnika in imenovalca).



Primeri izhodnih rezultatov izračuna



Ko je določen seznam



Ko je določena spremenljivka

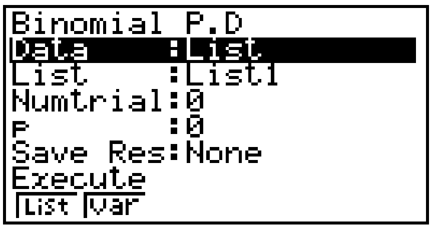
- Za obratno kumulativno porazdelitev F ni grafa.

■ Binomska

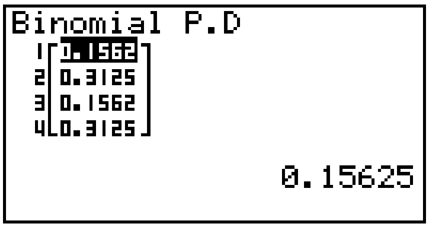
• Binomska verjetnost

5(DIST)5(BINM)1(BPd)

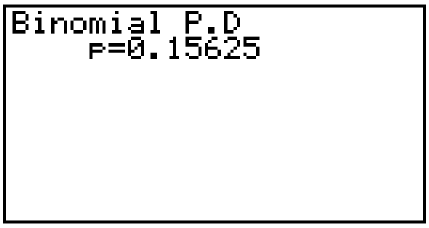
Binomialna verjetnost izračuna verjetnost za določeno posamezno vrednost x ali vsak element seznama za diskretno binomialno porazdelitev z določenim številom poskusov in verjetnostjo uspeha pri vsakem poskusu. Ko je določen seznam, se rezultati izračuna za vsak element seznama prikažejo v obliki seznama.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam



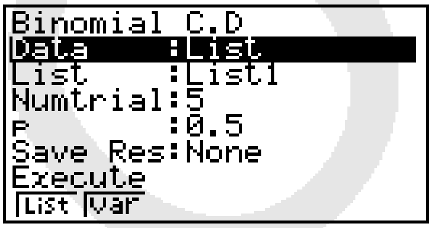
Ko je določena spremenljivka (x)

• Za binomialno verjetnost ni grafa.

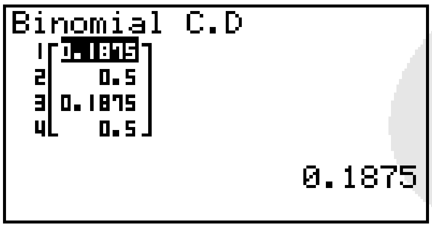
• Binomska kumulativna porazdelitev

5(DIST)5(BINM)2(BCd)

Kumulativna binomska porazdelitev izračuna kumulativno verjetnost v binomski porazdelitvi, da bo uspeh nastopil na ali pred določenim poskusom.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam

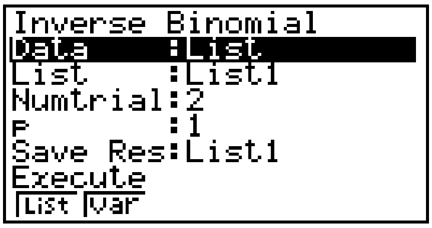
Ko je določena spremenljivka (x)

• Za binomialno kumulativno porazdelitev ni grafa.

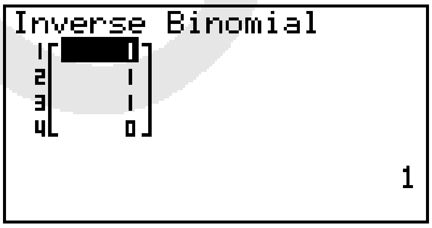
• Inverzna binomska kumulativna porazdelitev

5(DIST)5(BINM)3(InvB)

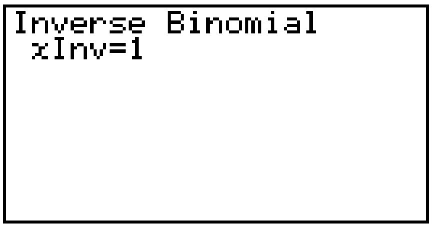
Inverzna binomska kumulativna porazdelitev izračuna najmanjše število poskusov binomske kumulativne porazdelitve za določene vrednosti.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam



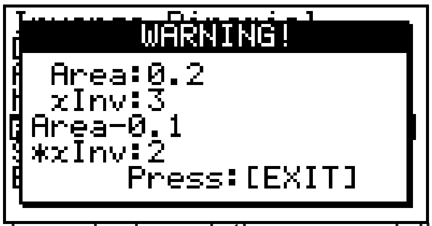
Ko je določena spremenljivka (x)

• Za obratno binomialno kumulativno porazdelitev ni grafa.

Pomembno!

Pri izračunu kumulativne porazdelitve obratnega binomskega porazdelitvenega razporeda kalkulator uporabi določeno vrednost površine in vrednost, ki je za eno manjša od najmanjšega števila pomembnih števk vrednosti površine (`vrednost površine), da izračuna najmanjše število vrednosti poskusov.

Rezultati so dodeljeni sistemskim spremenljivkam xInv (rezultat izračuna z uporabo Area) in `xInv (rezultat izračuna z uporabo `Area). Kalkulator vedno prikaže samo vrednost xInv. Če pa sta vrednosti xInv in `xInv različni, se prikaže spodnje sporočilo z obema vrednostma.

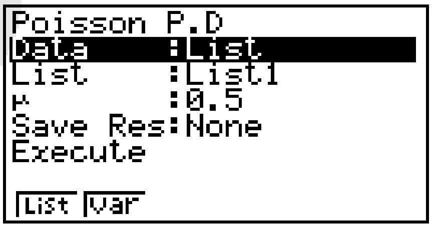


Rezultati izračuna inverzne binomske kumulativne porazdelitve so cela števila. Natančnost se lahko zmanjša, če ima prvi argument 10 ali več mest. Upoštevajte, da tudi majhna razlika v natančnosti izračuna vpliva na rezultate izračuna. Če se prikaže opozorilno sporočilo, preverite prikazane vrednosti.

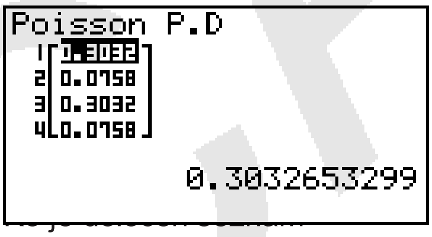
■ Poissonova

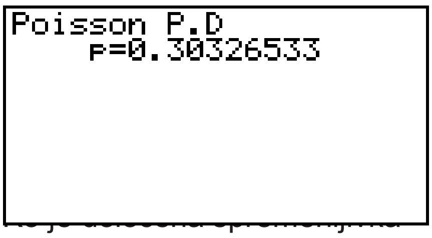
• Poissonova verjetnost 5(DIST)6(g)1(POISN)1(PPd)

Poissonova verjetnost izračuna verjetnost za določeno posamezno vrednost x ali vsak element seznama za diskretno Poissonovo porazdelitev z določeno srednjo



Primeri izhodnih rezultatov izračuna

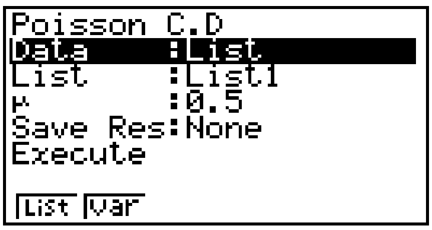




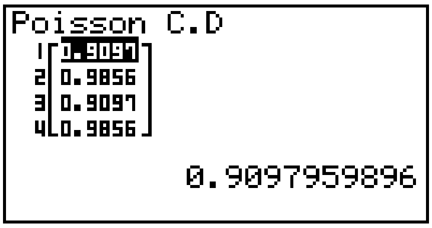
• Za Poissonovo verjetnost ni grafa.

• Poissonova kumulativna porazdelitev 5(DIST)6(g)1(POISN)2(PCd)

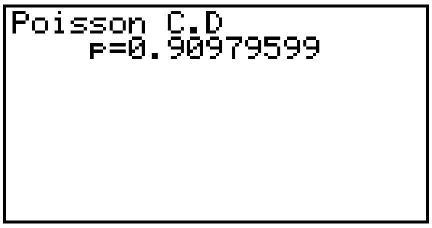
Poissonova kumulativna porazdelitev izračuna kumulativno verjetnost v Poissonovi porazdelitvi, da bo uspeh nastopil na ali pred določenim poskusom.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam



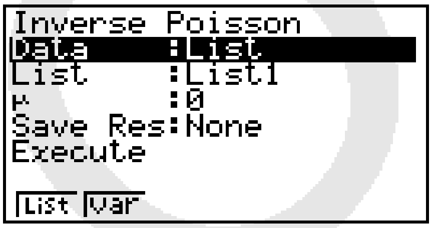
Ko je določena spremenljivka (x)

• Za Poissonovo kumulativno porazdelitev ni grafa.

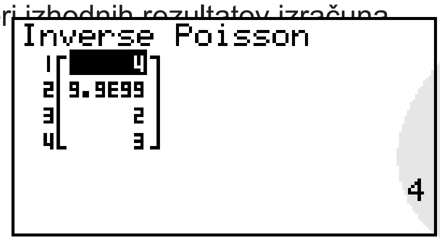
• Inverzna Poissonova kumulativna porazdelitev

5(DIST)6(g)1(POISN)3(InvP)

Inverzna Poissonova kumulativna porazdelitev izračuna minimalno število poskusov Poissonove kumulativne verjetnostne porazdelitve za določene vrednosti.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam

Ko je določena spremenljivka (x)

• Za obratno Poissonovo kumulativno porazdelitev ni grafa.

Pomembno!

Pri izvajanju izračuna obratne Poissonove kumulativne porazdelitve kalkulator uporabi določeno vrednost površine in vrednost, ki je za eno manjša od najmanjšega števila pomembnih števk vrednosti površine (`vrednost površine), da izračuna najmanjše število vrednosti poskusov.

Rezultati so dodeljeni sistemskim spremenljivkam xInv (rezultat izračuna z uporabo Area) in `xInv (rezultat izračuna z uporabo `Area). Kalkulator vedno prikaže samo vrednost xInv. Če pa sta vrednosti xInv in `xInv različni, se prikaže sporočilo z obema vrednostma.

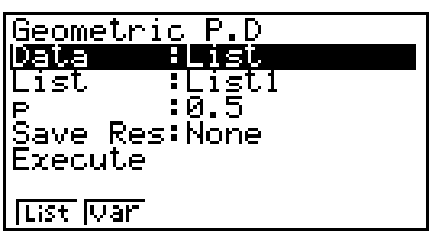
Rezultati izračuna inverzne Poissonove kumulativne porazdelitve so cela števila. Natančnost se lahko zmanjša, če ima prvi argument 10 ali več mest. Upoštevajte, da že majhna razlika v natančnosti izračuna vpliva na rezultate izračuna. Če se prikaže opozorilno sporočilo, preverite prikazane vrednosti.

■ Geometrična porazdelitev

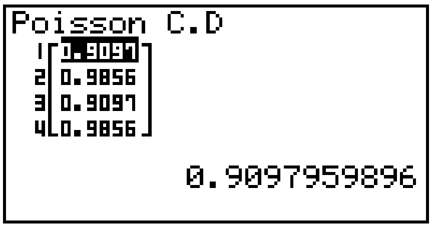
• Geometrična verjetnost

5(DIST)6(g)2(GEO)1(GPd)

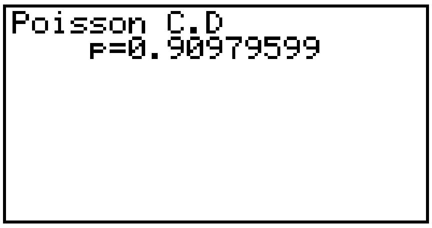
Geometrična verjetnost izračuna verjetnost za določeno posamezno vrednost x ali vsak element seznama ter število poskusov, pri katerih se prvič pojavi uspeh, za geometrično porazdelitev z določeno verjetnostjo uspeha.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam

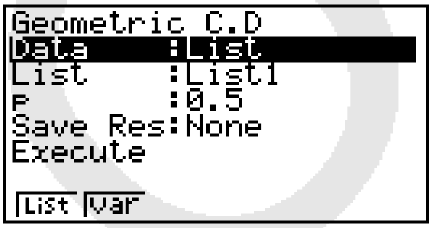


Ko je določena spremenljivka (x)

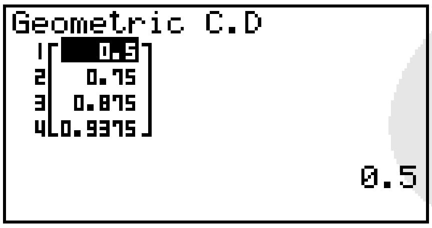
• Za geometrijsko verjetnost ni grafa.

• Geometrična kumulativna porazdelitev 5(DIST)6(g)2(GEO)2(GCd)

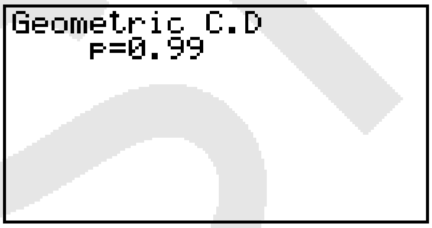
Geometrična kumulativna porazdelitev izračuna kumulativno verjetnost v geometrični porazdelitvi, da bo uspeh nastopil na ali pred določenim poskusom.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam

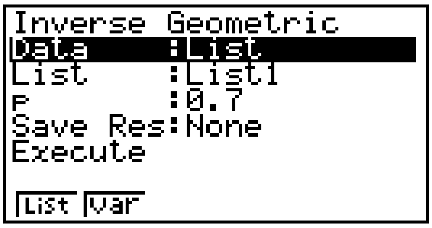


Ko je določena spremenljivka (x)

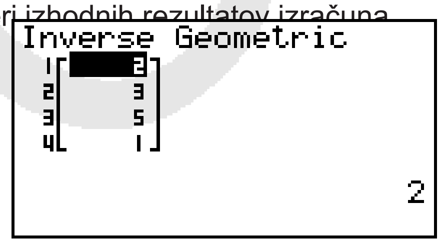
• Za geometrično kumulativno porazdelitev ni grafa.

• Inverzna geometrijska kumulativna porazdelitev 5(DIST)6(g)2(GEO)3(InvG)

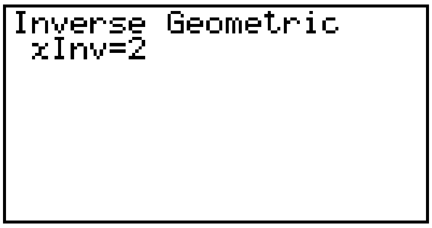
Inverzna geometrijska kumulativna porazdelitev izračuna minimalno število poskusov geometrijske kumulativne verjetnostne porazdelitve za določene vrednosti.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam



Ko je določena spremenljivka (x)

• Za obratno geometrijsko kumulativno porazdelitev ni grafa.

Pomembno!

Pri izvajanju izračuna obratne geometrične kumulativne porazdelitve kalkulator uporabi določeno vrednost površine in vrednost, ki je za eno manjša od najmanjšega števila pomembnih števk vrednosti površine (`vrednost površine), da izračuna najmanjše število vrednosti poskusov.

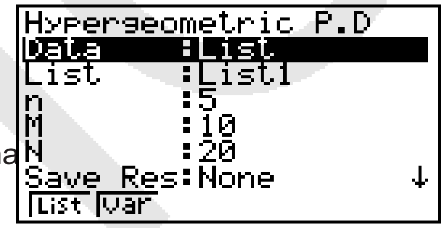
Rezultati so dodeljeni sistemskim spremenljivkam xInv (rezultat izračuna z uporabo Area) in `xInv (rezultat izračuna z uporabo `Area). Kalkulator vedno prikaže samo vrednost xInv. Če pa sta vrednosti xInv in `xInv različni, se prikaže sporočilo z obema vrednostma.

Rezultati izračuna inverzne geometrične kumulativne porazdelitve so cela števila. Natančnost se lahko zmanjša, če ima prvi argument 10 ali več mest. Upoštevajte, da že majhna razlika v natančnosti izračuna vpliva na rezultate izračuna. Če se prikaže opozorilno sporočilo, preverite prikazane vrednosti.

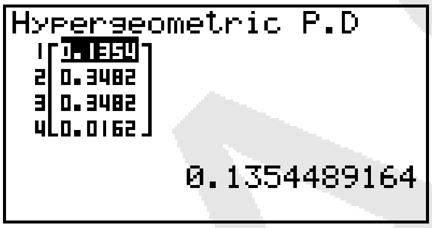
■ Hipergeometrična porazdelitev

• Hipergeometrična verjetnost 5(DIST)6(g)3(H.GEO)1(HPd)

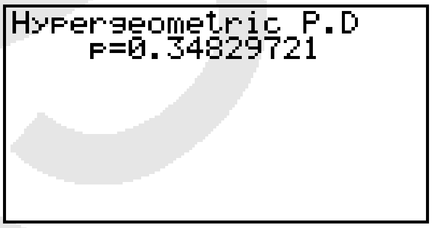
Hipergeometrična verjetnost izračuna verjetnost pri določeni posamezni vrednosti x ali vsakem elementu seznama ter
število poskusov, pri katerih se prvič pojavi uspeh, za hipergeometrično porazdelitev z določeno verjetnostjo uspeha.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam

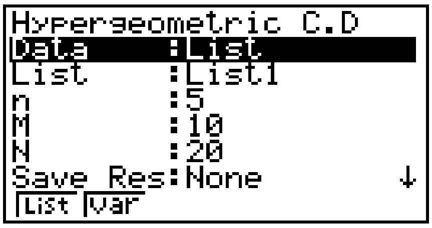


Ko je določena spremenljivka (x)

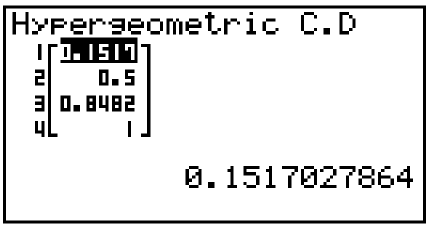
• Za hipergeometrično verjetnost ni grafa.

• Hipergeometrična kumulativna porazdelitev 5(DIST)6(g)3(H.GEO)2(HCd)

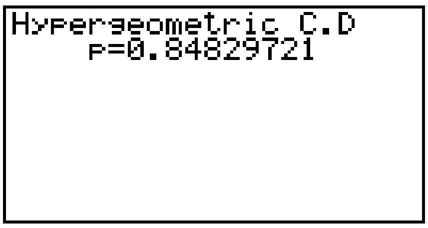
Hipergeometrična kumulativna porazdelitev izračuna kumulativno verjetnost v hipergeometrični porazdelitvi, da bo uspeh nastopil na ali pred določenim poskusom.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam



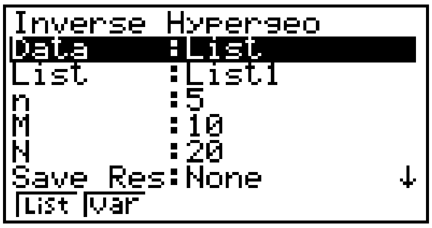
Ko je določena spremenljivka (x)

• Za hipergeometrično kumulativno porazdelitev ni grafa.

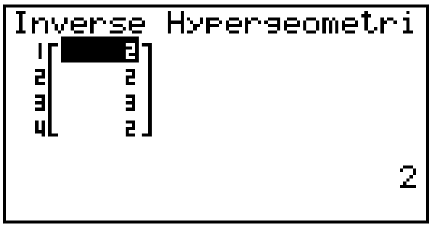
- **Inverzna hipergeometrična kumulativna porazdelitev**

5(DIST)6(g)3(H.GEO)3(InvH)

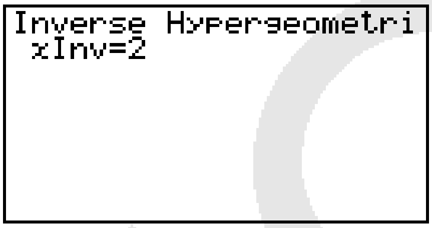
Inverzna hipergeometrična kumulativna porazdelitev izračuna minimalno število poskusov hipergeometrične kumulativne verjetnostne porazdelitve za določene vrednosti.



Primeri izhodnih rezultatov izračuna



Ko je določen seznam



Ko je določena spremenljivka (x)

- Za obratno hipergeometrično kumulativno porazdelitev ni grafa.

Pomembno!

Pri izvajanju izračuna inverzne hipergeometrične kumulativne porazdelitve kalkulator uporabi določeno vrednost površine in vrednost, ki je za eno manjša od najmanjšega števila pomembnih števk vrednosti površine (`vrednost površine), da izračuna najmanjše število vrednosti poskusov.

Rezultati so dodeljeni sistemskim spremenljivkam xInv (rezultat izračuna z uporabo Area) in `xInv (rezultat izračuna z uporabo `Area). Kalkulator vedno prikaže samo vrednost xInv. Če pa sta vrednosti xInv in `xInv različni, se prikaže sporočilo z obema vrednostma.

Rezultati izračuna inverzne hipergeometrične kumulativne porazdelitve so cela števila. Natančnost se lahko zmanjša, če ima prvi argument 10 ali več mest. Upoštevajte, da že majhna razlika v natančnosti izračuna vpliva na rezultate izračuna. Če se prikaže opozorilno sporočilo, preverite prikazane vrednosti.

8. Pogoji za vnos in izhod testov, interval zaupanja in porazdelitev (samo fx-9860GIII/fx-9750GIII)

V nadaljevanju so pojasnjeni vnosni in izhodni izrazi, ki se uporabljajo v testih, intervalu zaupanja in porazdelitvi.

■ Vhodni pogoji

Podatki................................tip podatkov

μ (1-vzorčni Z-test) ....povprečna vrednost populacije pogoji testa („$\neq \mu_0$" določa dvostranski test, „$< \mu_0$" določa spodnji enostranski test, „$> \mu_0$" določa zgornji enostranski test.)

μ_1 (2-vzorčni Z-test) ....pogoji testa populacijske srednje vrednosti („$\neq \mu_2$" določa dvostranski test, „$< \mu_2$" določa enostranski test, pri katerem je vzorec 1 manjši od vzorca 2, „> μ_2 “ določa enostranski test, pri katerem je vzorec 1 večji od vzorca 2.)

Prop (1-Prop Z test)...........pogoji testa deleža vzorca („$\neq p_0$ ” določa dvostranski test, „< p_0 “ določa enostranski test spodnjega dela, „> p_0 “ določa enostranski test zgornjega dela.)

p_1 (2-Prop Z Test) ....pogoji testa deleža vzorca („$\neq p_2$ ” določa dvostranski test, „< p_2 ” določa enostranski test, pri katerem je vzorec 1 manjši od vzorca 2, „> p_2 ”padoloča enostranski test, pri katerem je vzorec 1 večji od vzorca 2.

μ (1-vzorčni t-test) ....pogoji testa populacijske srednje vrednosti („$\neq \mu_0$ ” določa dvostranski test, „< μ_0 “ določa enostranski test spodnjega dela, „> μ_0 “ določa enostranski test zgornjega dela.

μ_1 (2-vzorčni t-test) ....pogoji za test srednje vrednosti vzorca („$\neq \mu_2$ ” določa dvostranski test, „< μ_2 ” določa enostranski test, pri katerem je vzorec 1 manjši od vzorca 2, „> μ_2 ” določa enostranski test, pri katerem je vzorec 1 večji od vzorca 2.)

β &ρ (LinearReg t Test) ρ-pogojev za testiranje vrednosti („$\neq$ 0” določa dvostranski test, „< 0” določa enostranski test spodnjega roba, „> 0“ določa enostranski test zgornjega roba).

σ1 (2-vzorčni F-test) ....pogoji testa standardnega odklona populacije („$\neq$ σ2” določa dvostranski test, „< σ2“ določa enostranski test, pri katerem je vzorec 1 manjši od vzorca 2, „> σ2“ določa enostranski test, pri katerem je vzorec 1 večji od vzorca 2).

μ_0 .... predpostavljena populacijska sredina

σ ....standardni odmik populacije (σ > 0)

σ1 .... populacijski standardni odmik vzorca 1 (σ1 > 0)

σ2 .... populacijski standardni odmik vzorca 2 (σ2 > 0)

Seznam ....seznam, katerega vsebino želite uporabiti kot podatke (Seznam 1 do 26)

Seznam1 ....seznam, katerega vsebino želite uporabiti kot podatke vzorca 1 (Seznam 1 do 26)

Seznam 2...........................seznam, katerega vsebino želite uporabiti kot podatke vzorca 2 (seznam 1 do 26)

Frekvenca..........................frekvenca (1 ali seznam 1 do 26)

Freq1 ....frekvenca vzorca 1 (1 ali seznam 1 do 26)

Freq2 ....frekvenca vzorca 2 (1 ali seznam 1 do 26)

Izvedi ....izvede izračun ali nariše graf

o ....povprečje vzorca

o1 .... povprečje vzorca 1

o2 .... povprečje vzorca 2

n ....velikost vzorca (pozitivno celo število)

n1 .... velikost vzorca 1 (pozitivno celo število)

n2 .... velikost vzorca 2 (pozitivno celo število)

p_0 .... pričakovani delež vzorca (0 < p_0 < 1)

p_1 .... pogojev za test vzorčnega deleža

x (1-Prop Z test)................vrednost vzorca (x   0 celo število)

x (1-Prop Z interval)..........podatki (0 ali pozitivno celo število)

x1 .... vrednost podatkov vzorca 1 (x1   0 celo število)

x2 .... vrednost podatkov vzorca 2 (x2   0 celo število)

sx .... standardni odmik vzorca (sx > 0)

sx1 ....standardni odmik vzorca 1 (sx1 > 0)

s_{x2} .... standardni odmik vzorca 2 ($s_{x2} > 0$)

XList ....seznam za podatke osi x (seznam 1 do 6)

YList ....seznam za podatke osi y (seznam 1 do 6)

C-raven ....stopnja zaupanja (0 C-Level < 1)

Združeno ....združevanje Vklopljeno (velja) ali Izklopljeno (ne velja)

x (porazdelitev)..................podatki

σ (porazdelitev) ....standardni odmik (σ > 0)

μ (porazdelitev) ....povprečje

Spodnja meja (porazdelitev) spodnja meja

Zgornja (porazdelitev) ....zgornja meja

df (porazdelitev) ....stopnje svobode (df > 0)

$n{:}df$ (Porazdelitev)...............števec stopnje svobode (pozitivno celo število)

$d{:}df$ (porazdelitev) ....imenovalec stopnje svobode (pozitivno celo število)

Numtrial (Porazdelitev)........število poskusov

p (porazdelitev) ....verjetnost uspeha (0 p 1)

■ Izhodni izrazi

z..z-rezultat

p..p-vrednost

t ....t rezultat

^{2}.. ($^{2)}$ vrednost

F ....F vrednost

$\hat{p}$..ocenjeni delež vzorca

$\hat{p}$1.. ocenjeni delež vzorca 1

$\hat{p}$2.. ocenjeni delež vzorca 2

o ....povprečje vzorca

o1 .... povprečje vzorca 1

o2 .... povprečje vzorca 2

sx.. standardni odmik vzorca

sx1 ....standardni odmik vzorca 1

sx2 ....standardni odmik vzorca 2

sp.. združeno standardno odstopanje vzorca

n ....velikost vzorca

n1 .... velikost vzorca 1

n... velikost vzorca 2

df......................................stopnje svobode

a..konstanta

b ....koeficient

se.. standardna napaka

r...korelacijski koeficient

r^2..koeficient determinacije

Leva...................................spodnja meja intervala zaupanja (levi rob)

Desni ....zgornja meja intervala zaupanja (desni rob)

9. Statistična formula

■ Test

Test	
1-vzorečni Z-test	$z = (\text{o} - \mu_0)/(\sigma/'n)$
Z-test za 2 vzorca	$z = (\text{o}_1 - \text{o}_2)/\sqrt{(\sigma_1^2/n_1) + (\sigma_2^2/n_2)}$
1-Prop Z test	$z = (x/n - p_0)/\sqrt{p_0(1 - p_0)/n}$
2-Prop Z test	$z = (x_1/n_1 - x_2/n_2)/\sqrt{\hat{p}(1 - \hat{p})(1/n_1 + 1/n_2)}$
1-vzorečni t-test	$t = (\text{o} - \mu_0)/(sx/'n)$
2-vzorčni t-test (združen)	$t = (\text{o}_1 - \text{o}_2)/\sqrt{sp^2(1/n_1 + 1/n_2)}$ $sp = \sqrt{((n_1 - 1)s_{x1}^2 + (n_2 - 1)s_{x2}^2)/(n_1 + n_2 - 2)}$ $df = n_1 + n_2 - 2$
2-vzorčni t-test (ne združen)	$t = (\text{o}_1 - \text{o}_2)/\sqrt{s_{x1}^2/n_1 + s_{x2}^2/n_2}$ $df = 1/(C^2/(n_1 - 1) + (1 - C)^2/(n_2 - 1))$ $C = (s_{x1}^2/n_1)/(s_{x1}^2/n_1 + s_{x2}^2/n_2)$
LinearReg t test	$b = \sum_{i=1}^{n}(x_i - \text{o})(y_i - \bar{y})/\sum_{i=1}^{n}(x_i - \text{o})^2 \quad a = \bar{y} - b\text{o}$ $t = r\sqrt{(n - 2)/(1 - r^2)}$
χ^2 GOF test	$\chi^2 = \sum_{i}^{k}(O_i - E_i)^2/E_i$ O_i : i-ti element opazovanega seznama E_i : i-ti element pričakovanega seznama
χ^2 dvosmerni test	$\chi^2 = \sum_{i}^{k}\sum_{j}^{R}(O_{ij} - E_{ij})^2/E_{ij}$ O_{ij} : Element v vrstici i, stolpcu j opazovane matrike $E_{ij} = \sum_{i=1}^{k} O_{ij} \sum_{j=1}^{R} O_{ij} / \sum_{i=1}^{k}\sum_{j=1}^{R} O_{ij}$ E_{ij} : Element v vrstici i, stolpcu j pričakovane matrike
2-vzorčni F-test	$F = s_{x1}^2/s_{x2}^2$
ANOVA test	$F = MS/MSe \quad MS = SS/Fdf \quad MSe = SSe/Edf$ $SS = \sum_{i=1}^{k} n_i(\text{o}_i - \text{o})^2 \quad SSe = \sum_{i=1}^{k}(n_i - 1)sx_i^2$ $Fdf = k - 1 \quad Edf = \sum_{i=1}^{k}(n_i - 1)$

■ Interval zaupanja

Interval zaupanja	Levo: spodnja meja intervala zaupanja (levi rob) Desno: zgornja meja intervala zaupanja (desni rob)
1-vzorec Z interval	$Levo, desno$ = $\bar{o} + Z(\alpha/2) \cdot$ $\sigma/\sqrt{n}$
2-vzorčni Z interval	$Levo, desno$ = $(o_1 - o_2) \pm Z(\alpha/2)\sqrt{\sigma_1^2/n_1 + \sigma_2^2/n_2}$
1-Prop Z interval	$Levo, desno$ = $x/n \mp Z(\alpha/2)\sqrt{1/n \cdot (x/n \cdot (1 - x/n))}$
2-Prop Z interval	$Levo, desno$ = $(x_1/n_1 - x_2/n_2)$ $\mp Z(\alpha/2)\sqrt{(x_1/n_1 \cdot (1 - x_{(1)}/n_{(1)}))/n_1 + (x_{(2)}/n_2 \cdot (1 - x_2/n_{2)})/n_2}$
1-vzorec t interval	$Levo, desno$ = $\bar{o} + t_{n-1}(\alpha/2) \cdot$ $sx/\sqrt{n}$
2-vzorec t interval (združen)	$Levo, desno$ = $(o_1 - o_2) + t_{n_1+n_2-2}(\alpha/2)\sqrt{s_p^2(1/n_1 + 1/n_2)}$ $s_p = \sqrt{((n_1 - 1)s_{x1}^2 + (n_2 - 1)s_{x2}^2)/(n_1 + n_2 - 2)}$
2-vzorec t interval (ne združen)	Levo, $desno$ = $(o_1 - o_2) \pm t_{df}(\alpha/2)\sqrt{s_{x1}^2/n_1 + s_{x2}^2/n_2}$ $df = 1/(C^2/(n_1 - 1) + (1 - C)^2/(n_2 - 1))$ $C = (s_{x1}^2/n_1)/(s_{x1}^2/n_1 + s_{x2}^2/n_2)$

α: stopnja pomembnosti $\alpha = 1 -$ [C-raven] C-stopnja : stopnja zaupanja (0 C-stopnja< 1)

$Z(\alpha/2)$: zgornja $\alpha/2$ točka standardne normalne porazdelitve

■ Porazdelitev

Porazdelitev	**Verjetnostna gostota**	**Kumulativna porazdelitev**
Normalna porazdelitev	$p(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ $(\sigma > 0)$	$p = \int_{Spodnji}^{Zgornji} p(x)dx$
$Student$-t porazdelitev	$p(x) = \frac{\Gamma\left(\frac{df+1}{2}\right)}{\Gamma\left(\frac{df}{2}\right)} \times \frac{\left(1 + \frac{x^2}{df}\right)^{-\frac{df+1}{2}}}{\sqrt{\pi \times df}}$	
χ^2 Razporeditev	$p(x) = \frac{1}{\Gamma\left(\frac{df}{2}\right)} \times \left(\frac{1}{2}\right)^{\frac{df}{2}} \times x^{\left(\frac{df}{2}\right)-1} \times e^{-\frac{x}{2}}$ (x 0)	

F Porazdelitev	$(p)(x) = \dfrac{\Gamma\left(\dfrac{ndf + ddf}{2}\right)}{\Gamma\left(\dfrac{ndf}{2}\right) \times \Gamma\left(\dfrac{dd}{2}\right)} \left(\dfrac{ndf}{ddf}\right)^{\frac{ndf}{2}} x^{\frac{ndf}{2}-1} \left(1 + \dfrac{ndf \times x}{ddf}\right)^{-\frac{ndf + ddf}{2}}$ $(x \quad 0)$	

Porazdelitev	Obratna kumulativna porazdelitev
Normalna porazdelitev	$p = \int_{-\infty}^{Zgornja} p(x)dx$ rep = Levi $p = \int_{Spodnji}^{\infty} p(x)dx$ rep = Desni $p = \int_{Spodnji}^{Zgornja} p(x)dx$ rep = srednji
Student-t porazdelitev	$p = \int_{Spodnji}^{\infty} p(x)dx$
χ^2 Porazdelitev	
F porazdelitev	

■ Porazdelitev

Porazdelitev	Verjetnost
Binomska porazdelitev	$p(x) = nCxp^x\ (1-p)^{n-x}$ (x = 0, 1, ·······, n) n: število poskusov
Poissonova porazdelitev	$p(x) = \frac{e^{-\mu} \times \mu^x}{x!}$ (x = 0, 1, 2, ···) μ: srednja vrednost ($\mu > 0$)
Geometrična porazdelitev	$p(x) = p(1-p)^{x-1}$ (x = 1, 2, 3, ···)
Hipergeometrična porazdelitev	$p(x) = \frac{MCx \times N-MCn-x}{NCn}$ n: število elementov, izvlečenih iz populacije (0 x celo število) M: število elementov, vsebovanih v atributu A (0 M celo število) N: število elementov populacije (n N, M N celo število)

Porazdelitev	Kumulativna porazdelitev	Obratna kumulativna porazdelitev
Binomska porazdelitev	$p = \sum_{x=0}^{X} p(x)$	p H$\sum_{x=0}^{X} p(x)$
Poissonova porazdelitev		
Geometrična porazdelitev	$p = \sum_{x=1}^{X} p(x)$	p H$\sum_{x=1}^{X} p(x)$
Hipergeometrična porazdelitev	$p = \sum_{x=0}^{X} p(x)$	p H$\sum_{x=0}^{X} p(x)$

Poglavje 7 Finančni izračun (TVM)

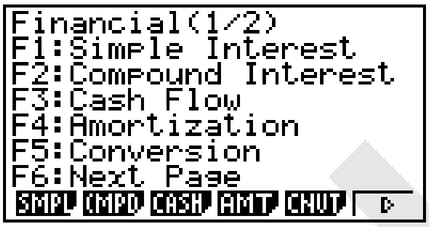
Pomembno!

- Kalkulator fx-7400GIII ni opremljen z načinom **TVM**.

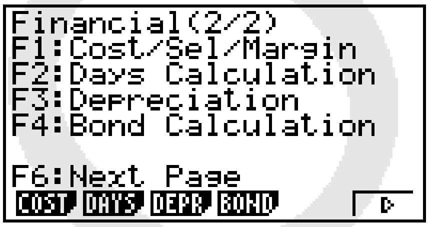
1. Pred izvedbo finančnih izračunov

V glavnem meniju vstopite v način **TVM** in prikažite finančni zaslon, kot je prikazan spodaj.

Finančni zaslon 1



Finančni zaslon 2



- {**SMPL**} … {enostavni obresti}
- {**CMPD**} … {sestavljene obresti}
- {**DENAR**} … {denarni tok (ocena naložbe)}
- {**AMT**} … {amortizacija}
- {**CNVT**} … {pretvorba obrestne mere}
- {**COST**} … {stroški, prodajna cena, marža}
- {**DAYS**} … {izračuni dni/datuma}
- {**DEPR**} … {izračuni amortizacije}
- {**BOND**} … {izračuni obveznic}

■ Nastavitvene postavke

u Plačilo

- {**BGN**}/{**END**} … Določa plačilo {začetek obdobja}/{konec obdobja}

u Način datuma

- {**365**}/{**360**} … Določa izračun v skladu z {365-dnevnim}/{360-dnevnim} letom

u Obdobja/YR. (določitev intervala plačila)

- {**Letno**}/{**Polletno**} … {letno}/{polletno}

Pri uporabi načina **TVM** upoštevajte naslednje točke glede nastavitev zaslona Nastavitve.

- Naslednje nastavitve zaslona Nastavitve so v načinu **TVM** za risanje grafikonov izklopljene: osi, mreža, dvojni zaslon.
- Pri risanju finančnega grafa, ko je vklopljena možnost Oznaka, se za navpično os (vplačila, izplačila) prikaže oznaka DENAR, za vodoravno os (pogostost) pa oznaka ČAS.

■ Grafični prikaz v načinu TVM

Po izvedbi finančnega izračuna lahko s tipko 6(GRPH) grafično prikažete rezultate, kot je prikazano spodaj.

- Če med prikazom grafa pritisnete !1(TRCE), se aktivira funkcija Trace, s katero lahko poiščete druge finančne vrednosti. V primeru enostavnih obresti na primer s pritiskom na e prikažete PV, SI in SFV. S pritiskom na d prikažete iste vrednosti v obratnem vrstnem redu.
- Zoom, Scroll in Sketch v načinu **TVM** ni mogoče uporabljati.
- Ali naj za sedanjo vrednost (PV) ali nakupno ceno (PRC) uporabite pozitivno ali negativno vrednost, je odvisno od vrste izračuna, ki ga želite opraviti.
- Upoštevajte, da je treba grafe uporabljati le za referenčne namene pri pregledovanju rezultatov izračuna v načinu **TVM**.
- Upoštevajte, da je treba rezultate izračuna, pridobljene v tem načinu, obravnavati le kot referenčne vrednosti.
- Pri izvajanju dejanske finančne transakcije vedno preverite rezultate izračuna, pridobljene s tem kalkulatorjem, s številkami, ki jih je izračunala vaša finančna institucija.

2. Enostavni obresti

Ta kalkulator uporablja naslednje formule za izračun enostavnih obresti.

---

u **Formula**

365-dnevni $SI' = \frac{n}{365} \times PV \times i$ SI' $\left(i = \frac{I\%}{100}\right)$

način 360- $= \frac{n}{360} \times PV \times i$ $\left(i = \frac{I\%}{100}\right)$

dnevni način $SI = -SI'$

$SFV = -(PV + SI')$

SI : obresti
n : število obrestnih obdobij
PV : glavnica
I% : letne obresti
SFV: glavnica plus obresti

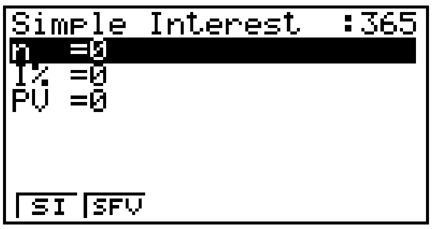
Na zaslonu Finančno 1 pritisnite 1(SMPL), da se prikaže naslednji zaslon za vnos enostavnih obresti.

1(SMPL)

n .... število obrestnih obdobij (dni)

I............ letna obrestna mera

PV .... glavnica



Po nastavitvi parametrov uporabite enega od spodaj navedenih funkcijskih menijev za izvedbo ustreznega izračuna.

- {**SI**} … {enostavne obresti}
- {**SFV**} … {preprosta prihodnja vrednost}

- Če parametri niso pravilno nastavljeni, se pojavi napaka (Ma ERROR).

Uporabite naslednje funkcionalne menije za premikanje med zasloni z rezultati izračuna.

- {**REPT**} … {zaslon za vnos parametrov}
- {**GRPH**} … {nariše graf}

Po risanju grafa lahko pritisnete !1(TRCE), da vklopite sledenje in preberete rezultate izračuna vzdolž grafa.

Vsaka pritisk na e, ko je sledenje vklopljeno, preklopi prikazano vrednost v zaporedju: trenutna vrednost (PV)→ na enostavna obrestna mera (SI)→ na enostavna prihodnja vrednost (SFV). Pritisnite d za preklop v nasprotni smeri.

Pritisnite J, da se vrnete na zaslon za vnos parametrov.

3. Sestavljene obresti

Ta kalkulator uporablja naslednje standardne formule za izračun sestavljenih obresti.

---

u **PV, PMT, FV, *n***

$\underline{I\,\% \neq 0}$

$$PV = -(\alpha \times PMT + \beta \times FV) \qquad PMT = -\frac{PV + \beta \times FV}{\alpha}$$

$$FV = -\frac{PV + \alpha \times PMT}{\beta} \qquad n = \frac{\log\left\{\dfrac{(1+iS)\times PMT - FV\times i}{(1+iS)\times PMT + PV\times i}\right\}}{\log(1+i)}$$

$\underline{I\,\% = 0}$

$$PV = -(PMT \times n + FV) \qquad PMT = -\frac{PV+FV}{n}$$

$$FV = -(PMT \times n + PV) \qquad n = -\frac{PV+FV}{PMT}$$

$$\alpha = (1+ i\times S)\times \frac{(1)(-)\beta}{i} \quad \beta = (1 + i)^{(-)(n)}$$

$$S = \begin{cases} 0 \text{ .... Plačilo: Konec (Nastavitveni} \\ 1 \text{ .... Plačilo: Začetek (Nastavitveni} \end{cases} \qquad i = \begin{cases} \dfrac{I\%}{100} \text{ .... } (P/Y = C/Y = 1) \\ \left(1+\dfrac{I\%}{100\times[C/Y]}\right)^{\frac{C/Y}{P/Y}} -1 \text{.... (razen zgoraj} \end{cases}$$

u ***I* %**

<u>i (efektivna obrestna mera)</u>

i (efektivna obrestna mera) se izračuna z Newtonovo metodo.

$$PV + \alpha \times PMT + \beta \times FV = 0$$

<u>Na I % iz i (efektivna obrestna mera)</u>

$$\text{I\%} = \begin{cases} i \times 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (P/Y = C/Y = 1) \\ \left\{ (1+i)^{\frac{P/Y}{C/Y}} - 1 \right\} \times \text{C/Y} \times 100 \ldots \text{(razen zgoraj} \end{cases}$$

n .... število sestavljenih obdobij

I% .... letna obrestna mera

PV .... sedanja vrednost

PMT ...... plačilo

FV.......... prihodnja vrednost

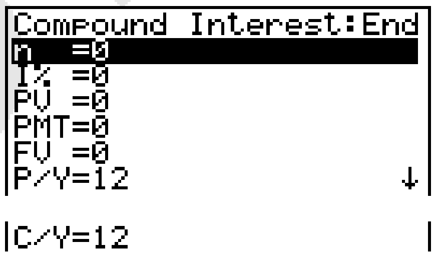
P/Y......... obrokov na leto

C/Y......... obdobja obrestovanja na leto

• Vplačilo je označeno s plusom (+), izplačilo pa z minusom (–).

Na zaslonu Finančno 1 pritisnite 2(CMPD), da se prikaže naslednji zaslon za vnos sestavljenih obresti.

2(CMPD)



n .... število sestavljenih obdobij

I .... letna obrestna mera

PV .... sedanja vrednost (znesek posojila v primeru posojila; glavnica v primeru varčevanja)

PMT ...... plačilo za vsak obrok (plačilo v primeru posojila; vloga v primeru varčevanja)

FV .... prihodnja vrednost (neplačani znesek v primeru posojila; glavnica plus obresti v primeru varčevanja)

P/Y......... obrokov na leto

C/Y......... obdobja obrestovanja na leto

Pomembno!

Vnos vrednosti

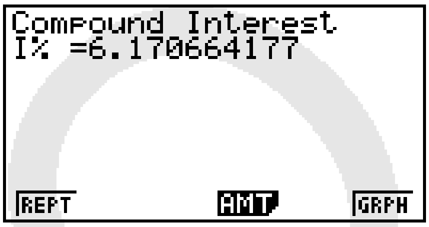
Obdobje (n) je izraženo kot pozitivna vrednost. Bodisi sedanja vrednost (PV) bodisi prihodnja vrednost (FV) je pozitivna, medtem ko je druga (PV ali FV) negativna.

Natančnost

Ta kalkulator izvaja izračune obresti z Newtonovo metodo, ki daje približne vrednosti, na katerih natančnost lahko vplivajo različne izračunske razmere. Zaradi tega je treba rezultate izračuna obresti, ki jih da ta kalkulator, uporabljati ob upoštevanju zgornje omejitve ali pa jih je treba preveriti.

Po konfiguraciji parametrov uporabite enega od spodaj navedenih funkcijskih menijev za izvedbo ustreznega izračuna.

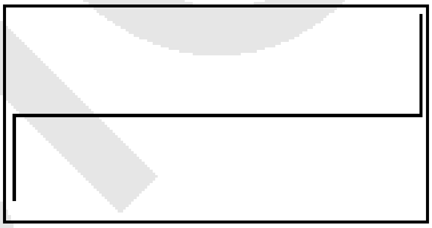
- {**n**} … {število sestavljenih obdobij}
- {**I%**} … {letna obrestna mera}
- {**PV**} … {sedanja vrednost} (posojilo: znesek posojila; varčevanje: saldo)
- {**PMT**} … {plačilo} (posojilo: obrok; prihranki: polog)
- {**FV**} … {prihodnja vrednost} (posojilo: neplačano stanje; prihranki: glavnica plus obresti)
- {**AMT**} … {zaslon amortizacije}



- Če parametri niso pravilno nastavljeni, se pojavi napaka (Ma ERROR).

Za premikanje med zasloni z rezultati izračunov uporabite naslednje funkcionalne menije.

- {**REPT**} … {zaslon za vnos parametrov}
- {**AMT**} … {zaslon amortizacije}
- {**GRPH**} … {nariše graf}



Po risanju grafa lahko pritisnete !1(TRCE), da vklopite sledenje in preberete rezultate izračuna vzdolž grafa.

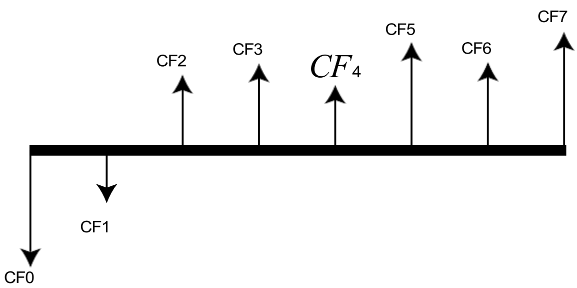
Pritisnite J, da se vrnete na zaslon za vnos parametrov.

4. Denarni tok (ocena naložbe)

Ta kalkulator uporablja metodo diskontiranega denarnega toka (DCF) za izvedbo ocene naložbe s seštevanjem denarnega toka za določeno obdobje. Ta kalkulator lahko izvede naslednje štiri vrste ocene naložbe.

- Neto sedanja vrednost (*NPV*)
- Neto prihodnja vrednost (*NFV*)
- Notranja stopnja donosa (*IRR*)
- Obdobje povračila (*PBP*)

Diagram denarnega toka, kot je prikazan spodaj, pomaga vizualizirati gibanje sredstev.



Na tem grafu je začetni znesek naložbe predstavljen s CF0. Denarni tok eno leto kasneje je prikazan s CF1, dve leti kasneje s CF2 in tako naprej.

Oceno naložbe je mogoče uporabiti za jasno ugotavljanje, ali naložba prinaša dobiček, ki je bil prvotno zastavljen.

---

u ***NPV***

$$NPV = CF_0 + \frac{CF_1}{(1+i)} + \frac{CF_2}{(1+i)^2} + \frac{CF_3}{(1+i)^3} + \dots + \frac{CF_n}{(1+i)^n} \qquad \left(i = \frac{I\%}{100}\right)$$

n: naravno število do 254

---

u ***NFV***

$$NFV = \mathrm{NPV} \times (1+i)^n$$

---

u ***IRR***

$$0 = CF_0 + \frac{CF_1}{(1+i)} + \frac{CF_2}{(1+i)^2} + \frac{CF_3}{(1+i)^3} + \dots + \frac{CF_n}{(1+i)^n}$$

V tej formuli je $NPV = 0$, vrednost IRR pa je enaka $i \times 100$. Treba pa je opozoriti, da se med nadaljnjimi izračuni, ki jih kalkulator izvede samodejno, nabirajo majhne decimalne vrednosti, zato NPV nikoli ne doseže točno nič. IRR je toliko natančnejši, kolikor se NPV približuje ničli.

---

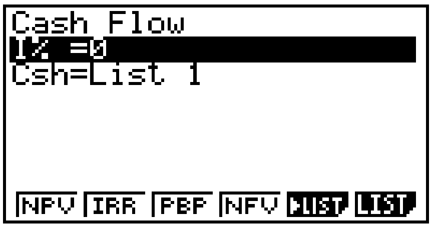
u ***PBP***

$$PBP = \begin{cases} 0 & \dots\dots (CF_0 > 0) \\ n - \dfrac{NPV_n}{NPV_{n+1} - NPV_n} & \dots\dots \text{(razen zgoraj navedenih)} \end{cases} \qquad NPV_n = \sum_{k=0}^{n} \frac{CF_k}{(1+i)^k}$$

n: najmanjše pozitivno celo število, ki izpolnjuje pogoje $NPV_n < 0$, $NPV_{n+1} > 0$ ali 0

Na zaslonu Finančno 1 pritisnite 3(CASH), da se prikaže naslednji zaslon za vnos denarnega toka.

3(CASH)

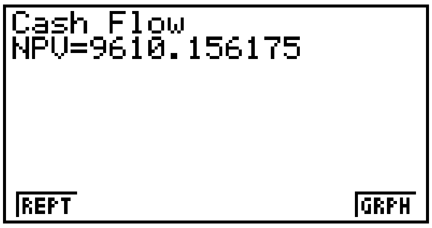


I .... obrestna mera

Csh .... seznam za denarni tok

Če še niste vnesli podatkov v seznam, pritisnite 5('LIST) in vnesite podatke v seznam.

Po nastavitvi parametrov uporabite enega od spodaj navedenih funkcijskih menijev za izvedbo ustreznega izračuna.



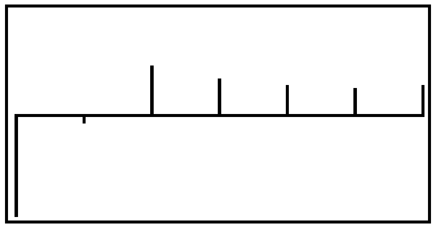
- {**NPV**} … {neto sedanja vrednost}
- {**IRR**} … {notranja stopnja donosa}
- {**PBP**} … {obdobje povračila}
- {**NFV**} … {neto prihodnja vrednost}
- {**'LIST**} … {vnos podatkov v seznam}
- {**LIST**} … {določi seznam za vnos podatkov}

• Če parametri niso pravilno konfigurirani, se pojavi napaka (Ma ERROR).

Za premikanje med zasloni z rezultati izračunov uporabite naslednje funkcionalne menije.

• {**REPT**} … {zaslon za vnos parametrov}

• {**GRPH**} … {riše graf}



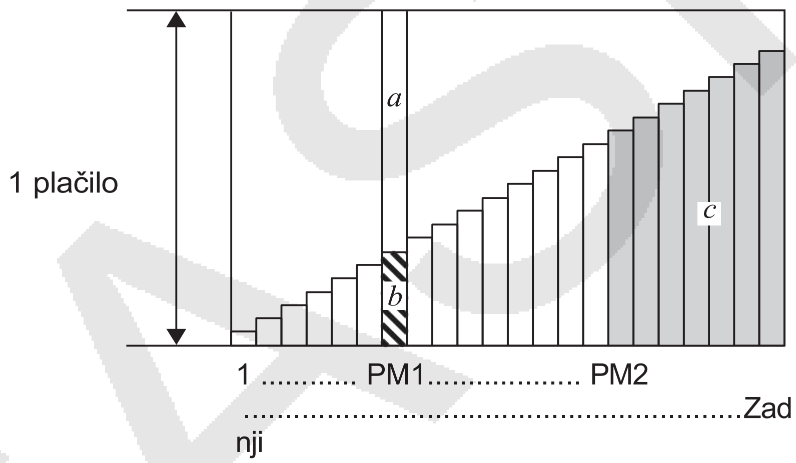
Po risanju grafa lahko pritisnete !1(TRCE), da vklopite sledenje in preberete rezultate izračuna rezultate vzdolž grafa.

Pritisnite J, da se vrnete na zaslon za vnos

5. Amortizacija

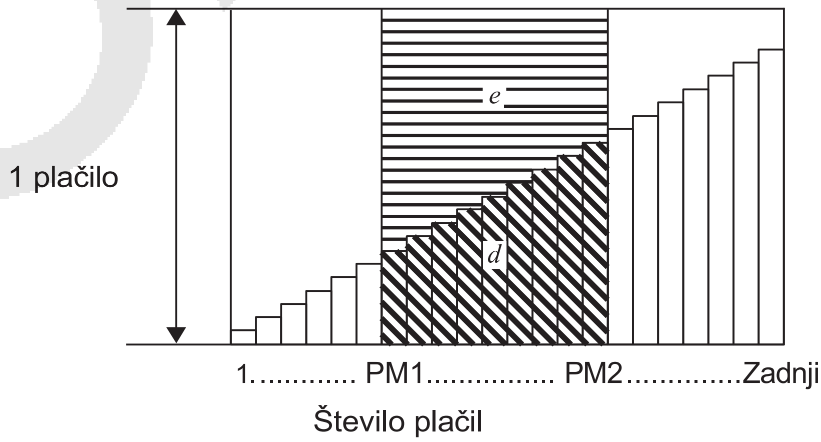
Ta kalkulator se lahko uporablja za izračun glavnice in obresti mesečnega obroka, preostale glavnice ter zneska glavnice in obresti, odplačanih do katerega koli trenutka.

u Formula



a: obrestni del obroka PM1 (*INT*)

b: glavni del obroka PM1 (*PRN*)



d: skupni znesek glavnice od obroka PM1 do plačila obroka PM2 (Σ *PRN*)

e: skupni znesek obresti od obroka PM1 do plačila obroka PM2 (Σ *INT*)

**a* + *b* = eno odplačilo (*PMT*)

a : $INT_{PM1} = |\ BAL_{PM1-1} \times i\ | \times (\text{znak } PMT)$

b : $PRN_{PM1} = PMT + BAL_{PM1-1} \times i$

c : $BAL_{PM2} = BAL_{PM2-1} + PRN_{PM2}$

d : $\sum_{PM1}^{PM2} PRN = PRN_{PM1} + PRN_{PM1+1} + \ldots + PRN_{PM2}$

e : $\sum_{PM1}^{PM2} INT = INT_{PM1} + INT_{PM1+1} + \ldots + INT_{PM2}$

$BAL_0 = PV$ ($INT_1 = 0$ in $PRN_1 = PMT$ na začetku obdobja obrokov)

---

u **Pretvorba med nominalno obrestno mero in efektivno obrestno mero**

Nominalna obrestna mera (vrednost I%, ki jo vnese uporabnik) se pretvori v efektivno obrestno mero ($I\%'$) za obročne kredite, pri katerih se število obrokov na leto razlikuje od števila obdobij za izračun sestavljenih obresti.

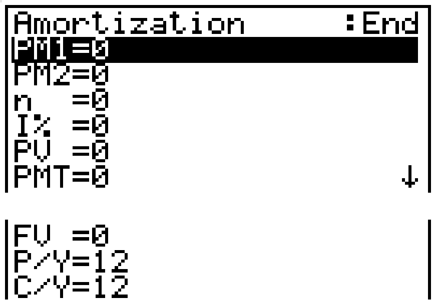
$$I\%' = \left\{\left(1+\frac{I\%}{100\times[C/Y]}\right)^{\frac{[P/Y]}{[C/Y]}} - 1\right\} \times 100$$

Naslednji izračun se opravi po pretvorbi nominalne obrestne mere v efektivno obrestno mero, rezultat pa se uporabi za vse nadaljnje izračune.

$$i = I\%' \div 100$$

Na zaslonu Finančno 1 pritisnite 4(AMT), da se prikaže naslednji zaslon za vnos amortizacije.

4(AMT)



PM1 .... prvi obrok obrokov od 1 do n

PM2 .... drugi obrok od obrokov 1 do n

n .... obroki

I .... obrestna mera

PV .... glavnica

PMT ...... plačilo za vsak obrok

FV .... saldo po zadnjem obroku

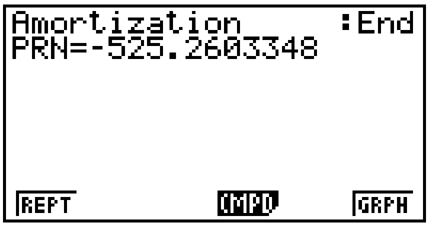
P/Y......... obrokov na leto

C/Y......... obrestne mere na leto

Po nastavitvi parametrov uporabite enega od spodaj navedenih funkcijskih menijev za izvedbo ustreznega izračuna.

- {**BAL**} … {stanje glavnice po obroku PM2}
- {**INT**} … {obrestni del obroka PM1}
- {**PRN**} … {glavnica obroka PM1}

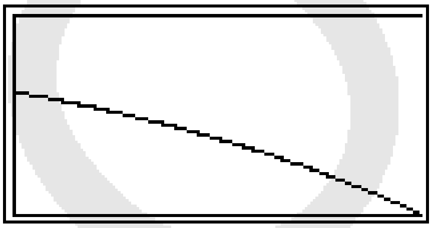
- {Σ **INT**} … {skupni plačani obresti od obroka PM1 do obroka PM2}
- {Σ **PRN**} … {skupni znesek glavnice, plačan od obroka PM1 do obroka PM2}
- {**CMPD**} … {zaslon za obrestno mero}



- Če parametri niso pravilno nastavljeni, se pojavi napaka (Ma ERROR).

Za premikanje med zasloni z rezultati izračunov uporabite naslednje funkcionalne menije.

- {**REPT**} … {zaslon za vnos parametrov}
- {**CMPD**} … {zaslon za obrestno mero}
- {**GRPH**} … {risanje grafa}



Po risanju grafa lahko pritisnete !1(TRCE), da vklopite sledenje in preberete rezultate izračuna vzdolž grafa.

Prvi pritisk na !1(TRCE) prikaže *INT* in *PRN,* ko je n = 1. Vsak pritisk na e prikaže *INT* in *PRN*, ko je n = 2, n = 3 itd.

Pritisnite J, da se vrnete na zaslon za vnos parametrov.

6. Pretvorba obrestne mere

Postopki v tem poglavju opisujejo, kako pretvoriti letno odstotno stopnjo v efektivno obrestno mero.

u **Formula**

$$EFF = \left[\left(1 + \frac{APR/100}{n}\right)^{n} - 1\right] \times 100$$

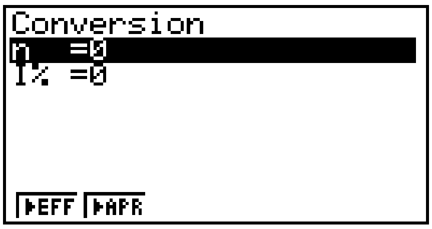
$$APR = \left[\left(1 + \frac{EFF}{100}\right)^{\frac{1}{n}} - 1\right] \times n \times 100$$

APR: letna efektivna obrestna mera (%)
EFF: efektivna obrestna mera (%)
n : število obrestnih obdobij

Na zaslonu Finančno 1 pritisnite 5(CNVT), da se prikaže naslednji zaslon za vnos za pretvorbo obrestne mere.

5(CNVT)

n .... število obrestnih obdobij
I .... obrestna mera



Po nastavitvi parametrov uporabite enega od spodaj navedenih funkcijskih menijev za izvedbo ustreznega izračuna.

- {'EFF} … {pretvori letno odstotno stopnjo v efektivno obrestno mero}
- {'APR} … {pretvori efektivno obrestno mero v letno odstotno mero}

- Če parametri niso pravilno nastavljeni, se pojavi napaka (Ma ERROR).

Za premikanje med zasloni z rezultati izračunov uporabite naslednji meni funkcij.

- {**REPT**} … {zaslon za vnos parametrov}

7. Stroški, prodajna cena, marža

Stroške, prodajno ceno ali maržo lahko izračunate z vnosom drugih dveh vrednosti.

---

u **Formula**

$$CST = SEL\left(1 \quad \frac{MRG}{100}\right)$$

$$SEL = \frac{CST}{1 - \frac{MRG}{100}}$$

$$MRG(\%) = \left(1 - \frac{CST}{SEL}\right) \times 100$$

CST : stroški
SEL : prodajna cena
MRG : marža

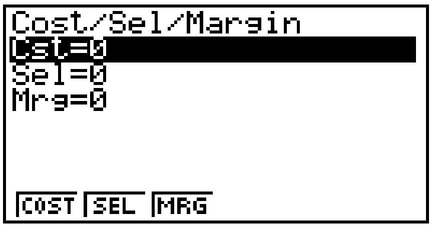
Na zaslonu Finančno 2 pritisnite 1(STROŠKI), da se prikaže naslednji zaslon za vnos.

6(g)1(COST)

Cst .... stroški

Sel .... prodajna cena

Mrg .... marža



Po konfiguraciji parametrov uporabite enega od spodaj navedenih funkcijskih menijev za izvedbo ustreznega izračuna.

- {**COST**} … {stroški}
- {**SEL**} … {prodajna cena}
- {**MRG**} … {marža}

- Če parametri niso pravilno nastavljeni, se pojavi napaka (Ma ERROR).

Za premikanje med zasloni z rezultati izračunov uporabite naslednji meni funkcij.

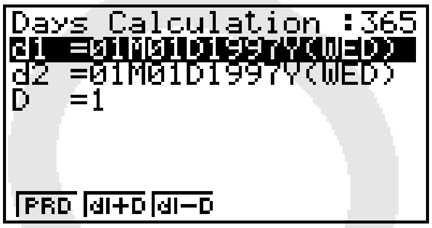
• {**REPT**} … {zaslon za vnos parametrov}

8. Izračuni dneva/datuma

Izračunate lahko število dni med dvema datumoma ali določite, kateri datum je določeno število dni pred ali po drugem datumu.

Na zaslonu Finančno 2 pritisnite 2(DAYS), da se prikaže naslednji zaslon za vnos za izračun dneva/datuma.

6(g)2(DAYS)



d1 .... datum 1

d2 .... datum 2

D............ število dni

Za vnos datuma najprej označite d1 ali d2. S pritiskom na številčno tipko za vnos meseca se na zaslonu prikaže vnosno okno, kot je prikazano spodaj.

Vnesite mesec, dan in leto ter po vsakem vnosu pritisnite w.

Po nastavitvi parametrov uporabite enega od spodaj navedenih funkcijskih menijev za izvedbo ustreznega izračuna.

• {**PRD**} … {število dni od d1 do d2 (d2 – d1)}

• {**d1+D**} … {d1 plus število dni (d1 + D)}

• {**d1–D**} … {d1 minus število dni (d1 – D)}

• Če parametri niso pravilno nastavljeni, se pojavi napaka (Ma ERROR).

Za premikanje med zasloni z rezultati izračunov uporabite naslednji meni funkcij.

• {**REPT**} … {zaslon za vnos parametrov}

• Na zaslonu Nastavitve lahko za finančne izračune določite leto s 365 ali 360 dnevi. Izračuni dneva/datuma se prav tako izvajajo v skladu z veljavno nastavitvijo števila dni v letu, vendar naslednjih izračunov ni mogoče izvesti, če je nastavljeno leto s 360 dnevi. Poskus izvedbe takšnega izračuna povzroči napako.

  (Datum) + (Število dni)

  (Datum) – (Število dni)

• Dovoljen razpon izračuna je od 1. januarja 1901 do 31. decembra 2099.

• **Izračuni v načinu 360 dni**

V nadaljevanju je opisano, kako se izvajajo izračuni, če je v nastavitvenem oknu za postavko Način datuma določeno 360.

• Če je d1 31. dan v mesecu, se d1 obravnava kot 30. dan v tem mesecu.

• Če je d2 31. dan v mesecu, se d2 obravnava kot 1. dan naslednjega meseca, razen če je d1 30. dan.

9. Amortizacija

Amortizacija vam omogoča izračun zneska, za katerega se lahko poslovni odhodki v danem letu izravnajo z dohodkom (amortizirajo).

- Ta kalkulator podpira naslednje štiri vrste izračunov amortizacije. linearna (SL), fiksni odstotek (FP), vsota letnih številk (SYD) ali degresivna (DB).
- Za izračun amortizacije za določeno obdobje se lahko uporabi katera koli od zgoraj navedenih metod. Tabela in graf amortiziranega zneska in neamortiziranega zneska v letu j.

---

u **Linearna metoda (SL)**

$$SL_1 = \frac{(PV-FV)}{n} \times \frac{\{Y-1\}}{12}$$

$$SL_j = \frac{(PV-FV)}{n}$$

$$SL_{n+1} = \frac{(PV-FV)}{n} \times \frac{12-\{Y-1\}}{12} \quad (\{Y-1\} \neq 12)$$

SL_j : amortizacijski strošek za j-to leto
n : življenjska doba
PV : prvotna cena (osnova)
FV : preostala knjigovodska vrednost
j : leto za izračun amortizacije strošek
Y−1 : število mesecev v prvem letu amortizacije

---

u **Metoda fiksnega odstotka (FP)**

$$FP_1 = PV \times \frac{I\%}{100} \times \frac{\{Y-1\}}{12}$$

$$FP_j = (RDV_{j-1} + FV) \times \frac{I\%}{100}$$

$$FP_{n+1} = RDV_n \quad (\{Y-1\} \neq 12)$$

$$RDV_1 = PV - FV - FP_1$$

$$RDV_j = RDV_{j-1} - FP_j$$

$$RDV_{n+1} = 0 \quad (\{Y-1\} \neq 12)$$

FP_j : amortizacijski odbitek za j-to leto
RDV_j : preostala amortizacijska vrednost ob koncu j-tega leta
I% : amortizacijski koeficient

---

u **Metoda vsote letnic (SYD)**

$$Z = \frac{n(n+1)}{2} \qquad n' = n - \frac{\{Y-1\}}{12}$$

$$Z' = \frac{(n' \text{ celo število } +1)(n' \text{ celo število } + 2*n' \text{ ulomek})}{2}$$

$$SYD_1 = \frac{n}{Z} \times \frac{\{Y-1\}}{12}(PV - FV)$$

$$SYD_j = \left(\frac{n'-j+2}{Z'}\right)(PV - FV - SYD_1) \quad (j \neq 1)$$

$$SYD_{n+1} = \left(\frac{n'-(n+1)+2}{Z'}\right)(PV - FV - SYD_1) \times \frac{12-\{Y-1\}}{12} \quad (\{Y-1\} \neq 12)$$

$$RDV_1 = PV - FV - SYD_1 \qquad RDV_j = RDV_{j-1} - SYD_j$$

SYD_j : amortizacijski odbitek za j-to leto

RDV_j : preostala amortizacijska vrednost ob koncu j-tega leta

u **Metoda padajočega salda (DB)**

$$DB_1 = PV \times \frac{I\%}{100n} \times \frac{Y-1}{12}$$

$$RDV_1 = PV - FV - DB_1$$

$$DB_j = (RDV_{j-1} + FV) \times \frac{I}{100n}$$

$$RDV_j = RDV_{j-1} - DB_j$$

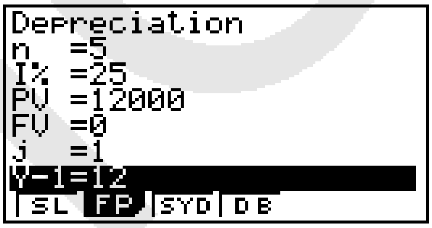
$$DB_{n+1} = RDV_n \qquad (\{Y-1\} \neq 12)$$

$$RDV_{n+1} = 0 \qquad (\{Y-1\} \neq 12)$$

DB_j : amortizacijski odbitek za j-to leto
RDV_j : preostala amortizacijska vrednost ob koncu j-tega leta
I : amortizacijski faktor

Na zaslonu Finančno 2 pritisnite 3(DEPR), da se prikaže naslednji zaslon za vnos podatkov za izračun amortizacije.

6(g)3(DEPR)



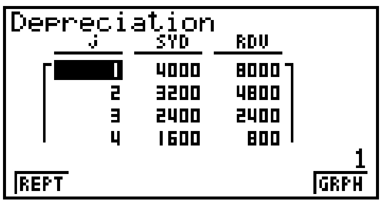
n .... uporabna življenjska doba
I .... odpisni koeficient v primeru metode fiksnega odstotka (FP), odpisni faktor v primeru metode degresivne amortizacije (DB)
PV .... prvotna vrednost (osnova)
FV .... ostala knjigovodska vrednost
j .... leto za izračun amortizacijskih stroškov
Y−1 .... število mesecev v prvem letu amortizacije

Po nastavitvi parametrov uporabite enega od spodaj navedenih funkcijskih menijev za izvedbo ustreznega izračuna.

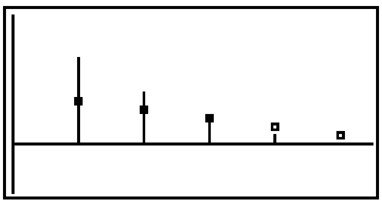
- {**SL**} … {Izračunajte amortizacijo za leto j z uporabo linearne metode}
- {**FP**} ... {**FP**}..... {Izračunaj amortizacijo za leto j z uporabo metode fiksnega odstotka}
  {**I%**} ..... {Izračunajte amortizacijsko stopnjo}
- {**SYD**} … {Izračunajte amortizacijo za leto j z uporabo metode vsote številk let}
- {**DB**} … {Izračunajte amortizacijo za leto j z uporabo metode degresivne amortizacije}

Primeri izhodnih rezultatov izračuna

{SYD}



{SYD} − {TABL}



{SYD} − {GRPH}

Če parametri niso pravilno nastavljeni, se pojavi napaka (Ma ERROR).

Za premikanje med zasloni z rezultati izračuna uporabite naslednji meni funkcij.

• {**REPT**} … {zaslon za vnos parametrov}

• {**TABL**} … {prikaže tabelo}

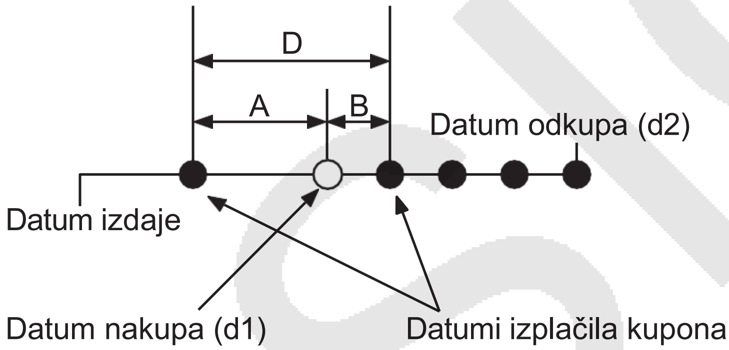
• {**GRPH**} … {nariše graf}

10. Izračuni obveznic

Izračun obveznic vam omogoča izračun nakupne cene ali letnega donosa obveznice.

Preden začnete z izračunavanjem obveznic, v oknu Nastavitve konfigurirajte nastavitve »Način datuma« in »Obdobja/leto« (stran 7-1).

u Formula



PRC : cena na 100 USD

nominalne vrednosti CPN : letna

kuponska stopnja (%) YLD :

donos do zapadlosti (%)

A : nabrani dnevi

M : število izplačil kuponov na leto (1 = letno, 2 = polletno)

N : število izplačil kuponov med datumom poravnave in datumom zapadlosti

RDB: odkupna cena ali cena odkupa na 100 USD nominalne vrednosti

D : število dni v kuponskem obdobju, v katerem pride do poravnave

B : število dni od datuma poravnave do naslednjega datuma izplačila kupona = D − A

INT : obračunane obresti

CST : cena, vključno z obrestmi

u Cena na 100 USD nominalne vrednosti (PRC)

• Za eno ali manj kuponskih obdobij do izplačila

$$PRC = -\frac{RDV + \dfrac{CPN}{M}}{1 + \left(\dfrac{B}{D} \times \dfrac{\text{YLD/100}}{M}\right)} + \left(\frac{\quad}{D} \times \frac{CPN}{M}\right)$$

• Za več kot eno obdobje kupona za unovčenje

$$PRC = -\frac{RDV}{\left(1+\frac{YLD/100}{M}\right)^{(N-1+B/D)}} - \sum_{k=1}^{N} \frac{\frac{CPN}{M}}{\left(1+\frac{YLD/100}{M}\right)^{(k-1+B/D)}} \quad \frac{A}{D} \times \frac{CPN}{M}$$

$$INT = -\frac{A}{D} \times \frac{CPN}{M} \qquad CST = PRC + INT$$

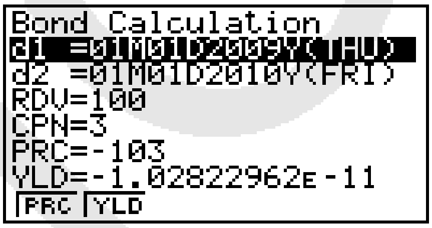
---

u Letni donos (YLD)

YLD se izračuna z Newtonovo metodo.

Na zaslonu Finančno 2 pritisnite 4(OBVEZNICE), da se prikaže naslednji zaslon za vnos za izračun obveznic.

6(g)4(BOND)



d1 .... datum nakupa (mesec, dan, leto)

d2 .... datum odkupa (mesec, dan, leto)

RDV ...... izplačilna cena na 100 USD nominalne vrednosti

CPN ...... kuponska stopnja

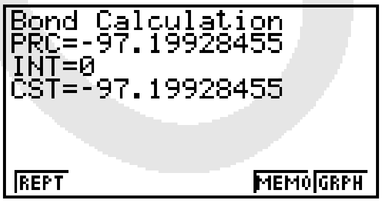
PRC....... cena na 100 USD nominalne vrednosti

YLD....... letni donos

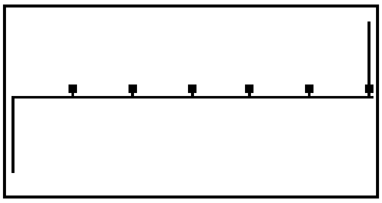
Po nastavitvi parametrov uporabite enega od spodaj navedenih funkcijskih menijev za izvedbo ustreznega izračuna.

• {**PRC**} … {Izračunajte ceno obveznice (PRC), natečene obresti (INT) in strošek obveznice (CST)}

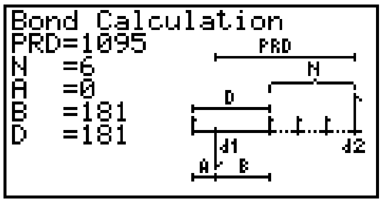
• {**YLD**} … {Izračunaj donos do zapadlosti}



{PRC}



{PRC} − {GRPH}



{PRC} − {MEMO}

Če parametri niso pravilno nastavljeni, se pojavi napaka (Ma ERROR).

Za premikanje med zasloni z rezultati izračuna uporabite naslednji meni funkcij.

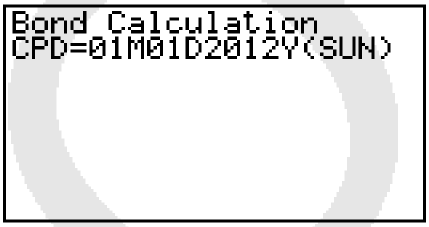
• {**REPT**} … {zaslon za vnos parametrov}

• {**GRPH**} … {riše graf}

• {**MEMO**} … {prikaže število dni, uporabljenih v izračunih}

Zaslon MEMO

- V nadaljevanju je opisano pomen elementov, prikazanih na zaslonu MEMO.
  - *PRD* ... število dni od d1 do d2
  - *N*......... število kuponskih plačil med datumom poravnave in datumom zapadlosti
  - *A*.......... nabrani dnevi
  - *B* .... število dni od datuma poravnave do datuma naslednjega plačila kupona (D−A)
  - *D*......... število dni v obdobju kupona, v katerem pride do poravnave
- Vsaka pritisk na tipko w, ko je prikazan zaslon MEMO, preklopi prikaz dneva izplačila kupona (CPD) zaporedno od leta izplačila do leta nakupa. To velja le, če je nastavitev „Date Mode“ (Način datuma) na zaslonu „Setup“ (Nastavitve) „365“.



11. Finančne kalkulacije z uporabo funkcij

Pomembno!

- Naslednjih operacij ni mogoče izvesti na fx-7400GIII.

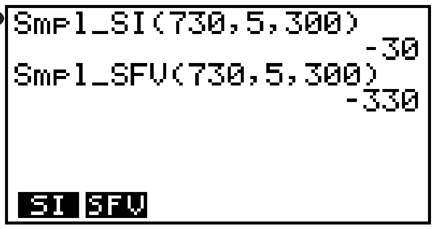
V načinu **RUN • MAT** ali **PRGM** lahko uporabite posebne funkcije za izvajanje izračunov, ki so enaki finančnim izračunom v načinu **TVM**.

Primer **Za izračun skupnih obresti in glavnice, plačanih za 2-letno (730-dnevno) z enostavno letno obrestno mero 5 %. Uporabite nastavitev Date Mode (Način datuma) 365.**

1. V glavnem meniju vstopite v način **RUN • MAT**.
2. Pritisnite tipke, kot je prikazano.

K6(g)6(g)6(g)1(TVM)
1(SMPL)1(SI)hd$\boxed{0}$,f,
d$\boxed{0}\boxed{0}$)w

2(SFV)hd$\boxed{0}$,f,d$\boxed{0}\boxed{0}$)
w



- Za spreminjanje nastavitve načina datuma uporabite zaslon za nastavitev načina **TVM** (!m(SET UP)). Nastavitev lahko spremenite tudi s posebnimi ukazi (DateMode365, DateMode360) v načinu **PRGM**.
- Podrobnosti o tem, kaj lahko storite s funkcijami za finančne izračune in njihovo sintakso, najdete v poglavju „Izvedba finančnih izračunov v programu“ (stran 8-38).

Poglavje 8 Programiranje

Pomembno!

Vnos v načinu **PRGM** se vedno izvaja z uporabo linearne vnosne/izhodne funkcije.

1. Osnovni koraki programiranja

Ukazi in izračuni se izvajajo zaporedno, tako kot ročni izračuni z več stavki.

1. V glavnem meniju vstopite v način **PRGM**. Ko to storite, se na zaslonu prikaže seznam programov.

Izbrano programsko področje (za premikanje uporabite f in c)

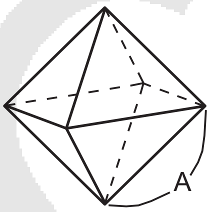
Datoteke so razvrščene po abecednem redu imen.

2. Registrirajte ime datoteke.
3. Vnesite program.
4. Zaženite program.

- Vrednosti desno od seznama programov označujejo število bajtov, ki jih uporablja vsak program.
- Ime datoteke je lahko dolgo do osem znakov.
- V imenu datoteke lahko uporabite naslednje znake: A do Z, r, θ, presledki, [,], {, }, ’, ”, ~, 0 do 9, ., +, –, ×, ÷
- Za registracijo imena datoteke se porabi 32 bajtov pomnilnika.

Primer **Izračunajte površino (cm²) in prostornino (cm³) treh pravilnih oktaedrov, če je dolžina ene stranice 7, 10 oziroma 15 cm.**

Shranite izračunsko formulo pod imenom datoteke OCTA.



Spodaj so formule, ki se uporabljajo za izračun površine S in prostornine V pravilnega oktaedra, za katerega je znana dolžina ene stranice A.

$$S = 2\sqrt{3}\,A^2 , \quad V = \frac{\sqrt{2}}{3}\,A^3$$

① m PRGM

2 3(NOVO) j (O) I (C) / (T) v (A) w

3 ! J (PRGM) 4 (?) a a v (A) 6 (g) 5 (:)

c * ! x (') d * a v (A) x 6 (g) 6 (g) 5 (^)

! x (') c / d * a v (A) M

d J J

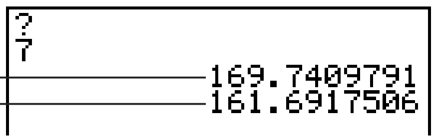
4 1(EXE) ali w

hw(Vrednost A)

w

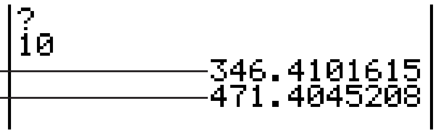
S, ko je A = 7

V, ko je A = 7



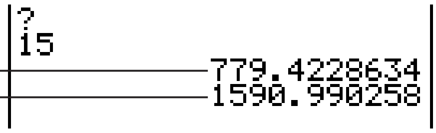
ww
b□0w
w

S, ko je A = 10
V, ko je A = 10



ww
bfw
w*1

S, ko je A = 15
V, ko je A = 15



*1 S pritiskom na w, ko je končni rezultat programa na zaslonu, zaprete program.

- Program lahko zaženete tudi v načinu **RUN • MAT** (ali **RUN**) z vnosom: Prog "<ime datoteke>" w.
- Če med prikazom končnega rezultata programa, izvedenega s to metodo, pritisnete w, se program ponovno izvede.
- Napaka se pojavi, če programa, ki ga določa Prog "<ime datoteke>", ni mogoče najti.

2. Funkcijske tipke v načinu PRGM

u Funkcijski meni seznama datotek

Če v pomnilniku ni programskih datotek, se prikažeta samo funkcijska menija {NEW} in {LOAD}.

- {**EXE**}/{**EDIT**} ... program {izvedi}/{uredi}
- {**NEW**} ... {nov program}
- {**DEL**}/{**DEL · A**} ... izbriši {določen program}/{vse programe}
- {**SRC**}/{**REN**} ... ime datoteke {poišči}/{spremeni}
- {**SV · AS**} ... shrani program kot besedilno datoteko
- {**LOAD**} ... pretvori besedilno datoteko v program in jo shrani

u Ko registrirate ime datoteke

- {**RUN**}/{**BASE**} ... {splošni izračun}/{številčna osnova} vnos programa
- {Q} ... {registracija gesla}
- {**SYBL**} ... {simbolni meni}

u Ko vnašate program —— 1(RUN) … privzeto

- {**TOP**}/{**BTM**} ... {vrh}/{dno} programa
- {**SRC**} ... {iskanje}
- {**MENU**} ... {meni načina}
-
  ... {statistika}/{matrika}/{seznam}/{graf}/{dinamični graf}/{tabela}/{rekurenca} meni
- {↔ **a**} ... {preklaplja med vnosom velikih in malih črk}
- {**CHAR**} ... {prikaže zaslon za izbiro različnih matematičnih simbolov, posebnih simbolov in znakov z naglasom}

* Ni vključeno v fx-7400GIII

• S pritiskom na !J(PRGM) se prikaže naslednji programski (PRGM) meni.

• {**COM**} ... {meni programskih ukazov}
• {**CTL**} ... {meni ukazov za nadzor programa}
• {**JUMP**} ... {meni ukazov za skok}
• {**?**}/{**^**} ... {ukaz za vnos}/{ukaz za iznos}
• {**CLR**}/{**DISP**} ... {izbriši}/{prikaži} ukazni meni
• {**REL**} ... {meni pogojnega skoka relacijski operator}
• {**I/O**} ... {meni ukazov za nadzor/prenos I/O}
• {**:**} ... {ukaz z več stavki}
• {**STR**} ... {ukaz niza}

Za podrobnejše informacije o posameznih ukazih glejte „Referenca ukazov“ na straneh 8–9.

• S pritiskom na gumb !m(SET UP) se prikaže spodnji meni ukazov načina.

• {**SIML**}/{**S-WIN**}/{**LIST**}/{**LOCS**}*/{**T-VAR**}/{**Σ DSP**}*/{**RESID**}/{**CPLX**}/{**FRAC**}/{**Y • SPD**}*/

* Ni vključeno v fx-7400GIII

Za podrobnosti o posameznih ukazih glejte „Meniji funkcijskih tipk zaslona za nastavitve“ na strani 1-31.

---

u Pri vnosu programa —— 2(BASE)*1

• {**TOP**}/{**BTM**}/{**SRC**}
• {**MENU**}
  • {**d~o**} ... {decimal}/{hexadecimal}/{binary}/{octal} vnos vrednosti
  • {**LOG**} ... {bitni operator}
  • {**DISP**} ... pretvorba prikazane vrednosti v {decimalno}/{heksadecimalno}/{binarno}/{oktalno}
• {**↔ a**}/{**SYBL**}

• S pritiskom na !J(PRGM) se prikaže naslednji meni PRGM (PROGRAM).

• {**Prog**} ... {ponovni priklic programa}
• {**JUMP**}/{**?**}/{**^**}
• {**REL**} ... {meni pogojnega skoka relacijskega operatorja}
• {**:**} ... {ukaz z več stavki}

• S pritiskom na !m(SET UP) se prikaže spodnji meni ukazov načina.

•

*1 Programi, vneseni po pritisku na 2(BASE), so označeni z B desno od imena datoteke.

3. Urejanje vsebine programa

■ Odpravljanje napak v programu

Problem v programu, ki preprečuje pravilno delovanje programa, se imenuje »bug«, proces odpravljanja takšnih problemov pa se imenuje »odpravljanje napak«. Kateri koli od naslednjih simptomov kaže, da vaš program vsebuje napake, ki jih je treba odpraviti.

- Napake, ki se pojavijo med izvajanjem programa
- Rezultati, ki niso v skladu z vašimi pričakovanji

u Odpravljanje napak, ki povzročajo sporočila o napakah

Napaka, kot je prikazana na desni, se prikaže, kadar se med izvajanjem programa pojavi nekaj nezakonitega.

Ko se prikaže takšno sporočilo, pritisnite J, da se prikaže mesto v programu, kjer je prišlo do napake. Kazalec bo utripal na mestu, kjer je prišlo do napake. V „Tabeli sporočil o napakah“ (stran α-1) preverite, kakšne ukrepe morate sprejeti, da odpravite napako.

- Upoštevajte, da pritisk na tipko J ne prikaže mesta napake, če je program zaščiten z geslom.

u Odprava napak, ki povzročajo slabe rezultate

Če vaš program daje rezultate, ki niso takšni, kot bi jih normalno pričakovali, preverite vsebino programa in naredite potrebne spremembe.

1(TOP)... Premakne kurzor na vrh programa

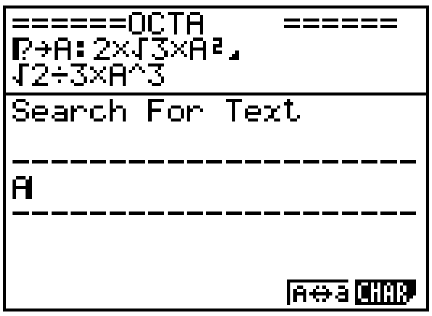
2(BTM)... Premakne kurzor na dno programa

■ Iskanje podatkov znotraj programa

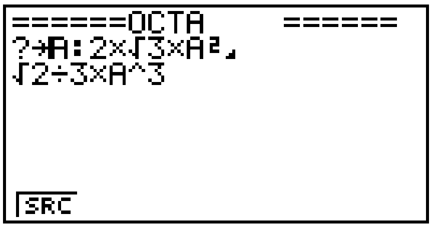
Primer **Iskanje črke „A“ znotraj programa z imenom OCTA**

1. Ponovno odprite program.
2. Pritisnite 3(SRC) in vnesite podatke, ki jih želite poiskati.

3(SRC)
av(A)



3. Pritisnite w, da začnete iskanje. Vsebina programa se prikaže na zaslonu, kurzor pa se nahaja na prvem pojavu podatkov, ki ste jih navedli.*[1]



4. Vsaka pritisk na w ali 1(SRC) povzroči, da se kurzor premakne na naslednji primer podatkov, ki ste jih določili.*[2]

*[1] Sporočilo „Ni najdeno“ se prikaže, ko v programu ni mogoče najti podatkov, ki ste jih določili.

*[2] Če ni več primerov podatkov, ki ste jih določili, se iskanje konča.

- Za podatke, ki jih iščete, ne morete določiti simbola za novo vrstico (_) ali ukaza za prikaz (^).
- Ko se vsebina programa prikaže na zaslonu, lahko s pomočjo tipk za premikanje kurzorja kurzor premaknete na drugo mesto, preden poiščete naslednji primer podatkov. Ko pritisnete w, se poišče samo del programa, ki se začne na trenutnem mestu kurzorja.
- Ko iskanje najde primer vaših podatkov, vnos znakov ali premikanje kurzorja povzroči prekinitev iskanja.
- Če med vnašanjem znakov za iskanje naredite napako, pritisnite AC , da izbrišete vneseno in ponovno vnesete od začetka.

4. Upravljanje datotek

■ Brisanje programa

u Če želite izbrisati določen program

1. Ko je seznam programov prikazan na zaslonu, s tipkama f in ② premaknite označbo na ime programa, ki ga želite izbrisati.
2. Pritisnite 4(DEL).
3. Pritisnite 1(YES), da izbrišete izbrani program, ali 6(NO), da prekinete postopek, ne da bi kaj izbrisali.

u Za izbris vseh programov

1. Ko je seznam programov prikazan na zaslonu, pritisnite 5(DEL • A).
2. Pritisnite 1 (DA), da izbrišete vse programe na seznamu, ali 6 (NE), da prekinete postopek, ne da bi kaj izbrisali.

- Vse programe lahko izbrišete tudi tako, da v glavnem meniju vstopite v način **MEMORY**. Podrobnosti najdete v poglavju 11 Upravitelj pomnilnika.

Iskanje datoteke

u Iskanje datoteke z iskanjem po začetnih črkah

Primer **Če želite s pomočjo iskanja po začetnih črkah priklicati program z imenom OCTA**

1. Ko je na zaslonu prikazan seznam programov, pritisnite 6(g)1(SRC) in vnesite začetne črke datoteke, ki jo želite poiskati.

   6(g)1(SRC)

   (O) (C) (T)

2. Za iskanje pritisnite w.
   - Ime, ki se začne z vnesenimi znaki, se poudari.

- Če ni programa, katerega ime datoteke se začne z vnesenimi znaki, se na zaslonu prikaže sporočilo »Not Found« (Ni najdeno). V tem primeru pritisnite J, da izbrišete sporočilo o napaki.

Urejanje imena datoteke

1. Ko je na zaslonu prikazan seznam programov, s tipkama f in ② premaknite označitev na datoteko, katere ime želite urediti, in nato pritisnite 6(g)2(REN).
2. Naredite želene spremembe.
3. Pritisnite w, da registrirate novo ime in se vrnete na seznam programov.

Seznam programov se ponovno razvrsti glede na spremembe, ki ste jih naredili v imenu datoteke.

- Če so spremembe, ki ste jih naredili, povzročile, da je ime datoteke enako imenu programa, ki je že shranjen v pomnilniku, se prikaže sporočilo »Že obstaja«. V tem primeru lahko izvedete eno od naslednjih dveh operacij, da popravite situacijo.
  - Pritisnite J, da izbrišete napako in se vrnete na zaslon za urejanje imena datoteke.
  - Pritisnite AC , da izbrišete ime datoteke in vnesete novo.

Pretvarjanje programov in besedilnih datotek

Programe, ustvarjene na tem kalkulatorju, lahko pretvorite v besedilno datoteko in jih nato uredite z besedilnim urejevalnikom ali drugo aplikacijo na računalniku. Besedilne datoteke, ustvarjene in urejene na računalniku, lahko pretvorite v program, ki ga lahko izvajate na kalkulatorju.

u Pravila za pretvorbo programov in besedilnih datotek

Pretvarjanje programskih in besedilnih datotek je podvrženo naslednjim pravilom.

- Nekateri znaki v imenu programa se samodejno nadomestijo, rezultat pa se dodeli kot ime datoteke, kadar program pretvorite v besedilno datoteko. Ko pretvorite besedilno datoteko v program, se ime programa dodeli s pretvorbo v nasprotni smeri.

Znakov imena programa	Znaki imena besedilne datoteke
r	_r_
θ	_t_
Vodilni/končni presledki	_s_
"	_q_
Vodilne/končne pike	_p_
×	_x_
÷	_d_
+	_+_
–	_-_

- Pri pretvorbi iz programa v besedilno datoteko se besedilni datoteki dodajo naslednje informacije v glavi.

  'Način programa: RUN (program v načinu

  RUN) 'Način programa: BASE (program v

  načinu BASE)
- Pretvorba besedilne datoteke, ki vsebuje zgornje informacije v glavi, v program pretvori v program v načinu, ki je določen v informacijah v glavi. Besedilo vrstice z informacijami v glavi ni vključeno v pretvorjeni program.
- Pretvorba programa v besedilno datoteko povzroči, da se vse ukaze, specifične za znanstveni kalkulator CASIO, v programu nadomestijo s posebnimi ustreznimi nizi znakov. Nasprotno, pretvorba iz besedilne datoteke v program pretvori posebne nize znakov nazaj v ustrezne ukaze. Za informacije o ukazih programa in ustreznih posebnih nizih znakov glejte „Posebni ukazi znanstvenega kalkulatorja CASIO⇔ na tabela pretvorbe besedila“ (stran 8-46).

---

u Pretvorba programa v besedilno datoteko

1. Na seznamu programov uporabite f in ②, da označite ime programa, ki ga želite pretvoriti v besedilno datoteko.
2. Pritisnite 6(g)3(SV • AS).
   - S tem se začne pretvorba v besedilno datoteko. Po končani pretvorbi se prikaže sporočilo „Končano!“. Za zaprtje pogovornega okna s sporočilom pritisnite J.
   - Rezultatna besedilna datoteka se shrani v mapo PROGRAM v pomnilniku, pod imenom, ki je v osnovi enako imenu izvirne datoteke, razen nekaterih posebnih znakov. Podrobnosti o izjemah pri posebnih znakih najdete v »Pravila pretvorbe programov in besedilnih datotek« (stran 8-6).

Pomembno!

Program, ki je zaščiten z geslom, ni mogoče pretvoriti v besedilno datoteko.

---

u Samodejna pretvorba iz besedilnih datotek v programe

Vsakič, ko prekinete USB-povezavo med kalkulatorjem in računalnikom, se vse besedilne datoteke, ki so bile med povezavo prenesene iz računalnika v pomnilnik Storage Memory\@MainMem\PROGRAM\, samodejno pretvorijo v programe in shranijo v glavni pomnilnik kalkulatorja.

Za podrobnosti glejte „Prenos podatkov med kalkulatorjem in osebnim računalnikom“ (stran 13-4).

u **Pretvorba besedilne datoteke v program**

Pomembno!

Če uporabite spodnji postopek za pretvorbo besedilne datoteke v program, se bo program ustvaril in shranil pod imenom, ki je v bistvu enako imenu izvirne datoteke, razen nekaterih posebnih znakov. Podrobnosti o izjemah pri posebnih znakih najdete v poglavju „Pravila pretvorbe programov in besedilnih datotek“ (stran 8-6).

Če je v pomnilniku že program z istim imenom kot program, ustvarjen s pretvorbo, bo obstoječi program samodejno prepisan z novim
programom. Če ne želite, da se obstoječi program prepiše, pred izvedbo tega postopka spremenite njegovo ime v seznamu programov.

1. Kopirajte besedilno datoteko, ki jo želite pretvoriti v program, v korenski imenik pomnilnika kalkulatorja.
   - Za informacije o postopku kopiranja datotek iz računalnika ali drugega kalkulatorja v pomnilnik tega kalkulatorja glejte „Poglavje 13 Podatkovna komunikacija“.
2. V glavnem meniju vstopite v način **PRGM**.
3. Na seznamu programov pritisnite 6(g)4(LOAD).

• Prikaže se seznam map in besedilnih datotek, ki so trenutno v korenskem imeniku pomnilnika.

4. S tipkama f in ② premaknite označitev na besedilno datoteko, ki jo želite pretvoriti, in nato pritisnite
   1(OPEN).

■ Registriranje gesla

Pri vnosu programa ga lahko zaščitite z geslom, ki omeji dostop do vsebine programa na tiste, ki poznajo geslo.

• Za zagon programa gesla ni treba vnašati.

• Postopek za vnos gesla je enak postopku za vnos imena datoteke.

1. Ko je na zaslonu seznam programov, pritisnite 3(NEW) in vnesite ime datoteke novega programa.
2. Pritisnite 5(Q) in vnesite geslo.
3. Pritisnite w, da registrirate ime datoteke in geslo. Sedaj lahko vnesete vsebino programske datoteke.
4. Po vnosu programa pritisnite (QUIT), da zaprete programsko datoteko in se vrnete na seznam programov. Datoteke, ki so zaščitene z geslom, so označene z zvezdico desno od imena datoteke.

■ Povrnitev programa, zaščitenega z geslom

1. Na seznamu programov uporabite f in ②, da označite ime programa, ki ga želite priklicati.
2. Pritisnite 2(EDIT).
3. Vnesite geslo in pritisnite w, da prikličete program.

• Če pri priklicu programa, zaščitenega z geslom, vnesete napačno geslo, se prikaže sporočilo „Mismatch“ (Neustrezno).

5. Referenca ukazov

■ Indeks ukazov

V nadaljevanju so navedene konvencije, ki se uporabljajo v tem poglavju pri opisovanju različnih ukazov.

Poudarjen tekst .... Dejanski ukazi in drugi elementi, ki jih je vedno treba vnesti, so prikazani v krepkem tisku.

{Oklepaji}....................... Zavite oklepaje se uporabljajo za obkroževanje več elementov, od katerih je eden

je treba izbrati pri uporabi ukaza. Pri vnosu ukaza ne vnašajte oklepajev.

[Kvadratne oklepaje]....... Kvadratne oklepaje se uporabljajo za obkroževanje elementov, ki so neobvezni. Pri vnosu ukaza ne

vnašajte oglatih oklepajev, ko vnašate ukaz.

Številčni izrazi .... Številčni izrazi (kot so 10, 10 + 20, A) označujejo konstante, izračune, številčne konstante itd.

Alfa znaki....................... Alfa znaki označujejo dobesedne nize (kot npr. AB).

Osnovni operativni ukazi

? (ukaz za vnos)

Funkcija: Zahteva vnos vrednosti za dodelitev spremenljivkam med izvajanjem programa.

Sintaksa: ?→ <ime spremenljivke>, "<vprašanje>" ?→ <ime spremenljivke>

Primer: ?→ A_

Opis:

- Ta ukaz začasno prekine izvajanje programa in zahteva vnos vrednosti ali izraza za dodelitev spremenljivki. Če ne določite poziva, se ob izvedbi tega ukaza prikaže znak „?“, ki označuje, da je kalkulator pripravljen za vnos. Če je poziv določen, se prikaže „<poziv>?“ za poziv k vnosu. Za poziv je mogoče uporabiti do 255 bajtov besedila.
- Vnos v odgovor na ukaz za vnos mora biti vrednost ali izraz, izraz pa ne sme biti večstavčni.
- Kot ime spremenljivke lahko navedete ime seznama, ime matrike, ime vektorja, pomnilnik niza, pomnilnik funkcije (fn), graf (Yn) itd.

^ (ukaz za izhod)

Funkcija: Prikaže vmesni rezultat med izvajanjem programa.

Opis:

- Ta ukaz za trenutek prekine izvajanje programa in prikaže besedilo z alfa znaki ali rezultat izračuna tik pred ukazom.
- Ukaz za izpis je treba uporabiti na mestih, kjer bi običajno pritisnili tipko w. ključ med ročnim izračunom.

: (ukaz z več stavki)

Funkcija: Poveže dve izjavi za zaporedno izvedbo brez ustavitve.

Opis:

- Za razliko od ukaza za izhod (^), se stavki, povezani z ukazom za več stavkov, izvajajo brez prekinitve.
- Ukaz za več stavkov se lahko uporabi za povezovanje dveh izračunskih izrazov ali dveh ukazov.
- Namesto ukaza za več stavkov lahko uporabite tudi vrstni znak, označen z _.

_ (vrnitev vozila)

Funkcija: Povezuje dve izjavi za zaporedno izvedbo brez ustavitve.

Opis:

- Delovanje vrnitve vozila je enako kot pri ukazu za več stavkov.
- V programu lahko ustvarite prazno vrstico tako, da vnesete samo vrnitev vozila. Uporaba vrnitve vozila namesto ukaza za več stavkov olajša branje prikazanega programa.

’ (Ločevalnik komentarjev)

Funkcija: Označuje komentarno besedilo, vstavljeno v program.

Opis: Vnos apostrofa (’) na začetku vrstice povzroči, da se vse od začetka vrstice do naslednjega večvrstnega ukaza (:), vrnitve vozila (_) ali izhodnega ukaza (^) obravnava kot komentarno besedilo, ki se med izvajanjem ignorira.

■ Programski ukazi (COM)

If~Then~(Else~)IfEnd

Funkcija: Izjava Then se izvede samo, če je pogoj If resničen (nenulen). Izjava Else se izvede, če je pogoj If napačen (0). Izjava IfEnd se vedno izvede po izjavi Then ali Else.

Sintaks a: If <pogoj> { — : ^ } Potem <izjava> [{ — : ^ } <izjava>]
številčni izraz

{ — : ^ } (Else <izjava> [{ — : ^ } <izjava>] { — : ^ }) IfEnd

Parametri: pogoj, numerični izraz

Opis:

(1) Če ~ Potem ~ IfEnd

- Ko je pogoj resničen, se izvajanje nadaljuje z izjavo Then in nato z izjavo, ki sledi IfEnd.
- Ko je pogoj lažen, izvedba preskoči na izjavo, ki sledi IfEnd.

(2) If ~ Then ~ Else ~ IfEnd

- Ko je pogoj resničen, se izvajanje nadaljuje z izjavo Then in nato skoči na izjavo, ki sledi IfEnd.
- Ko je pogoj lažen, izvedba preskoči na izjavo Else in nato nadaljuje z izjavo, ki sledi IfEnd.

For~To~(Step~)Next

Funkcija: Ta ukaz ponovi vse med izjavo For in izjavo Next. Začetna vrednost se pri prvem izvajanju dodeli kontrolni spremenljivki, vrednost kontrolne spremenljivke pa se pri vsakem izvajanju spremeni v skladu s stopnjo vrednosti. Izvajanje se nadaljuje, dokler vrednost kontrolne spremenljivke ne preseže končne vrednosti.

Sintaksa: For <začetna vrednost>→ <ime kontrolne spremenljivke> To <končna vrednost>

(Korak <vrednost koraka>) { — : ^ } Naslednji

Parametri:

- ime kontrolne spremenljivke: A do Z
- začetna vrednost: vrednost ali izraz, ki ustvari vrednost (npr. sin x, A itd.)
- končna vrednost: vrednost ali izraz, ki ustvari vrednost (npr. sin x, A itd.)
- vrednost koraka: številčna vrednost (privzeto: 1)

Opis:

- Privzeta vrednost koraka je 1.
- Če je začetna vrednost manjša od končne vrednosti in je določena pozitivna vrednost koraka, se kontrolna spremenljivka pri vsakem izvajanju poveča. Če je začetna vrednost večja od končne vrednosti in je določena negativna vrednost koraka, se kontrolna spremenljivka pri vsakem izvajanju zmanjša.

Do~LpWhile

Funkcija: Ta ukaz ponavlja določene ukaze, dokler je njegov pogoj resničen (ni enak nič).

Sintaksa:

Do $\left\{ \begin{array}{c} \text{—} \\ : \\ \wedge \end{array} \right\}$ <izjava> $\left\{ \begin{array}{c} \text{—} \\ : \\ \wedge \end{array} \right\}$ LpWhile <pogoj>
številčni izraz

Parametri: izraz

Opis:

- Ta ukaz ponovi ukaze, vsebovane v zanki, dokler je njen pogoj resničen (nenulen). Ko pogoj postane neren (0), se izvajanje nadaljuje z izjavo, ki sledi izjavi LpWhile.
- Ker je pogoj za stavkom LpWhile, se pogoj preveri (preveri) po izvedbi vseh ukazov znotraj zanke.

While~WhileEnd

Funkcija: Ta ukaz ponovi določene ukaze, dokler je njegov pogoj resničen (ni enak nič).

Sintaks a:

While <pogoj> $\left\{ \begin{array}{c} \text{—} \\ : \\ \wedge \end{array} \right\}$ <izjava> $\left\{ \begin{array}{c} \text{—} \\ : \\ \wedge \end{array} \right\}$ Medtem koKonec
številčni izraz

Parametri: izraz

Opis:

- Ta ukaz ponovi ukaze, vsebovane v zanki, dokler je njen pogoj resničen (nenulen). Ko pogoj postane neren (0), se izvajanje nadaljuje z izjavo, ki sledi izjavi WhileEnd.
- Ker je pogoj naveden za izjavo While, se pogoj preveri (preveri) pred izvedbo ukazov znotraj zanke.

■ Ukazi za nadzor programa (CTL)

Prekinitev

Funkcija: Ta ukaz prekine izvajanje zanke in nadaljuje z naslednjim ukazom, ki sledi zanki.

Sintaksa: Break_

Opis:

- Ta ukaz prekine izvajanje zanke in nadaljuje z naslednjim ukazom po zanki.
- Ta ukaz se lahko uporabi za prekinitev izvajanja izraza For, izraza Do in izraza While.

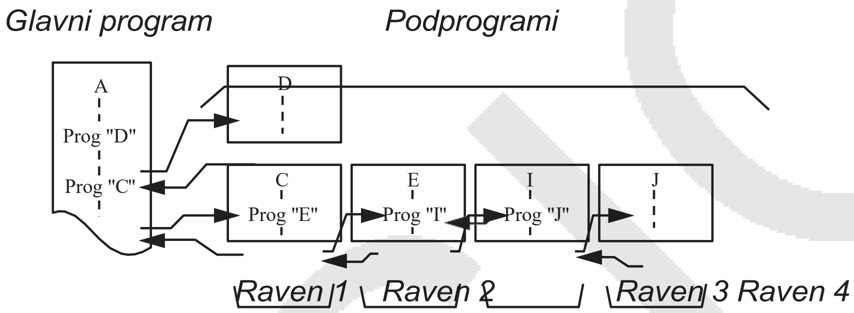
Prog

Funkcija: Ta ukaz določa izvajanje drugega programa kot podprograma. V načinu Način **RUN • MAT** (ali **RUN**) ta ukaz izvede nov program.

Sintaksa: Prog "ime datoteke"_

Primer: Prog "ABC"_ **Opis:**

- Tudi če je ta ukaz v zanki, njegova izvedba takoj prekine zanko in zažene podprogram.
- Ta ukaz se lahko uporabi tolikokrat, kolikor je potrebno znotraj glavne rutine, da se pokličejo neodvisne podprograme za izvedbo določenih nalog.
- Podprogram se lahko uporabi na več mestih v isti glavni rutini ali pa ga lahko pokliče poljubno število glavnih rutin.



- Klic podprograma povzroči, da se ta izvede od začetka. Po končani izvedbi podprograma se izvedba vrne v glavni program in nadaljuje z izjavo, ki sledi ukazu Prog.
- Ukaz Goto~Lbl znotraj podprograma je veljaven samo znotraj tega podprograma. Ne more se uporabiti za skok na oznako zunaj podprograma.
- Če podprogram z imenom datoteke, ki je določeno s ukazom Prog, ne obstaja, pride do napake.
- V načinu **RUN • MAT** (ali **RUN**) se z vnosom ukaza Prog in pritiskom na w zažene program, ki je določen z ukazom.

Vrnitev

Funkcija: Ta ukaz se vrne iz podprograma.

Sintaksa: Return_

Opis: Izvedba ukaza Return znotraj glavne rutine povzroči ustavitev izvajanja programa. Izvedba ukaza Return znotraj podprograma prekine podprogram in se vrne v program, iz katerega je bil podprogram poklican.

Stop

Funkcija: Ta ukaz prekine izvajanje programa.

Sintaksa: Stop_

Opis:

- Ta ukaz prekine izvajanje programa.
- Izvedba tega ukaza znotraj zanke prekine izvajanje programa, ne da bi se pojavila napaka.

■ Ukazi za skok (JUMP)

Dsz

Funkcija: Ta ukaz je skok s štetjem, ki zmanjša vrednost kontrolne spremenljivke za 1 in nato skoči, če je trenutna vrednost spremenljivke nič.

Sintaksa:

```
Spremenljivka Vrednost≠ 0
                                     _
Dsz <ime spremenljivke> : <izjava> { : } <izjava>
                                     ^
Spremenljivka Vrednost = 0
```

Parametri: ime spremenljivke: A do Z, r, θ

[Primer] Dsz B : Zmanjša vrednost, dodeljeno spremenljivki B, za 1.

Opis: Ta ukaz zmanjša vrednost kontrolne spremenljivke za 1 in jo nato preveri (preveri). Če je trenutna vrednost večja od nič, se izvajanje nadaljuje z naslednjim stavkom.
Če je trenutna vrednost nič, izvedba preskoči na izjavo, ki sledi večizjavi (:), ukaz za prikaz (^) ali vrnitev vozila (_).

Goto~Lbl

Funkcija: Ta ukaz izvede brezpogojni preskok na določeno mesto.

Sintaksa: Goto <ime oznake> ~ Lbl <ime oznake>

Parametri: ime oznake: vrednost (0 do 9), spremenljivka (A

do Z, r,θ) **Opis:**

- Ta ukaz je sestavljen iz dveh delov: Goto n (kjer je n parameter, kot je opisano zgoraj) in Lbl n (kjer je n parameter, na katerega se nanaša Goto n). Ta ukaz povzroči, da izvajanje programa preskoči na izjavo Lbl, katere parameter n se ujema s parametrom, določenim v izjavi Goto.
- Ta ukaz se lahko uporabi za vrnitev na začetek programa ali za skok na katero koli mesto znotraj programa.
- Ta ukaz se lahko uporablja v kombinaciji s pogojnimi skoki in skoki s štetjem.
- Če ni nobene Lbl-izjave, katere vrednost ustreza vrednosti, določeni v Goto-izjavi, pride do napake.

Isz

Funkcija: Ta ukaz je skok s štetjem, ki poveča vrednost kontrolne spremenljivke za 1 in nato skoči, če je trenutna vrednost spremenljivke nič.

Sintaksa:

```
Spremenljivka Vrednost≠ 0
                                     _
Isz <ime spremenljivke> : <izjava> { : } <izjava>
                                     ^
Spremenljivka Vrednost = 0
```

Parametri: ime spremenljivke: A do Z, r, θ

[Primer] Isz A : Poveča vrednost, dodeljeno spremenljivki A, za 1.

Opis: Ta ukaz poveča vrednost kontrolne spremenljivke za 1 in jo nato preveri (preveri). Če je trenutna vrednost večja od nič, se izvajanje nadaljuje z naslednjim stavkom.
Če je trenutna vrednost enaka nič, se izvajanje preskoči na izjavo, ki sledi ukazom z več izjavami (:), ukazom za prikaz (^) ali vrnitvijo vozila (_).

⇒ (Kod za preskok)

Funkcija: Ta koda se uporablja za nastavitev pogojev za pogojni skok. Skok se izvede, kadar so pogoji napačni.

Sintaksa:

True

<leva stran> <relacionalni operator> <desna stran>⇒ <izjava> { _ : ^ } <izjava>

Neraven

Parametri:

- leva stran/desna stran: spremenljivka (A do Z, r, θ), numerična konstanta, spremenljivčni izraz (na primer: A × 2)
- relacionalni operator: =,≠ , >, <,≥ ,≤ (stran 8-20)

Opis:

- Pogojni skok primerja vsebino dveh spremenljivk ali rezultate dveh izrazov, na podlagi rezultatov primerjave pa se odloči, ali se skok izvede ali ne.
- Če primerjava vrne resničen rezultat, se izvajanje nadaljuje z izjavo, ki sledi ⇒ . Če primerjava vrne lažni rezultat, se izvajanje preskoči na izjave, ki sledijo večizjavi (:), ukaz za prikaz (^) ali vrnitev vozila (_).

Men

Funkcija: Ustvari vejevit meni v programu.

Sintaksa: Menu "<niz (ime menija)>", "<niz (ime veje) 1>", <vrednost ali spremenljivka 1>, "<niz (ime veje) 2>" ,<vrednost ali spremenljivka 2>, ... ,"<niz (ime veje) n>", <vrednost ali spremenljivka n>

Parametri: vrednost (0 do 9), spremenljivka (A do Z, r, θ)

Opis:

- Vsak del "<niz (ime veje) n>" ,<vrednost ali spremenljivka n> je niz vej, vključiti pa je treba celoten niz vej.
- Vključiti je mogoče od dveh do devetih vejevalnih nizov. Napaka se pojavi, če je le en ali več kot devet vejevalnih nizov.
- Izbiranje veje v meniju med izvajanjem programa preskoči na enak tip oznake (Lbl n), kot je tisti, ki se uporablja v kombinaciji z ukazom Goto. Določitev „OK”, 3” za del „<niz (ime veje) n>”, <vrednost ali spremenljivka n>” določa preskok na Lbl 3.

Primer: Lbl 2_

Meniju »IS IT DONE?«, »OK«, 1, »EXIT«, 2_

Lbl 1_

»IT’S DONE !«

■ Jasna navodila (CLR)

ClrGraph

Funkcija: Ta ukaz izbriše grafični zaslon.

Sintaksa: ClrGraph_

Opis: Ta ukaz izbriše grafični zaslon med izvajanjem programa.

ClrList

Funkcija: Ta ukaz izbriše podatke seznama.

Sintaksa: ClrList <ime seznama>

ClrList

Parametri: ime seznama: 1 do 26, Ans

Opis: Ta ukaz izbriše podatke v seznamu, ki je določen z »ime seznama«. Če ni določeno nič za »ime seznama«, se izbrišejo vsi podatki v seznamu.

ClrMat	(Ni vključeno v fx-7400GIII)

Funkcija: Ta ukaz izbriše matrične podatke.

Sintaksa: ClrMat <ime matrike>

ClrMat

Parametri: ime matrike: A do Z, Ans

Opis: Ta ukaz izbriše podatke v matrični, ki je določena z »ime matrične«. Če ni določeno nič za »ime matrične«, se izbrišejo vsi podatki matrične.

ClrText

Funkcija: Ta ukaz počisti besedilni zaslon.

Sintaksa: ClrText_

Opis: Ta ukaz izbriše besedilo z zaslona med izvajanjem programa.

ClrVct	(Ni vključeno v fx-7400GIII)

Funkcija: Ta ukaz izbriše vektorske podatke.

Sintaksa: ClrVct <ime
vektorja> ClrVct

Parametri: ime vektorja: A do Z, Ans

Opis: Ta ukaz izbriše podatke v vektoru, ki je določen z »ime vektorja«. Če ni določeno ničesar za »ime vektorja«, se izbrišejo vsi vektorski podatki.

■ Ukazi za prikaz (DISP)

DispF-Tbl, DispR-Tbl*	* (Ni vključeno v fx-7400GIII)	Brez

Funkcija: Ti ukazi prikazujejo numerične tabele.

Opis:

- Ti ukazi ustvarjajo numerične tabele med izvajanjem programa v skladu s pogoji, opredeljenimi v programu.
- DispF-Tbl ustvari tabelo funkcij, medtem ko DispR-Tbl ustvari tabelo rekurzije.

DrawDyna	(Ni vključeno v fx-7400GIII)	Brez

Funkcija: Ta ukaz izvede operacijo risanja dinamičnega grafa.

Opis: Ta ukaz riše dinamični graf med izvajanjem programa v skladu z rišalnimi pogoji, opredeljenimi v programu.

DrawFTG-Con, DrawFTG-Plt	Brez

Funkcija: Ta ukaz uporablja vrednosti v ustvarjeni tabeli za grafično prikazovanje funkcije.

Opis:

- Ta ukaz nariše graf funkcije v skladu s pogoji, opredeljenimi v programu.
- DrawFTG-Con ustvari graf tipa connect, medtem ko DrawFTG-Plt ustvari graf tipa plot.

DrawGraph	Brez

Funkcija: Ta ukaz riše graf.

Opis: Ta ukaz nariše graf v skladu z risalnimi pogoji, opredeljenimi v programu.

DrawR-Con, DrawR-Plt	(Ni vključeno v fx-7400GIII)	Brez

Funkcija: Ti ukazi grafično prikazujejo rekurzivne izraze, *pri čemer* je (b_n ali c_n) navpična os, n pa vodoravna os.

Opis:

- Ti ukazi grafično prikazujejo rekurzivne izraze v skladu s pogoji, opredeljenimi v programu, *z* (b_n ali c_n) kot navpično osjo in n kot vodoravno osjo.
- DrawR-Con ustvari graf tipa connect, medtem ko DrawR-Plt ustvari graf tipa plot.

DrawRΣ -Con, DrawRΣ -Plt	(Ni vključeno v fx-7400GIII)	Brez

Funkcija: Ti ukazi grafično prikazujejo rekurzivne izraze, pri čemer jeΣa_n (Σb_n aliΣc_n) navpična os, n pa vodoravna os.

Opis:

- Ti ukazi grafično prikazujejo rekurzivne izraze v skladu s pogoji, opredeljenimi v programu, pri čemer jeΣin (Σb_n aliΣc_n) navpična os, n pa vodoravna os.
- DrawRΣ -Con ustvari graf tipa connect, medtem ko DrawRΣ -Plt ustvari graf tipa plot.

DrawStat

Funkcija: Nariše statistični graf.

Sintaksa: Glejte „Uporaba statističnih izračunov in grafikonov v programu” na strani 8-28.

Opis: Ta ukaz nariše statistični graf v skladu s pogoji, opredeljenimi v programu.

DrawWeb	(Ni vključeno v fx-7400GIII)

Funkcija: Ta ukaz nariše konvergenco/divergenco rekurzivnega izraza (WEB graf).

Sintaksa: DrawWeb <tip rekurzije>[, <število črt>]_

Primer: DrawWeb a_{n+1} (b_{n+1} ali c_{n+1}), 5_

Opis:

- Ta ukaz prikaže konvergenco/divergenco rekurzivnega izraza (WEB graf).
- Če število vrstic ni navedeno, se samodejno uporabi privzeta vrednost 30.

PlotPhase	(Ni vključeno v fx-7400GIII)

Funkcija: Prikaže fazni graf na podlagi numeričnih zaporedij, ki ustrezajo osi x in osi y.

Sintaksa: PlotPhase <ime numerične zaporedja osi x>, <ime numerične zaporedja osi y>

Opis:

- Za vsak argument je mogoče vnesti samo naslednje ukaze za določitev rekurzivne tabele.

  a_n, b_n, c_n, a_{n+1}, b_{n+1}, c_{n+1}, a_{n+2}, b_{n+2}, c_{n+2}, Σa_n, Σb_n, Σc_n, Σa_{n+1}, Σb_{n+1}, Σc_{n+1}, Σa_{n+2}, Σb_{n+2}, Σc_{n+2}

- Napaka v pomnilniku se pojavi, če določite ime številčnega zaporedja, ki nima vrednosti shranjenih v rekurzivni tabeli.

Primer: PlotPhase Σb_{n+1}, Σa_{n+1}

Nariše fazni grafikon z uporabo Σb_{n+1} za os x in Σa_{n+1} za os y.

■ Ukazi za vnos/iznos (I/O)

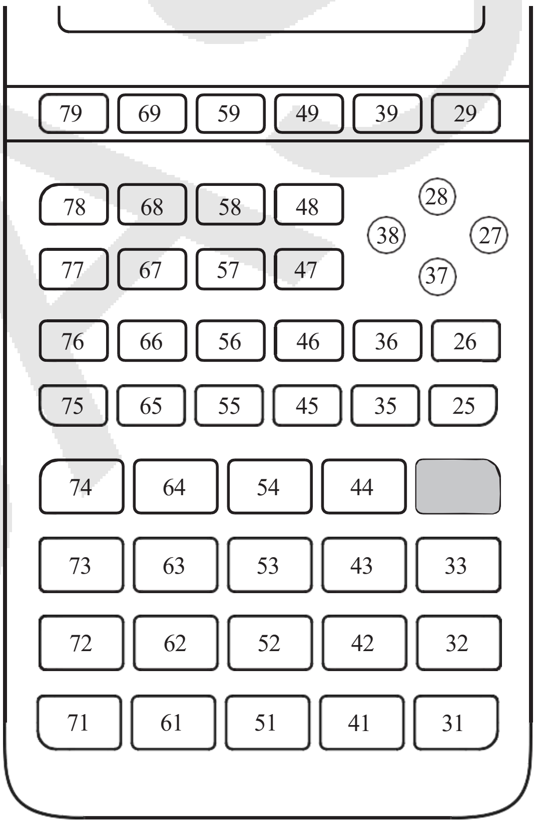
Getkey

Funkcija: Ta ukaz vrne kodo, ki ustreza zadnji pritisnjeni tipki.

Sintaksa: Getkey_

Opis:

- Ta ukaz vrne kodo, ki ustreza zadnji pritisnjeni tipki.



- Če pred izvedbo tega ukaza ni bil pritisnjen noben tipka, se vrne vrednost nič.
- Ta ukaz se lahko uporabi znotraj zanke.

Poišči

Funkcija: Ta ukaz prikaže alfanumerične znake na določeni lokaciji na besedilnem zaslonu.

Sintaksa: Poišči <številka stolpca>, <številka vrstice>, <vrednost>

Locate <številka stolpca>, <številka vrstice>, <številčni izraz>

Locate <številka stolpca>, <številka vrstice>, "<niz>"

[Primer] Poišči 1, 1, "AB"_

Parametri:

- številka vrstice: številka od 1 do 7
- številka stolpca: številka od 1 do 21
- vrednost in številčni izraz
- niz: niz znakov

Opis:

- Ta ukaz prikaže vrednosti (vključno z vsebino spremenljivk) ali besedilo na določeni lokaciji na besedilnem zaslonu. Če je vnesen izračun, se prikaže rezultat izračuna.
- Vrstica je označena z vrednostjo od 1 do 7, stolpec pa z vrednostjo od 1 do 21.

Primer: Cls_

Poišči 7, 1, »CASIO FX«

Ta program prikaže besedilo „CASIO FX“ na sredini zaslona.

- V nekaterih primerih je treba pred izvedbo zgornjega programa izvesti ukaz ClrText.

Receive(/ Send(

Funkcija: Ta ukaz prejema podatke iz povezane naprave in pošilja podatke v povezano napravo.

Sintaksa: Receive(<podatki>) / Send(<podatki>)

Opis:

- Ta ukaz sprejema podatke iz povezane naprave in pošilja podatke v povezano napravo.
- Ta ukaz lahko sprejema (pošilja) naslednje vrste podatkov.
  - Posamezne vrednosti, dodeljene spremenljivkam
  - Matrika podatkov (vse vrednosti – posamezne vrednosti ni mogoče določiti)
  - Podatki seznama (vse vrednosti – posamezne vrednosti ni mogoče določiti)

OpenComport38k / CloseComport38k

Funkcija: Odpre in zapre 3-pinski COM-vmesnik (serijski).

Opis: Glej ukaz Receive38k/Send38k spodaj.

Receive38k / Send38k

Funkcija**:** Izvede pošiljanje in sprejemanje podatkov s hitrostjo 38 kbps.

Sintaksa: Send38k <izraz>

Receive38k { <ime spremenljivke>
             <ime seznama> }

Opis:

- Pred izvedbo tega ukaza je treba izvesti ukaz OpenComport38k.
- Po izvedbi tega ukaza je treba izvesti ukaz CloseComport38k.
- Če se ta ukaz izvede, ko komunikacijski kabel ni priključen, se izvajanje programa nadaljuje brez napake.

■ Pogojni skoki Relacionalni operaterji (REL)

=,≠ , >, <,≥ , ≤

Funkcija: Ti relacijski operaterji se uporabljajo v kombinaciji s pogojnim skokom.

Sintaksa: <leva stran> <relacionalni operator> <desna stran>

Parametri:

- leva stran/desna stran: spremenljivka (A do Z, r, θ), numerična konstanta, spremenljivčni izraz (na primer: A× 2)
- relacionalni operator: =,≠ , >, <,≥ , ≤

■ Nizi

Niz je zaporedje znakov, zapisanih v dvojnih narekovajih. V programu se nizi uporabljajo za določanje prikazanega besedila. Niz, sestavljen iz številk (kot je „123“) ali izraza (kot je „x–1“), ni mogoče obdelati kot izračun.

Če želite niz prikazati na določeni lokaciji na zaslonu, uporabite ukaz Locate (stran 8-19).

- Če želite v niz vključiti dvojne narekovaje (") ali poševnico (\), pred dvojne narekovaje (") ali poševnico (\) vstavite poševnico (\).

  Primer 1: Če želite v niz vključiti Japonsko:
  „Tokio” v niz „Japonska:\"Tokio\""

  Primer 2: Če želite v niz vključiti main\abc,
  vnesite "main\\abc"

Nazajni pomišljaj lahko vnesete iz menija, ki se prikaže, ko v načinu **PRGM** pritisnete 6(CHAR)2(SYBL), ali iz kategorije Niz v katalogu, ki se prikaže, ko pritisnete $\boxed{4}$ (CATALOG).

- Nize lahko dodelite pomnilniku nizov (Str 1 do Str 20). Podrobnosti o nizih najdete v poglavju „Pomnilnik nizov“ (stran 2-8).
- Za povezovanje nizov znotraj argumenta lahko uporabite ukaz „+“ (stran 8-22).
- Funkcija ali ukaz znotraj nizne funkcije (Exp(, StrCmp(, itd.) se obravnava kot en znak. Na primer, funkcija „sin“ se obravnava kot en znak.

Exp(

Funkcija: Pretvori niz v izraz in izvede izraz.

Sintaksa: Exp("<niz>"[)]

Exp'Str(

Funkcija: Pretvori grafični izraz v niz in ga dodeli določeni spremenljivki.

Sintaksa: Exp'Str(<formula>, <ime spremenljivke niza>[)]

Opis: Kot prvi argument (<formula>) se lahko uporabi grafični izraz (Yn, r, Xt, Yt, X), rekurzivna formula (*an*, an+1, an+2, *bn*, bn+1, bn+2, *cn*, cn+1, cn+2) ali funkcionalni spomin (fn).

StrCmp(

Funkcija: Primerja „<niz 1>“ in „<niz 2>“ (primerjava znakovnih kod).

Sintaksa: StrCmp("<niz 1>", "<niz 2>"[)]

Opis: Primerja dve nizi in vrne eno od naslednjih vrednosti. Vrne 0, če je „<niz 1>“ = „<niz 2>“.

Vrne 1, če je „<niz 1>“ > „<niz 2>“.

Vrne –1, če je „<niz 1>“ < „<niz 2>“.

StrInv(

Funkcija: Obrati zaporedje niza.

Sintaksa: StrInv("<niz>"[)]

StrJoin(

Funkcija: Združi „<niz 1>” in „<niz 2>”.

Sintaksa: StrJoin("<niz 1>", "<niz 2>"[)]

Opomba: Enak rezultat lahko dosežete tudi z ukazom „+“ (stran 8-22).

StrLeft(

Funkcija: Kopira n-ti znak od leve.

Sintaksa: StrLeft("<niz>", n[)] (0 < n < 9999, n je naravno število)

StrLen(

Funkcija: Vrne dolžino niza (število njegovih znakov).

Sintaksa: StrLen("<niz>"[)]

StrLwr(

Funkcija: Pretvori vse znake niza v male črke.

Sintaksa: StrLwr("<niz>"[)]

StrMid(

Funkcija: Izvleče znake od n-tega do m-tega znaka niza.

Sintaksa: StrMid("<niz>", n [,m)]   ($0 < n < 9999$, n je naravno število)

Opis: Če izpustite „m“, se izvleče od n-tega znaka do konca niza.

StrRight(

Funkcija: Kopira niz do n-tega znaka od desne.

Sintaksa: StrRight("<niz>", n[)]   ($0 < n < 9999$, n je naravno število)

StrRotate(

Funkcija: Zavrti levi in desni del niza pri n-tem znaku.

Sintaksa: StrRotate("<niz>", [,n)]   ($-9999 < n < 9999$, n je celo število)

Opis: Če je „n“ pozitivno, se vrti v levo, če je „n“ negativno, pa v desno. Če „n“ ni navedeno, se uporabi privzeta vrednost +1.

Primer: StrRotate("abcde", 2)...............Vrne niz „cdeab”.

StrShift(

Funkcija: Premakne niz *za n* znakov v levo ali desno.

Sintaksa: StrShift("<niz>", [,n)]   ($-9999 < n < 9999$, n je celo število)

Opis: Premik je v levo, če je „n“ pozitivno, in v desno, če je „n“ negativno. Če „n“ ni navedeno, se uporabi privzeta vrednost +1.

Primer: StrShift("abcde", 2) .... Vrne niz „cde“.

StrSrc(

Funkcija: Išče »<niz 1>« od določene točke (n-ti znak od začetka niza), da ugotovi, ali vsebuje podatke, določene z »<niz 2>«. Če so podatki najdeni, ta ukaz vrne lokacijo prvega znaka »<niz 2>«, začenši od začetka »<niz 1>«..

Sintaksa: StrSrc("<niz 1>", "<niz 2>"[,n)]   ($0 < n < 9999$, n je naravno število)

Opis: Če izpustite začetno točko, se iskanje začne na začetku „<niz 1>“.

StrUpr(

Funkcija: Pretvori vse znake niza v velike črke.

Sintaksa: StrUpr("<niz>"[)]

+

Funkcija: Združi „<niz 1>” in „<niz 2>”.

Sintaksa: "<niz 1>"+"<niz 2>"

Primer: "abc"+"de"→ Str 1............. Določi „abcde” za Str 1.

■ Drugo

RclCapt

Funkcija: Prikaže vsebino, določeno s številko pomnilnika zajema.

Sintaksa: RclCapt <številka pomnilnika zajema> (številka pomnilnika zajema: 1 do 20)

6. Uporaba funkcij kalkulatorja v programih

■ Prikaz besedila

Besedilo lahko vključite v program tako, da ga preprosto vstavite med dvojne narekovaje. Takšno besedilo se prikaže na zaslonu med izvajanjem programa, kar pomeni, da lahko dodate oznake k pozivom za vnos in rezultatom.

Program	**Prikaz**
„CASIO“	CASIO
?→ X	?
„X =“ ?→ X	X = ?

• Če besedilu sledi izračunska formula, med besedilo in izračun vstavite ukaz za prikaz (^).

• Če vnesete več kot 21 znakov, se besedilo premakne na naslednjo vrstico. Zaslon se samodejno pomika, če besedilo presega 21 znakov.

• Za komentar lahko določite do 255 bajtov besedila.

■ Določanje oblike prikaza rezultata izračuna v programu

Lahko določite format prikaza rezultatov izračunov, ki so bili ustvarjeni v programu, kot je opisano spodaj.

• Število decimalnih mest: Fix <število mest> ... Število mest: od 0 do 9

• Število pomembnih števk: Sci <število števk> ... Število števk: od 0 do 9

• Normalni način prikazovanja: Norm <število*> ... Število: 1 ali 2

• Prikaz inženirskih simbolov vklopljen EngOn

• Prikaz inženirskih simbolov izklopljen EngOff

• Vklop/izklop preklapljanja inženirskega simbola Eng

* Vnos številke je mogoče izpustiti. Vnos brez številke, ko so nastavitve Fix, Sci in Norm 2 konfigurirane, bo preklopil na Norm 1. Če je nastavljen Norm 1, bo vnos preklopil na Norm 2.

■ Uporaba matričnih vrstnih operacij v programu (Ni na voljo na fx-7400GIII) Ti

ukazi omogočajo manipulacijo vrstic matrike v programu.

• Za ta program vstopite v način **RUN • MAT**, nato uporabite urejevalnik matrik za vnos matrike in vstopite v način **PRGM** za vnos programa.

u Zamenjava vsebine dveh vrstic (Swap)

Primer 1 **Zamenjava vrednosti vrstice 2 in vrstice 3 v naslednji matrici:**

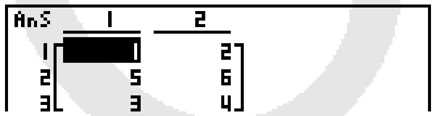
$$\textbf{Matrika A} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

Spodaj je navedena sintaksa, ki jo je treba uporabiti za ta program.

Zamenjaj A, 2, 3_

Vrstice, ki jih je treba
zamenjati Ime
matrike

Mat A



u Izračun skalarne množenja (`Row)

Primer 2 **Za izračun produkta vrstice 2 matrike v primeru 1 in skalarja 4**

Za ta program se uporabi naslednja sintaksa.

`Vrstica 4, A, 2_

Vrstica
Ime matrike
Multiplikator

Mat A

u Za izračun skalarnega množenja in dodajanje rezultatov v drugo vrstico (`Row+)

Primer 3 **Za izračun produkta vrstice 2 matrike iz primera 1 in skalarja 4, nato pa dodajanje rezultata k vrstici 3**

Spodaj je navedena sintaksa, ki jo je treba uporabiti za ta program.

`Vrstica+ 4, A, 2, 3_

Vrstice, ki jih je treba dodati
Vrstica, za katero je treba izračunati skalarnega
množenja Ime matrike
Množitelj

Mat A

u Za dodajanje dveh vrstic (Row+)

Primer 4 **Za dodajanje vrstice 2 k vrstici 3 matrike v primeru 1**

Spodaj je navedena sintaksa, ki jo je treba uporabiti za ta program.

Vrstica+ A, 2, 3_

Številka vrstice, ki jo želite
dodati Številka vrstice, ki jo
želite dodati Ime matrike

Mat A

■ Uporaba grafičnih funkcij v programu

Grafične funkcije lahko vključite v program, da narišete zapletene grafe in jih prekrivate drugega z drugim. Spodaj so prikazane različne vrste sintakse, ki jih morate uporabiti pri programiranju z grafičnimi funkcijami.

- V-okno — Pogled okna –5, 5, 1, –5, 5, 1_
- Vnos grafične funkcije — Y = Tip_ .... Določa tip grafa.
  „X^2 – 3“→ Y1*[1] _
- Operacija risanja grafa — DrawGraph_

*[1]Vnesite to Y1 z J4(GRPH)1(Y)b (prikazano kot Y1). Če vnesete „Y“ s tipkami kalkulatorja, se bo pojavila sintaktična napaka.

u Sintaksa drugih grafičnih funkcij

- V-Window — Okno pogleda <Xmin>, <Xmax>, <Xscale>, <Ymin>, <Ymax>, <Yscale>, <Tθ min>, <Tθ max>, <Tθ pitch>
  - StoV-Win <površina V-Win>...........površina: 1 do 6
  - RclV-Win <površina V-Win>...........površina: 1 do 6
- Slog
  - NormalG <površina grafa>.............površina: 1 do 20
  - NormalG <element rekurzivne formule>.........element: an+1, bn+1, itd.
  - ThickG <površina grafa>.................površina: 1 do 20
  - ThickG <element rekurzivne formule>.........element: an+1, bn+1, itd.
  - BrokenThickG <površina grafa> .....površina: 1 do 20
  - BrokenThickG <element rekurzivne formule>......... element: an+1, bn+1, itd.
  - DotG <površina grafa>....................površina: 1 do 20
  - DotG <element rekurzivne formule>.........element: an+1, bn+1, itd.
- Povečaj
  - Faktor <faktor X >, <faktor Y >
  - ZoomAuto. ....Neparametrični
- Pict
  - StoPict <površina slike>.................površina: 1 do 6 (površina slike: številčni izraz)
  - RclPict <površina slike> ....površina: 1 do 6 (površina slike: številčni izraz)
- Sketch
  - PlotOn <X-koordinata>, <Y-koordinata>
  - PlotOff <X-koordinata>, <Y-koordinata>

PlotChg <X-koordinata>, <Y-koordinata>

PxlOn <številka vrstice>, <številka

stolpca> PxlOff <številka vrstice>,

<številka stolpca> PxlChg <številka

vrstice>, <številka stolpca> PxlTest

<številka vrstice>, <številka stolpca>

Text <številka vrstice>, <številka stolpca>, "<besedilo>"

Besedilo <številka vrstice>, <številka stolpca>, <izraz>

SketchThick <izjava Sketch ali Graph>

SketchBroken <izjava Sketch ali Graph>

SketchDot <izjava Sketch ali Graph>

SketchNormal <izjava Sketch ali Graph>

Tangent <funkcija>, <X-koordinata>

Normalna <funkcija>, <X-koordinata>

Inverzna <funkcija>

Črta

F-črta <X-koordinata 1>, <Y-koordinata 1>, <X-koordinata 2>, <Y-koordinata 2>

Krog <središčna točka X-koordinata>, <središčna točka Y-koordinata>, <vrednost polmera R>

Navpična <X-

koordinata>

Vodoravna <Y-koordinata>

- Grafični pomnilnik StoGMEM <številka grafičnega pomnilnika> ...

  številka: 1 do 20 RclGMEM <številka grafičnega

  pomnilnika> ... številka: 1 do 20

■ Uporaba ozadja v programu

Nastavitev „Ozadje“ na zaslonu Nastavitve lahko spremenite iz programa.

- Sintaksa, ko je prikazana slika ozadja BG-

  Pict <območje slike> [,a] ... območje: 1 do 20

  Dodajanje črke „a“ na konec naloži vrednosti V-Window (ki so shranjene s podatki slike), ko se prikaže ozadje slike.

- Sintaksa, ko se slika v ozadju ne prikaže (ali je skrita) BG-

  None

■ Uporaba funkcij dinamičnega grafa v programu

Uporaba dinamičnih grafičnih funkcij v programu omogoča izvajanje ponavljajočih se dinamičnih grafičnih operacij. V nadaljevanju je prikazano, kako določiti dinamični grafični obseg znotraj programa.

- Območje

  dinamičnega grafa

1→ D Start_

5→ D End_

1→ D pitch_

■ Uporaba funkcij tabele in grafa v programu

Funkcije Table & Graph v programu lahko ustvarjajo numerične tabele in izvajajo grafične operacije. V nadaljevanju so prikazane različne vrste sintakse, ki jih morate uporabiti pri programiranju s funkcijami Table & Graph.

- Nastavitev obsega tabele

  1→ F Start_

  5→ F End_

  Plt_ 1→ F pitch_

- Ustvarjanje numerične

  tabele DispF-Tbl_

- Pogoji za ustvarjanje številčne tabele in grafa

  VarList <številka seznama> ... Ustvarjanje številčne tabele/grafa z uporabo navedenega seznama (številka: 1 do 26).

  VarRange ... Ustvarjanje številčne tabele/grafa z uporabo obsega tabele.

- Operacija risanja grafov

  Vrsta povezave: DrawFTG-Con_

  Vrsta risanja: DrawFTG-

■ Uporaba funkcij rekurzivne tabele in grafa v programu

Vključitev funkcij rekurzivne tabele in grafa v program vam omogoča ustvarjanje numeričnih tabel in izvajanje grafičnih operacij. V nadaljevanju so prikazani različni tipi sintakse, ki jih morate uporabiti pri programiranju s funkcijami rekurzivne tabele in grafa.

- Vnos rekurzivne formule

  an+1 Tip_ ....Določa vrsto rekurzije.

  "$3a_n$ + 2"→ an+1_

  "$4b_n$ + 6"→ bn+1_

- Nastavitev obsega tabele

  1→ R Start_

  5→ R Konec_

  1→ a0_

  2→ b0_

  1→ a_n Start_

  3→b_n Start_

- Ustvarjanje numerične tabele

  DispR-Tbl_

- Operacija risanja grafa

  Vrsta povezave: DrawR-Con_, DrawRΣ -Con_

  Vrsta risanja: DrawR-Plt_, DrawRΣ -Plt_

- Grafični prikaz statistične konvergence/divergence (grafikon WEB)

  DrawWeb an+1, 10_

■ Konfiguriranje nastavitev izračuna ostankov v programu

V programu lahko konfigurirate nastavitve izračuna ostankov in shranite vrednosti ostankov v določenem seznamu. Uporabite sintakso, kot je prikazana v spodnjih primerih.

- Za določitev seznama skladiščenja in izvedbo izračuna

  ostankov Resid-List <številka seznama>številka: 1 do

  26

- Za preskok izvedbe izračuna

  ostanka Resid-None

■ Določanje datoteke seznama za uporabo v programu

Lahko določite datoteko seznama, ki se uporablja pri izvajanju operacije seznama v programu. Oblike prikaza so prikazane v spodnjem primeru.

Datoteka <številka datoteke> ... številka: od 1 do 6

■ Uporaba funkcij razvrščanja seznama v programu

Te funkcije omogočajo razvrščanje podatkov v seznamih v naraščajočem ali padajočem vrstnem redu.

• Vzpenjajoči se red

① 2
SortA (Seznam 1, Seznam 2, Seznam 3)

Seznami, ki jih je treba razvrstiti (lahko jih je največ šest)

① 431 ② K11

• Padajoči red

3
SortD (Seznam 1, Seznam 2, Seznam 3)

Seznami, ki jih je treba razvrstiti (lahko se določi do šest)

3 432

■ Uporaba statističnih izračunov in grafikonov v programu

Vključitev statističnih izračunov in grafičnih operacij v program omogoča izračunavanje in grafično prikazovanje statističnih podatkov.

u Nastavitev pogojev in risanje statističnega grafa

Po ukazih StatGraph („S-Gph1”, „S-Gph2” ali „S-Gph3”) morate določiti naslednje pogoje za graf:

• Stanje risanja/nerisanja grafa (DrawOn/DrawOff)
• Vrsta grafa
• Lokacija podatkov na osi x (ime seznama)
• Lokacija podatkov na osi y (ime seznama)
• Lokacija podatkov o frekvenci (ime seznama)
• Vrsta oznake (križec, pika, kvadrat)
• Nastavitev prikaza krožnega diagrama (% ali podatki)
• Specifikacija seznama za shranjevanje podatkov o odstotkih v krožnem diagramu (Nič ali ime seznama)
• Podatki prvega stolpičastega grafa (ime seznama)
• Podatki drugega in tretjega stolpčnega diagrama (ime seznama)
• Usmeritev stolpčnega diagrama (dolžina ali vodoravno)

Zahtevani pogoji za grafikon so odvisni od vrste grafikona. Glejte „Spreminjanje parametrov grafikona“ (stran 6-1).

- V nadaljevanju je navedena tipična specifikacija pogojev grafa za razpršeni diagram ali graf

  xyLine. S-Gph1 DrawOn, Scatter, List 1, List 2, 1, Square __

  V primeru *xy*-črtastega grafa zamenjajte »Scatter« v zgornji specifikaciji z »xyLine«.

- Spodaj je navedena tipična specifikacija pogojev grafa za normalni verjetnostni

  diagram. S-Gph1 DrawOn, NPPlot, List 1, Square __

- Spodaj je prikazana tipična specifikacija pogojev za enovariabilni graf. S-Gph1

  DrawOn, Hist, List 1, List 2 __

  Enako obliko je mogoče uporabiti za naslednje vrste grafov, tako da preprosto zamenjate »Hist« v z ustreznim tipom grafa.

  Histogram .... Hist   Normalna porazdelitev.......... N-Dist

  Mediana Box .... MedBox*1   Prekinjena črta .... Prekinjena

  *1Izstopajoče vrednosti:Vklopljene   Izstopajoče vrednosti: izklopljene

  S-Gph1 DrawOn, MedBox, List 1, 1, 1   S-Gph1 DrawOn, MedBox, List 1, 1, 0

- Spodaj je prikazana tipična specifikacija pogojev za regresijski graf. S-Gph1

  DrawOn, Linear, List 1, List 2, List 3 __

  Enako obliko je mogoče uporabiti za naslednje vrste grafikonov, tako da v zgornji specifikaciji preprosto zamenjate »Linear«
  v zgornji specifikaciji z ustreznim tipom grafa.

  Linearna regresija .... Linear   Logaritemska regresija .... Log

  Med-Med........................ Med-Med   Eksponentna regresija.......... Exp(a·*e*ˆ*bx)*

  Kvadratna regresija .... Kvadratna

  Exp(a·bˆx) Kubična regresija .... Kubična

  Potencionalna regresija .... Potencna

  Kvadratna regresija .... Kvadrat

- Spodaj je tipična specifikacija pogojev grafa za sinusoidni regresijski graf. S-Gph1

  DrawOn, Sinusoidal, List 1, List 2 __

- Spodaj je tipična specifikacija pogojev za logistični regresijski graf. S-Gph1 DrawOn,

  Logistic, List 1, List 2 __

- Spodaj je prikazana tipična specifikacija pogojev za krožni grafikon.

  S-Gph1 DrawOn, Pie, List 1, %, None _

- Spodaj je prikazana tipična specifikacija pogojev za stolpični grafikon.

  S-Gph1 DrawOn, Bar, List 1, None, None, StickLength __

- Za risanje statističnega grafa vstavite ukaz »DrawStat« za specifikacijo pogoja grafa
  .

  ClrGraph

  S-Wind Auto

  {1, 2, 3}→ Seznam 1

  {1, 2, 3}→ Seznam 2

  S-Gph1 DrawOn, Scatter, List 1, List 2, 1, Square _

  DrawStat

■ Uporaba porazdelitvenih grafikonov v programu (Ni na voljo na fx-7400GIII)

Za risanje porazdelitvenih grafikonov v programu se uporabljajo posebni ukazi.

• Za risanje normalnega kumulativnega porazdelitvenega grafa

① DrawDistNorm <Lower>, <Upper> [,σ, μ]

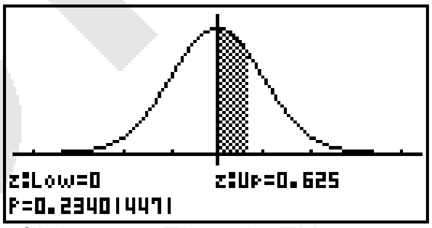
- μ — Povprečje *populacije**[1]
- σ — *Standardni* odmik *populacije**[1]
- Upper — *Zgornja meja podatkov*
- Lower — *Spodnja meja podatkov*

① 4151

*[1] To se lahko izpusti. Če se ti elementi izpustijo, se izračun opravi z uporabo σ = 1 in μ = 0.

$$p=\frac{1}{\sqrt{2\pi}\sigma}\int_{Spodnji}^{Zgornji} e^{-\frac{(x-\mu)^2}{2\sigma^2}}dx \qquad ZLow=\frac{Spodnji-\mu}{\sigma} \qquad ZUp=\frac{Zgornji-\mu}{\sigma}$$

• Izvedba DrawDistNorm izvede zgornji izračun v skladu z določenimi pogoji in nariše graf. V tem trenutku se na grafu izpolni območje ZLow < x < ZUp.



• Hkrati se vrednosti izračuna p, ZLow in ZUp dodelijo spremenljivkam p, ZLow in ZUp, p pa se dodeli Ans.

• Za risanje grafa kumulativne porazdelitve *Student-t*

① DrawDistT <Lower>, <Upper>, <df>

- df — *Stopnja svobode*
- Upper — *Zgornja meja podatkov*
- Lower — *Spodnja meja podatkov*

① 4152

$$p=\int_{Spodnji}^{Zgornji}\frac{\Gamma\left(\frac{df+1}{2}\right)}{\Gamma\left(\frac{df}{2}\right)}\times\frac{\left(1+\frac{x^2}{df}\right)^{-\frac{df+1}{2}}}{\sqrt{\pi\times df}}dx \qquad tLow = spodnji \qquad tUp = Zgornji$$

• Izvedba DrawDistT izvede zgornji izračun v skladu z določenimi pogoji in nariše graf. V tem trenutku se na grafu izpolni območje Lower < x < Upper.

• Hkrati se vrednost izračuna p ter spodnja in zgornja vhodna vrednost dodelijo spremenljivkam p, tLow in tUp, p pa se dodeli Ans.

- **Za risanje kumulativnega porazdelitvenega grafa ( ) (2)**

① DrawDistChi <Lower>, <Upper>, <df>

Stopnja svobode
Zgornja meja podatkov
Spodnja meja podatkov

① 4153

$$p = \int_{Nižji}^{Upper} \frac{1}{\Gamma\left(\frac{df}{2}\right)} \times \left(\frac{1}{2}\right)^{\frac{df}{2}} \times x^{\left(\frac{df}{2} -\right)} \times e^{-\frac{x}{2}}\, dx$$

- Izvedba DrawDistChi izvede zgornji izračun v skladu z določenimi pogoji in nariše graf. V tem trenutku se izpolni spodnji < x < zgornji del grafa.
- Hkrati se rezultat izračuna p dodeli spremenljivkama p in Ans.

- **Za risanje grafa kumulativne porazdelitve *F***

① DrawDistF <Lower>, <Upper>, <ndf>, <ddf>

Stopnje svobode imenovalca
Stopnje svobode števca
Zgornja meja podatkov
Spodnja meja podatkov

① 4154

$$p = \int_{Spodn}^{Zgornja} \frac{\Gamma\left(\frac{ndf + ddf}{2}\right)}{\Gamma\left(\frac{ndf}{2}\right) \times \Gamma\left(\frac{ddf}{2}\right)} \times \left(\frac{ndf}{ddf}\right)^{\frac{ndf}{2}} \times x^{\left(\frac{ndf}{2} - 1\right)} \times \left(1 + \frac{ndf \times x}{ddf}\right)^{-\frac{ndf + ddf}{2}} dx$$

- Izvedba DrawDistF izvede zgornji izračun v skladu z določenimi pogoji in nariše graf. V tem trenutku se na grafu izpolni območje Lower < x < Upper.
- Hkrati se rezultat izračuna p dodeli spremenljivkama p in Ans.

■ Izvedba statističnih izračunov v programu

- Statistični izračun z eno spremenljivko

① 1-spremenljivka Seznam 1, Seznam 2

Podatki o pogostosti (pogostost)
podatki na osi x (XList)

① 4161

- Statistični izračun parnih spremenljivk

① 4162

① 2-spremenljivka Seznam 1, Seznam 2, Seznam 3

Podatki o frekvenci (Frequency)

y-*a Podatki osi (YList)*

x-*podatki osi (XList)*

• Statistični izračun regresije

① LinearReg(ax+b) Seznam 1, Seznam 2, Seznam 3

*Vrsta izračun a**

Podatki o frekvenci (Frequency)

Podatki osi y (YList)

Podatki osi x (XList)

① 416611

* Kot vrsto izračuna je mogoče določiti katero koli od naslednjih možnosti.

LinearReg(ax+b) ....linearna regresija (tip $ax+b$)

LinearReg($a+bx$) ......linearna regresija (tip $a+bx$)

Med-MedLine ....Med-Med izračun

QuadReg ....kvadratna regresija

CubicReg ....kubična regresija

QuartReg ....kvadratna regresija

LogReg ....logaritemska regresija

ExpReg(a·eˆbx).........eksponentna regresija (tip a·e(bx))

ExpReg(a·bˆx) ....eksponentna regresija (a·b(x) tip)

PowerReg ....potencionalna regresija

• sinusoidna regresija statistični izračun

SinReg Seznam 1, Seznam 2

podatki osi y (YList)

podatki osi x (XList)

• Statistični izračun logistične regresije

LogisticReg Seznam 1, Seznam 2

podatki osi y (YList)

podatki osi x (XList)

■ Izvedba izračunov porazdelitve v programu

(Ni na voljo na fx-7400GIII)

• Naslednje vrednosti se nadomestijo, kadar katera koli od vrednosti v oklepajih ([ ]) ni navedena.

σ=1, μ=0, rep=L (levo)

• Za izračun formulo za vsako funkcijo gostote verjetnosti glejte „Statistična formula“ (stran 6-55).

• Normalna porazdelitev

NormPD(: vrne normalno verjetnostno gostoto (vrednost p) za določene podatke.

Sintaksa: NormPD(x[,σ , μ)]

• Za x je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna p je dodeljen

spremenljivkam p
in Ans (ListAns, če je x seznam).

NormCD(: Vrne normalno kumulativno porazdelitev (p vrednost) za določene podatke.

Sintaksa: NormCD(Lower, Upper[,σ , μ)]

- Za Lower in Upper je mogoče določiti posamezne vrednosti ali sezname. Rezultati izračuna p, ZLow in ZUp so dodeljeni spremenljivkam p, ZLow in ZUp. Rezultat izračuna p je dodeljen tudi Ans (ListAns, če sta Lower in Upper seznama).

InvNormCD(: Vrne obratno normalno kumulativno porazdelitev (spodnjo in/ali zgornjo vrednost) za določeno vrednost p.

Sintaksa: InvNormCD([$\underbrace{\text{"L(ali –1) ali R(ali 1) ali C(ali 0)"}}_{\text{rep (levi, desni, osrednji)}}$,]$p$[,$\sigma$, μ])

- Za p je mogoče določiti eno vrednost ali seznam. Rezultati izračuna se izpišejo v skladu z nastavitvijo repa, kot je opisano spodaj.

  rep = Left

  Zgornja vrednost je dodeljena spremenljivkam x1InvN in Ans (ListAns, če je p

  seznam). rep = Desno

  Spodnja vrednost je dodeljena spremenljivkam x1InvN in Ans (ListAns, če je p

  seznam). tail = Central

  Spodnja in zgornja vrednost sta dodeljeni spremenljivkama x1InvN in x2InvN. Spodnja vrednost je dodeljena Ans (ListAns, če je p seznam).

• *Student-t* porazdelitev

tPD(: Vrne *Student-t* verjetnostno gostoto (p vrednost) za določene podatke.

Sintaksa: tPD(x, df [)]

- Za x je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna p je dodeljen spremenljivkam p
  in Ans (ListAns, če je x seznam).

tCD(: Vrne kumulativno porazdelitev *Student-t* (p vrednost) za določene podatke.

Sintaksa: tCD(Lower,Upper,df [)]

- Za Lower in Upper je mogoče določiti posamezne vrednosti ali sezname. Rezultati izračuna p, tLow in tUp so dodeljeni spremenljivkam p, tLow in tUp. Rezultat izračuna p je dodeljen tudi Ans (ListAns, če sta Lower in Upper seznama).

InvTCD(: Vrne obratno kumulativno porazdelitev *Student-t* (spodnja vrednost) za določeno p vrednost.

Sintaksa: InvTCD(p,df [)]

- Za p je mogoče določiti eno samo vrednost ali seznam. Vrednost Lower se dodeli spremenljivkama xInv in Ans (ListAns, če je p seznam).

• ^{2} Porazdelitev

ChiPD(: Vrne ^{2} verjetnostno gostoto (p vrednost) za določene podatke.

Sintaksa: ChiPD(x,df [)]

- Za x je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna p se dodeli spremenljivkama p
  in Ans (ListAns, če je x seznam).

ChiCD(: Vrne ^{2} kumulativno porazdelitev (p vrednost) za določene podatke.

Sintaksa: ChiCD(Spodnja,Zgornja,df [)]

- Za Lower in Upper je mogoče določiti posamezne vrednosti ali seznameme. Rezultat izračuna p je dodeljen spremenljivkam p in Ans (ListAns, če sta Lower in Upper seznama).

InvChiCD(: Vrne inverzno ^{2} kumulativno porazdelitev (spodnja vrednost) za določeno p vrednosti.

Sintaksa: InvChiCD(p,df [)]

- Za p je mogoče določiti eno samo vrednost ali seznam. Vrednost Lower se dodeli spremenljivkama xInv in Ans (ListAns, če je p seznam).

• *F* porazdelitev

FPD(: Vrne gostoto verjetnosti F (p vrednost) za določene podatke.

Sintaksa: FPD(x,ndf,ddf [)]

- Za x je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna p se dodeli spremenljivkam p
  in Ans (ListAns, če je x seznam).

FCD(: Vrne kumulativno porazdelitev F (p vrednost) za določene podatke.

Sintaksa: FCD(Lower,Upper,ndf,ddf [)]

- Za spodnjo in zgornjo vrednost je mogoče določiti posamezne vrednosti ali seznameme. Rezultat izračuna p je dodeljen spremenljivkam p in Ans (ListAns, če sta spodnja in zgornja vrednost seznama).

InvFCD(: Vrne obratno F kumulativno porazdelitev (spodnja vrednost) za določene podatke.

Sintaksa: InvFCD(p,ndf,ddf [)]

- Za p je mogoče določiti posamezno vrednost ali seznam. Spodnja vrednost se dodeli spremenljivkama xInv in Ans (ListAns, če je p seznam).

• Binomialna porazdelitev

BinomialPD(: Vrne binomialno verjetnost (vrednost p) za določene podatke.

Sintaksa: BinomialPD([x,]n,P[)]

- Za x je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna p je dodeljen spremenljivkam p
  in Ans (ListAns, če je x seznam).

BinomialCD(: Vrne binomialno kumulativno porazdelitev (p vrednost) za določene podatke.

Sintaksa: BinomialCD([X,]n,P[)]

- Za vsako X je mogoče določiti eno vrednost ali seznam. Rezultat izračuna p je dodeljen spremenljivkam p in Ans (ListAns, če je X izpuščeno ali je seznam).

InvBinomialCD(: Vrne obratno binomialno kumulativno porazdelitev za določene podatke.

Sintaksa: InvBinomialCD(p,n,P[)]

- Za p je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna X se dodeli spremenljivkama xInv in Ans (ListAns, če je p seznam).

• Poissonova porazdelitev

PoissonPD(: Vrne Poissonovo verjetnost (vrednost p) za določene podatke.

Sintaksa: PoissonPD(x, μ[)]

• Za x je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna p je dodeljen spremenljivkam p
in Ans (ListAns, če je x seznam).

PoissonCD(: Vrne Poissonovo kumulativno porazdelitev (p vrednost) za določene podatke.

Sintaksa: PoissonCD(X,$)$[)]

• Za vsak X je mogoče določiti eno vrednost ali seznam. Rezultat izračuna p je dodeljen spremenljivkam p in Ans (ListAns, če je X seznam).

InvPoissonCD(: Vrne obratno Poissonovo kumulativno porazdelitev za določene podatke.

Sintaksa: InvPoissonCD(p,$)$[)]

• Za p je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna X se dodeli spremenljivkama
xInv in Ans (ListAns, če je p seznam).

• Geometrična porazdelitev

GeoPD(: Vrne geometrično verjetnost (vrednost p) za določene podatke.

Sintaksa: GeoPD(x, P[)]

• Za x je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna p je dodeljen spremenljivkam p
in Ans (ListAns, če je x seznam).

GeoCD(: Vrne geometrijsko kumulativno porazdelitev (p vrednost) za določene podatke.

Sintaksa: GeoCD(X,P[)]

• Za vsak X je mogoče določiti eno vrednost ali seznam. Rezultat izračuna p je dodeljen spremenljivkam p in Ans (ListAns, če je X seznam).

InvGeoCD(: Vrne obratno geometrično kumulativno porazdelitev za določene podatke.

Sintaksa: InvGeoCD(p,P[)]

• Za p je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna X se dodeli spremenljivki spremenljivkama xInv in Ans (ListAns, če je p seznam).

• Hipergeometrična porazdelitev

HypergeoPD(: Vrne hipergeometrično verjetnost (vrednost p) za določene podatke.

Sintaksa: HypergeoPD(x, n, M, N[)]

• Za x je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna p je dodeljen spremenljivkam p
in Ans (ListAns, če je x seznam).

HypergeoCD(: Vrne hipergeometrično kumulativno porazdelitev (p vrednost) za določene podatke.

Sintaksa: HypergeoCD(X, n, M, N[)]

- Za vsak X je mogoče določiti eno vrednost ali seznam. Rezultat izračuna p je dodeljen spremenljivkam p in Ans (ListAns, če je X seznam).

InvHypergeoCD(: Vrne inverzno hipergeometrično kumulativno porazdelitev za določene podatke.

Sintaksa: InvHypergeoCD(p, n, M, N[)]

- Za p je mogoče določiti eno samo vrednost ali seznam. Rezultat izračuna X se dodeli spremenljivki spremenljivkama xInv in Ans (ListAns, če je p seznam).

■ Uporaba ukaza TEST za izvedbo ukaza v programu

(Ni na voljo na fx-7400GIII)

- Spodaj so navedena območja specifikacij za argument »μ condition« ukaza. »<« ali –1,

  če je μ < μ0

  „≠ “ ali 0, če μ≠ μ0

  „>“ ali 1, če μ > μ0

  Zgoraj navedeno velja tudi za metode specifikacije „ρ“ in „ß&ρ“.
- Za pojasnila argumentov, ki tukaj niso podrobno obravnavani, glejte „Testi“ (stran 6-23) in „Vhodni in izhodni pogoji testov, interval zaupanja in porazdelitev“ (stran 6-52).
- Za izračunsko formulo posameznega ukaza glejte „Statistična formula“ (stran 6-55).

• Z-test

OneSampleZTest: Izvede izračun Z-testa za en vzorec.

Sintaksa: OneSampleZTest "μ pogoj", μ0,σ , o, n

Izhodne vrednosti: Z, p, o, n so dodeljeni spremenljivkam z, p, o, n in elementom ListAns od 1 do 4.

Sintaksa: OneSampleZTest "μ pogoj", μ0,σ , List[, Freq]

Izhodne vrednosti: Z, p, o, sx, n so dodeljeni spremenljivkam z, p, o, sx, n in elementom ListAns od 1 do 5.

TwoSampleZTest: Izvede izračun Z-testa za 2 vzorca.

Sintaksa: TwoSampleZTest "μ1 condition",σ_1,σ_2, o1, n1, o2, n2

Izhodne vrednosti: Z, p, o1, o2, n1, n2 so dodeljeni spremenljivkam z, p, o1, o2, n1, n2 in elementom ListAns od 1 do 6.

Sintaksa: TwoSampleZTest "μ1 pogoj",σ_1,σ_2, List1, List2[, Freq1 [, Freq2]]

Izhodne vrednosti: Z, p, o1, o2, sx1, sx2, n1, n2 so dodeljeni spremenljivkam z, p, o1, o2, sx1, sx2, n1, n2 in elementom ListAns od 1 do 8.

OnePropZTest: Izvede izračun 1-proporcionalnega Z-testa.

Sintaksa: OnePropZTest "p pogoj", p0, x, n

Izhodne vrednosti: Z, p, $\hat{p}$, n so dodeljeni spremenljivkam z, p, $\hat{p}$, n in elementom ListAns od 1 do 4.

TwoPropZTest: Izvede izračun Z-testa z 2-proporcionalnostjo.

Sintaksa: TwoPropZTest "p1 pogoj", x1, n1, x2, n2

Izhodne vrednosti: Z, p, $\hat{p}_1$, $\hat{p}_2$, $\hat{p}$, n1, n2 so dodeljeni spremenljivkam z, p, $\hat{p}_1$, $\hat{p}_2$, $\hat{p}$, n1, n2 in elementom ListAns od 1 do 7.

• *t* Test

OneSampleTTest: Izvede izračun t-testa za en vzorec.

Sintaksa: OneSampleTTest "μ pogoj", μ_0, o, sx, n
OneSampleTTest "μ pogoj", μ_0, Seznam[, Frekvenca]

Izhodne vrednosti: t, p, o, sx, n so dodeljeni spremenljivkam z enakimi imeni in elementom ListAns od 1 do 5.

TwoSampleTTest: Izvede izračun t-testa za 2 vzorca.

Sintaksa: TwoSampleTTest "μ_1 pogoj", o_1, sx_1, n_1, o_2, sx_2, n_2[, združen pogoj]
TwoSampleTTest "μ_1 pogoj", List1, List2, [, Freq1[, Freq2[,
Pooled condition]]]

Izhodne vrednosti: Ko je pogoj združevanja = 0, se t, p, df, o_1, o_2, sx_1, sx_2, n_1, n_2 dodelijo spremenljivkam z enakimi imeni in elementom ListAns od 1 do 9.
Ko je pogoj združevanja = 1, se t, p, df, o_1, o_2, sx_1, sx_2, sp, n_1, n_2 dodelijo spremenljivkam z enakimi imeni in elementom ListAns od 1 do 10.

Opomba: Če želite izklopiti pogoj združevanja, vnesite 0, če ga želite vklopiti, pa 1. Če vnos izpustite, se to obravnava kot izklopljen pogoj združevanja.

LinRegTTest: Izvede izračun t-testa linearne regresije.

Sintaksa: LinRegTTest "ß&ρ ni pogoj", XList, YList[, Freq]

Izhodne vrednosti: t, p, df, a, b, s, r, r^2 so dodeljeni spremenljivkam z enakimi imeni in elementom ListAns od 1 do 8.

• ^{2} Test

ChiGOFTest: Izvede test chi-kvadratne ustreznosti.

Sintaksa: ChiGOFTest Seznam 1, Seznam 2, df, Seznam 3
(Seznam 1 je seznam opazovanih vrednosti, seznam 2 je seznam pričakovanih vrednosti, seznam 3 pa je seznam CNTRB.)

Izhodne vrednosti: (^{2}) ,p, df so dodeljeni spremenljivkam z enakimi imeni in elementom ListAns od 1 do 3. Seznam CNTRB je shranjen v seznamu 3.

ChiTest: Izvede hi-kvadrat test.

Sintaksa: ChiTest MatA, MatB
(MatA je matrika opazovanih vrednosti, MatB pa matrika pričakovanih vrednosti.)

Izhodne vrednosti: (^{2}) ,p, df so dodeljeni spremenljivkam z enakimi imeni in elementom ListAns od 1 do 3. Matrika Expected je dodeljena MatB.

• *F*-test

TwoSampleFTest: Izvede izračun F-testa za 2 vzorca.

Sintaksa: TwoSampleFTest "σ_1 condition", sx_1, n_1, sx_2, n_2

Izhodne vrednosti: F, p, sx_1, sx_2, n_1, n_2 so dodeljeni spremenljivkam z enakimi imeni in elementom ListAns od 1 do 6.

Sintaksa: TwoSampleFTest "σ_1 condition", List1, List2, [, Freq1 [, Freq2]]

Izhodne vrednosti: F, p, o1, o2, sx1, sx2, n1, n2 so dodeljeni spremenljivkam z enakimi imeni in elementom ListAns od 1 do 8.

• ANOVA

OneWayANOVA: Izvede enofaktorsko ANOVA analizo variance.

Sintaksa: OneWayANOVA Seznam1, Seznam2
(Seznam1 je seznam faktorjev (A), seznam2 pa je seznam odvisnih spremenljivk.

Izhodne vrednosti: Adf, Ass, Ams, AF, Ap, ERRdf, ERRss, ERRms so dodeljeni spremenljivkam Adf, SSa, MSa, Fa, pa, Edf, SSe, MSe.

Prav tako so izhodne vrednosti dodeljene MatAns, kot je prikazano spodaj.

$$\text{MatAns} = \begin{bmatrix} Adf & Ass & Ams & AF & Ap \\ ERRdf & ERRss & ERRms & 0 & 0 \end{bmatrix}$$

TwoWayANOVA: Izvede dvostransko ANOVA analizo variance.

Sintaksa: TwoWayANOVA Seznam1, Seznam2, Seznam3 (Seznam1 je seznam faktorjev (A), Seznam2 je seznam faktorjev (B) in Seznam3 je seznam odvisnih spremenljivk.)

Izhodne vrednosti: Adf, Ass, Ams, AF, Ap, Bdf, Bss, Bms, BF, Bp, ABdf, ABss, ABms, ABF, ABp, ERRdf, ERRss, ERRms so dodeljeni spremenljivkam Adf, SSa, MSa, Fa, pa, Bdf, SSb, MSb, Fb, pb, ABdf, SSab, MSab, Fab, pab, Edf, SSe, MSe.

Prav tako so izhodne vrednosti dodeljene MatAns, kot je prikazano spodaj.

$$\text{MatAns} = \begin{bmatrix} Adf & Ass & Ams & AF & Ap \\ Bdf & Bss & Bms & BF & Bp \\ ABdf & ABss & ABms & ABF & ABp \\ ERRdf & ERRss & ERRms & 0 & 0 \end{bmatrix}$$

■ Izvedba finančnih izračunov v programu

(Ni na voljo na fx-7400GIII)

• Nastavitvene ukaze

- Nastavitev datumske mode za finančne
  izračune DateMode365 365 dni
  DateMode360....... 360 dni
- Nastavitev plačilnega obdobja
  PmtBgn................. Začetek
  obdobja
  PmtEnd................. Konec obdobja
- Izračun obveznic Obdobja plačila
  ObdobjaLetno....... Letno
  Obdobja polletna .. Polletno

• Finančni izračun Ukazi

Pomen posameznih argumentov je naveden v poglavju 7 Finančni izračun (TVM).

• Enostavne obresti

Smpl_SI: Vrne obresti na podlagi izračuna enostavnih obresti.

Sintaksa: Smpl_SI(n, I%, PV)

Smpl_SFV: Vrne skupni znesek glavnice in obresti na podlagi izračuna enostavnih obresti.

Sintaksa: Smpl_SFV(n, I%, PV)

• Obrestna mera

Opomba:

- P/Y in C/Y se lahko izpustita za vse izračune sestavljenih obresti. Ko se izpustita, se izračuni izvedejo z uporabo P/Y=12 in C/Y=12.
- Če izvedete izračun, ki uporablja funkcijo sestavljenih obresti (Cmpd_n(, Cmpd_I%(, Cmpd_PV(, Cmpd_PMT(, Cmpd_FV()), se argumenti, ki ste jih vnesli, in rezultati izračuna shranijo v ustrezne spremenljivke (n, I%, PV itd.). Če izvedete izračun, ki uporablja katero koli drugo vrsto funkcije za finančne izračune, argumenti in rezultati izračuna niso dodeljeni spremenljivkam.

Cmpd_n: Vrne število sestavljenih obdobij.

Sintaksa: *Cmpd_n*(I%, PV, PMT, FV, P/Y, C/Y)

Cmpd_I%: Vrne letno obrestno mero.

Sintaksa: Cmpd_I%(n, PV, PMT, FV, P/Y, C/Y)

Cmpd_PV: Vrne sedanjo vrednost (znesek posojila za obročno odplačevanje, glavnico za varčevanje).

Sintaksa: Cmpd_PV(n, I%, PMT, FV, P/Y, C/Y)

Cmpd_PMT: Vrne enake vrednosti vložka/izplačila (zneski plačil za obročno odplačevanje, zneski vlog za varčevanje) za določeno obdobje.

Sintaksa: Cmpd_PMT(n, I%, PV, FV, P/Y, C/Y)

Cmpd_FV: Vrne končni znesek vložka/izplačila ali skupni znesek glavnice in obresti.

Sintaksa: Cmpd_FV(n, I%, PV, PMT, P/Y, C/Y)

• Denarni tok (ocena naložbe)

Cash_NPV: Vrne neto sedanjo vrednost.

Sintaksa: Cash_NPV(I%, Csh)

Cash_IRR: Vrne notranjo stopnjo donosa.

Sintaksa: Cash_IRR(Csh)

Cash_PBP: Vrne obdobje povračila.

Sintaksa: Cash_PBP(I%, Csh)

Cash_NFV: Vrne neto prihodnjo vrednost.

Sintaksa: Cash_NFV(I%, Csh)

• **Amortizacija**

Amt_BAL: Vrne preostali znesek glavnice po plačilu PM2.

Sintaksa: Amt_BAL(PM1, PM2, I%, PV, PMT, P/Y, C/Y)

Amt_INT: Vrne obresti, plačane za plačilo PM1.

Sintaksa: Amt_INT(PM1, PM2, I%, PV, PMT, P/Y, C/Y)

Amt_PRN: Vrne glavnico in obresti, plačane za plačilo PM1.

Sintaksa: Amt_PRN(PM1, PM2, I%, PV, PMT, P/Y, C/Y)

Amt_Σ INT: Vrne skupno glavnico in obresti, plačane od plačila PM1 do PM2.

Sintaksa: Amt_Σ INT(PM1, PM2, I%, PV, PMT, P/Y, C/Y)

Amt_Σ PRN: Vrne skupni znesek glavnice, plačan od plačila PM1 do PM2.

Sintaksa: Amt_Σ PRN(PM1, PM2, I%, PV, PMT, P/Y, C/Y)

• **Pretvorba obrestne mere**

Cnvt_EFF: Vrne obrestno mero, pretvorjeno iz nominalne obrestne mere v efektivno obrestno mero.

Sintaksa: Cnvt_EFF(n, I%)

Cnvt_APR: Vrne obrestno mero, pretvorjeno iz efektivne obrestne mere v nominalno obrestno mero.

Sintaksa: Cnvt_APR(n, I%)

• **Izračun stroškov, prodajne cene, marže**

Stroški: Vrne stroške na podlagi določene prodajne cene in marže.

Sintaksa: Stroški(Prodaja, Marža)

Prodaja: Vrne prodajno ceno na podlagi določene cene in marže.

Sintaksa: Prodaja(Stroški, Marža)

Marža: Vrne maržo na podlagi določene cene in prodajne cene.

Sintaksa: Margin(Stroški, Prodaja)

• **Izračuni dneva/datuma**

Days_Prd: Vrne število dni od določene d1 do določene d2.

Sintaksa: Days_Prd(MM1, DD1, YYYY1, MM2, DD2, YYYY2)

• **Izračuni obveznic**

Bond_PRC: Vrne cene obveznic v obliki seznama na podlagi določenih pogojev.

Sintaksa: Bond_PRC(MM1, DD1, YYYY1, MM2, DD2, YYYY2, RDV, CPN, YLD) = {PRC, INT, CST}

Bond_YLD: Vrne donos na podlagi določenih pogojev.

Sintaksa: Bond_YLD(MM1, DD1, YYYY1, MM2, DD2, YYYY2, RDV, CPN, PRC)

7. Seznam ukazov v načinu PRGM

Vsi spodaj navedeni ukazi niso na voljo na vseh modelih, ki jih zajema ta priročnik.

Program RUN

Tipka 4(MENU)

Raven 1	Raven 2	Raven 3	Ukaz
STAT	DRAW	V	DrawOn
		Izklop	DrawOff
	GRPH	GPH1	S-Gph1_
		GPH2	S-Gph2_
		GPH3	S-Gph3_
		Scat	Scatter
		xy	xyLine
		Hist	Hist
		Box	MedBox
		Bar	Bar
		N-Dis	N-Dist
		Brkn	Broken
		X	Linear
		Med	Med-Med
		X^2	Quad
		X^3	Kubični
		X^4	Kvart
		Log	Log
		*1	
		Pwr	Moč
		Sin	Sinusoidal
		NPP	NPPlot
		Lgst	Logistični
		Pie	Pie
	Seznam		Seznam_
	TIP	*2	
	DIST	DrwN	DrawDistNorm_
		Drwt	DrawDistT_
		DrwC	DrawDistChi_
		DrwF	DrawDistF_
	CALC	1VAR	1-spremenljivka_
		2VAR	2-spremenljivka_
		*3	
		Med	Med-MedLine_
		X^2	QuadReg_
		X^3	KubičniReg_
		X^4	QuartReg_
		Log	LogReg_
		*4	
		Pwr	PowerReg_
		Sin	SinReg_
		Lgst	LogisticReg_
MAT	Swap		Swap_
	×Rw		\`Row_
	×Rw+		\`Row+_
	Rw+		Row+_
LIST	Srt-A		SortA(
	TIP	Y=	Y=Tip
		r=	r=Tip
		Parm	ParamTip
		X=	X=Tip
		Y>	Y>Tip
		Y<	Y<Tip
		Yt	YtTip
		Ys	YsTip
		X>	X>Tip
		X<	X<Tip
		Xt	XtTip
		Xs	XsTip
	STYL	—	NormalG_
		—	ThickG_
		·····	ZlomljeniG_
		······	DotG_
	GMEM	Sto	StoGMEM_
		Rcl	RclGMEM_
DYNA	On		D_SelOn_
	Off		D_SelOff_
	Var		D_Var_
	TIP	Y=	Y=Tip
		r=	r=Tip
		Parm	ParamTip
TABL	On		T_SelOn_
	Iz		T_SelOff_
	TIP	Y=	Y=Tip
		r=	r=Tip
		Parm	ParamTip
	STYL	—	NormalG_
		—	ThickG_
		·····	ZlomljeniG_
		······	DotG_
RECR	SEL+S	Vklop	R_SelOn_
		Off	R_SelOff_
		—	NormalG_
		—	ThickG_
		·····	ZlomljeniG_
		······	DotG_
	TIP	an	anType
		an+1	an+1Tip
		an+2	an+2Tip
	n.an··	n	n
		an	an
		an+1	an+1
		an+2	an+2
		bn	bn
		bn+1	bn+1
		bn+2	bn+2
		cn	cn
		cn+1	cn+1
		cn+2	cn+2
		Σan	Σan
		Σan+1	Σan+1
		Σan+2	Σan+2
		Σbn	Σbn
		Σbn+1	Σbn+1
		Σbn+2	Σbn+2
		Σcn	Σcn
		Σcn+1	Σcn+1
		Σcn+2	Σcn+2
	RANG	a0	Sel_a0
		a1	Sel_a1

Tipka K

Raven 1	Raven 2	Raven 3	Ukaz
LIST	Seznam		Seznam_
	L→ M		Seznam→ Mat(
	Dim		Dim_
	Fill		Fill(
	Seq		Seq(
	Min		Min(
	Max		Max(
	Povprečje		Povprečje(
	Med		Mediana(
	Aug		Povečaj(
	Sum		Sum_
	Prod		Prod_
	Cuml		Cuml_
	%		Percent_
	A		A Seznam_
MAT	Mat		Mat_
	M→ L		Mat→ Seznam(
	Det		Det_
	Trn		Trn_
	Aug		Augment(
	Iden		Identiteta_
	Dim		Dim_
	Fill		Fill(
	Ref		Ref_
	Rref		Rref_
	Vct		Vct_
	DotP		DotP(
	CrsP		CrossP(
	Angle		Angle(
	UntV		UnitV(
	Norm		Norm(
CPLX	i		i
	Abs		Abs_
	Arg		Arg_
	Conj		Conjg_
	ReP		ReP_
	ImP		ImP_

CALC	Reši		**Reši(**
	d/dx		**d/dx(**
	d^2/dx^2		**d^2/dx^2 (**
	∫dx		**∫(**
	RešiN		**RešiN(**
	FMin		**FMin(**
	FMax		**FMax(**
	Σ(		**Σ (**
	log$_a$ b		**log$_a$ b(**
	Int÷		**Int÷**
	Rmdr		**Rmdr**
	Simp		**'Simp**
STAT	$\hat{x}$		**$\hat{x}$**
	$\hat{y}$		**$\hat{y}$**
	DIST	*5	
	S·Dev		**StdDev(**
	Var		**Varianca(**
	TEST	*6	
CONV	►		**►**
	LENG	fm	**[fm]**
		Å	**[Å]**
		µm	**[µm]**
		mm	**[mm]**
		cm	**[cm]**
		m	**[m]**
		km	**[km]**
		AU	**[AU]**
		l.y.	**[l.y.]**
		pc	**[pc]**
		Mil	**[Mil]**
		v	**[in]**
		ft	**[ft]**
		yd	**[yd]**
		fath	**[fath]**
		rd	**[rd]**
		milja	**[milja]**
		n milja	**[n mile]**
	POVRŠINA	cm	**[cm²]**
		m	**[m²]**
		ha	**[ha]**
		km	**[km²]**
		in²	**[in²]**
		ft²	**[ft²]**
		yd²	**[yd²]**
		akr	**[akr]**
		milja²	**[milja²]**
	VLUM	cms	**[cm5]**
		mL	**[mL]**
		L	**[L]**
		ms	**[m5]**
		ins	**[in5]**
		fts	**[ft5]**
		fl_oz(UK)	**[fl_oz(UK)]**
		fl_oz(ZDA)	**[fl_oz(ZDA)]**
		gal(ZDA)	**[gal(ZDA)]**
		gal(UK)	**[gal(UK)]**
		pt	**[pt]**
		qt	**[qt]**
		tsp	**[tsp]**
		tbsp	**[tbsp]**

ČAS	ns	**[ns]**
	µs	**[µs]**
	ms	**[ms]**
	s	**[s]**
	min	**[min]**
	h	**[h]**
	dan	**[dan]**
	teden	**[teden]**
	leto	**[leto]**
	s-leto	**[s-leto]**
	t-leto	**[t-leto]**
TMPR	°C	**[° C]**
	K	**[K]**
	°F	**[° F]**
	°R	**[° R]**
VELO	m/s	**[m/s]**
	km/h	**[km/h]**
	voz	**[vozli]**
	ft/s	**[ft/s]**
	milja/h	**[milja/h]**
MAS	u	**[u]**
	mg	**[mg]**
	g	**[g]**
	kg	**[kg]**
	mton	**[mton]**
	oz	**[oz]**
	lb	**[lb]**
	slug	**[slug]**
	tona (kratka)	**[tona (kratka)]**
	tona (dolga)	**[tona (dolga)]**
RORC	N	**[N]**
	lbf	**[lbf]**
	tonf	**[tonf]**
	dina	**[dyne]**
	kgf	**[kgf]**
PRES	Pa	**[Pa]**
	kPa	**[kPa]**
	mmH2O	**[mmH2O]**
	mmHg	**[mmHg]**
	atm	**[atm]**
	inH2O	**[inH2O]**
	inHg	**[inHg]**
	lbf/in²	**[lbf/in²]**
	bar	**[bar]**
	kgf/cm²	**[kgf/cm²]**
ENGY	eV	**[eV]**
	J	**[J]**
	cal$_{th}$	**[cal$_{th}$]**
	cal(15)	**[cal$_{15}$]**
	cal$_{IT}$	**[cal$_{IT}$]**
	kcal$_{th}$	**[kcal$_{th}$]**
	kcal$_{15}$	**[kcal$_{15}$]**
	kcal$_{IT}$	**[kcal$_{IT}$]**
	l-atm	**[l-atm]**
	kW•h	**[kW•h]**
	ft•lbf	**[ft•lbf]**
	Btu	**[Btu]**
	erg	**[erg]**
	kgf•m	**[kgf•m]**

		hp	**[hp]**
		ft•lbf/s	**[ft•lbf/s]**
		Btu/min	**[Btu/min]**
HYP	sinh		**sinh_**
	cosh		**cosh_**
	tanh		**tanh_**
	sinh^{-1}		**sinh^{-1} _**
	cosh^{-1}		**cosh^{-1} _**
	tanh^{-1}		**tanh^{-1} _**
PROB	X!		**!**
	nPr		**P**
	nCr		**C**
	RAND	Ran#	**Ran#_**
		Int	**RanInt#(**
		Norm	**RanNorm#(**
		Bin	**RanBin#(**
		List	**RanList#(**
	P(		**P(**
	Q(		**Q(**
	R(		**R(**
	t(		**t(**
NUM	Abs		**Abs_**
	Int		**Int_**
	Frac		**Frac_**
	Rnd		**Rnd**
	Intg		**Intg_**
	RndFi		**RndFix(**
	GCD		**GCD(**
	LCM		**LCM(**
	MOD		**MOD(**
	MOD•E		**MOD_Exp(**
ANGL	°		**°**
	r		**r**
	g		**g**
	° ' "		**¤**
	Pol(		**Pol(**
	Rec(		**Rec(**
	'DMS		**'DMS**
ESYM	m		**m**
	µ		**µ**
	n		**n**
	p		**p**
	f		**f**
	k		**k**
	M		**M**
	G		**G**
	T		**T**
	P		**P**
	E		**E**
PICT	Sto		**StoPict_**
	Rcl		**RclPict_**
FMEM	fn		**fn**
LOGIC	In		**_In_**
	Ali		**_Ali_**
	Ne		**Ne_**
	Xor		**Xor_**
CAPT	Rcl		**RclCapt_**
TVM	SMPL	SI	**Smpl_SI(**
		SFV	**Smpl_SFV(**
	CMPD	n	**Cmpd_n(**
		I%	**Cmpd_I%(**

		PV	**Cmpd_PV(**
		PMT	**Cmpd_PMT(**
		FV	**Cmpd_FV(**
	CASH	NPV	**Cash_NPV(**
		IRR	**Cash_IRR(**
		PBP	**Denarni_PBP(**
		NFV	**Denarni_NFV(**
	AMT	BAL	**Znesek_BAL(**
		INT	**Znesek_INT(**
		PRN	**Amt_PRN(**
		ΣINT	**Σ INT(**
		ΣPRN	**Amt_Σ PRN(**
	CNVT	EFF	**Cnvt_EFF(**
		APR	**Cnvt_APR(**
	COST	Stroški	**Stroški(**
		Prodaja	**Prodaja(**
		Mrg	**Marža(**
	DAYS	PRD	**Days_Prd(**
	BOND	PRC	**Obligacija_PRC(**
		YLD	**Obligacija_YLD(**

tipka

Raven 1	Raven 2	Raven 3	Ukaz
V-WIN	X	min	**Xmin**
		max	**Xmax**
		scal	**Xscl**
		dot	**Xdot**
	Y	min	**Ymin**
		max	**Ymax**
		scal	**Yscl**
	T,θ	min	**θT min**
		max	**θmax**
		ptch	**θptch**
	R-X	min	**DesnoXmin**
		max	**DesnoXmax**
		scal	**DesnoXscl**
		dot	**DesniXdot**
	R-Y	min	**DesnoYmin**
		max	**DesnoYmax**
		scal	**DesnoYscl**
	R-T, θ	min	**DesniTθmin**
		max	**Desniθmax**
		ptch	**θptch**
FACT	Xfct		**Xfct**
	Yfct		**Yfct**
STAT	X	n	**n**
		x	**x**
		Σx	**Σx**
		Σx^2	**Σx^2**
		σx	σx
		sx	sx
		minX	**minX**
		maxX	**maxX**
	Y	y	**y**
		Σy	**Σy**
		Σy^2	**Σy^2**
		Σxy	**Σxy**
		σy	σy

		minY	**minY**
		maxY	**maxY**
	GRPH	a	**a**
		b	**b**
		c	**c**
		d	**d**
		e	**e**
		r	**r**
		r^2	**r^2**
		MSe	**MSe**
		Q1	**Q1**
		Med	**Med**
		Q3	**Q3**
		Mod	**Mod**
		Strt	**H_Start**
		Pitch	**H_pitch**
	PTS	x1	**x1**
		y1	**y1**
		x2	**x2**
		y2	**y2**
		x3	**x3**
		y3	**y3**
	INPT	n	**n**
		$\bar{x}$	**$\bar{x}$**
		sx	**sx**
		n1	**n1**
		n2	**n2**
		$\bar{x}1$	**$\bar{x}1$**
		$\bar{x}2$	**$\bar{x}2$**
		sx1	**sx1**
		sx2	**sx2**
		sp	**sp**
	RESLT		*7
GRPH	Y		**Y**
	r		**r**
	Xt		**Xt**
	Yt		**Yt**
	X		**X**
DYNA	Strt		**D_Start**
	Konec		**D_Konec**
	Korak		**D_pitch**
TABL	Strt		**F_Začetek**
	Konec		**F_Konec**
	Pitch		**F_pitch**
	Rezultat		**F_Rezultat**
RECR	FORM	an	**an**
		an+1	**an+1**
		an+2	**an+2**
		bn	**bn**
		bn+1	**bn+1**
		bn+2	**bn+2**
		cn	**cn**
		cn+1	**cn+1**
		cn+2	**cn+2**
	RANG	Strt	**R_Začetek**
		Konec	**R_Konec**
		a0	**a0**
		a1	**a1**
		a2	**a2**
		b0	**b0**

		b2	**b2**
		c0	**c0**
		c1	**c1**
		c2	**c2**
		anSt	**anStart**
		bnSt	**bnStart**
		cnSt	**cnStart**
	Rezultat		**R_Rezultat**
EQUA	S-Rlt		**Sim_Rezultat**
	S-Cof		**Sim_Coef**
	P-Rlt		**Ply_Rezultat**
	P-Cof		**Ply_Coef**
TVM	n		**n**
	I		**I%**
	PV		**PV**
	PMT		**PMT**
	FV		**FV**
	P/Y		**P/Y**
	C/Y		**C/Y**

(PRGM) ključ

Raven 1	Raven 2	Raven 3	Poveljstvo
COM	Če		**Če_**
	Potem		**Potem_**
	Else		**Drugače_**
	I-Konec		**ČeKonec**
	For		**For_**
	To		**_To_**
	Korak		**_Korak_**
	Naslednji		**Naslednji**
	Medtem		**Medtem ko_**
	Konec		**MedtemKoKonec**
	Do		**Do**
	Lp-W		**LpMedtem_**
CTL	Prog		**Prog_**
	Rtrn		**Vrnitev**
	Brk		**Prekinitev**
	Stop		**Stop**
SKOK	Lbl		**Lbl_**
	Goto		**Goto_**
	⇒		**⇒**
	Isz		**Isz_**
	Dsz		**Dsz_**
	Menu		**Menu_**
?			**?**
^			**^**
CLR	Besedilo		**ClrText**
	Grph		**ClrGraph**
	Seznam		**ClrList_**
	Mat		**ClrMat_**
	Vct		**ClrVct_**
DISP	Stat		**DrawStat**
	Grph		**DrawGraph**

	R-Tbl	Tabl	**DispR-Tbl**
		Faza	**PlotPhase**
		Web	**DrawWeb_**
		an-Cn	**DrawR-Con**
		Σa-Cn	**DrawRΣ-Con**
		an-Pl	**DrawR-Plt**
		Σa-Pl	**DrawRΣ-Plt**
REL	=		**=**
	≠		≠
	>		**>**
	<		**<**
	t		**t**
	s		s
I/O	Lcte		**Locate_**
	Gtky		**Getkey**
	Pošlji		**Pošlji(**
	Recv		**Prejmi(**
	S38k		**Pošlji38k_**
	R38k		**Prejem38k_**
	Odpri		**OdpriComport38k**
	Zapri		**ZapriComport38k**
:			**:**
STR	Pridruži		**StrJoin(**
	Len		**StrLen(**
	Cmp		**StrCmp(**
	Src		**StrSrc(**
	Left		**StrLeft(**
	Desno		**StrRight(**
	Srednja		**StrMid(**
	E'S		**Exp'Str(**
	Exp		**Exp(**
	Upr		**StrUpr(**
	Lwr		**StrLwr(**
	Inv		**StrInv(**
	Shift		**StrShift(**
	Rot		**StrRotate(**

!m(SET UP) tipka

Raven 1	Raven 2	Raven 3	Povelj
ANGL	Deg		**Stopnja**
	Rad		**Rad**
	Gra		**Gra**
COOR	On		**CoordOn**
	Off		**CoordOff**
GRID	Vklop		**GridOn**
	Izklop		**Mreža izklopljena**
OSI	Vklop		**OsVklop**
	Izklop		**OsOff**
LABL	Vklop		**OznakaVklop**
	Izklop		**Oznaka izklopljena**
DISP	Popravi		**Fix_**
	Sci		**Sci_**
	Norm		**Norm_**
	Eng	On	**EngOn**
		Iz	**EngOff**
		Eng	**Eng**
S/L	—		**S-L-Normal**
	······		**S-L-Dot**
DRAW	Con		**G-Connect**
	Plot		**G-Plot**
DERV	On		**DerivOn**
	Off		**DerivOff**
NAZA	Nič		**BG-Nič**
	Slik		**BG-Slika_**
FUNC	Vklop		**FuncOn**
	Iz		**FuncOff**
SIML	Vklop		**SimulOn**
	Izklop		**SimulOff**
S-WIN	Avtomatsko		**S-WindAuto**
	Man		**S-WindMan**
SEZNAM	Datoteka		**Datoteka_**
LOCS	Na		**LocusOn**
	Off		**LocusOff**
T-VAR	Rang		**VarRange**
	Seznam		**VarList_**
ΣDSP	Vklop		**ΣdispOn**
	Off		**ΣdispOff**
RESID	Nič		**Resid-Nič**
	Seznam		**Resid-Seznam_**
CPLX	Real		**Real**
	a+bi		**a+bi**
	$r\angle\theta$		$r\angle\theta$
FRAC	d/c		**d/c**
	ab/c		**ab/c**
Y•SPD	Norm		**Y=DrawSpeedNorm**
	Visoka		**Y=DrawSpeedHigh**
DATE	36		**DateMode365**
	360		**DateMode360**
PMT	Bgn		**PmtBgn**
	Konec		**PmtEnd**
PRD	Annu		**Obdobja Letno**
	Pol		**ObdobjaPololetno**
INEQ	In		**IneqTypeAnd**
	Ali		**IneqTypeOr**
SIMP	Avtomat		**SimplfyAuto**
	Man		**SimplfyMan**

tipka

Raven 1	Raven 2	Raven 3	Povelj
ZOOM	Dejstvo		**Faktor_**
	Avtomat		**ZoomAuto**
V-WIN	V-Win		**ViewWindow_**
	Sto		**StoV-Win_**
	Rcl		**RclV-Win_**
SKTCH	Cls		**Cls**
	Tang		**Tangent_**
	Norm		**Normal_**
	Inv		**Inverzna_**
	GRPH	Y=	**Graf_Y=**
		r=	**Graf_r=**
		Parm	**Graf(X,Y)=(**
		G-∫dx	**Graph_∫**
		Y>	**Graph_Y>**
		Y<	**Graph_Y<**
		Yt	**Graf_Yt**
		Ys	**Graf_Ys**
		X>	**Graf_X>**
		X<	**Graf_X<**
		Xt	**Graph_Xt**
		Xs	**Graph_Xs**
	PLOT	Plot	**Plot_**
		Pl-On	**PlotOn_**
		Pl-Off	**PlotOff_**
		Pl-Chg	**PlotChg_**
	LINE	Line	**Linija**
		F-Linija	**F-Line_**
	Crcl		**Circle_**
	Vert		**Vertical_**
	Hztl		**Horizontal_**
	Besedilo		**Besedilo_**
	PIXL	Na	**PxlOn_**
		Iz	**PxlOff_**
		Chg	**PxlChg_**
	Test		**PxlTest(**
	STYL	—	**SketchNormal_**
		━	**SketchThick_**
		·····	**SketchBroken_**
			SketchDot_

BASE Program

Tipka 4 (MENU)

Raven 1	Raven 2	Raven 3	Ukaz
d~o	d		**d**
	h		**h**
	b		**b**
	o		**o**
LOG	Neg		**Neg_**
	Ne		**Ne_**
	in		**in**
	ali		**ali**
	xor		**xor**
	xnor		**xnor**
DISP	'Dec		**'Dec**
	'Hex		**'Hex**
	'Bin		**'Bin**
	'Oct		**'Oct**

(PRGM) ključ

Raven 1	Raven 2	Raven 3	Ukaz
Prog			**Prog_**
SKOK	Lbl		**Lbl_**
	Goto		**Goto_**
	⇒		**⇒**
	Isz		**Isz_**
	Dsz		**Dsz_**
	Menu		**Menu_**

^			^
REL	=		=
	≠		≠
	>		>
	<		<
	≥		≥
	≤		≤
:			:

!m(SET UP) tipka			
Raven 1	Raven 2	Raven 3	Povelj
Dec			Dec
Hex			Hex
Bin			Bin

	Raven 3	Raven 4	Poveljstvo
*1	Exp	ae^bx	Exp(ae^bx)
		ab^x	Exp(ab^x)
*2	MARK		Kvadrat
		×	Križ
		▪	Pika
	PALICA	Dolžina	Dolžina palice
		Hztl	StickHoriz
	%DATA	%	%
		Podatki	Podatki
	Nič		Nič
*3	X	ax+b	LinearReg(ax+b)
		a+bx	LinearReg(a+bx)
*4	EXP	ae^bx	ExpReg(a•e^bx)
		ab^x	ExpReg(a•b^x)
*5	NORM	NPd	NormPD(
		NCd	NormCD(
		InvN	InvNormCD(
	t	TPd	tPD(
		TCd	tCD(
		Invt	InvTCD(
	CHI	CPd	ChiPD(
		CCd	ChiCD(
		InvC	InvChiCD(
	F	FPd	FPD(
		FCd	FCD(
		InvF	InvFCD(
	BINM	BPd	BinomialPD(
		BCd	BinomialCD(
		InvB	InvBinomialCD(
	POISN	PPd	PoissonPD(
		PCd	PoissonCD(
		InvP	InvPoissonCD(
	GEO	GPd	GeoPD(
		GCd	GeoCD(
		InvG	InvGeoCD(
	H·GEO	HPd	HypergeoPD(
		HCd	HypergeoCD(

*6	Z	1-S	OneSampleZTest_
		2-S	DvovzorčniZTest_
		1-P	Enostranski Z-test
		2-P	Dvostranski Z-test
	t	1-S	OneSampleTTest_
		2-S	Dvovzorčni t-test_
		REG	LinRegTTest_
	Chi	GOF	ChiGOFTest_
		2-WAY	ChiTest_
	F		Dvovzorčni FTest_
	ANOV	1-W	OneWayANOVA_
		2-W	Dvosmerna ANOVA_
*7	TEST	p	p
		z	z
		t	t
		Chi	²
		F	F
		$\hat{p}$	$\hat{p}$
		$\hat{p}_1$	$\hat{p}_1$
		$\hat{p}_2$	$\hat{p}_2$
		df	df
		se	se
		r	r
		r^2	r^2
		pa	pa
		Fa	Fa
		Adf	Adf
		SSa	SSa
		MSa	MSa
		pb	pb
		Fb	Fb
		Bdf	Bdf
		SSb	SSb
		MSb	MSb
		pab	pab
		Fab	Fab
		ABdf	ABdf
		SSab	SSab
		MSab	MSab
		Edf	Edf
		SSe	SSe
		MSe	MSe
	INTR	Levo	Levo
		Desno	Desno
		$\hat{p}$	$\hat{p}$
		$\hat{p}_1$	$\hat{p}_1$
		$\hat{p}_2$	$\hat{p}_2$
		df	df
	DIST	p	p
		xInv	xInv
		x1Inv	x1Inv
		x2Inv	x2Inv
		zLow	zLow
		zUp	zUp
		tLow	tLow

8. CASIO znanstveni funkcionalni kalkulator Posebni ukazi⇔ Tabela pretvorbe besedila

V spodnji tabeli so prikazani posebni nizi besedila, ki ustrezajo ukazom pri pretvarjanju med programi in besedilnimi datotekami. Podrobnosti o postopkih pretvarjanja med programi in besedilnimi datotekami najdete v poglavju „Pretvarjanje programov in besedilnih datotek“ (stran 8-6).

Pomembno!

- Pretvorba programa, ki vsebuje vrste ukazov, opisane spodaj, v besedilno datoteko bo povzročila, da se ukazi pretvorijo v besedilne nize z dodanimi podčrtnimi črkami (_) na začetku in koncu, kot je prikazano v spodnji tabeli.
  - Ukaz, zaprt v narekovaje (" ")
  - Ukaz v vrstici komentarja, ki se začne z enojnim narekovajem (')

Upoštevajte, da se alfanumerični znaki, ki niso ukazi v programu in so v navednicah (" ") ali v vrstici s komentarjem, izpišejo v besedilno datoteko takšni, kot so.

Primer:

V programu:	V besedilni datoteki (po pretvorbi):
"θ"	″_Theta_″
„Theta“*1	″Theta″
„T8max“*2	″_TThetamax_″
„TThetamax“*1	″TThetamax″
„ali“*3	″_ali_″
„ali“*1	″ali″

*1 Alfanumerični znaki, ki niso ukazi
*2 Ukaz V-Window T8max
*3 Logični operator ali

Pri pretvorbi iz besedilne datoteke v program se posebni nizi znakov pretvorijo nazaj v ustrezne ukaze, prikazane zgoraj.

- Pri pretvorbi programa, ki vsebuje posebne znake, vnesene z uporabo 6(CHAR) med urejanjem programa na kalkulatorju, se posebni znaki pretvorijo v kode znakovnih nizov, kot je prikazano spodaj.

  Primer:

V programu:	V besedilni datoteki (po pretvorbi):
λ	#E54A
□	#E5A5
ß	#E641
ˋ	#E69C
⇔	#E6D6

Ti kodi niso vključeni v tabele na straneh 8-47 do 8-52.

• „□ “ v naslednjih tabelah označuje presledek.

Ukaz	Besedilo
f	femto
p	piko
n	nano
μ	mikro
m	mili
k	kilo
M	Mega
G	Giga
T	Tera
P	Peta
E	Exa
^	Disps
↲	(CR)
→	->
E	Exp
≤	<=
≠	<>
≥	>=
⇒	=>
f1	f1
f2	f2
f3	f3
f4	f4
f5	f5
f6	f6
a	&HA
B	&HB
c	&HC
d	&HD
E	&HE
F	&HF
□	□
!	Char!
"	˝
#	#
$	$
%	%
&	&
'	'
(	(
)	)
*	**
+	++
,	,
–	Char-
.	.
/	//
0	0
1	1
2	2
3	3
4	4
5	5
6	6

Poveljstvo	Besedilo
7	7
8	8
9	9
:	:
;	;
<	<
=	=
>	>
?	?
@	@
A	A
B	B
C	C
D	D
E	E
F	F
G	G
H	H
I	I
J	J
K	K
L	L
M	M
N	N
O	O
P	P
Q	Q
R	R
S	S
T	T
U	U
V	V
W	W
X	X
Y	Y
Z	Z
[	[
\	¥
]	]
^	^^
_	_
'	`
a	a
b	b
c	c
d	d
e	e
f	f
g	g
h	h
i	i
j	j
k	k
l	l

Poveljstvo	Besedilo
m	m
n	n
o	o
p	p
q	q
r	r
s	s
t	t
u	u
v	v
w	w
x	x
y	y
z	z
{	{
|	|
}	}
~	˜
Pol(	Pol(
sin□	sin□
cos□	cos□
tan□	tan□
h	&h
ln□	ln□
√	Sqrt
−	(-)
P	nPr
+	+
xnor	xnor
²	^<2>
▫	dms
∫(	Integral(
Mod	Mod
Σx²	Sigmax^2
sin(−1)□	sin^-1□
cos⁻¹□	cos^-1□
tan⁻¹□	tan^-1□
d	&d
log□	log□
³√	Cbrt
Abs□	Abs□
C	nCr
–	–
xor	xor
⁻¹	^<-1>
°	deg
Med	Med
Σx	Sigmax
Rec(	Rec(
sinh□	sinh□
cosh□	cosh□
tanh□	tanh□
o	&o
e^	e^

Poveljstvo	Besedilo
Int□	Int□
Ne□	Ne□
^	^
×	∗
ali	ali
!	!
r	rad
minY	minY
minX	minX
n	Statn
$\sinh^{-1}$□	sinh^−1□
$\cosh^{-1}$□	cosh^−1□
$\tanh^{-1}$□	tanh^−1□
b	&b
10	(10)
Frac□	Frac□
Neg□	Neg□
x	Xrt
÷	/
in	in
{	frac
g	gra
maxY	maxY
maxX	maxX
Σy^2	Sigmay2
Odgovor	Odgovor
Ran#□	Ran#
$\bar{x}$	x-bar
$\bar{y}$	y-bar
σx	sigmax
sx	Sx
σx	sigmay
sy	Sy
a	Regresija_a
b	Regresija_b
r	Regresija_r
$\hat{x}$	x-hat
$\hat{y}$	y-hat
r	<r>
θ	Theta
Σy	Sigmay
π	pi
Cls	Cls
Rnd	Rnd
Dec	&D
Hex	&H
Bin	&B
Oct	&O
□	@D8
Norm□	Norm□
Deg	Deg
Rad	Rad
Gra	Gra
Eng	Eng
Intg□	Intg□

Poveljstvo	Besedilo
Σxy	Sigmaxy
Plot□	Zemljevid□
Črta	Linija
Lbl□	Lbl□
Popravek□	Popravek□
Sci□	Sci□
Dsz□	Dsz□
Isz□	Isz□
Faktor□	Faktor□
ViewWindow□	ViewWindow□
Goto□	Pojdi□
Prog□	Prog□
□ grafa Y=	□ Y=
Graf□ *f*	Graf□ Integral
□ ni grafikon Y>	Graf□ Y>
Graf□ Y<	Graf□ Y<
Graf□ ≥	Graf□ Y>=
Graf□ Y≤	Graf□ Y<=
Graf□ r=	Graf□ r=
Graf(X,Y)=(	Graf(X,Y)=(
,	Para,
P(	ProbP(
Q(	ProbQ(
R(	ProbR(
t(	Probt(
Xmin	Xmin
Xmax	Xmax
Xscl	Xscl
Ymin	Ymin
Ymax	Ymax
Yscl	Yscl
T8min	TThetamin
T8max	TThetamax
T8ptch	TThetaptch
Xfct	Xfct
Yfct	Yfct
D□ Začetek	D□ začetek
D□ Konec	□ , konec
□	□ ni korak
DesnoXmin	DesnoXmin
DesniXmax	Desni X-maks
DesniXscl	DesniXscl
DesnoYmin	DesniYmin
DesniYmax	DesniYmax
DesniYscl	DesnoYscl
DesnoT8min	DesniTThetamin
DesniT8max	Desni TThetamax
Desni T8ptch	DesniTThetaptch
c	Regresija_c
d	Regresija_d
e	Regresija_e
Max(	Max(
Det□	Det□
Arg□	Arg□
Conic□	Conic□

Poveljstvo	Besedilo
ReP□	ReP□
ImP□	ImP□
d/dx(	d/dx(
d^2/dx^2 (	d^2/dx^2(
Reši(	Reši(
Σ(	Sigma(
FMin(	FMin(
FMax(	FMax(
Seq(	Seq(
Min(	Min(
Povprečje(	Povprečje(
Mediana(	Mediana(
RešiN(	RešiN(
MOD(	MOD(
MOD_Exp(	MOD_Exp(
GCD(	GCD(
LCM(	LCM(
StdDev(	StdDev(
Variance(	Variance(
Mat□	Mat□
Trn□	Trn□
∗Vrstica□	∗Vrstica□
∗Vrstica+□	∗Vrstica+□
Vrstica+□	Vrstica+□
Zamenjava□	Zamenjava□
Dim□	Dim□
Fill(	Napolni(
Identiteta□	Identiteta□
Povečaj(	Povečaj(
Seznam→ Mat(	Seznam->Mat(
Mat→ List(	Mat->Seznam(
Sum□	Sum□
Prod□	Prod□
Odstotek□	Odstotek□
Skupaj□	Cuml□
i	Imaginarni
Seznam□	Seznam□
ΔSeznam□	Dlist□
∞	Neskončnost
∠	Kot
Ref□	Ref□
Rref□	Rref□
▶	Conv
Sim□ Coef	Sim□ Coef
Ply□ Coef	□ ni koeficient
Sim□ Rezultat	Rezultat simulacije□
□ ni rezultat za sloj	Rezultat□
n	Finančni□ n
I	Finančni□ I%
PV	Finančni□ PV
PMT	Finančni□ PMT
FV	Finančni□ FV
Seznam1	Seznam1
Seznam2	Seznam2

Ukaz	Besedilo
Seznam4	Seznam4
Seznam5	Seznam5
Seznam6	Seznam6
Q1	V1
V3	Q3
x1	x1
y1	y1
x2	x2
y2	y2
x3	x3
y3	y3
Vct□	Vct□
logab(	logab(
RndFix(	RndFix(
RanInt#(	RanInt#(
RanList#(	RanList#(
RanBin#(	RanBin#(
RanNorm#(	RanNorm#(
Σ_{an}	Sigmaan
Σ_{bn}	Sigmabn
Σ_{cn}	Sigmacn
Getkey	Getkey
F□ Rezultat	Rezultat F□
F□ začetek	F□ Začetek
□ Konec	□ Konec
□	F□ pitch
R□ Rezultat	R□ Rezultat
R□ Start	R□ Start
□ , konec	R□ Konec
H□ Začetek	H□ Začetek
H□ pitch	□ , višina
'Simp□	>Simp
an	an□
$an+^1$	an+1
$an+^2$	an+2
n	Indeks n
a^0	a0
a^1	a1
a^2	a2
bn	bn□
$bn+^1$	bn+1
$bn+^2$	bn+2
b^0	b0
b^1	b1
b^2	b2
anStart	anStart
bnStart	bnStart
□In□	□In□
□Ali□	□Ali□
Ne□	□Ne□
□Xor□	□Xor□
$\Sigma an+^1$	Sigmaan+1
$\Sigma bn+^1$	Sigmabn+1
$\Sigma cn+^1$	Sigmacn+1
$\Sigma an+^2$	Sigmaan+2

Poveljstvo	Besedilo
$\Sigma bn+^2$	Sigmabn+2
$\Sigma cn+^2$	Sigmacn+2
□Int÷□	□Int/□
□Rmdr□	□Rmdr□
Fa	Fa
n1	n1
n2	n2
$\bar{x}1$	x-bar1
$\bar{x}2$	x-bar2
sx1	sx1
sx2	sx2
sp	Sxp
$\hat{p}$	p-hat
$\hat{p}1$	p-hat1
$\hat{p}2$	p-hat2
Levo	Levo
Desno	Desno
P/Y	P/leto
C/Y	C/leto
Fb	Fb
F	F-vrednost
z	z-vrednost
p	p-vrednost
t	t-vrednost
se	se
χ^2	x^2
r^2	r^2
Adf	Adf
Edf	Edf
df	df
SSa	SSa
MSa	MSa
SSe	SSe
MSe	MSe
Fab	Fab
Bdf	Bdf
ABdf	ABdf
pa	pa
pb	pb
pab	pab
CellSum(	CellSum(
CellProd(	CellProd(
CellMin(	CellMin(
CellMax(	CellMax(
CellMean(	CellMean(
CellMedian(	CellMedian(
CellIf(	CellIf(
Y	GraphY
r	Graphr
Xt	GraphXt
Yt	GraphYt
X	GraphX
SSb	SSb
SSab	SSab
MSb	MSb

Poveljstvo	Besedilo
MSab	MSab
[ns]	[ns]
[µs]	[mikro]
[ms]	[ms]
[s]	[s]
[min]	[min]
[h]	[h]
[dan]	[dan]
[teden]	[teden]
[leto]	[leto]
[s-leto]	[s-leto]
[t-leto]	[t-leto]
[° C]	[Centigrade]
[K]	[Kel]
[° F]	[Fahrenheit]
[° R]	[Rankine]
[u]	[u]
[g]	[g]
[kg]	[kg]
[lb]	[lb]
[oz]	[oz]
[slug]	[slug]
[tona (kratka)]	[tona (kratka)]
[tona (dolga)]	[tona (dolga)]
[mton]	[mton]
[l-atm]	[l-atm]
[ft·lbf]	[ftlbf]
[calIT]	[calIT]
[calth]	[calth]
[Btu]	[Btu]
[kW·h]	[kWh]
[kgf·m]	[kgfm]
[Pa]	[Pa]
[kPa]	[kPa]
[bar]	[bar]
[mmH2O]	[mmH2O]
[mmHg]	[mmHg]
[inH2O]	[inH2O]
[inHg]	[inHg]
[lbf/in^2]	[lbf/in^2]
[kgf/cm^2]	[kgf/cm^2]
[atm]	[atm]
[dina]	[dina]
[N]	[New]
[kgf]	[kgf]
[lbf]	[lbf]
[tonf]	[tonf]
[fm]	[fm]
[mm]	[mm]
[cm]	[cm]
[m]	[m]
[km]	[km]
[Mil]	[Mil]
[in]	[in]
[ft]	[ft]

Poveljstvo	Besedilo
[yd]	[yd]
[fath]	[fath]
[rd]	[rd]
[milja]	[milja]
[n□ milja]	[n_milja]
[akr]	[akr]
[ha]	[ha]
[cm^2]	[cm^2]
[m^2]	[m^2]
[km^2]	[km^2]
[in^2]	[in^2]
[ft^2]	[ft^2]
[yd^2]	[yd^2]
[milja^2]	[milja^2]
[m/s]	[m/s]
[km/h]	[km/h]
[ft/s]	[ft/s]
[milja/h]	[milja/h]
[vozli]	[vozli]
[mL]	[mL]
[L]	[Lit]
[čajna žlička]	[čajna žlička]
[cm^3]	[cm^3]
[m^3]	[m^3]
[žlica]	[žlica]
[in^3]	[in^3]
[ft^3]	[ft^3]
[fl_oz(UK)]	[fl_oz(UK)]
[fl_oz(ZDA)]	[fl_oz(ZDA)]
[skodelica]	[skodelica]
[pt]	[pt]
[qt]	[qt]
[gal(ZDA)]	[gal(ZDA)]
[gal(UK)]	[gal(UK)]
[μm]	[mikrom]
[mg]	[mg]
[A]	[Ang]
[AU]	[AstU]
[l.y.]	[l.y.]
[pc]	[pc]
[ft·lbf/s]	[ftlbf/s]
[calth/s]	[calth/s]
[hp]	[hp]
[Btu/min]	[Btu/min]
[W]	[Wat]
[eV]	[eV]
[erg]	[erg]
[J]	[Jou]
[cal15]	[cal15]
[kcal15]	[kcal15]
[kcalth]	[kcalth]
[kcalIT]	[kcalIT]
Če□	Če□
Potem□	Potem□
Drugače□	Drugače□

Povelj	Besedilo
ČeKonec	IfEnd
Za□	Za□
□To□	□Za□
□Korak□	□Korak□
Naslednji	Naslednji
Medtem□	Medtem□
Medtem koKonec	Medtem koKonec
Do	Do
LpMedtem□	LpWhile□
Vrnitev	Vrnitev
Prekinitev	Prekinitev
Stop	Stop
Poišči□	Poišči□
Pošlji(	Pošlji(
Prejmi(	Prejmi(
OpenComport38k	OdpriComport38k
ZapriComport38k	ZapriComport38k
Pošlji38k□	Pošlji38k□
Prejmi38k□	Prejmi38k□
Izbriši besedilo	ClrText
ClrGraph	ClrGraph
ClrList□	ClrList
LinearReg(a+bx)□	LinearReg(a+bx)□
S-L-Normal	S-L-Normal
S-L-Debel	S-L-Debel
S-L-Prekinjen	S-L-Zlomljen
S-L-Pika	S-L-Pika
DrawGraph	DrawGraph
PlotPhase□	PlotPhase□
DrawDyna	DrawDyna
DrawStat	DrawStat
DrawFTG-Con	DrawFTG-Con
DrawFTG-Plt	DrawFTG-Plt
DrawR-Con	DrawR-Con
DrawR-Plt	DrawR-Plt
DrawRΣ -Con	DrawRSigma-Con
DrawRΣ -Plt	DrawRSigma-Plt
DrawWeb□	DrawWeb□
NormalG□	NormalG□
ThickG□	DebelG□
PrekinjenG□	PrekinjenG□
DispF-Tbl	DispF-Tbl
DispR-Tbl	DispR-Tbl
SimplifyAuto	Poenostavi samodejno
PoenostaviMo	SimplifyMan
NPPlot	NPPlot
Sinusoidal	Sinusoidal
SinReg□	SinReg□
Logistični	Logistični
LogisticReg□	LogisticReg□
Pie	Pie
Bar	Bar
DotG□	DotG
1-	1-spremenljivka□

Povelj	Besedilo
LinearReg(ax+b)□	LinearReg(ax+b)□
Med-MedLine□	Med-MedLine□
QuadReg□	QuadReg□
KubičniReg□	CubicReg□
QuartReg□	QuartReg□
LogReg□	LogReg□
ExpReg(a·e^bx)□	ExpReg(ae^bx)□
PowerReg□	PowerReg□
S-Gph1□	S-Gph1□
S-Gph2□	S-Gph2□
S-Gph3□	S-Gph3□
Kvadrat	Kvadrat
Križ	Križ
Pika	Pika
Razpršitev	Razpršitev
xyLine	xyLine
Hist	Hist
MedBox	MedBox
N-Dist	N-Dist
Broken	Pokvarjen
Linear	Linear
Med-Med	Med-Med
Quad	Kvadrat
Kubični	Kubični
Kvart	Kvart
Log	Log
Exp(a·e^bx)	Exp(ae^bx)
Moč	Moč
ExpReg(a·b^x)□	ExpReg(ab^x)□
S-WindAuto	S-WindAuto
S-WindMan	S-WindMan
Graf□ X=	Graf□ X=
Y=Tip	Y=Tip
r=Tip	r=Tip
ParamType	ParamType
X=Tip	X=Tip
X>Tip	X>Tip
X<Tip	X<Tip
Y>Tip	Y>Tip
Y<Tip	Y<Tip
YtTip	Y>=Tip
YsTip	Y<=Tip
XtTip	X>=Tip
XsTip	X<=Tip
G-Connect	G-Connect
G-Plot	G-Plot
Resid-None	Resid-Nič
Seznam ostankov□	Seznam ostankov□
BG-Nič	BG-Nič
BG-Slik□	BG-Slik□
GridOff	Mreža izklopljena
Mreža vklopljena	GridOn
Exp(a·b^x)	Exp(a^bx)
D□ Var□	D□ Var□

Povelj	Besedilo
VarRange	VarRange
Q1Q3TypeOnData	Q1Q3TipNaPodatkih
SketchNormal□	SketchNormal□
SketchThick□	SketchThick□
Skica prekinjena□	SketchBroken□
SketchDot□	SketchDot□
anType	anType
an+1Type	an+1Type
an+2Tip	an+2Tip
StoPict□	StoPict□
RclPict□	RclPict□
StoGMEM□	StoGMEM□
RclGMEM□	RclGMEM□
StoV-Win□	StoV-Win□
RclV-Win□	RclV-Win□
%	Prikaz
Podatki	Prikaz podatkov
Men□	Men□
RclCapt□	RclCapt
Tangent□	Tangent□
Normal□	Normal□
Inverzna□	Obratna□
Vertikalna□	Vertikalno□
Vodoravno□	Vodoravno□
Besedilo□	Besedilo□
Krog□	Krog□
F-linija□	F-linija□
PlotOn□	PlotOn□
PlotOff□	PlotOff□
PlotChg□	PlotChg□
PxlOn□	PxlOn□
PxlOff□	PxlOff□
PxlChg□	PxlChg□
PxlTest(	PxlTest(
SortA(	SortA(
SortD(	SortD(
VarList1	VarList1
VarList2	VarList2
VarList3	VarList3
VarList4	VarList4
VarList5	VarList5
VarList6	VarList6
Datoteka1	Datoteka1
Datoteka2	Datoteka2
Datoteka3	Datoteka3
Datoteka4	Datoteka4
Datoteka5	Datoteka5
Datoteka6	Datoteka6
Y=Hitrost risanja	Y=Hitrost risanja
Y=DrawSpeedHigh	Y=DrawSpeedHigh
FuncOn	FuncOn
SimulOn	SimulOn
AxesOn	AxesOn

Command	Besedilo
DerivOn	DerivOn
LocusOn	LocusOn
ΣdispOn	SigmadispOn
G□ SelOn□	G□ SelOn□
T□ SelOn□	T□ SelOn□
D□ SelOn□	D□ SelOn□
R□ SelOn□	R□ SelOn□
DrawOn	DrawOn
ImpMultiOn	ImpMultiOn
ab/c	ab/c
d/c	d/c
FuncOff	FuncOff
SimulOff	SimulOff
AxesOff	OsOff
Koordinacije izklopljene	CoordOff
OznakaOff	OznakaOff
DerivOff	DerivOff
LocusOff	LocusOff
ΣdispOff	SigmadispOff
G□ SelOff□	G□ SelOff□
T□ SelOff□	T□ SelOff□
D□ SelOff□	D□ SelOff□
R□ SelOff□	R□ SelOff□
DrawOff	DrawOff
ImpMultiOff	ImpMultiOff
'Dec	>&D
'Hex	>&H
'Bin	>&B
'Oct	>&O
'DMS	>DMS
'a+bi	>a+bi
'r∠θ	>re^Theta
Real	Real
a+bi	a+bi
r∠θ	re^Theta
EngOn	EngOn
EngOff	EngOff
Sel□ a0	Sel□ a0
Sel□ a1	Sel□ a1
cn	cn□
cn+1	cn+1
cn+2	cn+2
c0	c0
c1	c1
c2	c2
cnStart	CnStart
IneqTypeAnd	IneqTypeAnd
fn	fn
Datoteka□	Datoteka□
VarList□	VarList□
ClrMat□	ClrMat□
ZoomAuto	ZoomAuto
Xdot	Xdot
RightXdot	R-Xdot
DrawDistNorm□	DrawDistNorm□

Command	Besedilo
DrawDistT□	DrawDistT□
DrawDistChi□	DrawDistChi□
DrawDistF□	DrawDistF□
Nič	Nič
Dolžina palice	Dolžina palice
StickHoriz	StickHoriz
IneqTypeOr	IneqTypeOr
□ grafa X>	□ X>
□ X<	□ X<
□ X≥	Graf□ X>=
Graf□ X≤	Graf□ X<=
StrJoin(	StrJoin(
StrLen(	StrLen(
StrCmp(	StrCmp(
StrSrc(	StrSrc(
StrLeft(	StrLeft(
StrRight(	StrRight(
StrMid(	StrMid(
Exp'Str(	Exp>Str(
Exp(	Exp(
StrUpr(	StrUpr(
StrLwr(	StrLwr(
StrInv(	StrInv(
StrShift(	StrShift(
StrRotate(	StrRotate(
ClrVct□	ClrVct□
Str□	Str□
CrossP(	CrossP(
DotP(	DotP(
Norm(	Norm(
UnitV(	UnitV(
Angle(	Kot(
NormPD(	NormPD(
NormCD(	NormCD(
InvNormCD(	InvNormCD(
tPD(	tPD(
tCD(	tCD(
InvTCD(	InvTCD(
ChiPD(	ChiPD(
ChiCD(	ChiCD(
InvChiCD(	InvChiCD(
FPD(	FPD(
FCD(	FCD(
InvFCD(	InvFCD(
BinomialPD(	BinomialPD(
BinomialCD(	BinomialCD(
InvBinomialCD(	InvBinomialCD(
PoissonPD(	PoissonPD(
PoissonCD(	PoissonCD(
InvPoissonCD(	InvPoissonCD(
GeoPD(	GeoPD(
GeoCD(	GeoCD(
InvGeoCD(	InvGeoCD(
HypergeoPD(	HypergeoPD(
HypergeoCD(	HypergeoCD(
InvHypergeoCD(	InvHypergeoCD(

Ukaz	Besedilo
Smpl_SI(	Smpl_SI(
Smpl_SFV(	Smpl_SFV(
Cmpd_n(	Cmpd_n(
Cmpd_I%(	Cmpd_I%(
Cmpd_PV(	Cmpd_PV(
Cmpd_PMT(	Cmpd_PMT(
Cmpd_FV(	Cmpd_FV(
Denarni_NPV(	Denarni_NPV(
Denarni_IRR(	Denarni_IRR(
Denarni_PBP(	Denarni_PBP(
Denarna_NFV(	Denarna_NFV(
Znesek_BAL(	Znesek_BAL(
Znesek_INT(	Znesek_INT(
Znesek_PRN(	Amt_PRN(
Amt_Σ INT(	Amt_SigmaINT(
Amt_Σ PRN(	Amt_SigmaPRN(
Cnvt_EFF(	Cnvt_EFF(
Cnvt_APR(	Cnvt_APR(
Stroški(	Stroški(
Prodaja(	Prodaja(
Margin(	Marža(
PmtEnd	PmtEnd
PmtBgn	PmtBgn
Bond_PRC(	Bond_PRC(
Obligacija_YLD (	Bond_YLD(
DateMode365	DateMode365
DateMode360	DateMode360
ObdobjaLetno	ObdobjaLetno
ObdobjaPololetna	Obdobja polletna
Days_Prd(	Days_Prd(
OneSampleZTest□	Enovrstni Z-test□
Dvovzorčni Z-test□	Dvovzorčni Z-test□
Enostranski Z-test□	Enovrstni Z-test□
DvaPropZTest□	Dvostranski Z-test□
Enovrstni t-test□	Enovrstni t-test□
Dvovzorčni t-test□	Dvovzorčni t-test□
LinRegTTest□	LinRegTTest□
ChiGOFTest□	ChiGOFTest□
ChiTest□	ChiTest□
Dvovzorčni FT test□	Dvovzorčni FTest□
Enosmerna ANOVA□	Enosmerna ANOVA□
Dvosmerna ANOVA□	Dvosmerna ANOVA□
x1InvN	x1InvN
x2InvN	x2InvN
xInv	xInv
zLow	zLow
zUp	zUp
tLow	tLow
tUp	tUp

9. Programska knjižnica

- Preden začnete programirati, preverite, koliko bajtov neizkoriščenega pomnilnika je še na voljo.

Ime programa	Primarna faktorizacija

Opis

Ta program neprekinjeno deli naravno število s faktorji, dokler niso vsi njegovi praštevilski faktorji
.

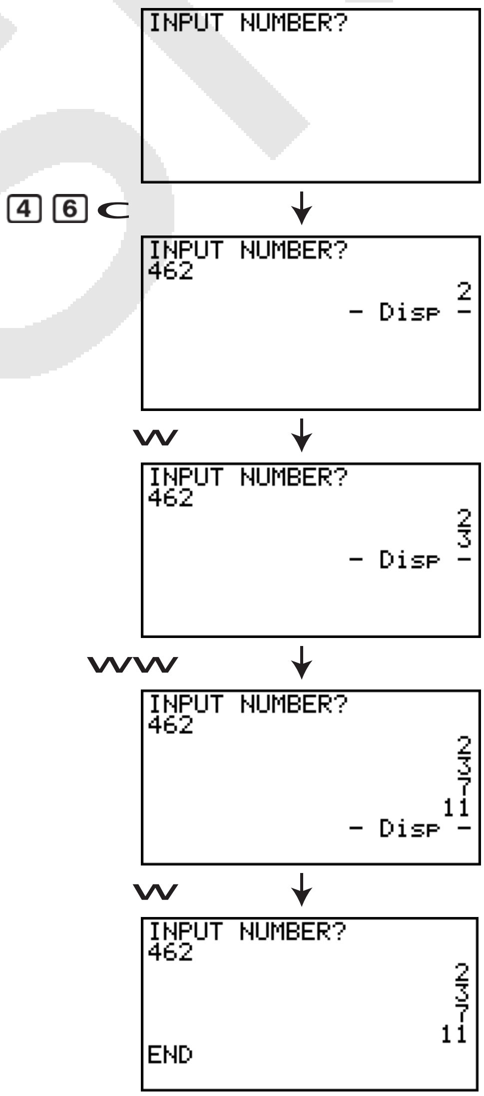
Namen

Ta program sprejme vnos naravnega števila A in ga deli z B (2, 3, 5, 7.............), da najde prvoštevilske faktorje A.

- Če deljenje ne da ostanka, se rezultat operacije pripiše A.
- Zgornji postopek se ponavlja, dokler B > A.

Primer **462 =** 2× 3× 7× **11**

```
ClrText↵
"INPUT NUMBER"?→A↵
2→B↵
Do↵
While Frac (A÷B)=0↵
B◢
A÷B→A↵
WhileEnd↵
If B=2↵
Then 3→B↵
Else B+2→B↵
IfEnd↵
LpWhile B≤A↵
"END"
```



Ime programa Ellipse

Opis

Ta program prikaže tabelo številk naslednjih vrednosti na podlagi vnosa žarišč elipse, vsote razdalje med lokusi in žarišči ter koraka (velikosti koraka) X.

Y1: Koordinatne vrednosti zgornje polovice elipse Y2: Koordinatne vrednosti spodnje polovice elipse Y3: Razdalje med desnim žariščem in lokusi

Y4: Razdalje med levim žariščem in lokusi

Y5: Vsota Y3 in Y4

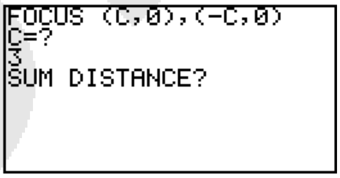
Nato program nariše žarišča in vrednosti v Y1 in Y2.

Namen

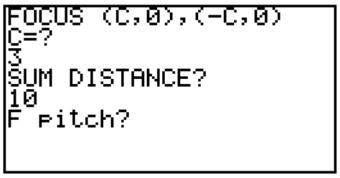
Ta program kaže, da so vsote razdalj med lokusi in dvema žariščema elipse enake.

```
AxesOff↵
Do↵
ClrText↵
"FOCUS (C,0),(-C,0)"↵
"C="?→C↵
"SUM DISTANCE"?→D↵
LpWhile 2Abs C≥D Or D≤0↵
D÷2→A↵
√(A²−C²)→B↵
Y=Type↵
"B√(1−X²÷A²)"→Y1↵
"−Y1"→Y2↵
"√((X−C)²+Y1²)"→Y3↵
"√((X+C)²+Y1²)"→Y4↵
"Y3+Y4"→Y5↵
For 1→E To 20↵
If E≤5↵
Then T SelOn E↵
Else T SelOff E↵
IfEnd↵
Next↵
−Int A→F Start↵
Int A→F End↵
"F pitch"?→F pitch↵
DispF-Tbl◢
ClrGraph↵
1.2A→Xmax↵
−1.2A→Xmin↵
1.2B→Ymax↵
−1.2B→Ymin↵
T SelOff 3↵
T SelOff 4↵
T SelOff 5↵
DispF-Tbl↵
DrawFTG-Plt↵
PlotOn C,0↵
PlotOn −C,0◢
"END"
```

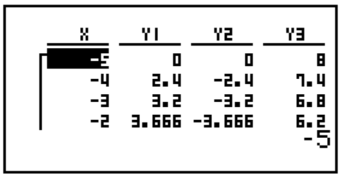
d

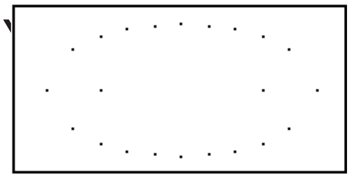


b□w



b





Poglavje 9 Preglednica

Aplikacija Spreadsheet vam ponuja zmogljive funkcije za delo s preglednicami, ki jih lahko vzamete s seboj kamorkoli.

Vse operacije v tem poglavju se izvajajo v načinu **S • SHT**.

Pomembno!

• fx-7400GIII ni opremljen z načinom **S • SHT**.

1. Osnove preglednice in meni funkcij

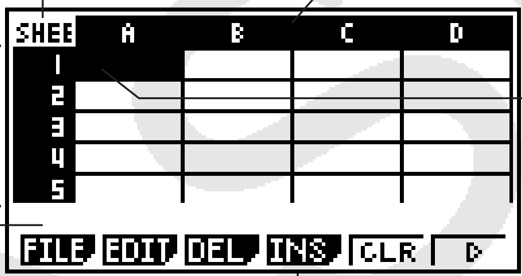
Če v glavnem meniju izberete **S • SHT,** se prikaže zaslon s preglednico. Ko vnesete **S • SHT** se samodejno ustvari nova preglednica z imenom „SHEET”.

Na zaslonu preglednice se prikažejo številne celice (kvadrati) in podatki, ki jih vsebuje vsaka celica.

Ime datoteke
Prikaže čim več znakov imena datoteke.

Črke stolpcev (A do Z)

Številke vrstic (od 1 do 999)



Kazalec celice

Urejevalno polje
Prikaže vsebino celice, v kateri se trenutno nahaja kurzor. Če je izbranih več celic, urejevalno polje prikaže izbrani obseg celic.

Meniju funkcij

V celico lahko vnesete naslednje vrste podatkov.

Konstante	Konstanta je vrednost, ki je fiksna takoj, ko končate z njenim vnosom. Konstanta je lahko številčna vrednost ali izračunska formula (kot na primer 7+3, sin30, A1× 2 itd.), ki nima pred seboj znaka za enako ((=)).
Besedilo	Niz znakov, ki se začne z narekovajem ("), se obravnava kot besedilo.
Formula	Formula, ki se začne z znakom za enako(=) , na primer =A1× 2, se izvede tako, kot je napisana.

Upoštevajte, da kompleksne številke niso podprte v načinu **S • SHT**.

■ Meniju funkcij preglednice

• {**FILE**} ... Prikaže naslednji podmeni FILE.

  • {**NOVO**}/{**ODPRI**}/{**SV • AS**}/{**PREIZRAČUNAJ**}/{**CSV**}

• {**EDIT**} ... Prikaže naslednji podmeni EDIT.

  • {**CUT**}/{**PASTE**}/{**COPY**}/{**CELL**}/{**JUMP**}/{**SEQ**}/{**FILL**}/{**SRT • A**}/{**SRT • D**}

  • PASTE se prikaže takoj po izvedbi ukaza CUT ali COPY.

- {**DEL**} ... Prikaže naslednji podmeni DEL (izbriši).
  - {**ROW**}/{**COL**}/{**ALL**}
- {**INS**} ... Prikaže naslednji podmeni INS (vstavi).
  - {**ROW**}/{**COL**}
- {**CLR**} ... Izbriše vsebino iz izbranega obsega celic.
- {**GRPH**} ... Prikaže naslednji meni GRPH. (Enako kot v načinu **STAT**.)
  -
- {**CALC**} ... Prikaže naslednji meni CALC (statistični izračun). (Enako kot v načinu **STAT** .)
  -
- {**STO**} ... Prikaže naslednji podmeni STO (shranjevanje).
  -
- {**RCL**} ... Prikaže naslednji podmeni RCL (ponovni priklic).
  -

- **Meniju funkcij za vnos podatkov**
- {**GRAB**} ... Vstopi v način GRAB za vnos imena sklicevanja na celico.
- {**$**} ... Vnese ukaz za absolutno sklicevanje na celico ($).
- {**:**} ... Vnese ukaz za določitev območja celic (:).
- {**If**} ... Vnese ukaz CellIf(.
- {**CEL**} ... Prikaže podmeni za vnos naslednjih ukazov.
  - CellMin(, CellMax(, CellMean(, CellMedian, CellSum, CellProd(
- {**REL**} ... Prikaže podmeni za vnos naslednjih relacijskih operatorjev.
  - =,≠ , >, <, t, s

2. Osnovne operacije s preglednicami

V tem poglavju so pojasnjene operacije s preglednicami, kako premikati kurzor in izbrati eno ali več celic ter kako vnašati in urejati podatke.

■ Operacije s preglednicami

u Ustvarjanje nove datoteke

1. Pritisnite 1(FILE)1(NEW).
2. V pogovornem oknu, ki se prikaže, vnesite do osem znakov za ime datoteke in nato pritisnite w.
   - S tem boste ustvarili novo datoteko in prikazali prazno preglednico.
   - Nova datoteka ne bo ustvarjena, če že obstaja datoteka z istim imenom, ki ste ga vnesli v koraku 2. Namesto tega se bo odprla obstoječa datoteka.

u **Za odpiranje datoteke**

1. Pritisnite 1(FILE)2(OPEN).
2. Na seznamu datotek, ki se prikaže, z uporabo f in ② izberite želeno datoteko in nato pritisnite w.

u **Samodejno shranjevanje**

V načinu **S • SHT** samodejno shranjevanje samodejno shrani trenutno odprto datoteko, kadarkoli jo uredite. To pomeni, da vam ni treba izvajati nobenega ročnega shranjevanja.

u **Shranjevanje datoteke pod novim imenom**

1. Pritisnite 1(FILE)3(SV • AS).
2. V pogovornem oknu, ki se prikaže, vnesite do osem znakov za novo ime datoteke in nato pritisnite w.
   - Če datoteka z imenom, ki ste ga vnesli v koraku 2, že obstaja, se prikaže sporočilo, v katerem vas vpraša, ali želite obstoječo datoteko nadomestiti z novo. Pritisnite 1(Yes), da nadomestite obstoječo datoteko, ali 6(No), da prekličete shranjevanje in se vrnete v pogovorno okno za vnos imena datoteke v koraku 2.

u **Če želite izbrisati datoteko**

1. Pritisnite 1 (DATOTEKA) 2 (ODPRI).
2. Na seznamu datotek, ki se prikaže, z uporabo f in ② izberite datoteko, ki jo želite izbrisati, in nato pritisnite 1(DEL).
3. Pojavi se potrditveno sporočilo. Pritisnite 1 (Da), da izbrišete datoteko, ali 6 (Ne), da prekličete brez brisanja.
4. Če se želite vrniti iz seznama datotek v preglednico, pritisnite J
   - Če izbrišete trenutno odprto datoteko, se samodejno ustvari nova datoteka z imenom „SHEET“ in prikaže njena preglednica.

■ Prenos podatkov med preglednico in CSV datotekami

Vsebino CSV datoteke, shranjene v tem kalkulatorju ali prenesene iz računalnika, lahko uvozite v preglednico. Vsebino preglednice lahko shranite tudi kot CSV datoteko.

u Uvoz vsebine CSV datoteke v preglednico

1. Pripravite CSV datoteko, ki jo želite uvoziti.
   - Glejte „Zahteve za uvoz CSV datoteke“ (stran 3-14).
2. Pritisnite 1(FILE)5(CSV)1(LOAD).
   - Če v naslednjem koraku pritisnete w, se bodo vsi podatki v preglednici nadomestili s podatki iz datoteke CSV.
3. V pogovornem oknu za izbiro datoteke, ki se prikaže, uporabite f in ②, da označite datoteko, ki jo želite uvoziti, in nato pritisnite w.
   - S tem uvozite vsebino CSV datoteke, ki ste jo določili, v preglednico.

Pomembno!

- Vsi prazni podatki v datoteki CSV se uvozijo kot prazne celice.
- Napaka se pojavi, če CSV datoteka vsebuje vsaj eno besedilno vrstico.
- Če CSV datoteka vsebuje podatke, ki jih ni mogoče pretvoriti, se prikaže sporočilo o napaki, ki prikazuje mesto v CSV datoteki (primer: vrstica 2, stolpec 3), kjer se nahajajo podatki, ki jih ni mogoče pretvoriti.
- Poskus uvoza CSV datoteke, ki ima več kot 26 stolpcev ali 999 vrstic, bo povzročil napako »Neveljavna velikost podatkov«.

---

u **Shranjevanje vsebine preglednice kot CSV datoteko**

1. Po potrebi pritisnite 1(FILE)4(RECAL), da ponovno izračunate vsebino preglednice.
   - Upoštevajte, da se ponovni izračun ne izvede samodejno, ko vsebino preglednice shranite v datoteko CSV. Ponovni izračun izvedite, če preglednica vsebuje formulo, ki se začne z znakom za enako (=). Za več informacij glejte »Vnos formule v celico« (stran 9-9).
   - Formule se ne shranijo v datoteko CSV. Shranijo se samo rezultati izračunov.
   - Vsi podatki v celicah ERROR v preglednici se shranijo kot prazni podatki.
2. Pritisnite 1(FILE)5(CSV)2(SV・AS).
   - Prikaže se zaslon za izbiro mape.
3. Izberite mapo, v katero želite shraniti CSV datoteko.
   - Če želite CSV datoteko shraniti v korenski imenik, označite »ROOT«.
   - Če želite CSV datoteko shraniti v mapo, s tipkama f in ② premaknite označitev na želeno mapo in nato pritisnite 1(OPEN).
4. Pritisnite 1(SV・AS).
5. Vnesite do osem znakov za ime datoteke in nato pritisnite w.
   - Za informacije o tem, kako se določene vrste podatkov pretvorijo pri shranjevanju v datoteko CSV, glej opombo »Pomembno!« pod »Shranjevanje vsebine matrike kot datoteke CSV« (stran 2-44).

---

u **Določanje ločevalnega znaka in decimalne vejice v datoteki CSV**

Pritisnite 1(FILE)5(CSV)3(SET), da prikažete zaslon za nastavitev formata CSV. Nato izvedite postopek iz koraka 3 v razdelku »Določanje ločevalnega simbola in decimalne vejice za datoteko CSV« (stran 3-16).

■ Ponovni izračun vseh formul v trenutno odprti preglednici

Način **S・SHT** ima funkcijo Auto Calc, ki samodejno ponovno izračuna vse formule v preglednici, ko jo odprete ali izvedete kakršno koli urejanje. Funkcija Auto Calc je omogočena v tovarniških nastavitvah. Če želite, lahko ponovni izračun izvedete tudi ročno.

u **Samodejni izračun**

Samodejno izračunavanje je element nastavitev načina **S • SHT** (stran 1-34).

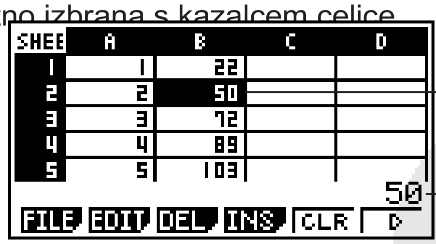
Ko je samodejno izračunavanje omogočeno (vklopljeno), se vse formule v preglednici ponovno izračunajo ob odprtju preglednice ali ob izvedbi katere koli operacije urejanja. Upoštevajte pa, da ponovni izračun lahko upočasni splošno hitrost obdelave. Ko je samodejno izračunavanje onemogočeno (izklopljeno), morate ponovni izračun izvesti ročno, kot je potrebno.

u **Ročno izvajanje ponovnega izračuna preglednice**

Pritisnite 1(FILE)4(RECAL). S tem se ponovno izračunajo vse formule v trenutno odprti datoteki in prikažejo ustrezni rezultati.

■ Uporaba kazalca celice

Kazalec celice prikazuje celico, ki je izbrana v preglednici. Označena celica je tista, ki je trenutno izbrana s kazalcem celice.



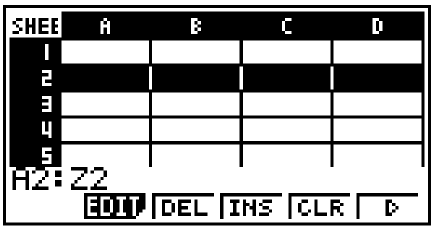
Kazalec

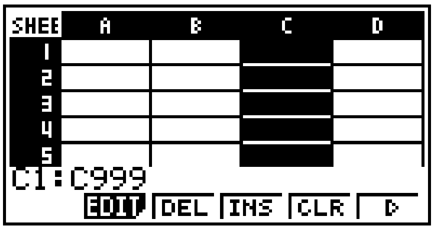
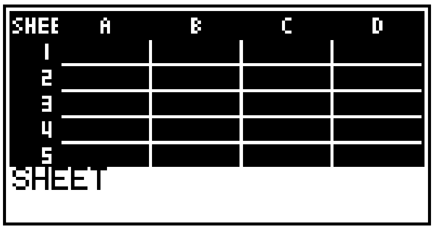
Urejeval

Ko je z kazalcem celice izbrana ena celica, se vsebina te celice prikaže v polju za urejanje. Vsebino celice lahko urejate v polju za urejanje.

Ko je z kazalcem celice izbranih več celic, se izbrani obseg prikaže v polju za urejanje. V tem primeru lahko kopirate, izbrišete ali izvedete druge operacije s celicami na celotnem obsegu izbranih celic.

u **Izbiranje celic**

Za izbiro tega:	**Naredite to:**
Posamezno celico	S pomočjo tipk za premikanje kurzorja premaknite kurzor na želeno celico ali uporabite ukaz JUMP, da preskočite neposredno na celico.
Območje celic	Glejte »Izbiranje območja celic« (stran 9-6).
Celotna vrstica celic 	Premaknite kurzor celice v stolpec A vrstice, katere celice želite izbrati, in nato pritisnite d. Če pritisnete d, ko je kurzor celice na primer na celici A2, bo izbrana celotna druga vrstica (od A2 do Z2). To bo povzročilo, da se bo v polju za urejanje pojavilo A2:Z2 (kar označuje izbrano območje).

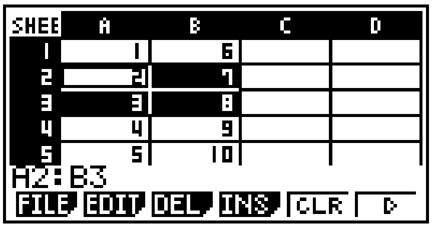
Da izberete to:	Naredite naslednje:
Celoten stolpec celic. 	Premaknite kurzor celice v vrstico 1 stolpca, katerega celice želite izbrati, in nato pritisnite f. Če pritisnete f, ko je kurzor celice na primer v celici C1, bo izbran celoten stolpec C (od C1 do C999). To bo povzročilo, da se bo v polju za urejanje pojavilo C1:C999 (kar označuje izbrano območje).
Vse celice v preglednici 	Pritisnite d, ko je izbran celoten stolpec A, ali f, ko je izbrana celotna vrstica 1. S tem boste izbrali vse celice v preglednici in v polju za urejanje se bo prikazalo ime datoteke preglednice.

u Uporaba ukaza JUMP za premikanje kazalca celice

Če želite premakniti kurzor celice sem:	Naredite naslednje:
Posamezna celica	1. Pritisnite 2(EDIT)4(JUMP)1(GO). 2. V pogovornem oknu, ki se prikaže, vnesite ime celice (A1 do Z999), na katero želite preskočiti. 3. Pritisnite w.
Vrstica 1 trenutnega stolpca	Pritisnite 2(EDIT)4(JUMP)2(TOP↑).
Stolpec A trenutne vrstice	Pritisnite 2(EDIT)4(JUMP)3(TOP←).
Zadnja vrstica trenutnega stolpca	Pritisnite 2(EDIT)4(JUMP)4(BOT↓).
Stolpec Z trenutne vrstice	Pritisnite 2(EDIT)4(JUMP)5(BOT→).

u Izbiranje območja celic

1. Premaknite kurzor celice na začetno točko območja celic, ki ga želite izbrati.
   - Če želite, lahko kot začetno točko izberete celotno vrstico ali stolpec celic. Podrobnosti o izbiranju celic najdete v poglavju „Izbiranje celic“ na strani 9-5.
2. Pritisnite (CLIP).
   - S tem se kazalec celice spremeni v debelo črto namesto običajnega označevanja.
3. S puščičnimi tipkami premaknite kurzor celice na končno točko območja celic, ki ga želite izbrati.
   - V oknu za urejanje se prikaže območje izbranih celic.
   - Če želite preklicati izbiro celice, pritisniteJ Če to storite, se kazalec celice nahaja na koncu izbranega območja.

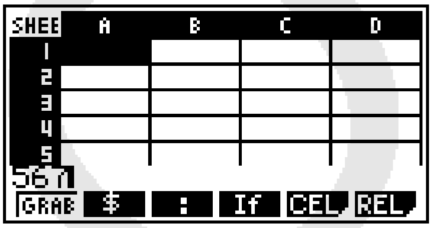


■ Osnove vnosa podatkov (konstante, besedilo, formule)

Najprej si oglejmo nekaj osnovnih postopkov, ki veljajo ne glede na vrsto podatkov, ki jih vnašate.

u Če želite nadomestiti podatke, ki so trenutno v celici, z novimi podatki

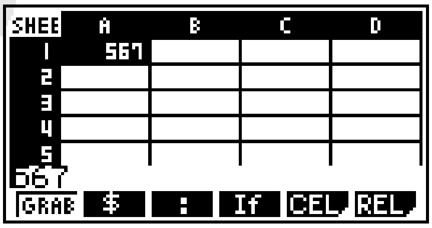
1. Premaknite kazalec celice na celico, v katero želite vnesti podatke.
   - Če izbrana celica že vsebuje podatke, bo naslednji korak nadomestil obstoječe podatke z novimi.
2. Za vnos podatkov uporabite tipke kalkulatorja.
   - Ko izvedete tipkanje za vnos vrednosti ali besedila (kot so b, al(B) itd.), se ustrezne številke prikažejo poravnane levo v oknu za urejanje.
   - Če želite prekiniti vnos podatkov kadarkoli pred nadaljevanjem s korakom 3 spodaj, pritisniteJ S tem se vsebina celice vrne v stanje iz koraka 1 tega postopka.



3. Za dokončanje in uporabo vnosa pritisnite w.

u Urejanje podatkov v celici

1. Premaknite kurzor v celico, katere vsebino želite urediti.
2. Pritisnite 2(EDIT)3(CELL).
   - Vsebina celice v oknu za urejanje se bo spremenila iz poravnave levo na poravnavo desno. V oknu za urejanje se bo pojavil kurzor za besedilo, tako da lahko uredite njegovo vsebino.



3. Z e in d premikajte kurzor po vsebini celice in jo uredite po potrebi.
   - Če želite prekiniti urejanje v katerem koli trenutku pred nadaljevanjem s korakom 4 spodaj, pritisniteJ S tem se vsebina celice vrne v stanje iz koraka 1 tega postopka.
4. Za dokončanje in uporabo urejanja pritisnite w.

u Premikanje kurzorja celice med vnašanjem podatkov v celico

V tovarniški privzeti nastavitvi bo pritisk na tipko w med vnašanjem podatkov v celico povzročil premik kazalca celice na naslednjo vrstico. Namesto tega lahko določite premik na naslednji stolpec z nastavitvijo »Premik«, kot je opisano na strani 1-34.

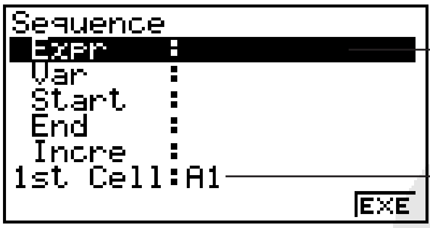
■ Vnos konstante (vrednosti, rezultata izračuna, številčne zaporedje) v celico

Konstanta je vrednost, ki je fiksna takoj, ko jo vnesete. Konstanta je lahko številčna vrednost ali izračunska formula (kot na primer 7+3, sin30, A1× 2 itd.), ki nima pred seboj znaka za enako ((=)). Če na primer vnesete sd□w, se v celic 0 prikaže vrednost 0,5 (rezultat izračuna) (če je kot enota kota izbrana Deg).

---

u **Za samodejno vnos številčne zaporedje na podlagi funkcijskega izraza**

1. Premaknite kurzor celice na celico, kjer želite začeti vnašanje številčne zaporedje.
   • V skladu s privzetimi nastavitvami se bo samodejno vnašanje številčne zaporedje nadaljevalo navzdol od začetne celice. Drugo smer lahko določite z nastavitvijo »Premakni«, kot je opisano na strani 1-34.
2. Pritisnite 2(EDIT)5(SEQ), da prikažete zaslon Zaporedje, nato pa določite funkcijski izraz in vrednosti, potrebne za ustvarjanje zahtevanega številčnega zaporedja.



Vnesete lahko podatke za element, ki je označen na zaslonu.

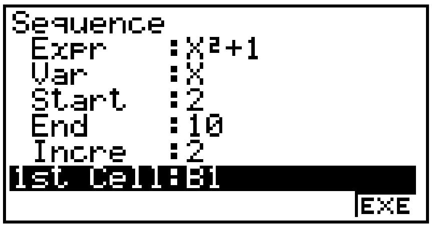
Referenčno ime celice, izbrane v koraku 1

Element	Opis
Expr	Vnesite funkcionalni izraz $f(x)$ za generiranje številčne zaporedje. Primer: a+(X)x+bw (X² + 1)
Var	Vnesite ime spremenljivke, uporabljene v izrazu funkcije, vnesenem za Expr. Primer: a+(X)w (X)
Začetek	Vnesite začetno vrednost (x_1) vrednosti, ki jo želite nadomestiti za spremenljivko, določeno s Var. Primer: cw
Konec	Vnesite končno vrednost (x_n) vrednosti, ki naj nadomesti spremenljivko, določeno s Var. Primer: b□w0
Povečaj	Vnesite vrednost povečanja (m) za zaporedne vrednosti x_1, kot v: ($x_2 = x_1 + m$), ($x_3 = x_2 + m$) in tako naprej. Številčna zaporedja se generirajo v območju $x_1 + (n - 1)\, m < x_n$. Primer: cw
1. celica	Vnesite referenčno ime (A1, B2 itd.) celice, v katero želite vnesti prvo vrednost številčne zaporedje. Celico določite tukaj le, če se začetna celica razlikuje od tiste, ki ste jo določili v koraku 1 tega postopka. Primer: aI(B)bw (B1)

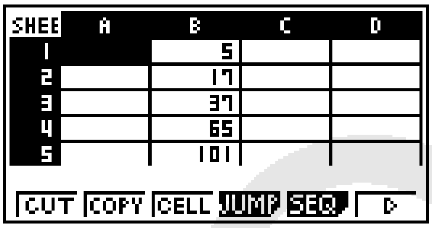
• Vsakič, ko po vnosu podatkov za nastavitveno postavko pritisnete w, se označitev premakne na naslednjo nastavitveno postavko. Z gumboma f in ② lahko označitev po potrebi premaknete navzgor ali navzdol.

- Z izvedbo naslednjega koraka se bo številčni niz samodejno vnesel, začenši z določeno celico. Če katera koli celica v območju celic, v katerega se bodo vnesle vrednosti številčnega zaporedja, že vsebuje podatke, se obstoječi podatki nadomestijo z vrednostmi številčnega zaporedja.

3. Po vnosu podatkov za vse nastavitvene elemente pritisnite 6(EXE) ali tipko w, da začnete ustvarjanje in vnos številčne zaporedje.



⇒



■ Vnos besedila v celico

Za vnos besedila se prepričajte, da je prva stvar, ki jo vnesete v celico, a5(”). Narekovaj (") kalkulatorju pove, da je tisto, kar sledi, besedilo, ki ga je treba prikazati takšno, kot je, brez izračuna. Narekovaj (") se ne prikaže kot del besedila.

■ Vnos formule v celico

Za primer poskusimo narediti tabelo, ki vsebuje podatke na podlagi formule <CENA>× <KOLIČINA> = <SKUPAJ>. Za to bi v stolpec A vnesli vrednosti <CENA>, vrednosti <QUANITY> v stolpec B in izračunske formule (kot so = A1× B1, = A2× B2 itd.) v stolpec C. Če je funkcija samodejnega izračuna omogočena (vklopljena), se vrednosti v stolpcu C ponovno izračunajo in posodobijo vsakič, ko spremenimo vrednosti v stolpcu A ali B.

V tem primeru je treba upoštevati, da moramo podatke v stolpcu C začeti z enakostnim znakom(=) , da označimo, da gre za formulo. Poleg vrednosti, aritmetičnih operatorjev in imen referenčnih celic lahko formula vsebuje tudi vgrajene funkcionalne ukaze (stran 2-13) in posebne ukaze v načinu **S・SHT** (stran 9-15).

Primer vnosa formule

	A	B	C
1	CENA	KOLIČINA	SKUPAJ
2	35	15	525
3	52	15	780
4	78	20	1560

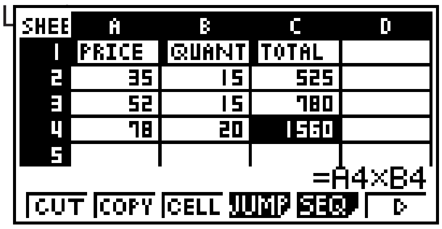
Postopek

1. Vnesite besedilo za vrstico 1 in ustrezne vrednosti v celice od A2 do B4.
2. Premaknite kurzor v celico C2 in vnesite formulo za A2× B2.

!.(=) av(A)c*al(B)cw

3. Kopirajte formulo v celici C2 in jo kopirajte v celici C3 in C4. Premaknite kurzor v celico C2 in izvedite naslednjo operacijo.

2 (UREDI) 2 (KOPIRAJ) (2) 1 (PRILEPI) (2) 1 (PRIL



- Za podrobnosti o kopiranju in lepljenju glejte „Kopiranje in lepljenje vsebine celic“ (stran 9-11).

■ Vnos imena sklicevanja na celico

Vsaka celica v preglednici ima tako imenovano »referenčno ime«, ki je sestavljeno iz imena stolpca (od A do Z) in imena vrstice (od 1 do 999). Referenčno ime celice se lahko uporabi v formuli, kar pomeni, da je vrednost navedene celice del formule. Za več informacij glejte »Vnos formule v celico« (stran 9-9). Obstajata dve metodi, ki jih lahko uporabite za vnos imena referenčne celice: neposreden vnos imena in vnos z uporabo ukaza GRAB. V nadaljevanju je prikazano, kako bi uporabili vsako od teh metod za vnos =A1+5 v celico B1.

u Vnos imena sklicevanja na celico z neposrednim vnosom

Premaknite kurzor v celico B1 in izvedite naslednjo operacijo.

(=) av(A)b+fw

u Vnos imena referenčne celice z ukazom GRAB

Premaknite kurzor celice na celico B1 in izvedite naslednjo operacijo.

(=) 1(GRAB)d1(SET)+fw

- Ukazi 2 (GO) do 6 (BOT→) v podmeniju, ki se prikaže, ko pritisnete 1 (GRAB), so enaki ukazom 1 (GO) do 5 (BOT→) v podmeniju ukaza JUMP. Glejte »Uporaba ukaza JUMP za premikanje kazalca celice« na strani 9-6 za več informacij o teh ukazih.

■ Relativna in absolutna imena referenčnih celic

Obstajata dve vrsti imen referenc celic: relativna in absolutna. Običajno se imena referenc celic obravnavajo kot relativna.

Relativna imena referenc celic

V formuli =A1+5 ime celice A1 označuje relativno sklicevanje na celico. Je »relativno«, ker se ob kopiranju formule in prilepitvi v drugo celico ime sklicevanja na celico spremeni v skladu z lokacijo celice, v katero je bila prilepjena. Če je formula =A1+5 prvotno v celici B1, bo na primer kopiranje in prilepitev v celico C3 povzročilo, da bo v celici C3 =B3+5. Premik iz stolpca A v stolpec B (en stolpec) povzroči spremembo A v B, medtem ko premik iz vrstice 1 v vrstico 3 (dve vrstici) spremeni 1 v 3.

Pomembno!: Če se zaradi kopiranja in lepljenja relativno ime celice spremeni v nekaj, kar je zunaj obsega celic preglednice, se ustrezna črka stolpca in/ali številka vrstice nadomesti z vprašajem (?) in kot podatki celice se prikaže »ERROR«.

Absolutna imena referenc

Če želite, da vrstica ali stolpec ali oba dela imena sklicevanja na celico ostanejo enaki ne glede na to, kam jih prilepite, morate ustvariti absolutno ime sklicevanja na celico. To storite tako, da pred del imena sklicevanja na celico, ki naj ostane nespremenjen, dodate znak dolarja ($). Pri uporabi znaka dolarja ($) za ustvarjanje absolutnega imena sklicevanja na celico imate tri možnosti: absolutni stolpec z relativno vrstico ($A1), relativni stolpec z absolutno vrstico (A$1) in absolutna vrstica in stolpec ($A$1).

---

u Vnos simbola absolutnega imena celice ($)

Pri vnosu sklicevanja na celico v celico preglednice pritisnite 2($).

Na primer, naslednja tipka vnese absolutno ime celice = $B$1.

(=) 2($)al(B)2($)b

■ Kopiranje in lepljenje vsebine celic

Vsebino ene ali več celic lahko kopirate in prilepite na drugo mesto. Ko izvedete operacijo kopiranja, lahko vsebino po želji kopirate na več mest.

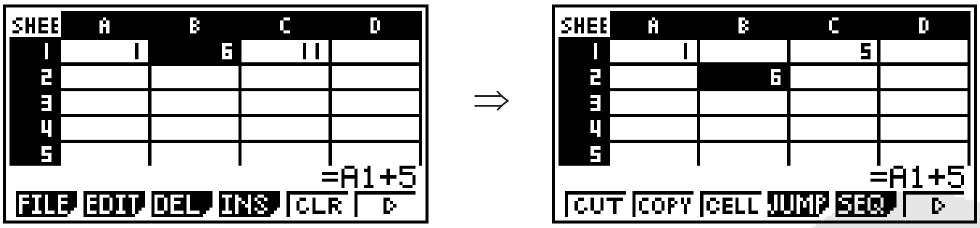
---

u Kopiranje in lepljenje podatkov iz preglednice

1. Izberite celico(-e), ki jo(-ih) želite kopirati.
   - Za več informacij glejte „Izbiranje celic“ (stran 9-5).
2 Pritisnite 2(EDIT)2(COPY).
   - S tem se izbrani podatki pripravijo za prilepitev, kar je označeno s spremembo menijske možnosti 1 v (PASTE).
   - Čakalni način za lepljenje lahko kadarkoli zaprete, preden izvedete korak 4 spodaj, tako da pritisnete J.
3. S pomočjo tipk za premikanje kurzorja premaknite kurzor celice na mesto, kamor želite prilepiti podatke.
   - Če ste v koraku 1 izbrali območje celic, bo celica, ki jo izberete s kazalcem celice, zgornja leva celica območja za prilepitev.
   - Če je izbrana lokacija znotraj območja, ki ste ga kopirali, bo izvedba spodnjega koraka povzročila, da bodo obstoječi podatki prepisani z vstavljenimi podatki.
4. Pritisnite 1 (PASTE).
   - S tem boste prilepili kopirane podatke.
   - Če želite iste podatke prilepiti na druge lokacije, ponovite koraka 3 in 4.
5. Ko končate z lepljenjem podatkov, pritisnite J, da zaprete stanje pripravljenosti za lepljenje.

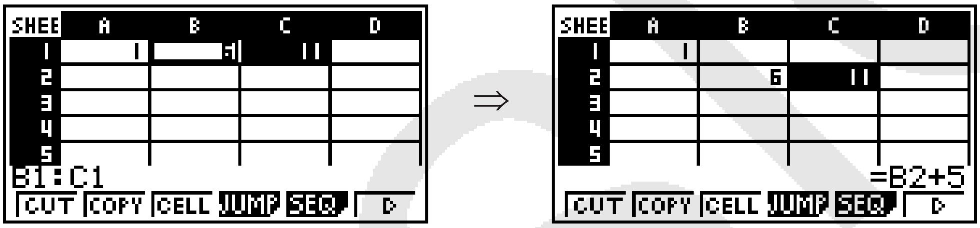
■ Izrezovanje in lepljenje vsebine celic

Z izrezovanjem in lepljenjem lahko vsebino ene ali več celic premaknete na drugo mesto. Vsebina celic (ne glede na to, ali vključuje relativne ali absolutne reference imen celic) se običajno pri izrezovanju in lepljenju ne spremeni.



Izrežite formulo =A1+5 v celici B1 in jo prilepite v celico B2. Referenčno ime A1 ostane nespremenjeno.

Ko izrežete in prilepite območje celic, se imena referenc, ki vplivajo na odnose znotraj območja, ustrezno spremenijo, ko se območje prilepi, da se ohrani pravilni odnos, ne glede na to, ali so relativna ali absolutna imena referenc.



Izrežemo območje celic B1:C1, ki vključuje formulo =B1+5, in ga prilepimo v B2:C2. Formula, prilepljena v C2, se spremeni v =B2+5, da se ohrani razmerje s celico na levi, ki je bila prav tako del prilepljenega območja.

---

u **Izrezovanje in vstavljanje podatkov iz preglednice**

1. Izberite celice, ki jih želite izrezati.
   - Za več informacij glejte „Izbiranje celic“ (stran 9-5).
2 Pritisnite 2(EDIT)1(CUT).
   - S tem se izbrani podatki pripravijo za prilepitev, kar je označeno s spremembo menijske možnosti 1 v (PASTE).
   - Čakalni položaj za prilepitev lahko kadarkoli zapustite, preden izvedete korak 4 spodaj, tako da pritisnete .
3. S puščičnimi tipkami premaknite kurzor celice na mesto, kamor želite vstaviti podatke.
   - Če ste v koraku 1 izbrali območje celic, bo celica, ki jo izberete s kazalcem celice, zgornja leva celica območja za vstavljanje.
   - Če je izbrana lokacija znotraj območja, ki ste ga izrezali, bo izvedba spodnjega koraka povzročila, da bodo obstoječi podatki prepisani z vstavljenimi podatki.
4. Pritisnite 1 (PASTE).
   - S tem boste prilepili podatke iz celice (celic), ki ste jih izbrali v koraku 1, in jih prilepili na mesto, ki ste ga izbrali v koraku 3.
   - Ne glede na to, ali je samodejno izračunavanje omogočeno ali onemogočeno (stran 9-5), bo prilepitev izrezanih podatkov povzročila ponovni izračun vseh formul v preglednici.

■ Vnos iste formule v območje celic

Uporabite ukaz Izpolni, če želite vstaviti isto formulo v določen obseg celic. Pravila, ki urejajo relativne in absolutne reference imen celic, so enaka kot pravila za kopiranje in vstavljanje.

Ko morate v celice B1, B2 in B3 vnesti isto formulo, lahko to storite z ukazom Izpolni, tako da formulo vnesete enkrat, v celico B1. Upoštevajte naslednje o tem, kako ukaz Izpolni v tem primeru obravnava sklicevanja na imena celic.

<table>
<tr><th>Ko celica B1 vsebuje naslednje:</th><th colspan="2">Ukaz Izpolni bo naredil naslednje:</th></tr>
<tr><td>=A1× 2</td><td><table><tr><th></th><th>A</th><th>B</th></tr><tr><td>1</td><td></td><td>=A1× 2</td></tr><tr><td>2</td><td></td><td>=A2× 2</td></tr><tr><td>3</td><td></td><td>=A3× 2</td></tr></table></td><td rowspan="2">* Upoštevajte, da bodo v praksi celice B1, B2 in B3 prikazujejo rezultate izračuna, ne pa formule, kot je prikazano tukaj.</td></tr>
<tr><td>=$A$2× 2</td><td><table><tr><th></th><th>A</th><th>B</th></tr><tr><td>1</td><td></td><td>=$A$2× 2</td></tr><tr><td>2</td><td></td><td>=$A$2× 2</td></tr><tr><td>3</td><td></td><td>=$A$2× 2</td></tr></table></td></tr>
</table>

u Vnos iste formule v območje celic

1. Izberite območje celic, v katerega želite vnesti isto formulo.
   - V tem primeru bomo predpostavili, da je izbran obseg B1:B3. Glejte „Za izbiro obsega celic“ (stran 9-6).

2 Pritisnite 2(EDIT)6(g)1(FILL).

3. Na zaslonu Fill, ki se prikaže, vnesite formulo, ki jo želite vnesti.

Vnesete lahko podatke za element, ki je označen na zaslonu.

To je območje celic, ki ste ga izbrali v koraku 1.

   - V vrstico »Formula« vnesite =A1× 2 (!.(=) av(A)b*cw). S pritiskom na tipko w se kazalec celice premakne na vrstico »Cell Range«.
   - Če katera koli celica v območju celic že vsebuje podatke, bo izvedba naslednjega koraka povzročila, da bodo obstoječi podatki prepisani z novimi podatki za izpolnjevanje (formulo).

4. Pritisnite 6(EXE) ali tipko w.
   - S tem boste vnesli formulo v območje celic, ki ste ga določili.

■ Razvrščanje konstantnih podatkov

Upoštevajte, da je mogoče razvrstiti le konstantne podatke. Za razvrščanje lahko izberete več stolpcev znotraj ene vrstice ali več vrstic znotraj enega stolpca.

u Razvrščanje konstantnih podatkov

1. Izberite območje stolpcev v eni vrstici ali območje vrstic v enem stolpcu.
   - Glejte »Izbiranje območja celic« (stran 9-6).
   - Če kateri koli od izbranih stolpcev vsebuje podatke, ki niso konstantni, se prikaže sporočilo o napaki v sintaksi.
2. Glede na vrsto razvrščanja, ki ga želite izvesti, izvedite eno od naslednjih operacij.

   Za razvrščanje po naraščajočem vrstnem redu: 2(EDIT)6(g)2(SRT • A) Za razvrščanje po padajočem vrstnem redu: 2(EDIT)6(g)3(SRT • D)

■ Brisanje in vstavljanje celic

u Če želite izbrisati celotno vrstico ali stolpec celic

Izberite vrstico(-e) ali stolpec(-e), ki jih želite izbrisati, in pritisnite 3(DEL). Izbrane vrstice ali stolpce bodo takoj izbrisani, brez prikaza potrditvenega sporočila.

Za izbris vrstice ali stolpca lahko izvedete tudi naslednje korake.

1. Izberite eno ali več celic znotraj vrstice(-ic) ali stolpca(-ev), ki jih želite izbrisati.
   - Če želite na primer izbrisati vrstice od 2 do 4, lahko izberete A2:B4, C2:C4 ali kateri koli drug obseg celic, ki vključuje vrstice, ki jih želite izbrisati.
   - Če želite na primer izbrisati stolpca A in B, lahko izberete A1:B1, A2:B4 itd.
2. Pritisnite 3(DEL).
   - S tem vstopite v stanje pripravljenosti za brisanje. Če se odločite, da želite preklicati brisanje, pritisnite J.
3. Če želite izbrisati celotno vrstico (vrstice), ki vključuje celice, izbrane v koraku 1, pritisnite 1(ROW). Če želite izbrisati celoten stolpec, pritisnite 2(COL).

u Za izbris vsebine vseh celic v preglednici

1. Pritisnite 3(DEL)3(ALL).
2. V odgovor na potrditveno sporočilo, ki se prikaže, pritisnite 1 (Da), da izbrišete podatke, ali 6 (Ne), da prekličete brez brisanja.

u Vstavljanje vrstice ali stolpca praznih celic

1. Izvedite eno od naslednjih dejanj, da določite mesto vstavljanja in število vrstic ali stolpcev, ki jih želite vstaviti.

   - **Za vstavljanje vrstic**

     Začnite z vrstico neposredno pod vrstico, v katero želite vstaviti, in izberite enako število vrstic, kot jih želite vstaviti.

Primer: Če želite vstaviti tri vrstice nad vrstico 2, lahko izberete A2:A4, B2:C4 itd.

• **Vstavljanje stolpcev**

Začnite s stolpcem, ki je neposredno desno od stolpca, v katerega želite vstaviti stolpce, in izberite enako število stolpcev, kot jih želite vstaviti.

Primer: Če želite vstaviti tri stolpce levo od stolpca B, lahko izberete B2:D4, B10:D20 itd.

2. Pritisnite 4(INS).
   • S tem boste vstopili v stanje pripravljenosti za vstavljanje. Če se odločite, da želite vstavljanje preklicati, pritisnite J .
3. Pritisnite 1(ROW), da vstavite ustrezno število vrstic, ali 2(COL), da vstavite stolpce.
   • Napaka območja se pojavi, če zaradi vstavljanja obstoječe celice, ki vsebujejo podatke, preidejo izven območja A1:Z999.

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u Za izbris vsebine določenih celic

Izberite celico ali območje celic, ki ga želite izbrisati, in pritisnite 5(CLR).

3. Uporaba posebnih ukazov v načinu S • SHT

Način **S • SHT** ima številne posebne ukaze, kot sta CellSum(, ki vrne vsoto območja celic, in CellIf(, ki določa pogoje za razvejanje. Te posebne ukaze je mogoče uporabljati v formulah.

■ Seznam posebnih ukazov v načinu S • SHT

Operacije „Input Key Operation“ (upravljanje s tipko za vnos) je mogoče izvajati samo med vnosom celice.

V sintaksi vsakega ukaza lahko izpustite vse, kar je v oklepajih ([ ]).

Ukaz	Opis
CellIf((Pogoj veje)	Vrne izraz 1, če je enačba ali neenačba, navedena kot pogoj veje, resnična, in izraz 2, če je napačna. **Operacija tipke za vnos:** 4(If) **Sintaksa:** CellIf(enakost, izraz 1, izraz 2[)] ali CellIf(neenakost, izraz 1, izraz 2[)] **Primer:** =CellIf(A1>B1, A1, B1) Vrne vrednost A1, če je {vrednost celice A1} > {vrednost celice B1}. V nasprotnem primeru vrne vrednost B1.
CellMin((Najmanjša vrednost celice)	Vrne najmanjšo vrednost v določenem obsegu celic. **Vnosna tipka:** 5(CEL)1(Min) **Sintaksa:** CellMin(začetna celica:končna celica[]) **Primer:** =CellMin(A3:C5) Vrne najmanjšo vrednost podatkov v obsegu celic A3:C5.
CellMax((Največja vrednost celice)	Vrne največjo vrednost v določenem obsegu celic. **Vnosna tipka:** 5(CEL)2(Max) **Sintaksa:** CellMax(začetna celica:končna celica[)] **Primer:** =CellMax(A3:C5) Vrne največjo vrednost podatkov v območju celic A3:C5.

Ukaz	Opis
CellMean((povprečje celic)	Vrne povprečno vrednost v določenem obsegu celic. **Vnosna tipka:** 5(CEL)3(Mean) **Sintaksa:** CellMean(začetna celica:končna celica[)] **Primer:** =CellMean(A3:C5) Vrne povprečno vrednost podatkov v obsegu celic A3:C5.
CellMedian((mediana celic)	Vrne mediano vrednost v določenem obsegu celic. **Vnosna tipka:** 5(CEL)4(Med) **Sintaksa:** CellMedian(začetna celica:končna celica[)] **Primer:** =CellMedian(A3:C5) Vrne mediano vrednost podatkov v območju celic A3:C5.
CellSum((Vsota celic)	Vrne vsoto podatkov v določenem obsegu celic. **Vnosna tipka:** 5(CEL)5(Sum) **Sintaksa:** CellSum(začetna celica:končna celica[)] **Primer:** =Cellsum(A3:C5) Vrne vsoto podatkov v obsegu celic A3:C5.
CellProd((Produkt celic)	Vrne produkt podatkov v določenem obsegu celic. **Vnosna tipka:** 5(CEL)6(Prod) **Sintaksa:** CellProd(začetna celica:končna celica[)] **Primer:** =CellProd(B3:B5) Vrne produkt podatkov v območju celic B3:B5.

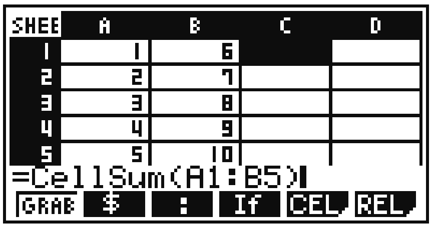
■ S • SHT Način ukaz Primer

V tem primeru se v celico C1 vnese posebna formula **S • SHT** CellSum(, da se izračuna vsota vseh podatkov v območju celic A1:B5. Predpostavlja se, da so v območju celic A1:B5 že vneseni podatki.

1. Premaknite kurzor v celico C1 in izvedite naslednjo operacijo.

(=) 5(CEL)5(Sum)

Jav(A)b3(:)al(B)f)



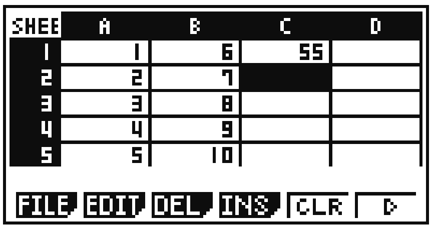
- Namesto podčrtanega dela v zgornji operaciji lahko izvedete naslednjo operacijo, ki uporablja funkcijo GRAB (stran 9-10) in funkcijo CLIP (stran 9-6).

J1(GRAB)4(TOP←) (Vstopi v način GRAB in premakne kurzor na A1.)

!i(CLIP)eccccc (Določa izbirni obseg za funkcijo CLIP.)

w)

2. Pritisnite w, da zaključite vnos formule.



4. Risba statističnih grafikonov in izvajanje statističnih in regresijskih izračunov

Če želite preveriti korelacijo med dvema nizoma podatkov (na primer temperaturo in ceno nekega izdelka), je lažje opaziti trende, če narišete graf, ki uporablja en niz podatkov kot os x in drugi niz podatkov kot os y.

V preglednici lahko vnesete vrednosti za vsak niz podatkov in narišete razpršeni diagram ali druge vrste grafikonov. Izvedba regresijskih izračunov na podatkih bo dala regresijsko formulo in korelacijski koeficient, regresijski grafikon pa lahko prekrivate z razpršenim diagramom.

Grafični prikaz v načinu **S • SHT**, statistični izračuni in regresijski izračuni uporabljajo iste funkcije kot način **STAT**. V nadaljevanju je prikazan primer delovanja, ki je značilen za način **S • SHT**.

■ Primer statističnih grafičnih operacij (meni GRPH)

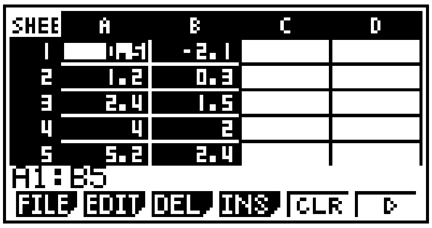
Vnesite naslednje podatke in narišite statistični grafikon (v tem primeru razpršeni grafikon).

0,5, 1,2, 2,4, 4,0, 5,2 (podatki na osi x)

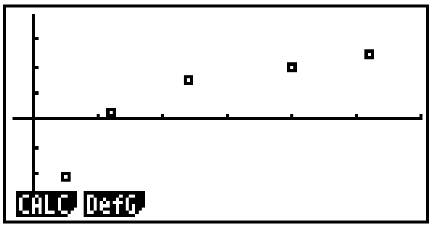
–2,1, 0,3, 1,5, 2,0, 2,4 (podatki na osi y)

u Za vnos podatkov in risanje statističnega grafa (razpršenega grafa)

1. Vnesite statistične podatke za izračun v preglednico.
   • Tukaj bomo vnesli podatke osi x v stolpec A, podatke osi y pa v stolpec B.
2. Izberite območje celic, ki ga želite prikazati v grafu (A1:B5).



3. Pritisnite 6(g)1(GRPH), da prikažete meni GRPH, nato pa pritisnite 1(GRPH1).
   • Tako boste dobili razpršeni grafikon podatkov v obsegu celic, ki ste jih izbrali v koraku 2 tega postopka.
   • Graf, prikazan tukaj, je tisti, ki se ustvari v začetnih privzetih nastavitvah načina **S • SHT**. Konfiguracijo nastavitev grafa lahko spremenite na zaslonu, ki se prikaže, ko pritisnete 6(SET) v meniju GRPH. Podrobnosti najdete v razdelku „Delovanje zaslona s splošnimi nastavitvami grafa“ spodaj.

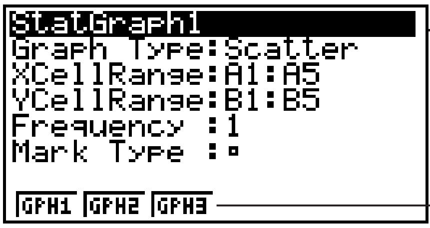


■ Splošne nastavitve grafa – delovanje zaslona

Na zaslonu splošnih nastavitev grafa lahko določite obseg podatkov, ki se uporabijo za risanje grafa, in izberete vrsto grafa, ki se bo narisal.

u **Konfiguracija nastavitev statističnega grafa**

1. Vnesite podatke za statistične izračune v preglednico in izberite obseg celic, ki jih želite prikazati v grafu.
   - Pravzaprav zgornji korak v tem trenutku ni potreben. Nastavitve lahko konfigurirate tudi pred vnosom podatkov in izbiro obsega celic, ki jih želite prikazati v grafu.
2. Pritisnite 6(g)1(GRPH)6(SET).
   - S tem se prikaže zaslon s splošnimi nastavitvami grafa (v tem primeru StatGraph1).



Nastavite lahko element, ki je označen na je zaslonu.

Ko izberete določene postavke nastavitev, se prikaže meni funkcij.

   - Število stolpcev, ki ga izberete v koraku 1, bo določilo, katere informacije se samodejno vnesejo na zaslonu s splošnimi nastavitvami grafa.

Če izberete to število stolpcev:	**Te informacije bodo vnesene samodejno:**
1	XCellRange
2	XCellRange, YCellRange
3	XCellRange, YCellRange, Frekvenca

   - V nadaljevanju so opisane vse nastavitve za ta zaslon.

Element	**Opis**
StatGraph1	Izberite ime želenega nastavitve. Registrirate lahko do tri različne nastavitve, imenovane StatGraph 1, 2 ali 3.
Vrsta grafa	Izberite vrsto grafa. Privzeta nastavitev je Scat (razpršen diagram).
XCellRange	Določa območje celic, dodeljeno osi x grafa (XCellRange). Za nekatere vrste grafov se prikaže samo XCellRange.
YCellRange	Določa območje celic, dodeljeno osi y grafa (YCellRange). YCellRange se za nekatere vrste grafov ne prikaže.
Frekvenca	Določa območje celic, ki vsebujejo vrednosti, ki označujejo frekvenco vsakega podatkovnega elementa grafa. Izberite 1(1), če ne želite uporabljati vrednosti frekvence.
Vrsta oznake	Določite vrsto oznake (□,× ali •), ki jo želite uporabiti kot oznako na razpršenem diagramu.

3. S tipkama f in ② premaknite označitev na nastavitev, ki jo želite spremeniti. V prikazanem meniju funkcij izberite želeno nastavitev.
   - Za podrobnosti o nastavitvah StatGraph1, Graph Type in Mark Type glejte „Prikaz zaslona s splošnimi nastavitvami grafa“ (stran 6-2).

• Če želite spremeniti nastavitev XCellRange, YCellRange ali Frequency, premaknite označitev na element, ki ga želite spremeniti, in nato neposredno vnesite območje celic ali izberite 1(CELL) (2(CELL) za Frequency) in nato uredite trenutno vneseno območje. Pri ročnem vnašanju območja celic uporabite 1(:) za vnos dvopičja (:) med dvema celicama, ki opredeljujeta območje.

4. Po konfiguraciji zahtevanih nastavitev pritisnite J ali w.

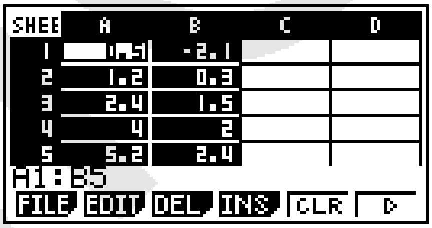
■ Primer statističnega izračuna (meni CALC)

V tem primeru se uporabljajo podatki iz „Risba razpršenega diagrama in *xy*-črtnega grafa“ (stran 6-10) za izvedbo statističnih izračunov s parnimi spremenljivkami.

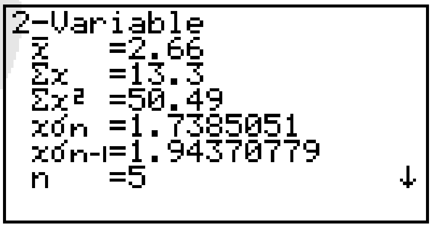
0,5,	1,2,	2,4,	4,0,	5,2	(x-podatki)
–2,1,	0,3,	1,5,	2,0,	2,4	(y-podatki)

u Za izvedbo statističnih izračunov parnih spremenljivk in regresijskih izračunov

1. Vnesite zgornje x-podatke v celice A1:A5 preglednice in y-podatke v celice B1:B5, nato pa izberite območje celic, v katerega ste vnesli podatke (A1:B5).



2. Pritisnite 6(g)2(CALC), da prikažete meni CALC, nato pa pritisnite 2(2VAR).



   • Prikazal se bo zaslon z rezultati izračuna parnih spremenljivk na podlagi podatkov, ki ste jih izbrali v koraku 1. Z e in d lahko pomikate zaslon z rezultati. Za zaprtje zaslona pritisnite J .

   • Za informacije o pomenu posameznih vrednosti na zaslonu z rezultati glejte „Prikaz rezultatov izračuna narisanega grafa parnih spremenljivk“ na strani 6-15.

3. Za vrnitev na zaslon preglednice pritisnite J.

■ Uporaba zaslona za določitev obsega podatkov za statistični izračun

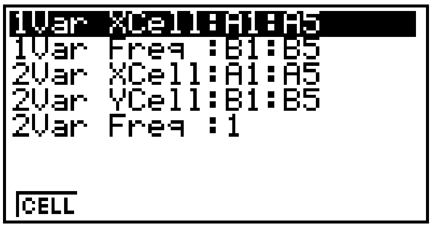
Na posebnem zaslonu za nastavitve lahko določite obseg podatkov, ki se bodo uporabili za statistični izračun.

u Določanje obsega podatkov za statistični izračun

1. Vnesite podatke za statistični izračun v preglednico in izberite obseg celic.

2. Pritisnite 6(g)2(CALC)6(SET).

   • Prikazal se bo zaslon za nastavitve, kot je prikazan na desni strani.



• Število stolpcev, ki ga izberete v koraku 1, bo določilo, katere informacije se samodejno vnesejo na zaslonu za določitev obsega podatkov za statistični izračun.

Če izberete to število stolpcev:	Te informacije bodo samodejno vnesene:
1	1Var XCell in 2Var XCell
2	1Var Freq in 2Var YCell
3	2Var Freq

• V nadaljevanju so opisane posamezne nastavitve na tem zaslonu.

Element	Opis
1Var XCell 1Var Freq	Podatki iz območja celic, ki so tukaj določeni, se uporabljajo za spremenljivke x in vrednosti frekvence pri izvajanju statističnih izračunov z eno spremenljivko.
2Var XCell 2Var YCell 2Var Freq	Podatki iz območja celic, ki so tukaj navedeni, se uporabljajo za spremenljivke x, spremenljivke y in vrednosti frekvence pri izvajanju statističnih izračunov za pare spremenljivk.

3. Če želite spremeniti območje celic, s tipkama f in ② premaknite označitev na element, ki ga želite spremeniti, in vnesite novo območje celic.
   • Za vnos dvopičja (:) pritisnite 1(:).
   • Če želite urediti trenutno vneseno območje celic, pritisnite 1(CELL) (v primeru 1Var XCell, 2Var XCell in 2Var YCell) ali 2(CELL) (v primeru 1Var Freq in 2Var Freq).
4. Po konfiguraciji zahtevanih nastavitev pritisnite J ali w.

■ Tabela ustreznosti funkcijskega menija v načinu STAT in S • SHT

V načinu **STAT** in načinu **S • SHT** so funkcije statističnih grafikonov v meniju funkcij GRPH, funkcije statističnih/regresijskih izračunov pa v meniju funkcij CALC. Struktura teh menijev in njihovih podmenijev je enaka v načinu **STAT** in načinu **S • SHT**. Podrobnosti o posameznih menijskih elementih najdete na straneh, navedenih v spodnji tabeli.

Za informacije o tej menijski postavki:	Glejte:
{GRPH} - {GPH1}	„Spreminjanje parametrov grafa“ (stran 6-1)
{GRPH} - {GPH2}	
{GRPH} - {GPH3}	
{GRPH} - {SEL}	„Stanje risanja/nerisanja grafa“ (stran 6-3)
{GRPH} - {SET}	„Spreminjanje parametrov grafa“ (stran 6-1) „Splošne nastavitve grafa“ (stran 6-1) „Prikaz zaslona s splošnimi nastavitvami grafa“ (stran 6-2) „Upravljanje zaslona s splošnimi nastavitvami grafa“ (stran 9-17)
{CALC} - {1VAR}	„Statistični izračuni z eno spremenljivko“ (stran 6-16)

Za informacije o tej možnosti menija:	Glejte:
{CALC} - {2VAR}	„Statistični izračuni z dvema spremenljivkama“ (stran 6-16)
{CALC} - {REG}	„Regresijski izračun“ (stran 6-17)
{CALC} - {SET}	„Uporaba zaslona za določitev obsega podatkov za statistični izračun“ (stran 9-19)

5. S • SHT način pomnilnika

Za shranjevanje podatkov lahko uporabite različne vrste pomnilnika kalkulatorja (spremenljivke, pomnilnik seznama, pomnilnik datotek, pomnilnik matrike, pomnilnik vektorja) in podatke iz pomnilnika prikličete v preglednico.

■ Shranjevanje podatkov iz preglednice v pomnilnik

V naslednji tabeli je prikazan pregled operacij shranjevanja za vsako vrsto pomnilnika. Podrobnosti o posameznih operacijah najdete v primerih operacij pod tabelo.

Vrsta pomnilnika	Shranjevalna operacija
Spremenljivke (A ~ Z, r, θ)	Vsebino posamezne celice lahko dodelite spremenljivki. Ko je izbrana ena celica, pritisnite 6(g)3(STO)1(VAR) in nato v pojavnem oknu določite ime spremenljivke.
Seznam pomnilnika (Seznam 1 ~ Seznam 26)	Podatke lahko shranite v območju celic v eni vrstici ali enem stolpcu v pomnilniku seznama. Ko je izbran obseg celic v eni vrstici ali enem stolpcu, pritisnite 6(g)3(STO)2(LIST) in nato v pojavnem oknu določite številko seznama.
Pomnilnik datotek (datoteka 1 do datoteka 6)	Podatke lahko shranite v območju celic, ki zajema več vrstic in stolpcev v pomnilniku datotek. Ko je izbrano območje celic, pritisnite 6(g)3(STO)3(FILE) in nato na zaslonu, ki se prikaže, določite številko datoteke. Prvi stolpec izbranega območja se shrani v določeno datoteko kot seznam 1, drugi stolpec se shrani kot seznam 2 in tako naprej.
Matrični pomnilnik (Mat A ~ Mat Z)	Podatke lahko shranite v območje celic, ki zajema več vrstic in stolpcev v matričnem pomnilniku. Ko je izbrano območje celic, pritisnite 6(g)3(STO)4(MAT) in nato v pojavnem oknu določite ime matrike. Prvi stolpec izbranega območja se shrani v določeno matriko kot seznam 1, drugi stolpec se shrani kot seznam 2 in tako naprej.
Vektorski pomnilnik (Vct A ~ Vct Z)	Podatke lahko shranite v območju celic v eni vrstici ali enem stolpcu v vektorskem pomnilniku. Ko je izbrano območje celic v eni vrstici ali enem stolpcu, pritisnite 6(g)3(STO)5(VCT) in nato v pojavnem oknu določite ime vektorja.

Pomembno!

V nadaljevanju je opisano, kaj se zgodi, če poskušate shraniti podatke v pomnilnik, ko celica ne vsebuje nobenih podatkov, ko celica vsebuje besedilo ali ko se za celico prikaže napaka ERROR.

- Če dodeljujete podatke spremenljivki, pride do napake.
- Če shranjujete podatke v pomnilnik seznama, pomnilnik datoteke, pomnilnik matrike ali pomnilnik vektorja, se v ustrezno celico (celice) zapiše 0.

u Primer: Shranjevanje podatkov stolpca v pomnilnik seznama

1. V enem stolpcu izberite območje celic, ki jih želite shraniti v pomnilnik seznama.
   - Na primer, lahko izberete A1:A10.
2. Pritisnite 6(g)3(STO)2(LIST).
   - Prikazal se bo zaslon, kot je prikazan na desni strani. Nastavitev „Cell Range“ (Območje celic) bo prikazala območje celic, ki ste ga izbrali v koraku 1.

3. Pritisnite ②, da se označitev premakne na »List[1-26]«.
4. Vnesite številko seznama (od 1 do 26) v pomnilniku seznama, kamor želite shraniti podatke, in nato pritisnite w.
   - Izvedba naslednjega koraka bo nadomestila vse podatke, ki so trenutno shranjeni pod številko pomnilnika seznama, ki ste jo tukaj določili, s podatki v obsegu celic, določenem z »CellRange«.
5. Za shranjevanje podatkov pritisnite 6(EXE) ali tipko w.

■ Povrnitev podatkov iz pomnilnika v preglednico

V naslednji tabeli je prikazan pregled operacij priklica za vsak tip pomnilnika. Podrobnosti o posameznih operacijah najdete v primerih operacij pod tabelo.

Vrsta pomnilnika	Operacija priklica
Seznam pomnilnika (Seznam 1 ~ Seznam 26)	Podatke iz določenega seznama pomnilnika lahko prikličete v območje celic v eni vrstici ali eni stolpcu. Ko je izbrana prva celica območja v eni vrstici ali eni stolpcu, pritisnite 6(g)4(RCL)1(LIST) in nato določite številko seznama na zaslonu, ki se prikaže. Ali se podatki prikličejo v stolpcu ali vrstici, je odvisno od nastavitve »Premik« na zaslonu Nastavitve (stran 1-34).
Pomnilnik datotek (datoteka 1 ~ datoteka 6)	Podatke iz določenega pomnilnika datotek lahko prikličete v preglednico. Izberite celico, ki naj bo zgornji levi kot priklicanih podatkov, in pritisnite 6(g)4(RCL)2(FILE). Nato v prikazanem zaslonu določite številko pomnilnika datotek.
Pomnilnik matrike (Mat A ~ Mat Z)	Podatke iz določenega matričnega pomnilnika lahko prikličete v preglednico. Izberite celico, ki naj bo zgornji levi kot priklicanih podatkov, in nato pritisnite 6(g)4(RCL)3(MAT). Nato v pojavnem oknu določite ime matrike.

Vrsta pomnilnika	Povratna operacija
Vektorski pomnilnik (Vct A ~ Vct Z)	Podatke iz določenega vektorskega pomnilnika lahko prikličete v območje celic v eni vrstici ali eni stolpcu. Medtem ko je izbrana prva celica območja v eni vrstici ali eni stolpcu, pritisnite 6(g)4(RCL)4(VCT) in nato v pojavljenem oknu določite ime vektorja.

u Primer: Povrnitev podatkov iz matričnega pomnilnika v preglednico

1. V preglednici izberite zgornjo levo celico območja, v katerega želite vnesti priklicane podatke.
2. Pritisnite 6(g)4(RCL)3(MAT).
   - Prikazal se bo zaslon, kot je prikazan na desni strani. Nastavitev „1st Cell“ (1. celica) bo prikazala ime celice, ki ste jo izbrali v koraku 1.

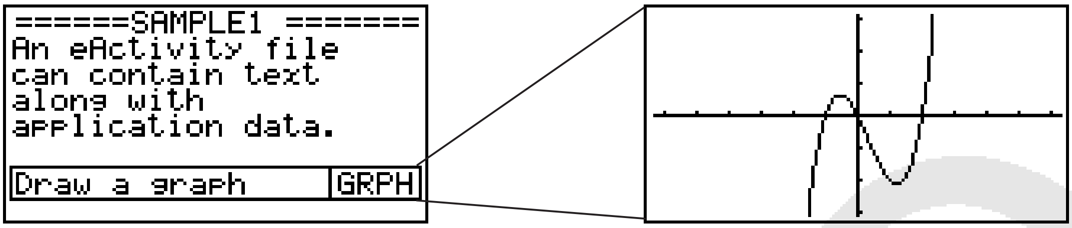
3. Vnesite ime (A do Z) matričnega pomnilnika, katerega podatke želite priklicati, in nato pritisnite w.
4. Pritisnite 6(EXE) ali w, da prikličete podatke.

Pomembno!

Pri priklicu podatkov iz seznama, datoteke, matrike ali vektorja se pojavi napaka, če priklicani podatki presegajo dovoljeni obseg preglednice (A1:Z999).

Poglavje 10 eActivity

Način **e • ACT** lahko uporabite za vnos podatkov v datoteko eActivity. Vnesete lahko besedilo in številčne izraze, prav tako pa lahko vstavite podatke (kot so grafi, tabele itd.) iz vgrajenih aplikacij kalkulatorja kot „trakove“.



Datoteke eActivity lahko učitelj uporabi na primer za ustvarjanje matematičnih problemov ali vaj, ki nudijo namige za rešitve, za razdelitev učencem. Učenci lahko datoteke eActivity uporabljajo za shranjevanje zapiskov iz pouka, opomb o problemih in njihovih rešitvah itd.

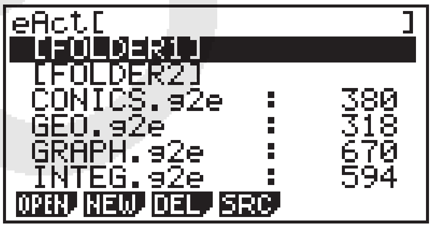
Pomembno!

- fx-7400GIII ni opremljen z načinom **e • ACT**.

1. Pregled eActivity

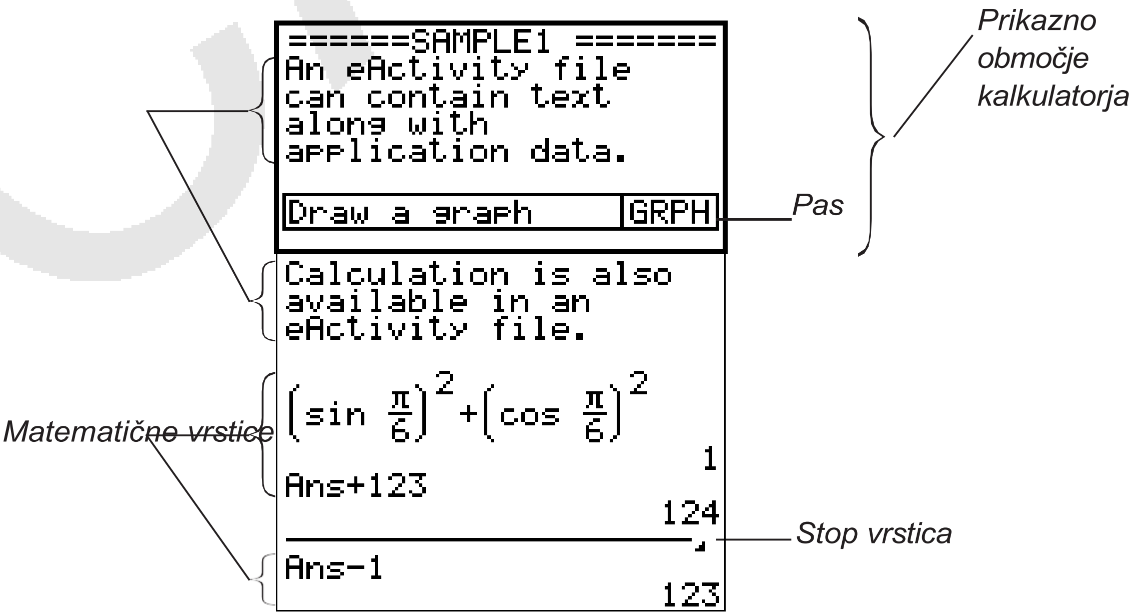
Prva stvar, ki se prikaže, ko v glavnem meniju izberete način **e • ACT,** je meniju datotek.

V pomnilniku ni datotek načina **e**



Vsaj ena datoteka v načinu **e •**

Ko odprete datoteko v načinu **e • ACT**, se prikaže delovno okno, ki ga lahko uporabljate za vnos in urejanje besedila, izračunskih izrazov in drugih podatkov.



V nadaljevanju je pojasnjeno, kakšne vrste podatkov lahko vnašate in urejate v datoteki eActivity.

Besedilna vrstica...Besedilna vrstica se lahko uporablja za vnos znakov, številk in izrazov kot besedilo.

Izračunska vrstica...Izračunsko vrstico uporabite za vnos izvedljive izračunske formule. Rezultat se prikaže v naslednji vrstici. Izračuni se izvajajo na enak način kot v načinu **RUN • MAT**, medtem ko je omogočen naravni vnos.

Stop linija...............Stop linijo lahko uporabite za ustavitev izračuna na določeni točki.

Pas ....Pas se lahko uporabi za vstavljanje podatkov v eAktivnost iz Grafa, Konik grafa, preglednice ali drugih vgrajenih aplikacij.

2. Meniji funkcij eActivity

■ Funkcijski meni seznama datotek

- {**OPEN**} .... Odpre datoteko ali mapo eActivity.
- {**NOVO**}.. Ustvari novo datoteko eActivity.
- {**DEL**} .... Izbriše datoteko eActivity.
- {**SRC**}.... Išče datoteko eActivity.

- Če v pomnilniku ni datotek eActivity, se prikaže samo funkcijski gumb 2(NEW).
- Ko prvič uporabite način **e • ACT**, je potrebnih vsaj 128 kB pomnilnika. Če ni dovolj prostora v pomnilniku, se prikaže napaka »Pomnilnik poln«.

■ Meniju funkcij delovnega prostora

Del vsebine menija funkcij delovnega prostora je odvisen od trenutno izbrane vrstice (ali traku).

- **Splošne postavke menija delovnega prostora**
- {**FILE**}.....Prikaže naslednji podmeni za upravljanje datotek.
  - {**SHRANI**} Shrani datoteko, ki jo trenutno urejate.
  - {**SV • AS**}.....Shrani trenutno urejeno datoteko pod drugim imenom.
  - {**OPT**} ....Glejte „Optimizacija pomnilnika za shranjevanje“ na strani 11-11.
  - {**CAPA**} ... Prikaže zaslon z velikostjo podatkov datoteke, ki se ureja, in koliko pomnilnika je še na voljo.
- {**STRP**}.... Vstavi trak.
- {**JUMP**} ....Prikaže naslednji podmeni za nadzor gibanja kurzorja.
  - ....Glejte stran 10-4.
- {**DEL-L**}..... Izbriše trenutno izbrano vrstico ali vrstico, na kateri se nahaja kurzor.
- {**INS**}.....Prikaže naslednji podmeni za vstavljanje, za vstavljanje nove vrstice nad trenutno izbrano vrstico
  trenutno izbrana ali kjer se nahaja kurzor.
  - {**TEXT**}.....Vstavi vrstico besedila.
  - {**CALC**}.... Vstavi vrstico za izračun.
  - {**STOP**}.... Vstavi vrstico za ustavitev izračuna.

• {'MAT} ... Prikaže urejevalnik matrik (stran 10-7)/urejevalnik vektorjev (stran 10-7).
• {'LIST} ... Prikaže urejevalnik seznama (stran 10-7).

• **Meni, ko je izbrana besedilna vrstica**
• {**TEXT**} ... Spremeni trenutno vrstico iz besedilne vrstice v izračunsko vrstico.
• {**CHAR**} ... Prikaže meni za vnos matematičnih simbolov, posebnih simbolov in znakov različnih jezikov.
• {**A↔ a**} ... Preklaplja med vnosom velikih in malih črk, ko je omogočen vnos črk (s pritiskom na tipko a).
• {**MATH**} ... Prikaže meni MATH (stran 1-13).

• **Meni, ko je izbrana vrstica za izračun ali vrstica za ustavitev**
• {**CALC**} ... Spremeni trenutno vrstico iz vrstice za izračun v vrstico za besedilo.
• {**MATH**} ... Enako kot {MATH} v „Meniju, ko je izbrana vrstica z besedilom“.

• **Meni, ko je izbran trak**
• {**FILE**} ... Prikaže naslednji podmeni za delo z datotekami.
  • {**SAVE**}/{**SV・AS**}/{**OPT**}/{**CAPA**} ... Enako kot podmeniji {FILE} v „Skupnih menijskih elementih zaslona delovnega prostora“.
  • {**SIZE**} ... Prikaže velikost traku na trenutni poziciji kurzorja.
• {**CHAR**} ... Enako kot {CHAR} pod „Meni, ko je izbrana vrstica besedila“.
• {**A↔ a**} ... Enako kot {A↔ a} pod „Meni, ko je izbrana vrstica besedila“.

3. eDejavnosti z datotekami

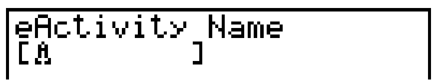
V tem poglavju so opisane različne operacije s datotekami, ki jih lahko izvedete v meniju datotek eActivity. Vse operacije iz tega poglavja lahko izvedete, ko je prikazan meni datotek.

Ta razdelek ne obravnava operacij z mapami. Podrobnosti o mapah najdete v „Poglavju 11 Upravitelj pomnilnika“.

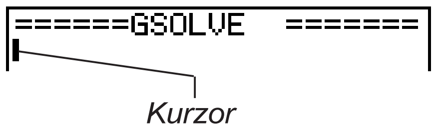
---

u Ustvarjanje nove datoteke

1. Medtem ko je prikazan meniju datotek, pritisnite 2(NOVO).
   • Prikazal se bo zaslon za vnos imena datoteke.



2. Vnesite do 8 znakov za ime datoteke in nato pritisnite w.
   • Prikaže se prazen zaslon delovnega prostora.



   • V imenu datoteke so dovoljeni naslednji znaki. A do Z, {, }, ’, ˜, 0 do 9 u **Za odpiranje datoteke**

Z uporabo f in ② označite datoteko, ki jo želite odpreti, nato pa pritisnite 1(OPEN) ali w*.

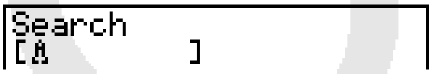
* Če pride do napake, izbrišite podatke iz pomnilnika zajema in odložišča ali prenesite podatke na računalnik.

u **Če želite izbrisati datoteko**

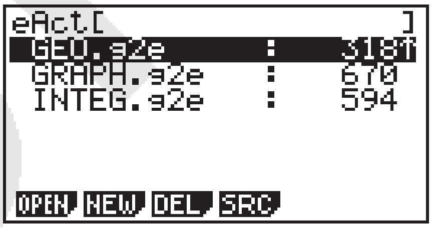
1. Z uporabo f in ② označite datoteko, ki jo želite izbrisati, nato pa pritisnite 3(DEL).
   - Prikazalo se bo potrditveno sporočilo „Izbrisati eActivity?“.
2. Pritisnite 1 (Da), da izbrišete datoteko, ali 6 (Ne), da prekličete brez brisanja.

u **Iskanje datoteke**

1. Medtem ko je prikazan meni datotek, pritisnite 4(SRC).
   - Prikazal se bo zaslon za iskanje datotek.



2. Vnesite del ali celotno ime datoteke, ki jo želite poiskati.
   - Znakov v imenu datoteke se išče od leve proti desni. Če vnesete »IT«, se bodo kot zadetki štela imena, kot so ITXX, ITABC, IT123, ne pa imena, kot so XXIT ali ABITC.
3. Pritisnite w.
   - Če se ime ujema z besedilom, ki ste ga vnesli v koraku 2, bo izbrano v meniju datotek.



   - Če ujemanje ni mogoče najti, se prikaže sporočilo „Not Found“ (Ni najdeno). Pritisnite tipko J, da zaprete pogovorno okno s sporočilom.

4. Vnašanje in urejanje podatkov

Vse operacije v tem poglavju se izvajajo na zaslonu delovnega prostora eActivity. Uporabite postopke iz poglavja „Operacije z datotekami eActivity“ (stran 10-3), da ustvarite novo datoteko ali odprete obstoječo datoteko.

■ Premikanje kurzorja in operacije pomikanja

Če želite to storiti:	Uporabite to tipko:
Premikajte kurzor naprej in nazaj	ali ②
Pomaknite en zaslon naprej	ali 6(g)1(JUMP)3(PgUp)
Pomaknite en zaslon nazaj	② ali 6(g)1(JUMP)4(PgDn)
Premakni kurzor na začetek zaslona delovnega prostora	6(g)1(SKOK)1(NA VRH)
Premaknite kurzor na konec zaslona delovnega prostora	6(g)1(JUMP)2(BTM)

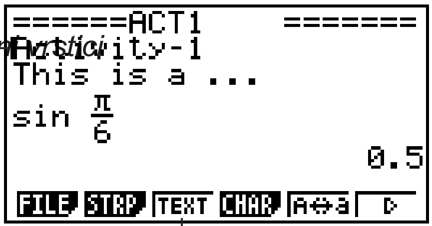
■ Vnos v besedilno vrstico

V besedilno vrstico vnesite alfanumerične znake, izraze itd.

u Vnašanje znakov in izrazov kot besedilo

1. Premaknite kurzor na besedilno vrstico.
   - Ko je kurzor v besedilni vrstici, se za funkcijo F3 prikaže »TEXT«. To pomeni, da je vnos besedila omogočen.

Kazalec v besedilni vrstici



Menijska tipka 3 postane »TEXT«.

   - Če je kurzor v vrstici za izračun, se za funkcijo F3 prikaže »CALC«. S pritiskom na 3(CALC) se vrstica za izračun spremeni v vrstico za vnos besedila.
   - Če je kurzor v traku, uporabite f in ②, da se kurzor premakne v vrstico za vnos besedila.
   - V meniju funkcij izberite {INS} in nato {TEXT}, da vstavite novo vrstico besedila nad vrstico, v kateri se trenutno nahaja kurzor.
2. Vnesite želeno besedilo ali izraz v besedilni trak.
   - Glejte „Vnos in urejanje besedilnih vrstic", opisano spodaj.

u Vnos in urejanje besedilnih vrstic

- V eno besedilno vrstico lahko vnesete do 255 bajtov besedila. Besedilo v vrstici se samodejno prelomi, da se prilega v prikazno območje (funkcija preloma besedila). Upoštevajte pa, da se številčni izrazi in ukazi ne prelomijo.*(1)Na levi in desni strani izračunske vrstice se prikažeta puščici za pomikanje (]' ❯, ki vas obvestita, da del izračuna ne ustreza prikaznemu območju izračunske vrstice. V tem primeru lahko z levo in desno puščico pomikate izračun.
- Funkcijska tipka 5(A↔ a) preklaplja med vnosom velikih in malih črk. Ta funkcija je na voljo samo, če je omogočen vnos alfa besedila. Podrobnosti so na strani 2-8. Kazalec besedilne vrstice je med vnosom velikih črk v obliki , med vnosom malih črk pa v obliki .
- Pritisnite w, da vnesete vrstico v besedilo. Za vrstico se ne prikaže noben simbol.
- Če je besedilo razdeljeno na več vrstic, bo pritisk na tipko AC izbrisal samo vrstico, na kateri se trenutno nahaja kurzor. Del besedila, ki je razdeljen na druge vrstice, ne bo izbrisan.
- Za vnos izraza v vrstico besedila vedno uporabljajte naravni vnos (stran 1-12).

*[1] Prav tako se ne prelomijo besede, ki vsebujejo simbole „ ' ", „ { " ali „▯ ", ki se vnašajo prek menija, ki se prikaže ob pritisku na tipko 4(CHAR).

■ Vnos v vrstico za izračun

Če vnesete izračunski izraz v izračunsko vrstico eActivity in pritisnete w, se rezultat izračuna prikaže v naslednji vrstici. Takšno izračunsko vrstico lahko uporabljate na enak način kot v načinu **RUN • MAT** (stran 1-3). Izračunska vrstica in njen rezultat tvorita en sklop.

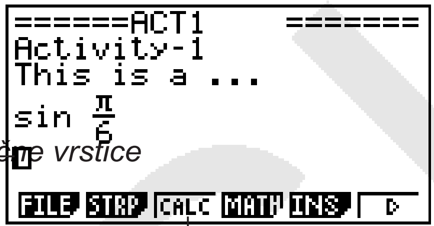
- Upoštevajte, da funkcija preloma besedila ne velja za matematične vrstice. Na levi in desni strani izračunske vrstice se prikažeta puščici za pomikanje (] ˉ), ki vas obvestita, da del izračuna ne ustreza prikaznemu področju izračunske vrstice. V tem primeru lahko z levo in desno puščico pomikate izračun.

---

u **Vnos izračunske formule v eActivity**

1. Premaknite kurzor na vrstico za izračun.
   - Ko je kurzor v vrstici za izračun, se za funkcijo F3 prikaže »CALC«. To pomeni, da je vnos izračunskega izraza omogočen.

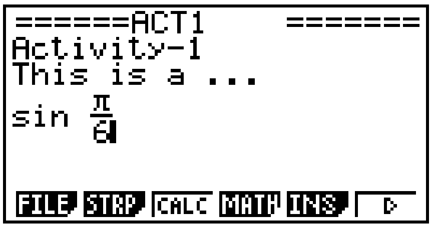
Kazalec matematične vrstice



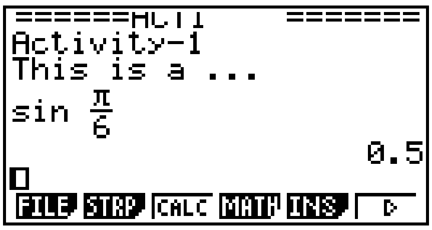
To bo povzročilo, da se bo meni tipke 3 spremenil v »CALC«.

   - Če je kurzor v vrstici za besedilo, se za funkcijo F3 prikaže »TEXT«. S pritiskom na 3(CALC) se vrstica za izračun spremeni v vrstico za besedilo.
   - Če je kurzor v traku, uporabite f in ②, da se kurzor premakne na vrstico za izračun.
   - V meniju funkcij izberite {INS} in nato {CALC}, da vstavite novo vrstico za izračun nad vrstico, v kateri se trenutno nahaja kurzor.

2. Vnesite izračunski izraz (primer: s'!5(π)②6).
   - Vnos in urejanje izračunske vrstice sta enaka kot v načinu naravnega vnosa **RUN • MAT**.



3. Za pridobitev rezultata izračuna pritisnite w.



u Matrični izračuni z uporabo matričnega urejevalnika

Izbiranje {'MAT} v meniju funkcij prikaže urejevalnik matrik.

Delovanje urejevalnika matrik in izračuni matrik v načinu **e • ACT** so v osnovi enaki tistim v načinu **RUN • MAT**. Podrobnosti o urejevalniku matrik in izračunih matrik najdete v poglavju „Izračuni matrik“ (stran 2-38). Upoštevajte pa, da se delovanje urejevalnika matrik in izračuni matrik v načinu **e • ACT** razlikujejo od tistih v načinu **RUN • MAT**, kot je opisano spodaj.

- Vrednosti spremenljivk matrike v načinu **e • ACT** se shranijo ločeno za vsako datoteko. Vrednosti spremenljivk matrike se bodo razlikovale od tistih, ki so bile ustvarjene ob klicu iz načina, **ki ni e • ACT**.

u Vektorski izračuni z uporabo vektorskega urejevalnika

Z izbiro {'MAT} v meniju funkcij se prikaže urejevalnik vektorjev.

Operacije vektorskega urejevalnika in vektorski izračuni v načinu **e • ACT** so v osnovi enaki tistim v načinu **RUN • MAT**. Podrobnosti o vektorskem urejevalniku in operacijah vektorskega izračuna najdete v poglavju „Vektorski izračuni“ (stran 2-52). Upoštevajte pa, da se operacije vektorskega urejevalnika in vektorski izračuni v načinu **e • ACT** razlikujejo od tistih v načinu **RUN • MAT**, kot je opisano spodaj.

- **e •** Vektorski pomnilnik v načinu **ACT** se shrani ločeno za vsako datoteko. Vektorski pomnilnik se bo razlikoval od tistih, ki so bili ustvarjeni ob klicu iz načina, **ki ni e • ACT**.

u Seznam izračunov z uporabo urejevalnika seznamov

Z izbiro {'LIST} v meniju funkcij se prikaže urejevalnik seznamov.

Operacije urednika seznamov v načinu **e • ACT** so enake tistim v načinu **STAT** („Vnašanje in urejanje seznama“, stran 3-1). Ta obdelava in izračuni so v osnovi enaki tistim v načinu **RUN • MAT** („Manipuliranje podatkov seznama“ na strani 3-5, „Aritmetični izračuni z uporabo seznamov“ na strani 3-10). Upoštevajte pa, da se operacije urejevalnika seznamov v načinu e **• ACT** in izračuni seznamov razlikujejo od tistih v drugih načinih, kot je opisano spodaj.

- Funkcijski meni urejevalnika seznama v načinu **e • ACT** ponuja le drugi zaslon funkcijskega menija urejevalnika seznama v načinu **STAT**.
- Če se želite iz urejevalnika seznamov v načinu **e • ACT** vrniti na zaslon delovnega prostora, pritisnite **J**
- V načinu **e • ACT** se vrednosti za spremenljivke seznama shranijo ločeno za vsako datoteko. Vrednosti spremenljivk seznama se bodo razlikovale od tistih, ki so bile ustvarjene ob klicu iz načina, **ki ni e • ACT**.

■ Vstavljanje vrstice za ustavitev izračuna

Če po urejanju izračunske vrstice na delovnem zaslonu, ki vsebuje več izračunskih vrstic, pritisnete **w**, se bodo vsi izračuni, ki sledijo urejani vrstici, ponovno izračunali. Ponovni izračun lahko traja precej časa, če je izračunskih vrstic veliko ali če so nekateri izračuni zapleteni. Vstavljanje vrstice za ustavitev izračuna bo ustavilo proces ponovnega izračuna na mestu, kjer se vrstica nahaja.

u Vstavljanje črte za ustavitev

V meniju funkcij izberite {INS} in nato {STOP}, da vstavite črto za ustavitev nad trenutno izbrano črto ali trak.

■ Uporaba trakov

Pasovi so orodja, s katerimi lahko vstavite vgrajene podatke aplikacije v datoteko eActivity. Z vsakim pasom je mogoče povezati le en vgrajen zaslon aplikacije, pas pa lahko shranjuje podatke (grafe itd.), ki jih proizvaja zaslon.

Spodnja tabela prikazuje vgrajene zaslone aplikacije, ki jih lahko vstavite v trake. Stolpec »Ime traku« prikazuje imena, vključena v pogovorno okno, ki se prikaže, ko pritisnete 2(STRP).

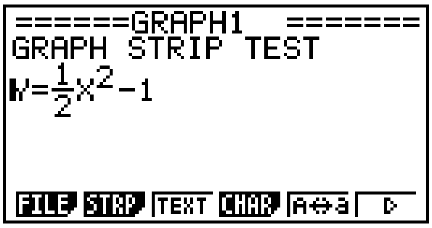
Tabela tipov podatkov trakov

Vrsta podatkov	Ime traku
Podatki za izračun v načinu **RUN・MAT** (Ko se način **RUN・MAT** pokliče iz eActivity, se zažene v naravnem načinu vnosa.)	Run (Math)
Podatki grafa v načinu **GRAPH**	Graph
Podatki grafa v načinu **GRAPH**	Urejevalnik grafov
Podatki na zaslonu seznama povezav v načinu TABELA	Urejevalnik tabel
CONICS način podatki na zaslonu grafa	Graf konik
Podatki na zaslonu s seznamom funkcij v načinu **CONICS**	Urejevalnik konik
Podatki na zaslonu statističnega grafa v načinu **STAT**	Statistični grafikon
STAT način podatki urednika seznama	Urejevalnik seznamov
Podatki zaslona rešitev izračuna v načinu **EQUA**	Reševalec
Zaslon za izbiro tipa rekurzije v načinu **RECUR**	Urejevalnik ponovitev
Podatki zaslona Notes (Notes je posebna aplikacija eActivity. Za več informacij glejte „Notes Strips“ na strani 10-10).	Opombe
RUN・MAT način Podatki urejevalnika matrike	Urejevalnik matrik
RUN・MAT način Podatki urejevalnika vektorjev	Urejevalnik vektorjev
Podatki zaslona za reševanje simultanih enačb v načinu **EQUA**	Simul Equation
Podatki zaslona za reševanje enačb visokega reda v načinu **EQUA**	Poly Equation
Podatki na zaslonu grafa v načinu **DYNA**	Dinamični grafikon
Podatki na zaslonu za reševanje izračunov v načinu **TVM**	Finančni
Podatki na zaslonu preglednice v načinu **S・SHT**	Preglednica
Podatki čarovnika za nastavitev načina **E-CON3**	Čarovnik za nastavitev Econ
Podatki za napredno nastavitev načina **E-CON3**	Econ AdvancSetup
Podatki za napredno nastavitev načina **E-CON3** (Z izvedbo tega traku se takoj začne vzorčenje na podlagi nastavitvenih podatkov, ki so zabeleženi na traku ob prvi izvedbi traku.)	Econ vzorčenje

Podatki za napredno nastavitev načina **E-CON3** (Izvedba tega traku prikaže grafični prikaz vzorčenih podatkov, ki so bili zabeleženi na traku ob prvi izvedbi traku.	Econ Graph

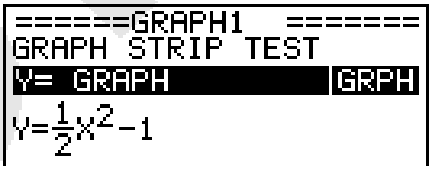
u Vstavljanje traku

1. Premaknite kurzor na mesto, kamor želite vstaviti trak.

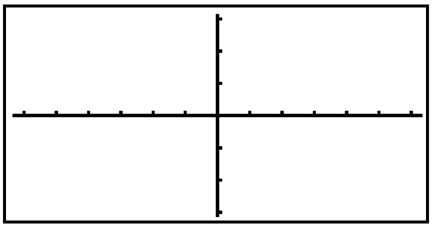


2. Pritisnite 2(STRP).
   - Prikazalo se bo pogovorno okno s seznamom vstavljivih trakov. Za informacije o prikaznih imenih in tipih podatkov, ki se pojavijo v tem pogovornem oknu, glejte „Tabela tipov podatkov trakov“ (stran 10-8).

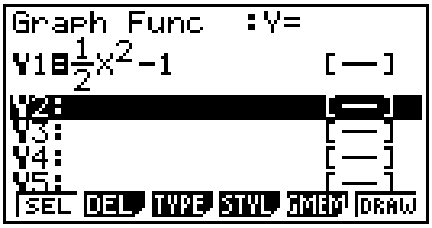
3. Z uporabo ② in f izberite trak, ki ustreza vrsti podatkov, ki jih želite vstaviti.
   - V tem primeru bomo izbrali „Graf“ (podatki grafa v načinu **GRAPH**).
4. Pritisnite w.
   - S tem boste vstavili vrsto traku, ki ste jo izbrali (v tem primeru trak Grafični), eno vrstico nad vrstico, kjer ste v koraku 1 tega postopka postavili kurzor.
5. Vnesite do 16 znakov za naslov stripa in nato pritisnite w.



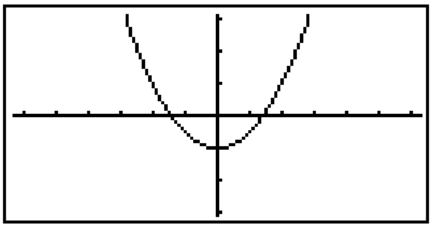
6. Ponovno pritisnite w, da začnete ustvarjati podatke o traku.
   - S tem se bo zagnala vgrajena aplikacija za izbrani tip traku (v tem primeru način **GRAPH**) in prikazal se bo grafični zaslon. Na tej točki se prikaže prazen grafični zaslon, ker še ni podatkov.



7. Pritisnite J, da prikažete zaslon s seznamom grafičnih funkcij.
8. Vnesite funkcijo, ki jo želite prikazati v grafu. (Primer: $Y = \frac{1}{2}X^2 - 1$)



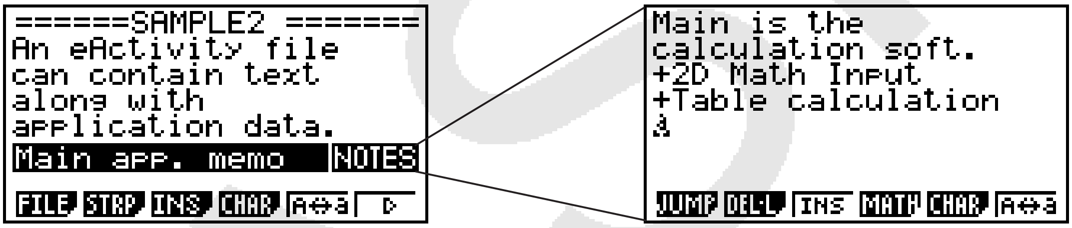
9. Pritisnite 6(DRAW).
   - S tem se bo grafično prikazala funkcija, ki ste jo vnesli.



10. Če se želite vrniti na zaslon delovnega prostora eActivity, pritisnite !a'
    - Podatki, ki so prikazani v grafu v koraku 8, bodo shranjeni v grafu.
    - Shranjeni podatki grafa so povezani samo s tem trakom Graph. So neodvisni od podatkov za načine, ki so vneseni iz glavnega menija.
11. Če ponovno pritisnete w, se prikaže grafični zaslon in nariše graf na podlagi podatkov, shranjenih v traku.

u Opombe Trakovi

„Opombe“ je poseben urejevalnik besedila eActivity, ki pride prav, ko želite napisati dolga besedilna pojasnila na zaslonu delovnega prostora. Zaslon Opombe lahko odprete iz traku Opombe na zaslonu delovnega prostora. Vnos in urejanje na zaslonu Opombe sta enaka kot pri vrstici besedila eActivity.



V nadaljevanju so opisane funkcije menija na zaslonu Notes.

- {**JUMP**}... Prikaže meni JUMP, ki ga lahko uporabite za preskok na vrh (1(TOP)) podatkov, na dno (2(BTM)) podatkov, na prejšnjo stran (3(PgUp)) ali na naslednjo stran (4(PgDn)).
- {**DEL-L**} ... Izbriše vrstico, ki je trenutno izbrana ali na kateri se nahaja kurzor.
- {**INS**} ... Vstavi eno novo vrstico nad vrstico, kjer se trenutno nahaja kurzor.
- {**MATH**} ... Prikaže meni MATH (stran 1-13).
- {**CHAR**} ... Prikaže meni za vnos matematičnih simbolov, posebnih simbolov in znakov različnih jezikov.
- {**A↔ a**} ... Preklaplja med vnosom velikih in malih črk, ko je omogočen vnos črk (s pritiskom na tipko a).

u Za spremembo naslova traku

1. Z uporabo ② in f izberite trak, katerega naslov želite spremeniti.
2. Vnesite do 16 znakov za naslov traku in nato pritisnite w.
   - Preostanek obstoječega naslova bo izginil, takoj ko vnesete prvi znak. Vnesite celoten novi naslov. Če želite delno urediti obstoječi naslov, najprej pritisnite d ali e, da premaknete kurzor.
   - Če namesto w pritisnete J, se urejanje naslova traku zaključi, ne da bi se kaj spremenilo.

u **Za klic aplikacije iz traku**

Z uporabo ② in f izberite trak, katerega aplikacijo želite poklicati, nato pa pritisnite w.

- Prikazal se bo zaslon aplikacije, ki ustreza izbranemu traku. Če trak že vsebuje podatke, se aplikacija pokliče z uporabo zadnjih shranjenih podatkov.
- Če izberete trak Conics Graph in pritisnete w, ne da bi vnesli podatke grafa, se namesto zaslona Conics Graph prikaže zaslon Conics Editor.

u **Preklop med zaslonom delovnega prostora eActivity in zaslonom aplikacije, ki je bil poklican iz traku**

Pritisnite ! a(').

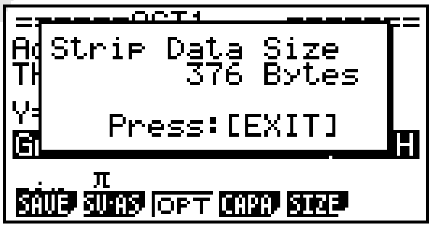
Vsaka pritisk na !a' preklopi med zaslonom delovnega prostora eActivity in zaslonom aplikacije, ki je bil poklican iz traku.

u **Za preklop iz zaslona aplikacije, ki je bil poklican iz traku, na drug zaslon aplikacije**

Pritisnite ! ,(,). V pogovornem oknu, ki se prikaže, z uporabo ② in f izberite ime aplikacije in nato pritisnite w.

u **Za prikaz zaslona porabe pomnilnika traku**

1. Z uporabo ② in f izberite trak, katerega zaslon porabe pomnilnika želite prikazati.
2. Pritisnite 1(FILE)5(SIZE).
   - Tako se prikaže zaslon porabe pomnilnika trenutno izbranega traku.



3. Za izhod iz zaslona porabe pomnilnika pritisnite J.

u **Za izbris vrstice ali traku**

1. Premaknite kurzor na vrstico ali trak, ki ga želite izbrisati.
   - Če premaknete kurzor na vrstico z izračunom, upoštevajte, da bosta izbrisana tako izračun kot tudi rezultat.
2. Pritisnite 6(g)2(DEL-L).
   - Pojavi se potrditveno sporočilo.
3. Pritisnite 1(Da), da izbrišete, ali 6(Ne), da prekličete brez brisanja.

■ Shranjevanje datoteke

Uporabite postopke v tem poglavju, da shranite datoteko po vnosu ali urejanju na zaslonu delovnega prostora.

Datoteka eActivity za OS različico 2.0 ali novejšo lahko ima končnico datoteke „g2e“. Izvedba katere koli od naslednjih operacij na modelu kalkulatorja, ki je zajet v tem priročniku (z operacijskim sistemom OS različice 2.0 ali novejše) za shranjevanje datoteke eActivity vedno povzroči, da se k imenu datoteke doda končnica „g2e“.

- Shranjevanje novo ustvarjene datoteke
- Shranjevanje obstoječe datoteke z operacijo „shrani kot“ (1(FILE)2(SV-AS))

Če shranite datoteko eActivity z uporabo modela kalkulatorja, ki je zajet v tem priročniku, da shranite datoteko s končnico „g1e“ (datoteka, prenesena iz starejše različice kalkulatorja), bo končnica datoteke določena v skladu z naslednjimi pravili.

- Pripona „g2e“ se uporablja za datoteko eActivity, ki vsebuje podatke za nove funkcije (razen matematičnih funkcij in ukazov), dodane v operacijskem sistemu različice 2.0 ali novejši.
  Izraz „podatki za nove funkcije, dodane v operacijskem sistemu različice 2.0 ali novejši“ pomeni na primer podatke o rezultatih izračunov, prikazane v formatu ' ali π .
- Razširitev „g1e“ se uporablja za datoteke eActivity, ki niso opisane zgoraj.

---

u **Če želite obstoječo datoteko nadomestiti z novo različico**

Pritisnite 1(FILE)1(SAVE), da shranite trenutno odprto datoteko.

---

u **Shranjevanje datoteke pod novim imenom**

1. Na zaslonu delovnega prostora eActivity pritisnite 1(FILE)2(SV-AS).
   - Prikazal se bo zaslon za vnos imena datoteke.
2. Vnesite do 8 znakov za ime datoteke in nato pritisnite w.
   - Če datoteka z istim imenom, kot ste ga vnesli v koraku 2, že obstaja, se prikaže sporočilo, v katerem vas vpraša, ali želite obstoječo datoteko nadomestiti z novo. Pritisnite 1 (Da), če želite nadomestiti obstoječo datoteko, ali 6 (Ne), če želite preklicati shranjevanje in se vrniti v pogovorno okno za vnos imena datoteke v koraku 2.

Pomembno!

- Datoteke eActivity z razširitvijo imena datoteke „g2e“ ni mogoče odpreti na kalkulatorju z operacijskim sistemom, starejšim od OS različice 2.0.
- Odpiranje datoteke eActivity z razširitvijo imena datoteke „g1e“, vnos funkcij, dodanih z OS različico 2.0 ali novejšo, in nato shranjevanje datoteke lahko povzroči, da nova shranjena datoteka ohrani razširitev imena datoteke „g1e“. Čeprav boste takšno datoteko lahko odprli na kalkulatorju z operacijskim sistemom, starejšim od OS različice 2.0 (ker ima končnico imena datoteke „g1e“), ne boste mogli uporabljati matematičnih funkcij in ukazov, dodanih od OS različice 2.0.

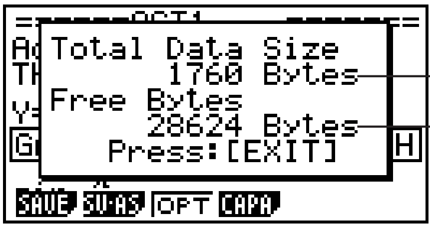
■ Prikaz zaslona porabe pomnilnika eActivity

Največja velikost datoteke eActivity je približno 30.000 bajtov.* Na zaslonu porabe pomnilnika eActivity lahko preverite, koliko pomnilnika je še na voljo za datoteko, s katero trenutno delate.

* Dejanska največja velikost datoteke je odvisna od porabe pomnilnika za zajemanje in pomnilnika za odložišče in je lahko manjša od 30.000 bajtov.

u **Prikaz zaslona porabe pomnilnika eActivity**

Na zaslonu delovnega prostora pritisnite 1(FILE)4(CAPA).



Za zaprtje zaslona porabe pomnilnika

u **Za vrnitev na seznam datotek iz zaslona delovnega prostora**

Pritisnite .

Če se prikaže potrditveno sporočilo, v katerem vas vpraša, ali želite shraniti trenutno datoteko, izvedite eno od spodaj opisnih dejanj.

To storite tako:	Pritisnite to tipko:
Prepišite obstoječo datoteko eActivity z urejano različico in se vrnite na seznam datotek	1(Da)
Vrnite se na seznam datotek, ne da bi shranili datoteko, ki jo trenutno urejate.	6(Ne)
Vrnite se na zaslon delovnega prostora eActivity.	AC

Poglavje 11 Upravitelj pomnilnika

fx-7400GIII

Ta model podpira naslednje operacije s podatki: prikaz podatkov, iskanje in brisanje.

Pomembno!

fx-7400GIII ni opremljen s pomnilnikom za shranjevanje. Zaradi tega operacije pomnilnika za shranjevanje, opisane spodaj, niso podprte.

Ti modeli so opremljeni z glavnim pomnilnikom in pomnilnikom za shranjevanje, zato podpirajo naslednje operacije z podatki: prikaz, iskanje in brisanje podatkov ter kopiranje podatkov med pomnilniki.

Glavni pomnilnik je delovno območje, kjer lahko vnašate podatke, izvajate izračune in zaženete programe. Podatki v glavnem pomnilniku so relativno varni, vendar se lahko izbrišejo, če se izpraznijo baterije ali če izvedete popolno ponastavitev.

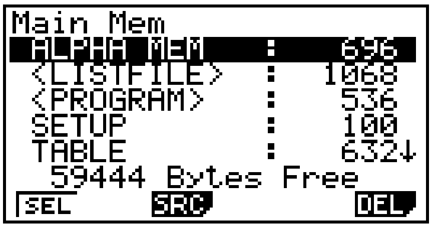
Pomnilnik za shranjevanje uporablja »flash pomnilnik«, zato so podatki varni tudi ob prekinitvi napajanja.

Običajno bi morali pomnilnik za shranjevanje uporabljati za podatke, ki jih morate varno shraniti za daljše obdobje, podatke pa naložiti v glavni pomnilnik samo, ko jih potrebujete.

1. Uporaba upravitelja pomnilnika

V glavnem meniju izberite ikono **MEMORY**, da vstopite v način **MEMORY**.

- Na fx-7400GIII se prikaže zaslon z informacijami o glavnem pomnilniku, ki je prikazan desno. Za informacije o uporabi tega zaslona glejte „Zaslon z informacijami o pomnilniku“ (stran 11-2).



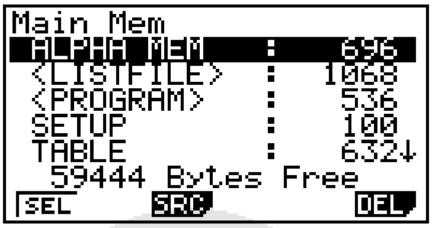
- Na fx-9860GIII ali fx-9750GIII se prikaže zaslon, prikazan na .

  - {**MAIN**}.....{prikaže informacije o glavnem pomnilniku}
  - {**SMEM**}..... {prikaže informacije o pomnilniku za shranjevanje}
  - {**BKUP**} ....{varnostna kopija glavnega pomnilnika}
  - {**OPT**}.....{optimizacija pomnilnika za shranjevanje}

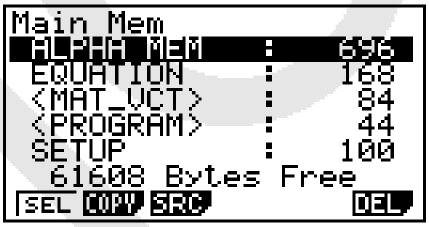
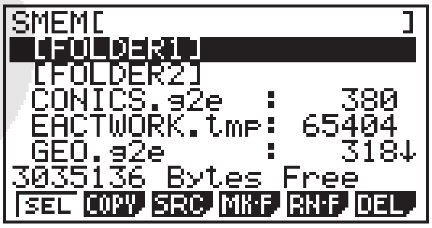
■ Zaslon s podatki o pomnilniku

Na zaslonu s podatki o pomnilniku so prikazani podatki o enem pomnilniku hkrati: glavnem pomnilniku kalkulatorja ali pomnilniku za shranjevanje.

- Ker ima fx-7400GIII samo glavni pomnilnik, se vsebina glavnega pomnilnika prikaže samo na zaslonu z informacijami o glavnem pomnilniku.



- Pri fx-9860GIII ali fx-9750GIII izvedite eno od naslednjih operacij v meniju **MEMORY**, da prikažete želeni zaslon s podatki o pomnilniku.

Ko se prikaže ta zaslon s podatki o pomnilniku:	**Pritisnite to tipko:**
Glavni pomnilnik	1(MAIN) 
Pomnilnik za shranjevanje	2(SMEM) 

- S tipkama f in ② premaknite označbo in preverite število bajtov, ki jih uporablja vsak tip podatkov.
- V vrstici 7 je prikazano, koliko bajtov pomnilnika je trenutno neizkoriščenih v trenutno izbranem pomnilniku (glavnem ali pomnilniku za shranjevanje).
- Na zaslonu glavnega pomnilnika < > označuje skupino podatkov. Na zaslonu pomnilnika za shranjevanje [ ] označuje mape.
- Če je ime datoteke, prenesene v pomnilnik iz računalnika ali drugega vira, daljše od osmih znakov, bo njegovo ime na zaslonu s podatki o pomnilniku skrajšano na osem znakov (primer:
AAAABBBBCC.txt > AAAABB~1.txt). Če ima končnica imena datoteke več kot tri znake, bo vse, kar je za tretjim znakom končnice imena datoteke, odrezano.
- Ko se prikaže vsebina mape pomnilnika, se ustrezna pot prikaže v oklepajih ([ ]) v zgornji vrstici.

Če označite podatkovno skupino ali mapo in pritisnete w, se prikaže vsebina podatkovne skupine ali mape. S pritiskom na J se vrnete na prejšnji zaslon.

Preveriti je mogoče naslednje

Glavni pomnilnik

Ime podatkov	Vsebina
ALPHA MEM	Spremenljivke z alfa črkami
<CAPTURE>	Skupina pomnilnika zajemanja
CAPT n (n = 1 do 20)	Zajem pomnilnika
CONICS*	Podatki o nastavitvah konik
DYNA MEM*	Dinamični grafični spomin
EQUATION	Podatki enačb
FINANČNI*	Finančni podatki
<F-MEM>	Skupina pomnilnika funkcij
F-MEM n (n = 1 do 20)	Pomnilnik funkcij
<G-MEM>	Skupina grafičnega pomnilnika
G-MEM n (n = 1 do 20)	Grafični pomnilnik
<LISTFILE>	Skupina seznamov datotek
LIST n (n = 1 do 26 in Ans)	Seznam vsebine pomnilnika
LIST FILE n (n = 1 do 6)	Seznam datotek
<MAT_VCT>*	Matrična/vektorska skupina
MAT n (n = A do Z in Ans)*	Matrika
VCT n (n = A do Z in Ans)*	Vektor
<SLIKA>	Skupina slikovnega pomnilnika
PICT n (n = 1 do 20)	Slikovni pomnilnik
<PROGRAM>	Skupina programov
Ime vsakega programa	Programi
REKURZIJA*	Podatki o rekurziji
NASTAVITVE	Podatki o nastavitvah
STAT	Podatki o rezultatih statističnih podatkov
<STRING>	Skupina pomnilnika nizov
STR n (n = 1 do 20)	Pomnilnik nizov
SYSTEM	OS in podatki, ki jih delijo aplikacije (odložišče, ponovitev, zgodovina itd.)
<S-SHEET>*	Skupina preglednic
Ime vsake preglednice*	Podatki iz preglednic
Ime vsake dodatne aplikacije*	Podatki, specifični za aplikacijo
TABELA	Podatki v tabeli
<V-WIN>	Skupina pomnilnika V-Window
V-WIN n (n = 1 do 6)	Pomnilnik V-Window
Y=DATA	Grafični izraz

* Ni vključeno v fx-7400GIII.

Pomnilnik **za**

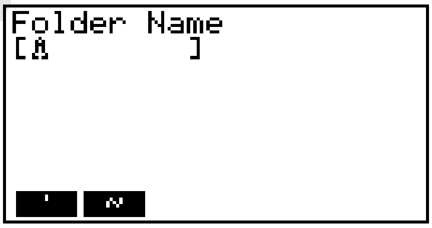
Ime podatkov	Vsebina
Imena datotek *.g1m ali .g2m	Podatkovni elementi, navedeni v tabeli glavnega pomnilnika, ki so bili kopirani v pomnilnik za shranjevanje. Imena teh datotek imajo končnico „.g1m“ ali „.g2m“.
Imena podatkov eActivity	Podatki eActivity, shranjeni v pomnilniku.
Imena dodatne programske opreme (aplikacije, jeziki, meniji)	Dodatne aplikacije, dodatni jeziki in dodatni meniji, shranjeni v pomnilniku.
Imena map	V oklepajih ([ ]).
Imena datotek *.py	Datoteke skriptov Python (datoteke py). Imena datotek imajo pripono „.py“.
Neznano	Območje, ki je neuporabno zaradi napake pri pisanju itd.

*[1] „Ni podatkov“ se prikaže, kadar v pomnilniku ni podatkov.

■ Ustvarjanje mape v pomnilniku

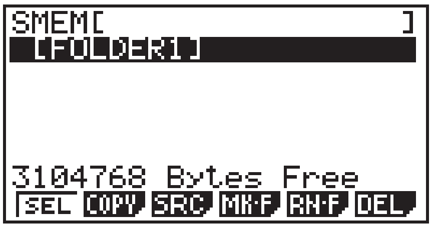
u Ustvarjanje nove mape

1. Ko so podatki iz pomnilnika prikazani na zaslonu, pritisnite 4(MK•F), da se prikaže zaslon za vnos imena mape.
2. Vnesite do osem znakov za ime, ki ga želite dati mapi.



- Podprti so samo naslednji znaki: A do Z, {, }, ’, ~, 0 do 9 Vnos katerega koli neveljavnega znaka bo povzročil napako „Neveljavno ime”.
- Napaka »Neveljavno ime« se pojavi tudi, če je ime, ki ste ga vnesli, že v uporabi v obstoječi datoteki.
- Če želite preklicati ustvarjanje mape, pritisniteJ.

3. Pritisnite w, da ustvarite mapo in se vrnete na zaslon s podatki o pomnilniku.



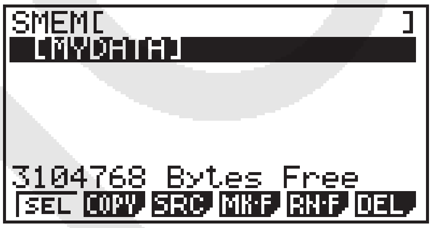
- Ta kalkulator podpira le vgrajevanje map do treh ravni.
- Čeprav lahko na računalniku ustvarite mape, ki so v pomnilniku shranjene v več kot treh ravneh, bo ta kalkulator prikazal le do tretje ravni. V tem primeru boste lahko videli mape, shranjene v mapi tretje ravni, vendar jih ne boste mogli odpreti.
- Če izberete mapo, shranjeno v mapi tretje ravni, in nato izvedete operacijo brisanja (stran 11-8), se bo izbrisala izbrana mapa (ravni 4) in vse, kar je v njej.

u **Preimenovanje mape**

1. Na zaslonu s podatki o pomnilniku izberite mapo, ki jo želite preimenovati.
2. Pritisnite 5(RN • F), da prikažete zaslon za preimenovanje mape.
3. Vnesite do osem znakov za ime, ki ga želite dati mapi.

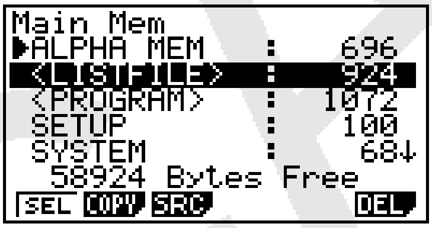
- Podprti so samo naslednji znaki: A do Z, {, }, ’, ~, 0 do 9 Vnos neveljavnega znaka bo povzročil napako „Neveljavno ime”.
- Napaka »Neveljavno ime« se pojavi tudi, če je ime, ki ste ga vnesli, že v uporabi v obstoječi datoteki.
- Če želite preklicati ustvarjanje mape, pritisnite J

4. Pritisnite w, da preimenujete mapo in se vrnete na zaslon s podatki o pomnilniku.

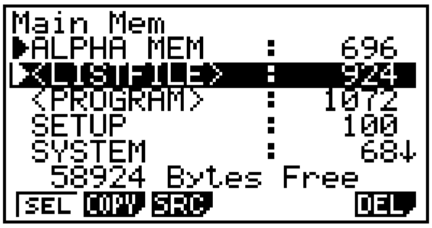


■ Izbiranje podatkov

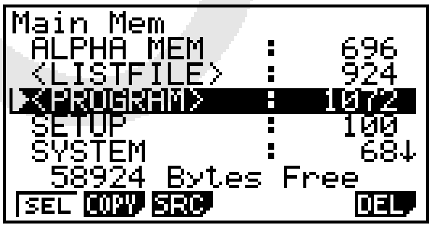
- Pritisnite 1(SEL), da izberete trenutno označeno postavko, ki je označena s črnim kazalcem izbire (►) poleg nje. Ponovno pritisnite 1(SEL), da prekličete izbiro postavke, pri čemer bo kazalec izbire izginil.
- Po želji lahko izberete več datotek.



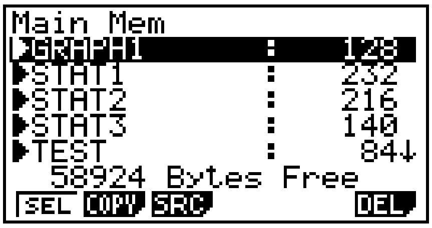
→ 1(SEL) ←



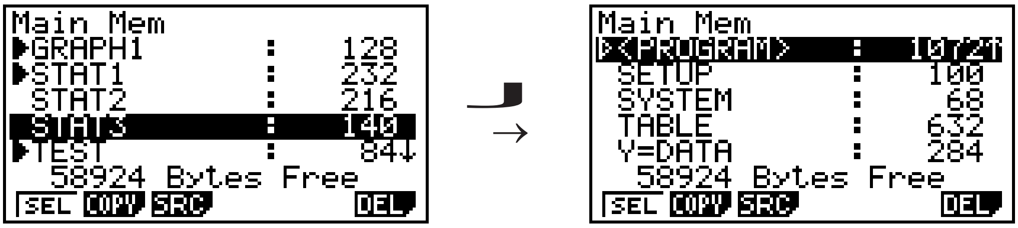
- Z izbiro skupine ali mape izberete tudi vse, kar je v njej. Z odpravo izbire skupine ali mape se odpravi izbira vseh njenih vsebin.



w →



• Če izberete enega ali več posameznih elementov znotraj skupine podatkov ali mape, se poleg vsakega elementa prikaže črn kazalec izbire (►), medtem ko se poleg imena skupine ali mape prikaže bel kazalec izbire (g).



• Vrnitev na začetni zaslon načina **MEMORY** razveljavi izbiro vseh trenutno izbranih elementov.

■ Kopiranje podatkov

Pomembno!

• Kopiranje podatkov ni podprto na fx-7400GIII.

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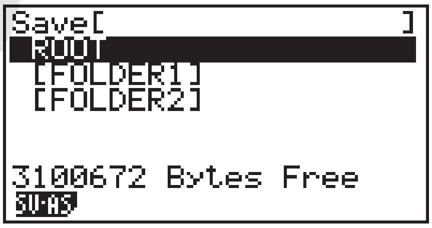
u **Kopiranje iz glavnega pomnilnika v pomnilnik za shranjevanje**

Opomba

• Sledeči postopek shrani izbrane podatke v eno samo datoteko. Datoteki dodelite ime, ki se shrani v pomnilniku.

1. Na glavnem zaslonu s podatki o pomnilniku izberite podatke, ki jih želite kopirati.
2. Pritisnite 2(KOPIRAJ).
   • Prikaže se zaslon za izbiro mape.



3. Določite želeno mapo.
   • Poudarite ROOT, da kopirate podatke v korensko mapo.
   • Če želite podatke kopirati v določeno mapo, s tipkama f in ② premaknite označitev na želeno mapo in nato pritisnite 1(OPEN).
4. Pritisnite 1(SV • AS).
   • Prikaže se zaslon za vnos imena datoteke.
5. Vnesite ime datoteke, ki ga želite dodeliti datoteki.
   • Če želite preklicati kopiranje, pritisnite J.
6. Pritisnite w, da kopirate podatke.
   • Ko je kopiranje končano, se prikaže sporočilo »Končano!«.
   • Zaslon za vnos imena datoteke se ne prikaže, ko kopirate podatke iz pomnilnika v glavni pomnilnik.

u Preverjanje napak med kopiranjem podatkov

Med kopiranjem podatkov se izvedejo naslednje preverjanja napak.

Preverjanje nizke napolnjenosti baterije

Kalkulator pred začetkom kopiranja podatkov preveri stanje baterije. Če je baterija na stopnji 1, se pojavi napaka zaradi izpraznjene baterije in kopiranje se ne izvede.

Preverjanje razpoložljivega pomnilnika

Kalkulator preveri, ali je na voljo dovolj prostega pomnilnika za shranjevanje kopiranih podatkov. Če ni dovolj prostega pomnilnika, se prikaže napaka »Pomnilnik poln«.

Napaka »Preveč podatkov« se pojavi, če je število podatkovnih elementov preveliko.

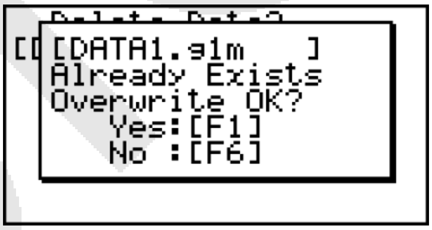
Napaka »Fragmentacija« se pojavi, če je na voljo dovolj prostega pomnilnika, vendar je potrebno izvesti operacijo zbiranja smeti.

Če se pojavi napaka »Fragmentation ERROR«, izvedite postopek optimizacije (stran 11-11).

Preverjanje prepisovanja

Kalkulator preveri, ali na ciljnem mestu kopiranja obstajajo podatki z enakim imenom kot podatki, ki se kopirajo.

Če obstajajo podatki z enakim imenom, se prikaže sporočilo za potrditev prepisovanja.



  - 1 (Da) ... nadomesti obstoječe podatke z novimi podatki
  - 6 (Ne) ... preide na naslednji podatkovni element, ne da bi kopiral podatke z enakim imenom
- S pritiskom na tipko AC prekine kopiranje in se vrne na začetni zaslon načina **MEMORY**.

Preverjanje prepisovanja se izvaja samo za naslednje vrste podatkov. Vse druge vrste podatkov se kopirajo, ne da bi se preverjalo, ali obstajajo datoteke z enakim imenom.

- Programi
- Matrike/vektorji
- Seznam datotek
- Grafični pomnilniki
- Dinamični grafični spomini
- Podatki iz preglednic

Preverjanje prepisovanja se izvede samo za podatke istega tipa. Če imajo različni tipi podatkov isto ime, se kopiranje izvede brez upoštevanja podatkov z istim imenom.

Preverjanje prepisovanja velja samo za cilj kopiranja.

Preverjanje napak zaradi neskladja tipov

Podatki eActivity, dodatne aplikacije, dodatni jeziki, dodatni meniji in varnostne kopije podatkov se ne morejo kopirati v glavni pomnilnik. Poskus kopiranja bo povzročil napako neskladja tipov.

■ Brisanje datotek

u Če želite izbrisati datoteko iz glavnega pomnilnika

1. Prikažite zaslon z informacijami o glavnem pomnilniku.
   - Glejte »Zaslon s podatki o pomnilniku« na strani 11-2.
2. Izberite datoteko(-e), ki jo(-ih) želite izbrisati. Po želji lahko izberete več datotek.
3. Pritisnite 6(DEL).
   - Pritisnite 1(Da), da izbrišete datoteko.
   - Pritisnite 6 (Ne), da prekličete brisanje.

u Za izbris datoteke iz pomnilnika

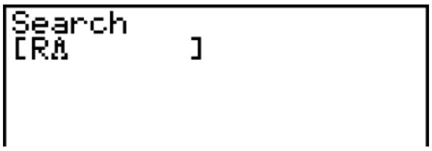
1. Prikažite zaslon s podatki o pomnilniku.
   - Glejte „Zaslon s podatki o pomnilniku“ na strani 11-2.
2. Izberite datoteko(-e), ki jo(-ih) želite izbrisati. Po želji lahko izberete več datotek.
3. Pritisnite 6(DEL).
   - Pritisnite 1(Da), da izbrišete datoteko.
   - Pritisnite 6(Ne), da prekličete brisanje.

■ Iskanje datoteke

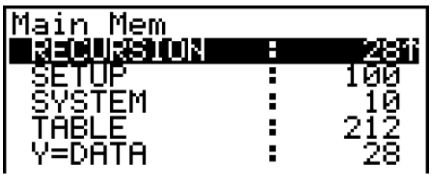
u Iskanje datoteke v glavnem pomnilniku

Primer **Iskanje vseh datotek v glavnem pomnilniku, katerih imena se začnejo s črko „R“**

1. Prikažite zaslon z informacijami o glavnem pomnilniku.
   - Glejte „Zaslon s podatki o pomnilniku“ na strani 11-2.
2. Pritisnite 3(SRC).
   - Vnesite črko „R“ kot ključno besedo.



   - Prvo ime datoteke, ki se začne s črko „R“, se na zaslonu prikaže poudarjeno.

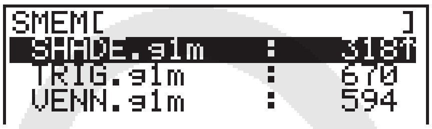


- Za ključno besedo lahko vnesete do osem znakov.

u **Iskanje datoteke v pomnilniku**

Primer **Če želite poiskati vse datoteke v pomnilniku, katerih imena se začnejo s črko „S“**

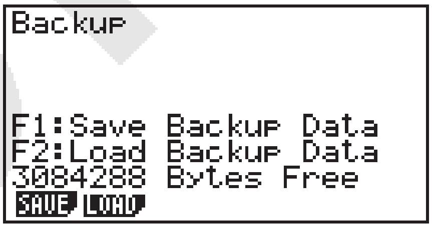
1. Prikažite zaslon s podatki o pomnilniku.
   - Glejte „Zaslon s podatki o pomnilniku“ na strani 11-2.
2. Pritisnite 3(SRC).
   - Vnesite črko „S“ kot ključno besedo.
   - Prva datoteka, katere ime se začne s črko „S“, se na zaslonu prikaže poudarjena.



■ Varnostno kopiranje podatkov glavnega pomnilnika

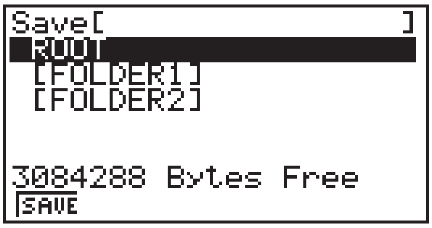
Pomembno!

u **Varnostno kopiranje podatkov v glavnem pomnilniku**



2. Pritisnite 1(SAVE).

   Prikaže se zaslon za izbiro mape.



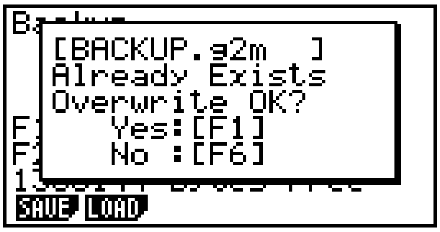
3. Izberite želeno mapo.
   - Poudarite ROOT, da shranite podatke v korenski imenik.
   - Če želite podatke shraniti v določeno mapo, s tipkama f in ② premaknite označitev na želeno mapo in pritisnite 1(OPEN).
4. Pritisnite 1 (SHRANI).

- Varnostna kopija podatkov se shrani v datoteko z imenom BACKUP.g2m.

Ko je varnostno kopiranje končano, se prikaže sporočilo „Končano!“.

Pritisnite J , da se vrnete na zaslon, prikazan v koraku 1.

Če so v pomnilniku že shranjeni varnostni podatki, se prikaže naslednje sporočilo.



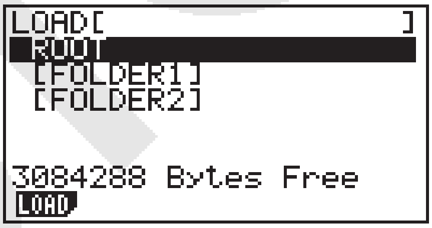
Pritisnite 1 (Da), da varnostno kopirate podatke, ali 6 (Ne), da prekličete varnostno kopiranje.

Napaka »Pomnilnik poln« se pojavi, ko v pomnilniku ni dovolj prostora za dokončanje postopka varnostnega kopiranja.

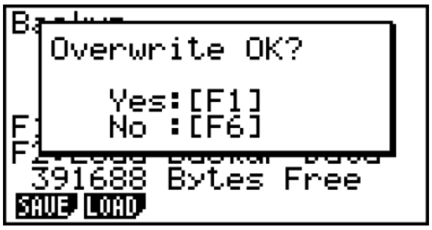
---

u **Za obnovitev varnostnih kopij podatkov v glavni pomnilnik**

1. Na začetnem zaslonu načina **MEMORY** pritisnite 4 (BKUP).
   • Na zaslonu, ki se prikaže, lahko preverite, ali so v pomnilniku shranjeni varnostni podatki.
2. Pritisnite 2 (LOAD).
   Prikaže se zaslon za izbiro mape.



3. Določite želeno mapo.
   • Poudarite ROOT, da izberete podatke v korenski mapi.
   • Če želite izbrati podatke v določeni mapi, uporabite f in ②, da označite želeno mapo, nato pa pritisnite 1(OPEN).
4. Pritisnite 1(LOAD).*1
   • Prikaže se sporočilo, v katerem morate potrditi, ali res želite obnoviti varnostno kopijo podatkov.



*1 Če v mapi ni shranjenih nobenih varnostnih kopij podatkov, se prikaže sporočilo „No Data“ (Ni podatkov). S pritiskom na tipko J se vrnete na zaslon iz koraka 1.

Pritisnite 1 (Da), da obnovite podatke in izbrišete vse podatke, ki so trenutno v tem območju. Pritisnite 6 (Ne), da prekličete operacijo varnostnega kopiranja podatkov.

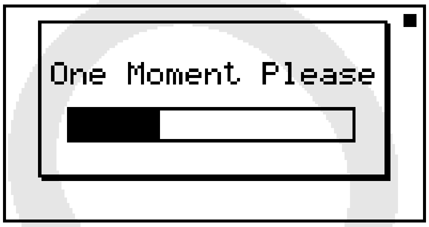
Ko je postopek obnovitve končan, se prikaže sporočilo „Končano!“. S pritiskom na J se vrnete na zaslon, prikazan v koraku 1.

Optimizacija pomnilnika

Pomnilnik se lahko po več operacijah shranjevanja in nalaganja fragmentira. Fragmentacija lahko povzroči, da bloki pomnilnika niso več na voljo za shranjevanje podatkov. Zato morate redno izvajati postopek optimizacije pomnilnika, ki preureja podatke v pomnilniku in omogoča bolj ekonomično rabo pomnilnika.

u Optimiziranje pomnilnika

1. Na začetnem zaslonu načina **MEMORY** pritisnite 5(OPT), da optimizirate pomnilnik.



Ko je optimizacija končana, se prikaže sporočilo »Complete!« (Končano!).

Pritisnite J, da se vrnete na začetni zaslon načina **MEMORY**.

- V nekaterih primerih se lahko prosti pomnilnik po optimizaciji ne spremeni. To ne pomeni, da je z računskim strojem kaj narobe.

Poglavje 12 Sistemski upravitelj

Sistemski upravitelj uporabite za pregled informacij o sistemu in nastavitev sistema.

1. Uporaba upravitelja sistema

V glavnem meniju vstopite v način **SYSTEM** in prikažite naslednje menijske postavke.

- 1( ) ... {nastavitev kontrasta zaslona}
- 2( ) ... {nastavitev časa samodejnega izklopa}
- 3(LANG) ... {jezik sistema}
- 4(VER) ... {različica}
- 5(RSET) ... {ponastavitev sistema}
- 6(g)5(OS) ... {posodobitev operacijskega sistema}*

* samo fx-9860GIII/fx-9750GIII

2. Sistemski nastavitve

■ Nastavitev kontrasta

Medtem ko je prikazan začetni zaslon načina **SYSTEM**, pritisnite 1( ), da prikažete zaslon za nastavitev kontrasta.

- Tipka e za premikanje kurzorja po zaslonu zmanjša kontrast zaslona.
- Tipka s kurzorjem d posvetli kontrast zaslona.
- 1(INIT) vrne kontrast zaslona na prvotno privzeto vrednost.

Pritisnite J ali (QUIT), da se vrnete na začetni zaslon načina **SYSTEM**.

Kontrast lahko nastavite, ko je na zaslonu prikazan kateri koli zaslon, tako da pritisnete ! in ali
d. Za izhod iz nastavitve kontrasta ponovno pritisnite !.

■ Nastavitve lastnosti napajanja

u Za določitev časa sprožitve samodejnega izklopa

Medtem ko je prikazan začetni zaslon načina **SYSTEM**, pritisnite 2 ( ), da prikažete zaslon nastavitev Power Properties.

- 1(10) ... {10 minut} (začetna privzeta nastavitev)
- 2(60) ... {60 minut}

Pritisnite J ali (QUIT), da se vrnete na začetni zas
.

12

■ Nastavitev jezika sistema

Z LANG določite jezik zaslona za vgrajene aplikacije.

u Izbiranje jezika sporočil

1. Na začetnem zaslonu v načinu **SYSTEM** pritisnite 3(LANG), da prikažete zaslon za izbiro jezika sporočil.
2. Z uporabo tipk za premikanje kurzorja f in ② izberite želeni jezik in nato pritisnite 1(SEL).
3. Pojavi se pojavno okno v izbranem jeziku. Preverite vsebino in pritisnite J.
4. Pritisnite J ali !J(QUIT), da se vrnete na začetni zaslon načina **SYSTEM**.

u Izbiranje jezika menija (fx-9860GIII, fx-9750GIII)

1. Na začetnem zaslonu načina **SYSTEM** pritisnite 3(LANG), da se prikaže zaslon za izbiro jezika sporočil.
2. Pritisnite 6(MENU).
3. Z uporabo tipk za premikanje kurzorja f in ② izberite želeni jezik in nato pritisnite 1(SEL).
4. Pojavi se pojavno okno v izbranem jeziku. Preverite vsebino in pritisnite J.
   - Pritisnite 6(MSG), da se vrnete na zaslon za izbiro jezika sporočil.
5. Pritisnite J ali !J(QUIT), da se vrnete na začetni zaslon načina **SYSTEM**.

■ Seznam različic

Uporabite VER (različica), da prikažete različico operacijskega sistema. Registrirate lahko tudi želeno ime uporabnika.

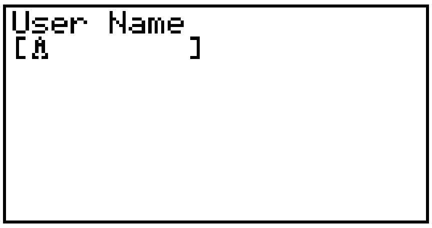
u Za prikaz informacij o različici

1. Na začetnem zaslonu načina **SYSTEM** pritisnite 4(VER), da prikažete seznam različic.
2. Za pomikanje po zaslonu uporabite tipki f in ②. Vsebina seznama je prikazana spodaj.
   - Elementi, označeni z zvezdico (*), so prikazani za vse modele. Drugi elementi so prikazani na modelih, ki podpirajo ustrezne funkcije.
     - Različica operacijskega sistema*
     - Imena in različice dodatnih programov (prikazani so samo nameščeni dodatki)
     - Jeziki in različice sporočil*
     - Jeziki in različice menija
     - Uporabniško ime*
3. Pritisnite J ali !J(QUIT), da se vrnete na začetni zaslon načina **SYSTEM**.

- Različica operacijskega sistema, ki se dejansko prikaže, je odvisna od modela kalkulatorja.

u **Registracija uporabniškega imena**

1. Medtem ko je prikazan seznam različic, pritisnite 1(NAME), da se prikaže zaslon za vnos uporabniškega imena.



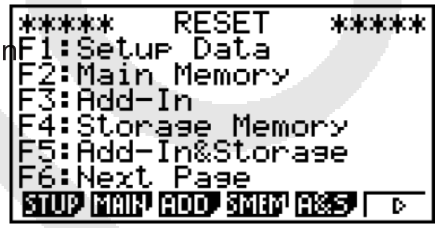
2. Vnesite do osem znakov za želeno uporabniško ime.
3. Po vnosu imena pritisnite w, da ga registrirate, in se vrnite na seznam različic.
   - Če želite preklicati vnos uporabniškega imena in se vrniti na seznam različic brez registracije imena, pritisnite J.

■ Ponastavitev

1. Medtem ko je prikazan začetni zaslon načina **SYSTEM**, pritisnite 5(RSET), da se prikaže zaslon ponastavitve 1.

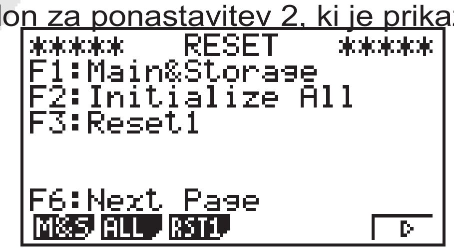
Pomembno

Elementi, ki se prikažejo na zaslonu ponastavitve, so odvisni od modela kalkulatorja.



- 1(STUP) ... {inicializacija nastavitev}
- 2(MAIN) ... {izbris podatkov iz glavnega pomnilnika}
- 3(ADD) ... {izbris dodatne aplikacije}*1
- 4(SMEM) ... {izbris podatkov iz pomnilnika za shranjevanje}*1
- 5(A&S) ... {izbris dodatne aplikacije in podatkov iz pomnilnika za shranjevanje}*1

S pritiskom na 6(g) na zgornjem zaslonu se prikaže zaslon za ponastavitev 2, ki je prikazan spodaj.



- 1(M&S) ... {izbris podatkov iz glavnega pomnilnika in pomnilnika za shranjevanje}*1
- 2(ALL) ... {izbriši ves pomnilnik}*1
- 3(RST1) ... {izbris vseh podatkov v pomnilniku, razen nekaterih dodatnih aplikacij}*1 *2

*1 Ni vključeno v fx-7400GIII.

*2 Za informacije o tem, katere dodatne aplikacije niso izbrisane, obiščite spodnjo spletno stran.
https://edu.casio.com/products/graphic/gcreset/

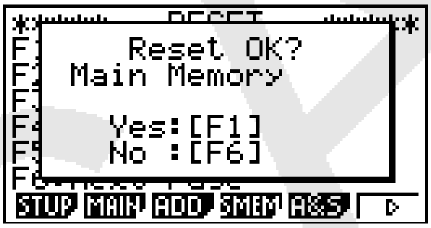
V spodnji tabeli so prikazane funkcije funkcijskih tipk. S funkcijskimi tipkami lahko izbrišete želene podatke.

Funkcije funkcijskih tipk

	Inicializirajte nastavitvene informacije	Izbriši podatke iz glavnega pomnilnika	Izbriše dodatne aplikacije	Izbriše podatke iz pomnilnika (razen dodatnih programov)
1(STUP)	○			
2(MAIN)	○	○		
3(ADD)			○	
4(SMEM)				○
5(A&S)			○	○
6(g)1(M&S)	○	○		○
6(g)2(VSE)	○	○	○	○
6(g)3(RST1)	○	○	*3	○

*3 Nekatere dodatne aplikacije niso izbrisane. Za informacije o tem, katere dodatne aplikacije niso izbrisane, obiščite spodnjo spletno stran.
https://edu.casio.com/products/graphic/gcreset/

2. Pritisnite funkcijska tipka, ki ustreza ponastavitvi, ki jo želite izvesti.
3. V odgovor na potrditveno sporočilo, ki se prikaže, pritisnite 1 (Da), da izvedete ponastavitev, ki ste jo določili, ali 6 (Ne), da prekličete.
4. Prikaže se sporočilo, ki vas obvesti, da je ponastavitev končana.



Zaslon, ki se prikaže, ko v koraku 2 pritisnete 2 (MAIN).

Zaslon, ki se prikaže, ko V koraku 3 pritisnite 1 (Da).

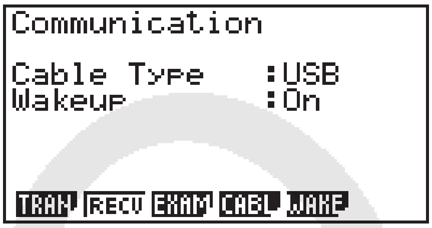
Pomembno! **(samo fx-9860GIII/fx-9750GIII)**

Upoštevajte, da se z izbrisom dodatnih jezikovnih podatkov jezikovna nastavitev samodejno preklopi na angleščino. Izbrisani jezik ne bo več na voljo za prikaz.

Poglavje 13 Podatkovna komunikacija

V tem poglavju je pojasnjeno, kako prenašati podatke med kalkulatorjem in računalnikom ali med dvema kalkulatorjema. Operacije podatkovne komunikacije se izvajajo v načinu **LINK**.

V glavnem meniju vstopite v način **LINK**. Na zaslonu se prikaže naslednji glavni meni za komunikacijo podatkov.



- {**TRAN**} ... {prikaže zaslon za pošiljanje podatkov}
- {**RECV**} ... {prikaže zaslon za sprejem podatkov}
- {**EXAM**}* ... {prikaže meni načina pregleda}
- {**CABL**}* ... {prikaže zaslon za izbiro vrste kabla}
- {**WAKE**} ... {prikaže zaslon za nastavitev prebujanja}

* Ni vključeno v fx-7400GIII

Komunikacijski parametri so fiksno nastavljeni na naslednje vrednosti.

- 3-pinski serijski vmesnik
  - Hitrost (BPS): največ 115200 bps. (Povezan z drugim fx-9860GIII, fx-9750GIII, fx-7400GIII, fx-9860GII SD, fx-9860GII, fx-9860GII s, fx-9860G AU PLUS, fx-9750GII ali fx-7400GII kalkulator)
  - Paritetni (PARITY): NONE
- USB-priključek*
  - Hitrost komunikacije je v skladu s standardi USB.

  * fx-7400GIII ni opremljen z USB-priključkom.

■ Nastavitev funkcije prebujanja sprejemnika

Ko je funkcija prebujanja vklopljena na sprejemniku, se sprejemnik samodejno vklopi, ko se začne prenos podatkov.

fx-7400GIII

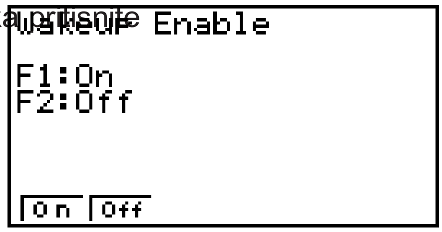
- Sprejemnik po prebujanju samodejno preide v način sprejemanja.

fx-9860GIII, fx-9750GIII

- Pri komunikaciji med dvema kalkulatorjema (kot tip kabla je izbran 3PIN) sprejemnik po prebujanju samodejno preide v način sprejemanja.
- Pri komunikaciji z računalnikom (kot tip kabla je izbran USB) se računalo vklopi in prikaže se pogovorno okno »Izberite način povezave«, če USB kabel priključite na računalnik in nato na računalo (medtem ko je računalo izklopljeno).

1. V glavnem meniju za podatkovno komunikacijo sprejemnika pritisnite 5(WAKE).

   Prikaže se zaslon za nastavitev prebujanja.

   - {**On**} ... {vklopi prebujenje}
   - {**Izklopljeno**} ... {izklopi Wakeup}

13

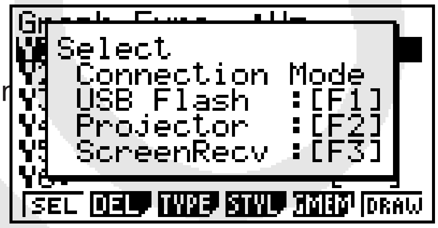
2. Pritisnite 1 (Vklop).

   S tem vklopite Wakeup in se vrnete v glavni meni za podatkovno komunikacijo.

3. Izklopite sprejemnik.
4. Povežite sprejemnik s pošiljateljem.
5. Začetek pošiljanja na pošiljatelju povzroči samodejno vklop sprejemnika in izvedbo prenosa podatkov.

■ Izberite zaslon Connection Mode (Način povezave) (samo fx-9860GIII/fx-9750GIII)

Ko priključite USB kabel na kalkulator, se prikaže pogovorno okno „Izberite način povezave“. Ključna operacija, ki jo morate izvesti na tem zaslonu, je odvisna od naprave, ki je trenutno priključena na kalkulator.



- 1(USB Flash) ... Način za priključitev kalkulatorja na računalnikom za prenos podatkov. Glej „Vzpostavitev povezave med kalkulatorjem in računalnikom“ (stran 13-3).
- 2(Projektor) ... Način za priključitev kalkulatorja na projektorju in projiciranje zaslona kalkulatorja. Glejte „Povezovanje kalkulatorja s projektorjem“ (stran 13-14).
- 3(ScreenRecv) ... Način uporabe programske opreme Screen Receiver na računalniku za prikaz zaslona kalkulatorja na računalniku. Podrobnosti najdete v ločenem „Priročniku za uporabo Screen Receiver“.
  Pred izvedbo kakršne koli operacije na kalkulatorju počakajte, da se zaslon kalkulatorja prikaže v oknu Screen Receiver.

1. Izvedba podatkovne komunikacije med kalkulatorjem in osebnim računalnikom

(samo fx-9860GIII/fx-9750GIII)

Vzpostavitev povezave USB med kalkulatorjem in računalnikom bo povzročila, da bo računalnik prepoznal pomnilnik kalkulatorja kot pogon za masovno shranjevanje. Povezava takoj povzroči, da se vsebina glavnega pomnilnika samodejno prebere v pomnilnik za shranjevanje, tako da je do podatkov v glavnem pomnilniku mogoče dostopati z računalnika. Po vzpostavitvi povezave
je mogoče podatke med kalkulatorjem in računalnikom prenašati samo z računalniškimi operacijami.

■ Minimalne zahteve za računalniški sistem

Spodaj so navedene minimalne zahteve za računalnik, ki želi izmenjavati podatke s kalkulatorjem.

- USB-priključek
- Delovanje enega od naslednjih operacijskih

  sistemov. Windows 8.1 (32-bitni, 64-bitni)
  Windows 10 (32-bitni, 64-bitni)

macOS 10.13, macOS 10.14, macOS 10.15

■ Povezovanje in odklapljanje z računalnikom v načinu masovnega shranjevanja

Za povezavo z računalnikom uporabite dodatni USB-kabel*.

* V nekaterih regijah je priložen kalkulatorju.

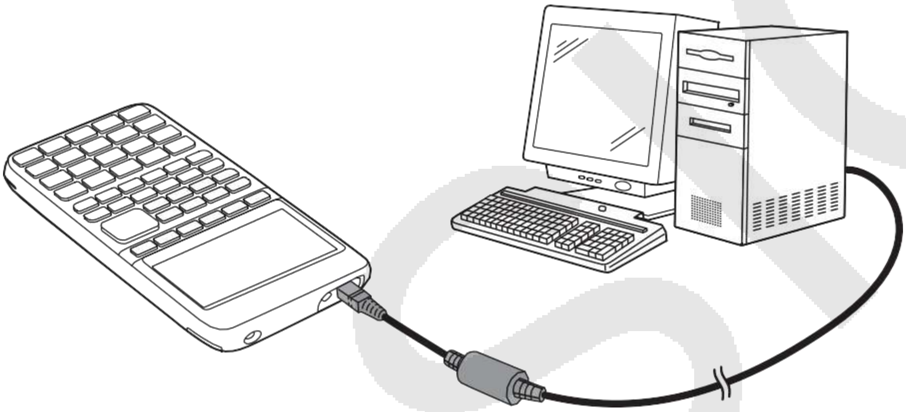
Pomembno!

Nikoli ne dotikajte se vtičnikov USB-kabla in zaslona med prenosom podatkov. Statična elektrika iz vaših prstov lahko prekine prenos podatkov.

---

u **Vzpostavite povezavo med kalkulatorjem in računalnikom**

1. Zaženite računalnik.
2. Po zagonu računalnika ga s kablom USB povežite s kalkulatorjem.



- Kalkulator se bo samodejno vklopil in prikazal zaslon »Izberite način povezave«.

3. Pritisnite 1(USB Flash).

- Na zaslonu kalkulatorja se prikaže sporočilo »Preparing USB« (Priprava USB). Počakajte in ne izvajajte nobenih operacij na kalkulatorju. Ko vzpostavite povezavo med kalkulatorjem in računalnikom, se prikaže zaslon, ki je prikazan v bližini.

```
Tips
MainMemory Update:
 Save file to
 @MainMem folder.
```

4. Na računalniku odprite pogon kalkulatorja.

- Če uporabljate Windows, je lokacija pogona kalkulatorja odvisna od vaše različice Windows. Uporabite Windows Explorer, da odprete pogon kalkulatorja.
  - Windows 8.1: Znotraj računalnika
  - Windows 10: znotraj tega računalnika
- V operacijskem sistemu OS X ali macOS se ikona pogona kalkulatorja prikaže na namizju računalnika Mac. Dvakrat kliknite ikono, da jo odprete.
- Disk kalkulatorja predstavlja pomnilnik kalkulatorja.

5. Na računalniku izvedite potrebne postopke za prenos podatkov.

- Podrobnosti o operacijah prenosa podatkov najdete v poglavju „Prenos podatkov med kalkulatorjem in osebnim računalnikom“ (stran 13-4).

u **Prekinitev povezave med kalkulatorjem in računalnikom**

1. Če je kalkulator povezan z računalnikom z operacijskim sistemom Windows, si zapišite črko pogona (E, F, G itd.), dodeljeno pogonu kalkulatorja.
2. Glede na vrsto operacijskega sistema, ki ga uporablja vaš računalnik, izvedite eno od naslednjih dejanj.

   Pomembno!
   Glede na operacijski sistem računalnika izvedite eno od naslednjih dejanj, preden odklopite kabel USB iz kalkulatorja.

   • Windows: Kliknite ikono »Varno odstranjevanje strojne opreme« v opravilni vrstici v spodnjem desnem kotu zaslona. V meniju, ki se prikaže, izberite »USB-naprava za masovno shranjevanje«, katere črka ustreza črki pogona kalkulatorja, ki ste jo zabeležili v koraku 1 zgoraj. Preverite, ali se prikaže sporočilo »Varno odstranjevanje strojne opreme«.

   • Mac OS: Prenesite ikono kalkulatorja na ikono Izmeti (ikona Koš). Preverite, ali ikona kalkulatorja ni več na namizju.

3. Na zaslonu kalkulatorja se prikaže sporočilo »Posodabljanje glavnega pomnilnika«. Počakajte in ne izvajajte nobenih operacij na kalkulatorju. Po končanem posodabljanju glavnega pomnilnika se prikaže sporočilo »Končano!«. Za zaprtje pogovornega okna s sporočilom pritisnite .
4. Odklopite kabel USB iz kalkulatorja.

■ Prenos podatkov med kalkulatorjem in osebnim računalnikom

V tem poglavju je pojasnjeno, kako priključiti kalkulator na računalnik in odpreti pogon kalkulatorja na računalniku za prenos podatkov.

Podatki v glavnem pomnilniku med povezavo USB

Vsebina mape @MainMem na disku kalkulatorja ustreza vsebini glavnega pomnilnika kalkulatorja. Vsakič, ko vzpostavite povezavo med kalkulatorjem in računalnikom, se vsebina glavnega pomnilnika kalkulatorja kopira v pomnilnik za shranjevanje.
Če ni dovolj prostora v pomnilniku za kopiranje, se na kalkulatorju prikaže sporočilo »Pomnilnik poln« in kopiranje se ne izvede. V tem primeru izbrišite datoteke, ki jih ne potrebujete več, da povečate prostora v pomnilniku, nato pa ponovno poskusite vzpostaviti povezavo USB.

Vsaka skupina v glavnem pomnilniku se prikaže kot mapa v mapi @MainMem. Prav tako se vsak podatkovni element v glavnem pomnilniku prikaže kot datoteka v mapi @MainMem. Imena skupin glavnega pomnilnika in imena podatkovnih elementov so prikazana v mapi @MainMem, kot je prikazano v spodnji tabeli.

Glavni pomnilnik Ime skupine	@MainMem Ime mape	Glavni pomnilnik Ime elementa	@MainMem Ime datoteke
E-CON2	ECON2	Econ3Now	Econ3Now.g1m
		SUxxx	SUxxx.g1m
		SDxxx	SDxxx.g1m
		CPxxx	CPxxx.g1m
F-MEM	FMEM	F-MEM xx	FMEMxx.g1m
G-MEM	GMEM	G-MEM xx	GMEMxx.g2m

Glavni pomnilnik Ime skupine	@MainMem Ime mape	Glavni pomnilnik Ime elementa	@MainMem Ime datoteke
LISTFILE	LISTFILE	LIST xx	LISTxx.g1m ali LISTxx.g2m
		LIST ANS	LISTANS.g1m ali LISTANS.g2m
		LISTFILE x	FILEx.g1m ali FILEx.g2m
MAT_VCT	MAT_VCT	MAT ANS	MATANS.g1m ali MATANS.g2m
		MAT x	MATx.g1m ali MATx.g2m
		VCT ANS	VCTANS.g2m
		VCT x	VCTx.g2m
PROGRAM	PROGRAM	<Ime programa>	<Ime programa>.g1m
			<Ime programa>.txt
S-SHEET	SSHEET	<Ime podatkov>	<Ime podatkov>.g1m ali <Ime podatkov>.g2m
V-WIN	V-WIN	V-WIN x	VMEMx.g1m ali VMEMx.g2m
SLIKA	SLIKA	SLIKA xx	PICTxx.g1m
ZAPIS	ZAPIS	CAPT xx	CAPTxx.g1m
STRING	STRING	STRING xx	STRINGxx.g2m
ROOT	ROOT	ALPHA MEM	ALPHAMEM.g1m ali ALPHAMEM.g2m
		RECURSION	RECUR.g1m ali RECUR.g2m
		SETUP	SETUP.g2m
		KONIČNOST	KONIKE.g1m
		DYNA MEM	DYNA MEM.g1m ali DYNA MEM.g2m
		EQUATION	EQUATION.g1m ali EQUATION.g2m
		FINANČNO	FINANCE.g2m
		STAT	STAT.g1m ali STAT.g2m
		SISTEM	SYSTEM.g1m ali SYSTEM.g2m
		TABELA	TABLE.g1m ali TABLE.g2m
		Y=DATA	Y=DATA.g1m ali Y=DATA.g2m
@GEOM	@GEOM	@IMAGE	@SLIKA.g1m
		<Ime podatkov>	<Ime podatkov>.g1m
@<Vsaka dodatna aplikacija ime>	@<Ime vsake dodatne aplikacije ime>	@<Ime elementa>	@<Ime elementa>.g1m

u Posodobitev podatkov v glavnem pomnilniku ob prekinitvi povezave USB

Medtem ko je med kalkulatorjem in računalnikom vzpostavljena povezava USB, lahko z računalnikom urejate vsebino mape @MainMem, tako da izbrišete mape in datoteke, urejate datoteke,
dodajanjem datotek itd. Ko prekinete USB povezavo, se podatki v glavnem pomnilniku kalkulatorja posodobijo s trenutno vsebino mape @MainMem. Upoštevajte naslednje pomembne točke.

- Izbris mape @MainMem bo povzročil inicializacijo vseh podatkov v glavnem pomnilniku kalkulatorja.
- Posodobitev mape @MainMem vpliva na do tri ravni map v korenski mapi pomnilnika.

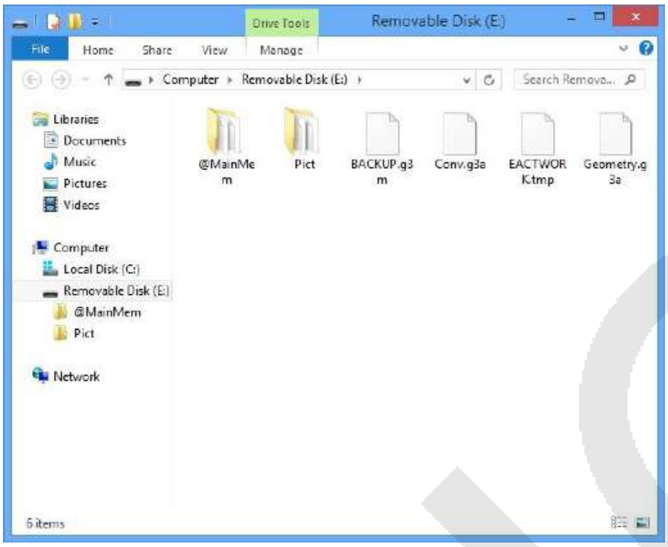
```
SMEM← Korenjska mapa pomnilnika
 │
 └─ @MainMem (raven 1)
     └─ Mapa (ravni 2)
         └─ Mapa (raven 3)← Posodobitev vpliva na datoteke do te ravni
```

Vse mape in datoteke nad ravnjo 3 se premaknejo v mapo z imenom „SAVE-F“ v pomnilniku.

- Dodajanje datoteke g1m v mapo @MainMem, medtem ko je kalkulator prek USB-ja povezan z računalnikom, bo kopiralo podatke iz datoteke g1m v glavni pomnilnik kalkulatorja. Podrobnosti o imenih podatkov v glavnem pomnilniku, ki ustrezajo imenom datotek g1m v mapi @MainMem, glejte „Podatki v glavnem pomnilniku med povezavo USB“ (stran 13-4). Če v glavnem pomnilniku ni skupine, ki ustreza podatkovnim elementom v datoteki g1m, se ustrezna skupina ustvari samodejno in podatkovni elementi se kopirajo v to skupino.
- Glede na vrsto podatkov se prikaže sporočilo za potrditev prepisovanja, če so v glavnem pomnilniku kalkulatorja že podatki z istim imenom kot podatki, ki se kopirajo iz mape @MainMem. Za informacije o tem, kateri tipi podatkov povzročijo prikaz potrditvenega sporočila, glej stolpec „Preverjanje prepisovanja“ v tabeli podatkov na strani 13-11. „Da“ pomeni, da se prikaže potrditveno sporočilo, „Ne“ pa pomeni, da se kopiranje izvede brez potrditvenega sporočila.
- Če v mapo @MainMem shranite datoteko ali mapo, ki kalkulator ne podpira, bo ta prenesena v mapo z imenom „SAVE-F“ v pomnilniku kalkulatorja in ne bo prikazana v glavnem pomnilniku.
- Če velikost podatkov v mapi @MainMem presega razpoložljivo zmogljivost glavnega pomnilnika, se ob prekinitvi povezave USB na kalkulatorju prikaže sporočilo »Memory ERROR« (Napaka pomnilnika) in glavni pomnilnik se ne posodobi.
- Če je v mapi @MainMem datoteka dodatka (.g1a/.g1l), bo ta datoteka premaknjena v korenski imenik pomnilnika. Upoštevajte pa, da če je v korenskem imeniku pomnilnika že dodatek z enakim imenom, bo obstoječi dodatek prepisan z novim, brez prikaza potrditvenega sporočila.
- Če je bila v mapo @MainMem\PROGRAM dodana besedilna datoteka (.txt), bo ta samodejno pretvorjena v program z istim imenom kot datoteka in shranjena v glavnem pomnilniku v skupini PROGRAM. Podrobnosti o pravilih, ki urejajo imena datotek in druge zadeve v zvezi s pretvorbo, najdete v poglavju „Pravila pretvorbe programov in besedilnih datotek“ (stran 8-6).

u Prenos podatkov med kalkulatorjem in računalnikom

1. Povežite kalkulator in računalnik ter odprite pogon kalkulatorja na računalniku.
   - Glejte „Vzpostavitev povezave med kalkulatorjem in računalnikom“ (stran 13-3).



2. Kopirajte, urejajte, izbrišite ali dodajte datoteke po želji.
   - Uporabite iste operacije s datotekami, kot jih običajno uporabljate na računalniku.
   - Za informacije o mapah in datotekah v mapi @MainMem glejte „Podatki glavnega pomnilnika med povezavo USB“ (stran 13-4) in „Posodabljanje podatkov glavnega pomnilnika ob prekinitvi povezave USB“ (stran 13-6).
3. Ko končate vse želene operacije, prekinite povezavo med kalkulatorjem in računalnikom.
   - Glejte „Prekinitev povezave med kalkulatorjem in računalnikom“ (stran 13-4).

Opomba

Kopiranje datoteke v pomnilnik lahko povzroči prekinitev povezave med kalkulatorjem in računalnikom. Če se to zgodi, vstopite v način **MEMORY** in izvedite operacijo Optimize (stran 11-11), nato pa ponovno vzpostavite povezavo med kalkulatorjem in računalnikom.

u Uporaba računalnika za urejanje programa, ustvarjenega na kalkulatorju

1. Program ustvarite v načinu **PRGM** kalkulatorja. (Glejte »Poglavje 8 Programiranje«.)
2. Povežite kalkulator in računalnik ter odprite pogon kalkulatorja na računalniku.
3. Prikažite vsebino mape @MainMem\PROGRAM in nato z urejevalnikom besedil odprite besedilno datoteko z istim imenom kot program, ki ga želite urediti.
   - Če uporabljate operacijski sistem Windows, lahko uporabite Notepad, če uporabljate operacijski sistem Mac OS, pa lahko uporabite TextEdit.
4. Opravite potrebne spremembe.
   - Za informacije o ukazih kalkulatorja in ustreznih nizih posebnih znakov glejte „Posebni ukazi znanstvenega funkcijskega kalkulatorja CASIO⇔ na tabela pretvorbe besedila“ (stran 8-46).

5. Ko končate z urejanjem, shranite in zaprite besedilno datoteko.
   - Shranite spremembe pod drugim imenom datoteke, kot je potrebno. Če za shranjevanje sprememb uporabite možnost Shrani kot, novo datoteko shranite v @MainMem\PROGRAM\.
   - Datoteko shranite v formatu ASCII ali ANSI txt.
6. Prekinite povezavo med kalkulatorjem in računalnikom
   - Glejte „Prekinitev povezave med kalkulatorjem in računalnikom“ (stran 13-4).

■ Namestitev dodatnih datotek

Dodatne datoteke lahko namestite na kalkulator, da mu dodate dodatne funkcije. Na voljo so naslednje vrste dodatnih datotek.

- Dodatne aplikacije (.g1a): Te datoteke dodajo nove aplikacije v glavni meni.
- Dodatni jeziki (.g1l): Ti datoteki dodajajo jezike k tistim, ki jih je mogoče izbrati s postopkom »Nastavitev sistemskega jezika« (stran 12-2) za sporočila na zaslonu.
- Dodatni meniji (.g1l): Te datoteke dodajajo jezike k tistim, ki jih je mogoče izbrati s postopkom »Nastavitev sistemskega jezika« (stran 12-2) za funkcionalne menije.

u **Namestitev dodatne datoteke**

V koraku 2 postopka pod »Prenos podatkov med kalkulatorjem in računalnikom« (stran 13-7) kopirajte dodatno datoteko (.g1a/.g1l), ki jo želite namestiti, v korenski imenik kalkulatorja.

■ Varnostni ukrepi za USB-priključek

- Glede na operacijski sistem, ki ga uporablja vaš računalnik, izvedite eno od naslednjih dejanj na računalniku, da prekinete povezavo s kalkulatorjem.
  - Windows: Kliknite ikono »Varno odstranjevanje strojne opreme« v opravilni vrstici v spodnjem desnem kotu zaslona. V meniju, ki se prikaže, izberite »USB-naprava za masovno shranjevanje«. Preverite, ali se prikaže sporočilo »Varno odstranjevanje strojne opreme«.
  - Mac OS: Prenesite pogon kalkulatorja v koš. Preverite, ali pogon kalkulatorja ni več na namizju.
- Nikoli ne uporabljajte računalniškega programa za formatiranje pogona kalkulatorja. Če to storite, se bo na zaslonu kalkulatorja po prekinitvi USB-povezave med kalkulatorjem in računalnikom prikazalo sporočilo »Napaka datotečnega sistema«. V tem primeru kalkulatorja ne boste mogli zagnati, razen če izvedete operacijo »Inicializiraj vse«, ki izbriše vse podatke, ki so trenutno v pomnilniku kalkulatorja. Podrobnosti najdete v »Napaka datotečnega sistema« (stranα -5).
- Pri kopiranju datoteke z lokalnega diska računalnika na pogon kalkulatorja lahko traja nekaj minut, preden se kopiranje začne. To je zato, ker kopiranje samodejno izvede optimizacijo pomnilnika kalkulatorja. To ne pomeni, da je prišlo do napake. Za informacije o optimizaciji pomnilnika glejte »Optimizacija pomnilnika« (stran 11-11).
- USB povezava med kalkulatorjem in računalnikom se lahko samodejno prekine, če računalnik preide v varčevalni način, način mirovanja ali kateri koli drug stanje pripravljenosti.

2. Izvedba podatkovne komunikacije med dvema kalkulatorjema

V nadaljevanju je opisano, kako povezati dve enoti s kablom SB-62*.

* V nekaterih regijah je priložen kalkulatorju.

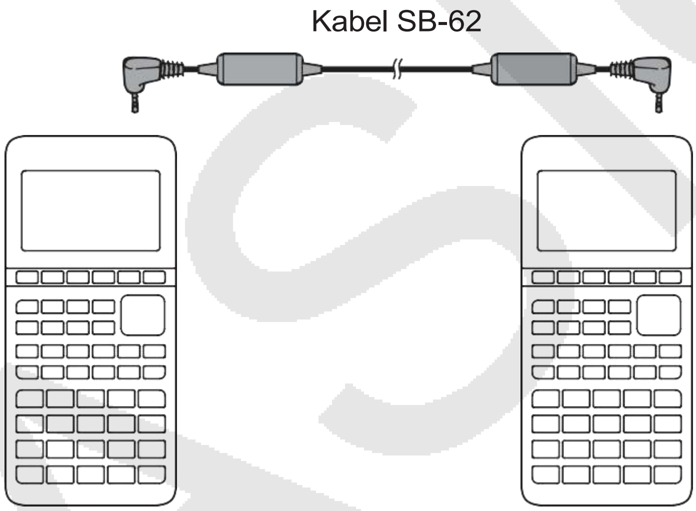
---

u **Za povezavo dveh enot**

1. Preverite, ali sta obe napravi izklopljeni.
2. Povežite dve enoti s kablom SB-62.

• Korak 3 ni potreben za fx-7400GIII.

3. Na obeh enotah izvedite naslednje korake, da kot tip kabla določite 3PIN.
   (1) V glavnem meniju vstopite v način **LINK**.
   (2) Pritisnite 4(CABL). Prikaže se zaslon za izbiro tipa kabla.
   (3) Pritisnite 2(3PIN).



• Modeli, ki so podprti za to konfiguracijo, so prikazani spodaj. fx-9860GIII, fx-9750GIII, fx-7400GIII

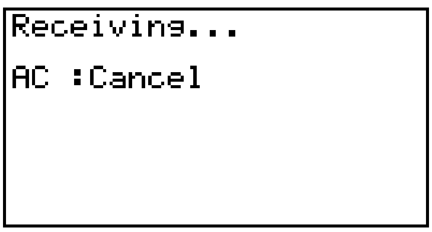
Starejši modeli kalkulatorjev:
fx-9860GII SD, fx-9860GII, fx-9860GII s, fx-9860G AU PLUS, fx-9750GII, fx-7400GII

■ Izvedba prenosa podatkov

Povežite obe enoti in nato izvedite naslednje postopke.

Sprejemna enota

Če želite nastaviti kalkulator za sprejemanje podatkov, pritisnite 2(RECV), ko je prikazan glavni meni za prenos podatkov.



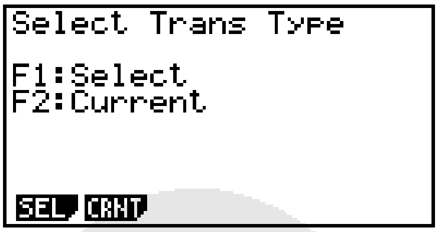
Kalkulator preide v stanje pripravljenosti za sprejem podatkov in čaka na prihod podatkov.

Dejanski sprejem podatkov se začne takoj, ko enota za pošiljanje pošlje podatke.

Pošiljajoča enota

Če želite nastaviti kalkulator za pošiljanje podatkov, pritisnite 1(TRAN), medtem ko je prikazan glavni meni za komunikacijo podatkov.

Prikaže se zaslon za določitev načina izbire podatkov.

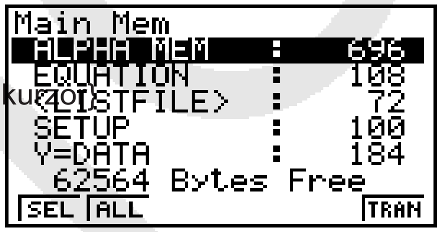


- {**SEL**} ... {izbere nove podatke}
- {**CRNT**} ... {samodejno izbere prej izbrane podatke*[1] }

*[1] Prej izbrani podatkovni pomnilnik se izbriše, ko preklopite v drug način.

---

u **Za pošiljanje izbranih podatkovnih elementov** (primer: za pošiljanje uporabniških podatkov) Pritisnite 1(SEL) ali 2(CRNT), da prikažete zaslon za izbiro podatkovnega elementa.



- {**SEL**} ... {izbere podatkovni element, na katerem se nahaja kurzor}
- {**ALL**} ... {izbere vse podatke}
- {**TRAN**} ... {pošlje izbrane podatkovne elemente}

S puščičnima tipkama f in ② premaknite kurzor na želeni podatkovni element in ga izberite s tipko 1(SEL). Trenutno izbrani podatkovni elementi so označeni z „ ►“. S tipko 6(TRAN) pošljete vse izbrane podatkovne elemente.

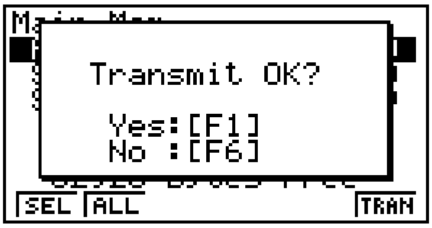
- Če želite izbrisati izbiro podatkovnega elementa, premaknite kurzor nanj in ponovno pritisnite 1(SEL).

Na zaslonu za izbiro podatkovnih elementov se prikažejo samo elementi, ki vsebujejo podatke. Če je podatkovnih elementov preveč, da bi se prilegali na en zaslon, se seznam pomika, ko premaknete kurzor na spodnjo vrstico elementov na zaslonu.

---

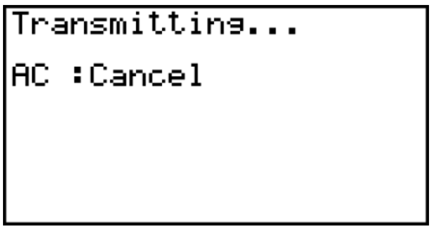
u **Izvedba pošiljanja**

Po izbiri podatkovnih elementov, ki jih želite poslati, pritisnite 6(TRAN). Prikaže se sporočilo, v katerem potrdite, da želite izvesti pošiljanje.



- 1(Da) ... pošlje podatke
- 6(Ne) ... vrne na zaslon za izbiro podatkov

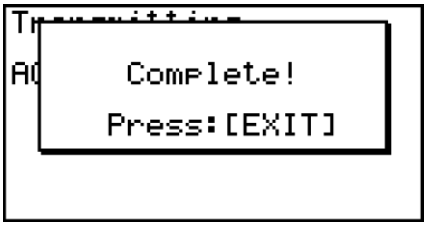
Pritisnite 1(Da), da pošljete podatke.



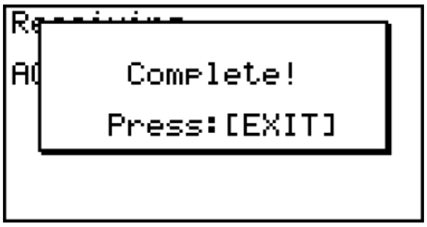
- Operacijo s podatki lahko kadarkoli prekinete s pritiskom nAC .

Spodaj je prikazano, kako izgledajo zasloni pošiljajoče in sprejemne enote po končani komunikaciji podatkov.

Pošiljatelj



Sprejemna enota



Pritisnite J, da se vrnete v glavni meni za prenos

■ Varnostni ukrepi pri komunikaciji podatkov

Spodaj so navedeni tipi podatkovnih elementov, ki jih je

Podatek	**Vsebina**	Preverjanje **prepisovanja***[2]
ALPHA MEM	Vsebina pomnilnika Alpha	Ne
<CAPTURE>	Skupina za zajemanje spomina	
CAPT *n*	Zajem podatkov iz pomnilnika (1 do 20)	Ne
CONICS*[1]	Podatki o nastavitvah konik	Ne
DYNA MEM*[1]	Dinamične grafične funkcije	Da
ENACBA	Vrednosti koeficientov za izračun enačb	Ne
<E-CON2>*[1]	Skupina pomnilnika E-CON3	
CPn*[1]	Vsebina pomnilnika po meri (1 do 99)	Da
SUn*[1]	Vsebina pomnilnika nastavitev E-CON (1 do 99)	Da
SDn*[1]	Vsebina pomnilnika meritev E-CON (CH1, CH2, CH3, CHSNC, CHMIC, CHFFT) vsebina	Da
Econ3Now*[1]	Vsebina pomnilnika trenutne nastavitve E-CON3	Da
FINANCIAL*[1]	Finančni podatki	Ne
<F-MEM>	Skupina pomnilnika funkcij	
F-MEM *n*	Vsebina funkcijskega pomnilnika (1 do 20)	Št
<G-MEM>	Skupina grafičnega pomnilnika	
G-MEM *n*	Vsebina grafičnega pomnilnika (1 do 20)	Da
<LISTFILE>	Skupina seznamov datotek	
LIST *n*	Vsebina pomnilnika seznama (1 do 26 in Ans)	Da
LIST FILE *n*	Seznam vsebine pomnilnika datoteke (1 do 6)	Da
<MAT_VCT>*[1]	Matrična/vektorska skupina	
MAT n*[1]	Vsebina pomnilnika matrike (A do Z in Ans)	Da
VCT n*[1]	Vsebina vektorskega pomnilnika (A do Z in Ans)	Da
<SLIKA>	Skupina za pomnjenje slik	
PICT *n*	Podatki o slikovnem (grafičnem) spominu (1 do 20)	Ne
<PROGRAM>	Skupina programov	
Imena programov	Vsebina programa (navedeni so vsi programi)	Da

REKURZIJA*[1]	Podatki o rekurziji	Ne

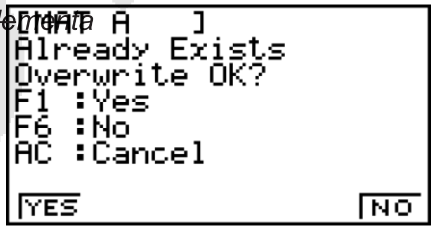
Podatek	Vsebina	Preverjanje **prepisovanja***2
NASTAVITVE	Nastavitvene podatke	Ne
STAT	Podatki o rezultatih statistične analize	Ne
<STRING>	Skupina pomnilnika nizov	
STR *n*	Podatki o pomnilniku nizov (1 do 20)	Ne
SISTEM	OS in podatki, ki jih delijo aplikacije (odložišče, ponovno predvajanje, zgodovina itd.)	Ne
<S-SHEET>*1	Skupina preglednic	
Podatki iz preglednic imena*1	Podatki iz preglednice (Našteti so vsi podatki iz preglednice.)	Da
TABELA	Podatki v tabeli	Ne
<V-WIN>	Skupina pomnilnika V-Window	
V-WIN *n*	Vsebina pomnilnika V-Window (1 do 6)	Ne
Y=DATA	Grafični izrazi, stanje risanja/nerisanja grafa, vsebina V-Window, faktorji povečave	Ne

*1 Ni vključeno v fx-7400GIII.

*2 Brez preverjanja prepisovanja: če sprejemna enota že vsebuje enake podatke, se obstoječi podatki prepišejo z novimi.

S preverjanjem prepisovanja: Če sprejemna enota že vsebuje enake podatke, se prikaže sporočilo, v katerem se vpraša, ali naj se obstoječi podatki prepišejo z novimi.

Ime podatkovnega elementa



- 1(DA) ... {nadomesti obstoječe podatke sprejemne enote z novimi podatki}
- 6(NE) ... {preskoči na naslednji podatkovni element}

Pri izvajanju podatkovne komunikacije upoštevajte naslednje previdnostne ukrepe.

- Napaka se pojavi, kadar poskušate poslati podatke na sprejemno enoto, ki še ni pripravljena za sprejem podatkov. V tem primeru pritisnite J, da izbrišete napako, in poskusite znova, potem ko nastavite sprejemno enoto za sprejem podatkov.
- Napaka se pojavi, kadar sprejemna enota približno šest minut po nastavitvi za sprejem podatkov ne prejme nobenih podatkov. V tem primeru pritisnite J, da napako izbrišete.
- Napaka pri komunikaciji podatkov nastane, če se kabel odklopi, če se parametri obeh enot ne ujemajo ali če nastane kakršna koli druga težava s komunikacijo. V tem primeru pritisnite J, da izbrišete napako, nato pa odpravite težavo, preden ponovno poskusite s komunikacijo podatkov. Če komunikacijo podatkov prekine tipka J ali napako, se vsi podatki, ki so bili uspešno prejeti do prekinitve, shranijo v pomnilnik sprejemne enote.
- Napaka se pojavi, če se med prenosom podatkov spomin sprejemne enote zapolni. V tem primeru pritisnite J, da izbrišete napako in nepotrebne podatke iz sprejemne enote, da naredite prostor za nove podatke, nato pa poskusite znova.

■ Izmenjava podatkov z drugim modelom kalkulatorja

fx-9860GIII, fx-9750GIII ali fx-7400GIII podpirajo izmenjavo podatkov z naslednjimi modeli kalkulatorjev.

- fx-9860GIII, fx-9750GIII, fx-7400GIII

Starejši modeli kalkulatorjev:

- fx-9860GII SD, fx-9860GII, fx-9860GII s, fx-9860G AU PLUS, fx-9750GII, fx-7400GII

Spodaj je opis osnovnih operacij, ki se izvajajo pri izmenjavi podatkov med dvema kalkulatorjema:

Pošiljatelj	Prejemnik	Opis
fx-9860GIII ali fx-9750GIII	fx-9860GIII ali fx-9750GIII	Vsi podatki so preneseni.
	fx-7400GIII ali starejši model kalkulatorja	Podatki, ki jih podpirajo fx-9860GIII in fx-9750GIII, vendar jih model prejemnika ne podpira, se ne prenesejo ali se pred pošiljanjem pretvorijo v format, združljiv z modelom prejemnika.
fx-7400GIII ali starejši model kalkulatorja	fx-9860GIII ali fx-9750GIII	Večina podatkov, poslanih iz drugega modela kalkulatorja, se prejme takšnih, kot so. Vendar pa se v primeru razlike med funkcijo fx-9860GIII ali fx-9750GIII in funkcijo modela oddajnika, bo fx-9860GIII ali fx-9750GIII podatke pretvori po potrebi.
fx-7400GIII	fx-7400GIII ali starejši model kalkulatorja	Vsi podatki so preneseni.
Starejši model kalkulatorja (razen fx-7400GII)	fx-7400GIII	Podatki, ki jih podpira drug model kalkulatorja, vendar jih fx-7400GIII ne podpira, se ne prejmejo ali se pred prejemom pretvorijo v format, združljiv z fx-7400GIII.
fx-7400GII	fx-7400GIII	Vsi podatki so bili preneseni.

V nadaljevanju so navedene podrobnosti o združljivosti podatkov med kalkulatorjem fx-9860GIII ali fx-9750GIII

u Pošiljanje podatkov iz fx-9860GIII ali fx-9750GIII na kalkulator fx-7400GIII

Pošiljatelj: fx-9860GIII, fx-

9750GIII Prejemnik: fx-7400GIII

- Če naslednji podatki vsebujejo izraz kvadratnega korena √ ali pi (π), se pošljejo kot decimalne vrednosti.
  - Podatki v alfa pomnilniku (A do Z, r, θ)
  - Podatki o pomnilniku
  - rezultati in koeficienti simultanih linearnih enačb in enačb višjega reda v način **EQUA**
  - podatki o zgodovini (vključno s podatkovnim elementom „SYSTEM“)
  - podatki seznama
  - podatki o matrikah/vektorjih
- Pred pošiljanjem se naslednji numerični izrazi v načinu Math input/output pretvorijo v način Linear input/output:
  - grafični izrazi, shranjeni v načinu **DYNA** in **RECUR**
  - izrazi za reševanje, shranjeni v načinu **EQUA**
  - grafični izrazi, shranjeni v načinu **GRAPH** in **TABLE**

3. Povezovanje kalkulatorja s projektorjem

Kalkulator lahko priključite na projektor CASIO in vsebino zaslona kalkulatorja projicirate na zaslon.

u Projektorji, ki jih je mogoče priključiti

Za informacije o projektorjih, ki jih je mogoče priključiti, obiščite spodnjo spletno stran. https://edu.casio.com/support/projector/

- Kalkulator lahko priključite tudi na večfunkcijski predstavitveni komplet YP-100 in projicirate iz drugih projektorjev, ki niso prikazani zgoraj.

u Za projiciranje vsebine zaslona kalkulatorja iz projektorja

1. Za priključitev na projektor (ali enoto YP-100) uporabite dodatni USB-kabel*.

   * V nekaterih regijah je priložen kalkulatorju.

   - Ko priključite USB kabel na kalkulator, se prikaže pogovorno okno „Izberite način povezave“.

2. Pritisnite 2(Projektor).

u **Previdnostni ukrepi pri priključevanju**

- Po priključitvi kalkulatorja na projektor (ali YP-100) se na zaslonu lahko prikaže simbol peščene ure. Prav tako lahko prehod na drug zaslon med risanjem grafa ali med izvajanjem programa v načinu **PRGM** povzroči, da se prikaže projicirani zaslon. razlikuje od zaslona kalkulatorja. Če se to zgodi, bo izvedba nekaterih operacij na kalkulatorju ponovno vzpostavila normalno prikazovanje.
- Če kalkulator ne deluje normalno, odklopite kabel USB in ga ponovno priklopite. Če to ne reši problema, odklopite kabel USB, izklopite projektor (ali YP-100) in ga ponovno vklopite, nato pa ponovno priklopite kabel USB.

Poglavje 14 PYTHON (samo fx-9860GIII, fx-9750GIII)

Način **PYTHON** zagotavlja okolje za izvajanje programskega jezika Python. Način **PYTHON** lahko uporabite za ustvarjanje, shranjevanje, urejanje in izvajanje datotek Python.

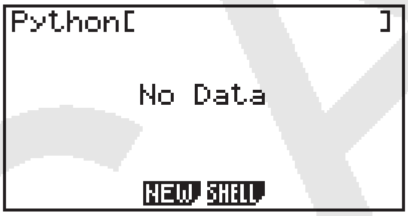
Pomembno!

- Način **PYTHON** podpira različico MicroPython 1.9.4, ki je bila prilagojena za delovanje na tem kalkulatorju. Upoštevajte, da se MicroPython na splošno razlikuje od Python, ki deluje na računalniku. Poleg tega način **PYTHON** ne podpira vseh funkcij, ukazov, modulov in knjižnic MicroPython.
- MicroPython je odprtokodni projekt. Informacije o licenci najdete v „Informacije o licenci MicroPython“ (stran -1).
- Način **PYTHON** izvaja izvedbe z uporabo procesnega sistema MicroPython. Zaradi tega se lahko rezultati izračunov in drugi podatki, ki jih proizvede ta način, razlikujejo od rezultatov izvedbe drugih funkcionalnih načinov.
- Python je registrirana blagovna znamka Python Software Foundation. Simboli blagovne znamke (™) in registrirane blagovne znamke (®) v tem priročniku niso uporabljeni.

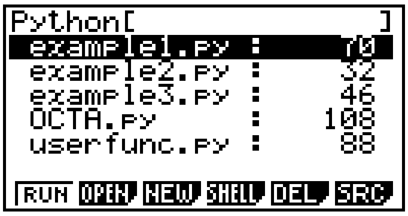
1. Pregled načina PYTHON

■ Zaslon s seznamom datotek

Prva stvar, ki se prikaže, ko v glavnem meniju izberete način **PYTHON,** je zaslon s seznamom datotek.



Ko v pomnilniku ni datotek py* ali map



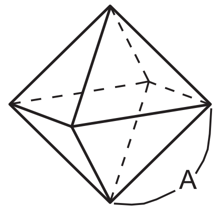
Ko so v pomnilniku datoteke py ali mape

* V tem priročniku se datoteka, ustvarjena v načinu **PYTHON** (razširitev imena datoteke py), imenuje „py datoteka”.

■ Potek od ustvarjanja datoteke py do izvajanja datoteke

Spodnji primer pojasnjuje potek delovanja od ustvarjanja nove datoteke py do njenega izvajanja.

Primer: **Ustvarite py datoteko, ki izračuna površino in prostornino pravilnega oktaedra, in jo zaženite, da izračuna površino in prostornino, ko je dolžina ene stranice 10. Ime datoteke je OCTA.**



Površino (S) in prostornino (V) pravilnega oktaedra lahko izračunate, če je znana dolžina ene stranice (A), s pomočjo spodnjih formul.

$$S = 2\sqrt{3}\,A^2\ ,\ V = \frac{\sqrt{2}}{3}\,A^3$$

Tukaj bomo napisali program, ki ob zagonu datoteke py zahteva vnos A, ki se nato uporabi v zgornjih formulah za izpis rezultatov izračuna. V tem priročniku se program, napisan v Pythonu (in shranjen v datoteki py), imenuje „py skript“.

Za ta primer bomo vnesli py skript, kot je prikazan na zaslonu desno.

```
==OCTA      001/006 →
import math
A=int(input("A= "))
S=2*math.sqrt(3)*A**2
V=math.sqrt(2)/3*A**3
print("S=",S)
print("V=",V)
FILE RUN SYBL CHAR A⇔a ▷
```

Postopek

1. V glavnem meniju vstopite v način **PYTHON**.
   - Prikaže se zaslon s seznamom datotek.
   - Imena datotek so navedena v abecednem redu.
   - Vrednosti na desni strani seznama datotek označujejo število bajtov, ki jih uporablja vsaka datoteka py.

```
Python[              ]
 example1.py :     70
 example2.py :     32
 example3.py :     46
 userfunc.py :     88

RUN OPEN NEW SHELL DEL SRC
```

2. Ustvarite novo datoteko in registrirajte ime datoteke*.

   Tukaj bomo uporabili spodnji postopek za ustvarjanje nove datoteke py z imenom „OCTA”.

   3(NOVO)5(↔ a)j(O)I(C)/(T)v(A)w

   - Prikaže se zaslon urejevalnika skript.

   *** Imena datotek**

   - Za ime datoteke lahko vnesete do osem črk (osem bajtov).
   - Ime datoteke lahko sestavljajo enobajtni alfanumerični znaki (A do Z, a do z, 0 do 9). Ta kalkulator ne razlikuje med velikimi in malimi črkami.

   Pomembno!

   Upoštevajte, da datoteka, katere ime se začne s številko ali imenom, ki je rezervirana beseda v Pythonu, ne bo delovala.

3. Za vnos vsake vrstice skripta py izvedite spodnje ključne operacije.

- Za učinkovitejše vnašanje funkcij in ukazov lahko uporabite funkcijo kataloga v načinu **PYTHON** (stran 14-9). V spodnjih ključnih operacijah so podčrtani tekstovni nizi in v oklepajih navedeni imeni funkcij in ukazov, vneseni s funkcijo Katalog.

Izvedite to tipko:	**Za vnos tega:**
!4 (CATALOG)6(CTGY)d(math) ((I)(<u>import math</u>) ww	import math
a5(A↔ a)v(A)!.(=) !4 (CATALOG)6(CTGY)c(Built-in) ((I)②②②② ②②②②②②②②(<u>int()</u>)w !4 (KATALOG)ff(<u>input()</u>)w aZ(")a5(A↔ a)v(A)!.(=)a.(SPACE) aZ(")eew	A=int(input("A= "))
a5(A↔ a)*(S)!.(=)c* !4 (KATALOG)6(CTGY)d(math)h(M)(<u>math.</u>)w !x(')de*a5(A↔ a)v(A)xw	S=2*math.sqrt(3)*A**2
a5(A↔ a)c(V)!.(=) !4 (KATALOG)(<u>math.</u>)w !x(')ce/d*a5(A↔ a)v(A)^dw	V=math.sqrt(2)/3*A**3
!4 (KATALOG)6(CTGY)c(Vgrajeno)4 (P)②②②② (<u>print()</u>)w aZ(")a5(A↔ a)*(S)!.(=)aZ(") ,a5(A↔ a)*(S)ew	print("S=",S)
!4 (CATALOG)(<u>print()</u>)w aZ(")a5(A↔ a)c(V)!.(=)aZ(") ,a5(A↔ a)c(V)	print("V=",V)

4. Za izvedbo trenutno prikazanega skripta py izvedite spodnjo tipko.

2(RUN)1(Da)

(Shrani skript v datoteko, preden ga zažene.)

Spodnje operacije se izvedejo po zagonu skripta.

b0(Vnese vrednost A)

w

Vnos vrednosti za A Rezultat izvedbe (vrednost S) Rezultat izvedbe (vrednost V)

- Po zgornji operaciji lahko ponovno izvedete isti py skript z izvedbo spodnje operacije.

  1. Pritisnite J, da se vrnete na zaslon urejevalnika skripta.
  2. Pritisnite 2(RUN).

■ Zaslon SHELL

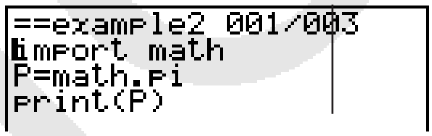
S pritiskom na 2(RUN) v koraku 4 zgornjega postopka se zažene način **PYTHON** SHELL, ki se lahko uporablja za izvajanje skriptov py. Zaslon, ki se v tem trenutku prikaže, se imenuje »zaslon SHELL«. Zaslon SHELL ne omogoča le izvajanja skriptov py, ki so bili shranjeni kot datoteke, ampak omogoča tudi neposredno vnašanje izrazov in ukazov ter njihovo izvajanje po eno vrstico naenkrat. Podrobnosti o SHELL-u najdete v poglavju »Uporaba SHELL-a« (stran 14-13).

- Če skript py ne deluje normalno zaradi napake pri vnosu, se pri izvajanju skripta v koraku 4 prikaže sporočilo o napaki. Pritisnite J, da se iz zaslona SHELL vrnete na zaslon urejevalnika skript. Informacije o popravljanju skripta py najdete v poglavju „Urejanje datoteke py“ (stran 14–17).

■ Zaslon urejevalnika skript

Na zaslonu urejevalnika skript, ki se prikaže v koraku 2 zgoraj, lahko vnesete do 150 vrstic, od katerih vsaka lahko vsebuje do 127 znakov.
Statusna vrstica uredniškega zaslona prikazuje ime trenutno odprtega py datoteke, skupno število vrstic v py skriptu in številko vrstice trenutne pozicije kurzorja.

Številka vrstice, kjer se nahaja kurzor *Ime datoteke*



Skupno število vrstic v skriptu py

Za informacije o tem, kako odpreti datoteko py in preveriti njeno vsebino ter kako odpraviti napake v skriptu py in ga urediti, glejte „Urejanje datoteke py“ (stran 14-17).

2. Meniju funkcij PYTHON

■ Meniju funkcij zaslona seznama datotek

Če v pomnilniku ni datotek py, bosta v spodnjem meniju na voljo samo možnosti {NEW} in {SHELL}.

- {**RUN**}/{**OPEN**} … zažene ali odpre shranjeno datoteko py za urejanje
- {**NEW**} … prikaže zaslon za registracijo imena datoteke za ustvarjanje nove datoteke py
- {**SHELL**} … zažene lupino in prikaže zaslon SHELL
- {**DEL**} … izbriše določeno datoteko py
- {**SRC**} … poišče ime datoteke

■ Funkcijski meni za registracijo imena za novo datoteko py

- {↔ } … preklaplja med vnosom velikih in malih črk

■ Meniju funkcij zaslona urejevalnika skript

- {**FILE**}
  - {**SAVE**} … prepiše trenutno odprto datoteko py
  - {**SV · AS**} … shrani trenutno odprto datoteko py pod drugim imenom
- {**RUN**} ... prikaže zaslon SHELL in zažene trenutno prikazani py skript
- {**SYBL**} … prikaže meniju funkcij za vnos simbolov
- {**CHAR**} … prikaže meni za vnos alfanumeričnih znakov, simbolov in operatorjev
- {**A↔ a**} … preklaplja med vnosom velikih in malih črk
- {**COM**} … prikaže meni pogojnih vejev in zank
  Glejte „Uporaba menija funkcij za vnos ukazov (pogojnih vezi ali zank) kot blokov izjav“ (stran 14-8).
- {**OPER**} … prikaže operator (= != > < % | ^ & ~) vnosni meni
- {**JUMP**} … prikaže meni funkcij za preskok vrstice
  - {**TOP**} … skoči na prvo vrstico skripta py
  - {**BTM**} … skoči na zadnjo vrstico skripta py
  - {**LINE**} … prikaže pogovorno okno za določitev vrstice in skoči na določeno vrstico skripta py
- {**SRC**} … poišče določeno vrstico

■ SHELL Meni funkcij zaslona

- {**RUN**} … izvede izraz ali ukaz, vnesen v zadnji vrstici (vrstici za ukaz) zaslona SHELL
- {↔ } … preklaplja med vnosom velikih in malih črk
- {**CHAR**} … prikaže meni za vnos alfanumeričnih znakov, simbolov in operatorjev

3. Vnos besedila in ukazov

V načinu **PYTHON** obstajajo trije načini za vnos besedila in ukazov.

- Uporaba tipkovnice za vnos črk, simbolov in funkcij (glej postopek spodaj).
- Vnos iz menija funkcij
  - Vnos alfanumeričnih znakov, simbolov in operatorjev (stran 14-7)
  - Vnos ukazov pogojne veje in zanke (stran 14-8)
- Uporaba kataloga (seznam funkcij ali ukazov) za izbiro elementa in njegovo vnos (stran 14-9)

■ Uporaba tipkovnice za neposredno vnos ukazov

Na zaslonu urejevalnika skriptov ali zaslonu SHELL lahko s tipkovnico kalkulatorja vnesete številke, črke in funkcije (~,log itd.), ki so dodeljene posameznim tipkam.

u Uporaba tipk za vnos številk, operatorjev, oklepajev in funkcij

Spodnja tabela prikazuje, kaj se vnese (številka, operator, oklepaj ali funkcija), ko pritisnete tipko ali pritisnete ! in nato tipko.

Izvedba te tipke:	Vnese to:
0 do j	0 do 9
x	**2
^	**
v	X
l	log10()
I	log()
s	sin()
c	cos()
t	tan()
(	(
)	)
.	.
,	,
*	*
/	/

Izvedba te ključne operacije:	Vnesite naslednje:
+	+
–	–
Z	e
!x(~)	sqrt()
!I(e^x)	exp()
!s(sin⁻¹)	asin()
!c(cos⁻¹)	acos()
!t(tan⁻¹)	atan()
!)(x^{-1})	**−1
!*({)	{
!/(})	}
!+([)	[
!–(])	]
!0(i)	1j
!.(=)	=
!Z(π)	pi

Pomembno!

Med zgornjimi besedilnimi nizi, ki so vneseni s tipkami, so *log*() in druge funkcije, ki jim sledijo oklepaji, *e* (osnova naravnega logaritma) in *pi* funkcije matematičnega modula. Da bi lahko uporabili te funkcije, morate najprej uvoziti matematični modul. Za podrobnosti glejte „Kategorije ukazov“ (stran 14-10) in „Primer delovanja: Uporaba funkcij matematičnega modula“ (stran 14-12).

* Če za vnos modula uporabite *import* namesto *from*, morate pred vsako funkcijo, ki jo uporabljate, dodati „math.“. Za več informacij glejte „Uporaba modulov (*import*)“ (stran 14-11).

u Vnos s tipko abecede

Prvi vnos takoj po pritisku a ali če je bil vnos zaklenjen v abecedni način s pritiskom !a (stran 1-2), bo pritisk na tipko vnesel znak, označen z rdečo barvo na tipki, presledek ali narekovaje (”).

- Če na zaslonu s seznamom datotek izberete {NEW} ali {OPEN}, se prikaže zaslon urejevalnika skriptov in vnos se samodejno pretvori v male črke.

u Samodejno vstavljanje zamika ob vnosu nove vrstice

Na zaslonu urejevalnika skriptov v načinu **PYTHON** s pritiskom na w vnesete nov vrstni red.

- Če pritisnete w po vrstici, ki se konča z dvopičjem (:), se nova vrstica samodejno zamakne za dve presledki več kot vrstica nad njo (samodejni zamik).
- Če pritisnete w, ko je kurzor v vrstici z zamikom, se vrstica za novim vrstnim znakom zamakne za enako razdaljo kot vrstica z zamikom nad njo.
- Če želite vstaviti nov vrstni red brez vdolbinjenja nove vrstice,

pritisnite !w. Kode novih vrstnih redov se v načinu **PYTHON** ne prikažejo.

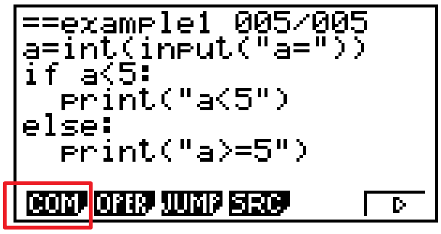
■ Uporaba funkcijskega menija za vnos besedila (alfanumerični znaki, simboli, operacijski znaki)

Za vnos alfanumeričnih znakov, simbolov ali operatorjev uporabite funkcionalne menije, prikazane v spodnji tabeli.

<table>
<tr><th colspan="2">Tipka</th><th rowspan="2">Vnesljivi znaki (alfanumerični znaki, simboli, operacije)</th></tr>
<tr><th>Zaslon urejevalnika skript</th><th>Zaslon SHELL</th></tr>
<tr><td>3(SYBL) (simboli)</td><td>—</td><td>, () [] : ; # ’ ” \ _</td></tr>
<tr><td>4(CHAR) (alfanumerično znaki, simboli, operacijski znaki)</td><td>6(CHAR) (alfanumerični znaki, simboli, operatorji)</td><td>!"#$%&'()*+,-./0123
456789:;<=>?@ABCDEF
GHIJKLMNOPQRSTUVWXY
Z[\]^_`abcdefghijkl
mnopqrstuvwxyz{|}~</td></tr>
<tr><td>6(g)2(OPER) (operatorji)</td><td>—</td><td>= != > < % | ^ & ~</td></tr>
</table>

■ Uporaba menija funkcij za vnos ukazov (pogojnih vejev ali zank) kot blokov izjav

Na zaslonu urejevalnika skriptov lahko uporabite funkcijske menije {COM}, da vnesete izjave pogojnih vejev in zank.



1
→

Izvedite naslednjo tipko:	Za vnos tega bloka izjav:*
6(g)1(COM) 1(if)	if□ |: □□
6(g)1(COM) 2(ifelse)	če□ |: □□ drugače: □□
6(g)1(COM) 3(ifelif)	če□ |: □□ elif: □□ drugače: □□

Izvedi to ključno operacijo:	Za vnos tega stavka:*
6(g)1(COM) 4(za)	za□ i□ v□ |: □□
6(g)1(COM) 5(f · ran)	za□ i□ v□ range(|): □□
6(g)1(COM) 6(medtem ko)	medtem ko□ |: □□

* Simboli v okvirčkih (□) v zgornjih tabelah predstavljajo prazna mesta. Simboli v okvirčkih se na zaslonu ne prikažejo. Navpične črte (|) označujejo položaj kurzorja takoj po vnosu. Navpična črta (|) se ne vstavi.

- Poleg šestih blokov izjav zgoraj lahko uporabite tudi katalog (stran 14-9) za vnos blokov izjav, prikazanih spodaj.
  - **for:range(,)**
  - **for:range(,,)**
  - **if · and:else**
  - **če · ali:drugače**
  - **def:return**
- Na zaslonu SHELL je mogoče vnesti le eno vrstico, zato vnos blokov izjav ni dovoljen. Na zaslonu SHELL bo izbira menija, ki vnese bloke izjav, vnesla le prvo vrstico bloka.

u **Primer: Vnos izraza if...else**

1. Na zaslonu urejevalnika skriptov premaknite kurzor na vrstico, v katero želite vnesti blok izjave, in nato pritisnite 6(g)1(COM)2(ifelse).
   - To vnese blok izjave if...else, pri čemer je kurzor nameščen za vnos pogoja if.
   - Vrstici 2 in 4 sta samodejno zamaknjeni za dve presledki.

■ Vnos ukaza iz kataloga (funkcija kataloga)

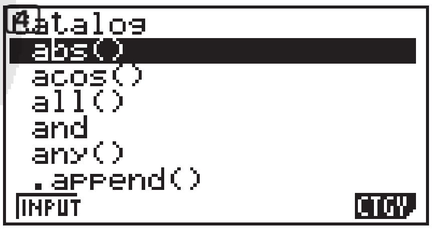
Katalog je seznam funkcij in ukazov. Vnos lahko izvedete tako, da prikažete zaslon kataloga in izberete želeno funkcijo ali ukaz. Ta operacija je mogoča tako na zaslonu urejevalnika skript kot na zaslonu SHELL.

* Samo če je kurzor v vrstici za ukaz.

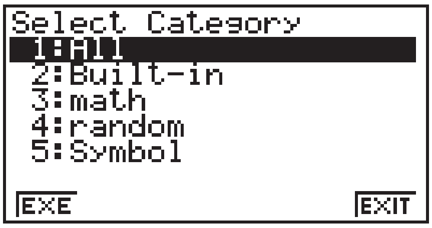
V postopkih v tem poglavju se funkcije, ukazi in drugi elementi, ki jih je mogoče vnesti iz kataloga, skupaj imenujejo »ukazi«.

u **Za vnos ukaza iz kataloga**

1. Na zaslonu urejevalnika skriptov ali zaslonu SHELL pritisnite !4 (CATALOG).
   - Prikaže se zaslon s seznamom ukazov iz kataloga.
   - Če želite na tem zaslonu izbrati ukaz za vnos, nadaljujte s korakom 4 tega postopka. Če želite izbrati kategorijo, nadaljujte s korakom 2 tega postopka.



2. Pritisnite 6(CTGY).
   - Prikaže se seznam kategorij.
   - Podrobne informacije o posameznih kategorijah najdete v poglavju »Kategorije ukazov« (stran 14-10).



3. Pritisnite številčno tipko (od b do f, ki ustreza kategoriji, ki jo želite izbrati. Ali pa lahko uporabite f in ②, da premaknete označitev na kategorijo, nato pa pritisnite w.
   - S tem se vrnete na zaslon s seznamom ukazov, ki bo zdaj prikazoval samo ukaze znotraj izbrane kategorije.

4. Z uporabo tipk f in ② izberite ukaz, ki ga želite vnesti.
5. Po izbiri ukaza, ki ga želite vnesti, pritisnite 1(INPUT) ali w.

- Ko vstopite v način **PYTHON** in prikažete katalog, se najprej prikaže ukaz, ki je bil izbran zadnjič, ko ste prikazali katalog.

Kategorije ukazov

Vsebina posameznih kategorij kataloga načina **PYTHON** je opisana v spodnji tabeli.

Ime kategorije	Opis
Vse	Prikaže seznam vseh funkcij in ukazov, vključenih v katalog načinov **PYTHON** .
Vgrajene	Prikaže seznam vgrajenih funkcij in ukazov Python. Funkcije in ukazi, vključeni v to kategorijo, se lahko uporabljajo brez uvoza modula.*
math	Prikaže seznam ukazov, ki uvažajo modul Python math* (matematične funkcije), in funkcije, vključene v modul math.
naključno	Prikaže seznam ukazov, ki uvažajo Pythonov modul random* (funkcije naključnih številk), in funkcije, vključene v modul random.
Symbol	Prikaže seznam simbolov in operatorjev.

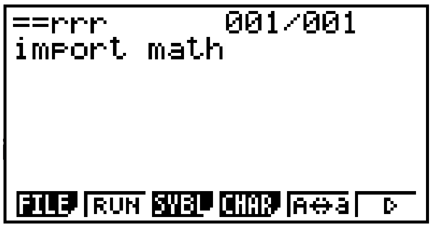
* Podrobnosti o modulih najdete v poglavju „Uporaba modulov (*uvoz*)“ (stran 14-11).

- Za razliko od katalogov drugih načinov (stran 1-9) v načinu **PYTHON** ni funkcije zgodovine ukazov ali funkcije QR-kode.

---

u Primer vnosa: Uporaba funkcije katalog za vnos »import math«

1. Na zaslonu urejevalnika skriptov premaknite kurzor na vrstico, v katero želite vnesti ukaz, in nato pritisnite ▼ 4 (CATALOG).
2. Pritisnite 6(CTGY), da prikažete zaslon kategorij, nato pa pritisnite d(math).
3. Pritisnite ☾ da poiščete ukaze, ki se začnejo z »i«.
4. Ko se prepričate, da je izbrana možnost »import math«, pritisni
   - Za podrobnosti o „import math“ glejte „Uporaba modulov (*import*)“ (stran 14-11).



■ Uporaba modulov (*import*)

V načinu **PYTHON** lahko uporabljate vgrajene funkcije Python, matematični modul in funkcije naključnega modula. Da bi lahko uporabili funkcijo, ki je vsebovana v modulu, morate najprej uvoziti (*import*) modul.

Sintaksa *uvoza*	**Opis**
import <ime modula>	Uvozi modul (py datoteko), ki je določen z <ime modula>.
from <ime modula> import *	Uvozi vse elemente*, vključene v modul, določen z <ime modula>.
iz <ime modula> uvozi <element> [, <element>]	Uvozi določene elemente (funkcije itd.), vključene v modul, določen z <ime modula>.

* Element, katerega ime se začne z znakom podčrtaj (_), ni mogoče uvoziti.

- Posamezna datoteka py, napisana s skriptom py, se imenuje »modul«. Datoteke py se uvozijo z isto sintakso kot *import*.
- Primer uvoza in uporabe datoteke py najdete v »Primer 4: Uvoz datoteke py« v »Primerih skript« (stran 14-23).

Primeri zapisa:

import math (Uvozi modul math.)

iz matematike uvozi pi, sqrt (Iz matematičnega modula uvozi samo *pi* in *sqrt*.)

- Če za uvoz modula uporabite *import*, morate pred funkcijo vključiti „<ime modula>“, da lahko uporabite to funkcijo. Če želite na primer uporabiti *pi* v matematičnem modulu, morate napisati „math.pi“.
- Pri uporabi *from* za uvoz modula ne uporabljajte spodnje sintakse.

  <ime modula>.<ime funkcije>

  Izvedba uvoza s to sintakso bo povzročila napako.

Primer operacije: Uporaba funkcij modula math

1. Na zaslonu s seznamom datotek pritisnite 4(SHELL).
2. Pritisnite !4 (CATALOG), da prikažete katalog.
3. Pritisnite 6(CTGY), da prikažete zaslon kategorij, nato pa pritisnite d(math).
4. Izvedite spodnjo zaporedje tipkanja.

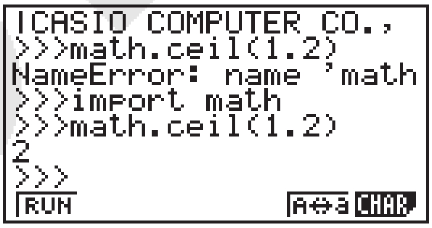
   h(M)w (vnesite »math.«)

   !4 (CATALOG) ■ (C)w (vnesite „ceil()”)

5. Pritisnite b.cw.
   - Matematični modul ni uvožen, zato funkcija matematičnega modula „ceil()“ povzroči napako.

6. Pritisnite !4 (CATALOG), da ponovno prikažete katalog, pritisnite c da izberete „import math“, nato pa pritisnite w.
7. Ponovno pritisnite w, da izvedete »import math«.
   - S tem uvozite matematični modul.

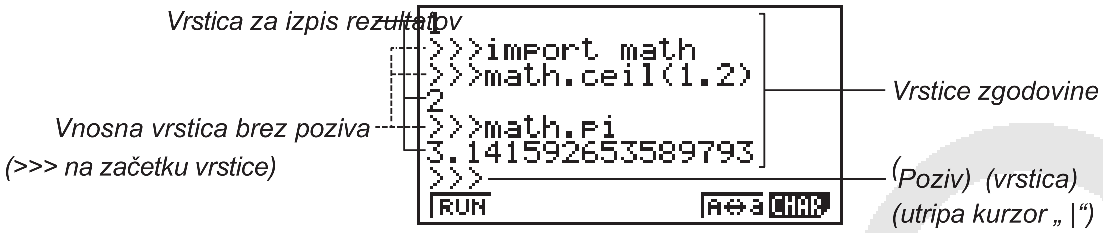
8. Z uporabo f izberite vrstico „math.ceil(1.2)“, ki ste jo vnesli v koraku 5 zgoraj, nato pritisnite w.
   - S tem se izbrana vrstica kopira v vrstico za ukaz.
9. Pritisnite w.
   - To prikaže rezultat izvedbe „math.ceil(1.2)”.



- Zgornjo operacijo lahko izvedete z neposrednim izvajanjem ukazov na zaslonu SHELL. Podrobnosti o SHELL-u najdete v poglavju „Uporaba SHELL-a“ (stran 14-13).
- Da bi lahko uporabili matematični modul in/ali funkcijo naključnega modula v skriptu py, je treba ustrezni ukaz za uvoz modula napisati enkrat v vrstici pred prvo uporabo funkcije.

4. Uporaba SHELL

Zaslon SHELL ponuja interaktivno ukazno vrstico, ki jo lahko uporabite za vnos izrazov in ukazov ter izpis njihovih rezultatov. Izraz ali ukaz lahko neposredno vnesete na zaslon SHELL in ga izvedete, da dobite rezultat. Izvedba datoteke py bo prikazala njen rezultat na zaslonu SHELL.



SHELL zaslon

- V vrstico z ukazno vrstico je mogoče vnesti do 127 znakov, ne upoštevajoč znakov >>> na začetku vrstice.
- Vrstica z izpisom rezultata lahko vsebuje do 255 znakov.
- Vse vrstice nad vrstico ukazne vrstice prikazujejo zgodovino vnosa/izpisa.
  Na zaslonu SHELL se shrani do 100 vrstic zgodovine, ki so sestavljene iz vrstic z izpisom rezultatov in vrstic z vnosom, brez vrstice z ukazno vrstico. To je dodatek k ukazni vrstici. Vrstice zgodovine lahko pomikate od najnovejših do najstarejših, vrstico zgodovine pa lahko kopirate v ukazno vrstico.
  Vsebina zgodovine se ohrani*, tudi če preklopite na drug zaslon v načinu **PYTHON**. Izbriše se, ko vstopite v drug funkcionalni način, ki ni način **PYTHON**.

  * Čeprav se vsebina zgodovine ohrani, ko preklopite iz zaslona SHELL na drug zaslon v načinu **PYTHON**, se spremenljivke, ki jih uporablja SHELL, inicializirajo vsakič, ko preklopite na drug zaslon. Za več informacij glejte „Inicializacija SHELL“ (stran 14–16).

■ Osnovne operacije zaslona SHELL

u Prikaz zaslona SHELL

Z izvedbo katere koli od spodnjih operacij se prikaže zaslon SHELL.

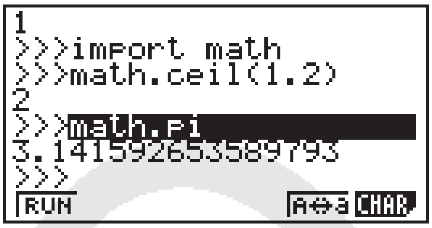
- Na zaslonu s seznamom datotek pritisnite 4(SHELL).
- Na zaslonu s seznamom datotek izberite datoteko py in nato pritisnite 1 (RUN) ali w. S tem se zažene datoteka py in prikaže zaslon SHELL.
- Na zaslonu urejevalnika skriptov pritisnite 2(RUN).
  S tem se zažene prikazani py skript in prikaže zaslon SHELL.

u **Izvedba ukaza iz zaslona SHELL**

Glejte „Neposredno vnašanje ukaza na zaslonu SHELL in njegovo izvajanje“ (stran 14–15).

u **Za navpično pomikanje po zaslonu SHELL (za prikaz vrstic zgodovine)**

Pritisnite f ali ②. Trenutno izbrana vrstica zgodovine je tista, ki je označena.



u **Za vodoravno pomikanje po eni vrstici zaslona SHELL (vrstica zgodovine ali vrstica ukazne vrstice)**

1. Uporabite f in ②, da označbo premaknete na vrstico, po kateri želite pomikati.
2. Pritisnite d ali e.
   - Preveč dolga vrstica zgodovine, ki je ni mogoče v celoti prikazati, je označena s puščicami (in ", ki kažejo, v katero smer so dodatni znaki. Puščice (in "se ne prikažejo v vrstici za ukaz, čeprav je njena vsebina preveč dolga, da bi jo bilo mogoče v celoti prikazati.

u **Kopiranje ene vrstice zgodovine zaslona SHELL v vrstico za ukaz**

Uporabite f in ②, da označite vrstico, ki jo želite kopirati, nato pa pritisnite w. Dejanski primer delovanja si oglejte v koraku 8 pod »Primer delovanja: Uporaba funkcij matematičnega modula« (stran 14-12).

u **Za vrnitev na zaslon s seznamom datotek iz zaslona SHELL**

Pritisnite J .

- Če ste na trenutno prikazani zaslon SHELL prišli s pritiskom na 2(RUN) za zagon skripta py iz zaslona urejevalnika skript, se s prvim pritiskom na J vrnete na zaslon urejevalnika skript. V tem primeru ponovno pritisnite J, da se vrnete na zaslon s seznamom datotek.
- Prehod iz zaslona SHELL na drug zaslon v načinu **PYTHON** bo povzročil inicializacijo vseh spremenljivk, ki jih uporablja SHELL. Za več informacij glejte „Inicializacija SHELL“ (stran 14–16).

■ Neposredno vnašanje ukaza na zaslon SHELL in njegovo izvajanje

V ukazno vrstico zaslona SHELL lahko vnesete enovrstični izraz ali ukaz in ga izvedete. Vsi spodnji primeri delovanja se začnejo z že prikazanim zaslonom SHELL.

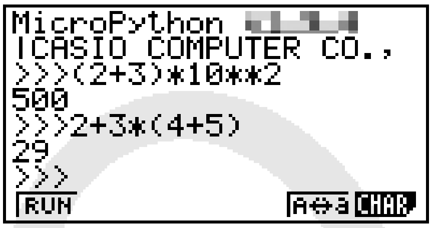
u Primer operacije 1: Izvedba preprostih aritmetičnih operacij

(2+3) × 10² = 500

(c+d)*b0xw

2+3 × (4+5) = 29

c+d*(4 +f)w



Upoštevajte spodnje pomembne točke.

- Za vnos znaka minus uporabite tipko −, ne tipko -.
- Natančnost izračunov v načinu **PYTHON** se razlikuje od izračunov, izvedenih v načinu **RUN · MAT**.

u Primer delovanja 2: Za priklic in zagon datoteke py iz zaslona SHELL

Spodnja operacija uporablja datoteko „OCTA.py“, ki je bila ustvarjena na podlagi primera v poglavju „Potek od ustvarjanja datoteke py do izvajanja datoteke“ (stran 14-2). Predpostavlja se, da je SHELL že v teku. Če želite datoteko „OCTA.py“ poklicati iz SHELL-a, mora biti SHELL zagnan, medtem ko je na zaslonu prikazan seznam datotek, ki vsebuje datoteko „OCTA.py“.

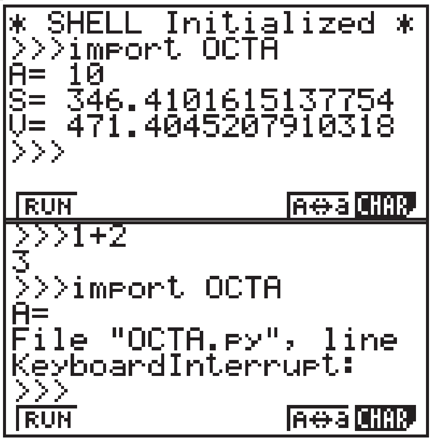
!4 (CATALOG)6(CTGY)c(Vgrajeno)

C(I)②②②②②②②(import)w

!a5(A↔ a)j(O)l(C)/(T)v(A)w

ab0 (Vnos vrednosti za A) w

- Če želite ustaviti izvajanje skripta, pritisnite AC .
  To bo povzročilo pojav sporočila „KeyboardInterrupt:”, pri čemer bo kurzor utripal v spodnji vrstici (vrstici za ukaz) zaslona.



u *input* Delovanje v načinu PYTHON

input je vgrajena funkcija Python, ki sprejema uporabniške vnose med izvajanjem skripta py.

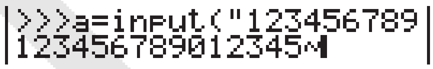
input **Sintaksa**	**Opis**
input([niz besedila poziva])	Med izvajanjem skripta py *input* zapiše [prompt text string] argumenta v izhodno vrstico SHELL in čaka na uporabniški vnos. Za [prompt text string] je mogoče določiti ime nizne spremenljivke ali niz znakov, zapisan v dvojnih narekovajih (”) ali enojnih narekovajih (’).

V primeru nizov spremenljivk, dolgih do 16 znakov, se bodo vsi znaki imena nizov spremenljivk, ki so bili določeni z *vnosom,* prikazali kot poziv, ko se funkcija izvede v načinu **PYTHON**. V primeru nizov spremenljivk, daljših od 16 znakov, se bo kot poziv prikazalo prvih 15 znakov niza spremenljivk, ki jim sledi simbol podobnosti (~).

Primer izvedbe ***vnosa***

Niz besedila poziva, dolg do 16 znakov (vnos »123?« kot niz besedila poziva).

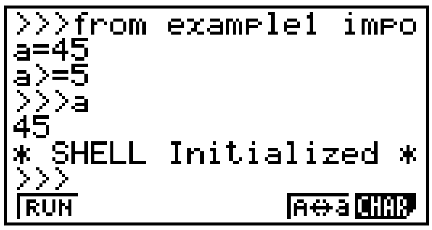
Niz besedila poziva, daljši od 16 znakov (”12345678901234567” vnos kot niz besedila poziva).



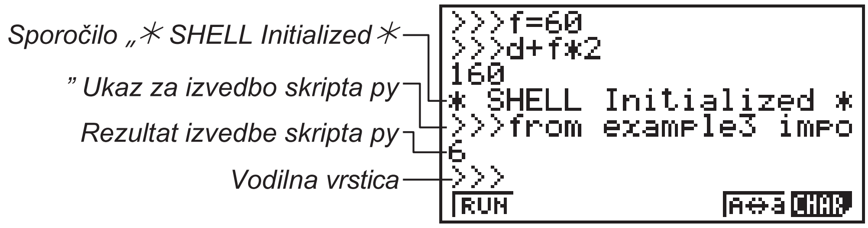
■ Inicializacija SHELL

Funkcije in spremenljivke, ki so definirane, moduli, ki so uvoženi, in rezultati drugih operacij SHELL se shranijo v območju kup SHELL (začasno pomnilniško območje), medtem ko SHELL teče. Kadarkoli se SHELL zapre (z prehodom na drug zaslon načina **PYTHON**), se vsebina območja kup SHELL do tega trenutka izbriše. To izbrisanje vsebine območja kup SHELL se imenuje „inicializacija SHELL“.

- Ko ponovno zaženete SHELL v načinu **PYTHON**, se v vrstici nad spodnjo vrstico (vrstica za ukazno vrstico) zaslona SHELL prikaže sporočilo »∗ SHELL Initialized∗ «.
- To sporočilo se prikaže samo, če ponovno prikažete zaslon SHELL, vendar se ne prikaže, ko prvič prikažete zaslon SHELL po vstopu v način **PYTHON**.



• Če se SHELL ponovno zažene z izvedbo skripta py iz seznama datotek ali iz urednika skript, se SHELL inicializira pred izvedbo skripta py. Zaradi tega se bo prikazal zaslon SHELL, kot je prikazano na spodnji sliki.



5. Urejanje datoteke py

■ Prikaz in urejanje datoteke py

Z naslednjim postopkom lahko odprete shranjeno datoteko py in prikažete njeno vsebino na zaslonu urejevalnika skript, kjer jo lahko po želji uredite.

u Za odpiranje datoteke py in prikaz zaslona urejevalnika skript

1. V glavnem meniju vstopite v način **PYTHON**.
2. Na zaslonu s seznamom datotek, ki se prikaže, s tipkama f in ② premaknite označitev na datoteko py, ki jo želite odpreti, in nato pritisnite 2(OPEN).
   • S tem se odpre izbrana datoteka py in prikaže zaslon urejevalnika skript.
   • Pazite, da med prikazom seznama datotek ne pritisnete po pomoti tipko w. S tem bi namreč izvedli datoteko py in prikazali zaslon SHELL.

u Za preskok na prvo ali zadnjo vrstico na zaslonu urejevalnika skript

• Za preskok na prvo vrstico na zaslonu urejevalnika skriptov pritisnite 6(g)3(JUMP)1(TOP).
• Če želite preskočiti na zadnjo vrstico na zaslonu urejevalnika skript, pritisnite 6(g)3(JUMP)2(BTM).

u Za preskok na določeno vrstico na zaslonu urejevalnika skript

1. Iz skriptni urejevalnik
2. V pogovornem oknu, ki se prikaže, vnesite številko vrstice, na katero želite preskočiti, in nato pritisnite w.

u **Iskanje besedila na zaslonu urejevalnika skript**

1. Na zaslonu urejevalnika skriptov pritisnite 6(g)4(SRC).
2. Na zaslonu, ki se prikaže, vnesite niz znakov, ki ga želite poiskati, in nato pritisnite w.
   - S tem se začne iskanje od vrha skripta py in kurzor se premakne levo od prvega znaka prvega najdenega ujemajočega se niza znakov. Če se ne najde noben ujemajoč se niz znakov, se prikaže sporočilo »Not Found« (Ni najdeno). V tem primeru pritisnite J
   - Če želite nadaljevati iskanje z istim nizom znakov, pritisnite 1(SRC).
   - Iskanje lahko nadaljujete le, če je za tipko menija funkcij 1 prikazano „SRC“, kar pomeni, da je v skriptu vsaj še en niz znakov, ki ustreza iskanemu. Če želite iskanje prekiniti, pritisnite tipko J. Iskanje se samodejno konča, če ni več ujemanj z vnesenim nizom znakov.

u **Kopiranje ali izrezovanje niza znakov iz zaslona urejevalnika skripte in shranjevanje v odložišče**

1. Na zaslonu urejevalnika skript premaknite kurzor na začetek območja, ki ga želite kopirati ali izrezati, in nato pritisnite !i(CLIP).
2. Premaknite kurzor na konec območja, ki ga želite kopirati ali izrezati.
   - Izbrani obseg se bo poudaril.
   - Ni pomembno, ali izberete od začetka do konca območja ali od konca do začetka.
3. Pritisnite 1 (KOPIRAJ) ali 2 (IZREŽI).

u **Vstavljanje niza znakov, ki je v odložišču**

1. Na zaslonu urejevalnika skriptov premaknite kurzor na mesto, kamor želite vstaviti besedilni niz.
2. Pritisnite !j(PASTE).

■ Odpravljanje napak v skriptu py

Če datoteka py ne deluje tako, kot ste pričakovali, je morda vzrok za to napaka (error) v skriptu py. Spodnji simptomi kažejo, da je treba datoteko py odpraviti.

- Pri izvajanju datoteke py skript prikaže sporočilo o napaki.
- Pri izvajanju datoteke py se ne izvedejo želene operacije ali rezultati.

u Uporaba sporočil o napakah za odpravljanje napak

Če se pri zagonu datoteke py na zaslonu SHELL prikaže sporočilo o napaki, izvedite spodnje korake.

1. Z uporabo f premaknite označitev na vrstico z napako, nato pa z uporabo d in e preverite podrobnosti napake.
2. Pritisnite J.
   - To vas vrne na zaslon, s katerega je bil py datoteka zažena (zaslon urejevalnika skriptov ali zaslon seznama datotek). Odprite py datoteko, v kateri je prišlo do napake, in preverite vsebino vrstice, za katero je bilo prikazano sporočilo o napaki. Po potrebi popravite.
   - Upoštevajte, da sporočilo o napaki ne nujno identificira dejanskega problema.
   - Upoštevajte, da se sporočilo o napaki prikaže tudi, če pride do težave z vnosom SHELL, zaradi česar se zdi, da je v datoteki py napaka. Na primer, če vhodni podatki ne ustrezajo podatkovnemu tipu, določenemu z *vnosom*, itd. Če ne morete najti težave v vrstici, za katero se je prikazalo sporočilo o napaki, preverite, ali je vnos SHELL pravilen.

Funkcija {JUMP} je uporabna, ko želite preskočiti na določeno vrstico na zaslonu urejevalnika skript. Glejte „Preskok na določeno vrstico na zaslonu urejevalnika skript“ (stran 14-17).

u Odpravljanje napak na podlagi rezultatov izvajanja datoteke py

Če izvajanje datoteke py prinese nepričakovane rezultate, preverite celotno vsebino datoteke py in po potrebi popravite.

6. Upravljanje datotek (iskanje in brisanje datotek)

Na zaslonu s seznamom datotek lahko poiščete shranjene datoteke py po njihovih imenih in jih izbrišete.

- Datoteke py, ki jih ustvarite v načinu **PYTHON,** se shranijo v pomnilnik kalkulatorja.
- Poleg operacij z datotekami, opisane v tem poglavju, lahko uporabite tudi upravitelja pomnilnika za ustvarjanje map in izvajanje drugih operacij z mapami. Za več informacij glejte „Poglavje 11 Upravitelj pomnilnika“.

---

u **Iskanje datoteke py po imenu datoteke**

1. Na zaslonu s seznamom datotek pritisnite 6(SRC).

```
Search
[        ]
```

- Prikaže se zaslon za vnos iskanega besedila.

2. Vnesite del ali celotno ime datoteke, ki jo želite poiskati.
   - Vnašate lahko samo velike črke. Iskanje ni občutljivo na velike in male črke.
   - Znakov v imenu datoteke se išče od leve proti desni. To pomeni, da če tukaj vnesete „IT“, bodo imena, kot so ITXX, ITABC in IT123, šteta kot zadetki, imena, kot so XXIT in ABITC, pa ne bodo šteta kot zadetki.
3. Pritisnite w.
   - Če se ime datoteke ujema z nizom znakov, ki ste ga vnesli v koraku 2, bo ta datoteka izbrana na zaslonu seznama datotek.
   - Če se ujemajoče ime datoteke ne najde, se prikaže sporočilo »Ni najdeno«. Pritisnite J. za zaprtje pogovornega okna s sporočilom.

---

u **Za izbris datoteke py**

1. Na zaslonu s seznamom datotek z uporabo tipk ② in f označite datoteko, ki jo želite izbrisati, in nato pritisnite 5(DEL).
   - Pojavilo se bo sporočilo za potrditev izbrisa.
2. Pritisnite 1(Da), da izbrišete, ali 6(Ne), da prekličete izbris.

7. Združljivost datotek

py datoteke lahko delite med kalkulatorjem in računalnikom. Py datoteko, ustvarjeno s kalkulatorjem, lahko prenesete na računalnik in jo uredite z urejevalnikom besedil ali drugo programsko opremo. Py datoteko, ustvarjeno na računalniku, lahko prenesete na kalkulator in jo tam zaženete.

- Datoteke py, ki jih ustvarite v načinu **PYTHON,** se shranijo v pomnilnik kalkulatorja (z razširitvijo imena datoteke py).
- Za informacije o postopku prenosa datotek med kalkulatorjem in računalnikom glejte „Izvedba podatkovne komunikacije med kalkulatorjem in osebnim računalnikom“ (stran 13-2).

■ Datoteke py, ustvarjene in shranjene s tem kalkulatorjem

Oblike datotek py, ustvarjenih in shranjenih s tem kalkulatorjem, so prikazane spodaj.

Znakovna koda:	ASCII koda
Uporabljeni	ASCII*
znaki: Koda za	CR+LF
novo vrstico:	Presledki (dva presledka za samodejni zamik)
Vdolbina:	

* ASCII znaki so tisti, ki so prikazani spodaj.
A-Z a-z 0 ! " # $ % & ' ( ) ∗ + , − . / : ; < = > ? @
[\ ] ^ _ ` { | } ~ prostor

■ Varnostni ukrepi pri uporabi zunanje datoteke py na tem kalkulatorju

Spodnje omejitve veljajo, kadar poskušate uporabiti način **PYTHON** kalkulatorja za prikaz (ime datoteke ali vsebino datoteke), urejanje ali zagon datoteke py, ki je bila prenesena na računalnik iz zunanjega vira.

u **Prikaz imena datoteke**

- Na zaslonu **PYTHON**
  .
- Datoteke z imeni, ki vsebujejo ne-ASCII znake, se ne prikažejo.

  * Vendar pa naslednji znaki niso dovoljeni v imenih datotek.
  \ / : * ? " < > | .
- Če je ime datoteke py, prenesene v pomnilnik iz računalnika ali drugega vira, daljše od osmih znakov, se bo njegovo ime pri prikazu na zaslonu s podatki o pomnilniku skrajšalo na osem znakov. (Primer: AAAABBBBCC.py bo postalo AAAABB~1.py.)

u Prikaz in urejanje vsebine datoteke

Odpiranje datoteke py, ki izpolnjuje pogoje (A) in (B) spodaj v načinu **PYTHON**, bo povzročilo normalno prikazovanje vse vsebine datoteke. Datoteka py, ki prikazuje vsebino, se lahko normalno prikaže in uredi v načinu **PYTHON**.

(A) py datoteka, napisana izključno v ASCII znakih in shranjena v formatu UTF-8 ali drugih ASCII-združljivih kodah

- Če je datoteka shranjena z znakovnimi kodami, ki niso združljive z ASCII, se njena vsebina ne bo prikazala, če jo odprete v načinu **PYTHON**. Vsi znaki bodo nadomeščeni s presledki ali se bodo prikazali popačeno.

(B) py datoteka z največ 150 vrsticami, vsaka vrstica pa vsebuje največ 127 znakov

- Vsebina datoteke py, ki presega število znakov in/ali število vrstic, navedenih zgoraj, se ne more prikazati v načinu **PYTHON**. Pri poskusu odpiranja takšne datoteke se prikaže napaka »Invalid Data Size« (Neveljavna velikost podatkov).
- Čeprav vsebine datoteke py, ki presega število znakov in/ali število vrstic, navedenih zgoraj, ni mogoče prikazati ali urediti v načinu **PYTHON**, jo lahko morda zaženete. Glejte »Zagon datoteke py« (stran 14-22).

- Vsi tabulatorji v datoteki py bodo nadomeščeni z dvema presledkoma, ko bo datoteka odprta v načinu
  način **PYTHON**.
- Nobena vrsta znakov za novo vrstico (LF, CR, CR+LF) ne vpliva na vsebino prikaza v načinu **PYTHON**. Vsi kodeks novih vrstic v datoteki py bodo nadomeščeni s CR+LF (standardni kodeks novih vrstic v sistemu Windows), ko bo datoteka odprta v načinu **PYTHON**. Preden prenesete datoteko py, ki je bila urejena in shranjena v načinu **PYTHON**, na zunanjo napravo za uporabo na tej napravi, nadomestite njene kodekse novih vrstic s tistimi, ki so primerni za okolje, v katerem bo datoteka uporabljena.

u Izvajanje datoteke py

Datoteko py lahko zaženete, če je ta datoteka prikazana na zaslonu seznama datotek v načinu **PYTHON.**
način. Glejte „Prikaz imena datoteke“ (stran 14-21). Upoštevajte spodaj navedene pomembne točke.

- Zagon datoteke py, ki vsebuje ukaze, ki jih način **PYTHON** kalkulatorja ne podpira, bo povzročil napako.
- Uporaba načina **PYTHON** za odpiranje datoteke py, ustvarjene na zunanji napravi, bo povzročila zamenjavo znakov in kod za novo vrstico. Podrobnosti najdete v poglavju „Prikaz in urejanje vsebine datoteke“ (stran 14-22). Zaradi tega bo odpiranje datoteke py v načinu **PYTHON**, njeno shranjevanje in izvajanje spremenilo vsebino iz prvotne datoteke py, kar lahko vpliva na rezultate izvajanja.

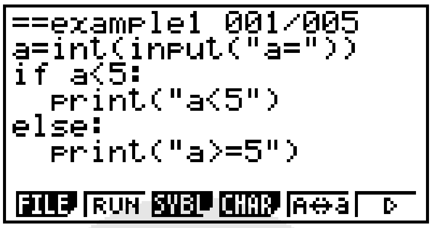
8. Primeri skript

Primer 1: Pogojno vejanje

Namen

Pri pogojnem razvejanju se izračuna pogoj, nato pa se obdelava nadaljuje po eni od več poti v skladu z rezultatom izračuna.

Spodnji primer prikazuje preprosto izjavo „if... else...“.



Opis

a=int(input("a="))	Sprejme uporabniško vnos med izvajanjem skripta py. Vnesene vrednosti se pretvorijo v cela števila in opredelijo spremenljivko a.
if a<5:	Če je spremenljivka a manjša od 5,
print("a<5")	izpiše besedilni niz a<5.
drugače:	V nasprotnem primeru (če je spremenljivka a enaka ali večja od 5),
print("a>=5")	izpiše besedilni niz a>=5.

Rezultat izvedbe (ko sta vneseni a=1 in a=10)

(1) Če vnesete a = 1

b

w

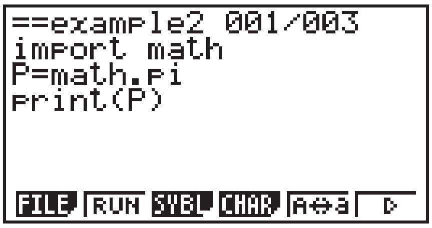
(2) Če vnesete a =

b□ 0

w

Primer 2: Uvoz modula

Namen



import uvozi modul in omogoča izvajanje funkcij, ki so v njem definirane. Uporabite spodnjo sintakso za izvajanje funkcij znotraj modula.

<ime modula>.<ime funkcije>

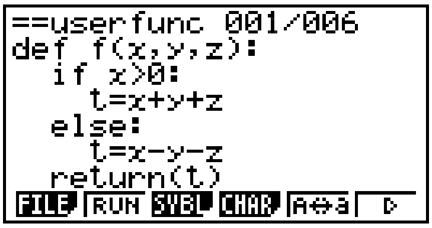
Opis

import math	Uvozi matematični modul in omogoča izvajanje funkcije, ki jo ta modul definira.
P=math.pi	Opredeli spremenljivko P kot *pi*, ki je opredeljena v matematičnem modulu.
print(P)	Izpiše vrednost, shranjeno v spremenljivki P.

Rezultat izvedbe

Primer 3: Opredelitev uporabniško definirane funkcije

Namen



def definira funkcijo, ki jo določi uporabnik.

Spodnji skript prikliče in uporabi skript py, ustvarjen v „Primer 4: Uvoz datoteke py“.

Opis

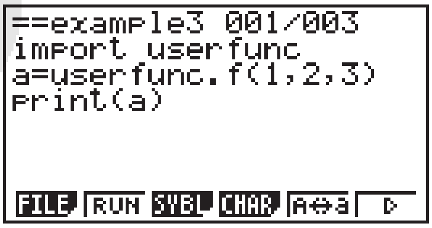
def f(x,y,z):	Opredeli uporabniško definirano funkcijo z imenom f in argumenti x, y in z.
if x>0:	Če je spremenljivka x večja od 0,
t=x+y+z	opredeli spremenljivko t kot rezultat izvedbe x+y+z.
drugače:	V nasprotnem primeru (če je spremenljivka x enaka 0 ali manjša),
t=x-y-z	opredeli spremenljivko t kot rezultat izvedbe x-y-z.
return(t)	Spremeni spremenljivko t v vrnjeno vrednost.

Zagon tega py skripta kot samostojnega skripta bo samo opredelil uporabniško definirano funkcijo. Funkcija ne bo izvedena, zato se bo py skript končal brez izpisa.

Rezultat izvedbe

Primer 4: Uvoz datoteke py

Namen



import se lahko uporabi za uvoz py datotek v druge py datoteke in za zagon procesov, zapisanih v uvoženih py datotekah.

To omogoča uporabo uporabniško definiranih funkcij in spremenljivk v več datotekah py.

Za izvedbo funkcije ali spremenljivke modula uporabite

<ime datoteke py (modul)>.<ime funkcije ali ime

Opis

import userfunc	Uvozi userfunc.py in izvede napisani proces.
a=userfunc.f(1,2,3)	Vnese argumente 1, 2 in 3 v uporabniško definirano funkcijo f, definirano v userfunc.py, izvede funkcijo f in definira spremenljivko a kot vrednost rezultata.
print(a)	Izpiše vrednost, shranjeno v spremenljivki a.

Rezultat izvedbe

Pomembno!

- Za uvoz datotek py v drugo datoteko ali datoteke py morajo biti vse datoteke v isti mapi (mapah).
- Py datoteke, ki jih je mogoče uvoziti s pomočjo zaslona SHELL, so opisane spodaj.
  - Če se SHELL zažene z operacijo zaslona seznama datotek*, so datoteke, ki jih je mogoče uvoziti, datoteke py v imeniku, prikazanem na zaslonu seznama datotek.
  - Če se SHELL zažene z operacijo zaslona urejevalnika skript,* so datoteke, ki jih je mogoče uvoziti, datoteke py v isti mapi, ki se prikliče z zaslonom urejevalnika skript.

  * Za dejansko delovanje glejte „Prikaz zaslona SHELL“ (stran 14-13).

Dodatek

1. Tabela sporočil o napakah

Sporočilo	Pomen	Ukrep
Sintaktič na napaka	• Nezakonita sintaksa • Poskus vnosa nezakonitega ukaza	• Pritisnite J, da prikažete napako in opravite potrebne popravke.
Ma NAPAKA	• Rezultat izračuna presega obseg prikaza. • Vmesni ali končni rezultat izračuna je zunaj dovoljenega obsega izračuna. • Izračun je zunaj obsega vnosa funkcije. • Matematična napaka (deljenje z ničlo itd.) • Ni bilo mogoče doseči zadostne natančnosti za izračunΣ, diferencialni izračun itd. • Rešitev ni bila dosežena za izračun enačbe itd.	• Preverite vnesene vrednosti in jih popravite, da bodo vrednosti v dovoljenih mejah.
Pojavi se napaka	① Ni ustreznega Lbl n za Goto n. 2 V programskem območju Prog „ime datoteke“ ni shranjen noben program.	① Pravilno vnesite Lbl n, ki ustreza Goto n, ali izbrišite Goto n, če ni potreben. 2 Shranite program v programskem območju Prog "ime datoteke" ali izbrišite Prog "ime datoteke", če ga ne potrebujete.
Napaka v gnezdenj u	• Vgrajevanje podprogramov s Prog "ime datoteke" presega 10 ravni.	• Prepričajte se, da se Prog "ime datoteke" ne uporablja za vrnitev iz podprogramov v glavni program. Če se uporablja, izbrišite vse nepotrebne Prog "ime datoteke". • Sledite ciljem skokov podprogramov in se prepričajte, da ni skokov nazaj v prvotno programsko območje. Prepričajte se, da so vrnitve izvedene pravilno.
Napaka v	• Izvedba izračunov, ki presegajo	• Poenostavite formule, da se

Sporočilo	Pomen	Ukrep
Napaka pomnilnik a	• Operacija ali operacija shranjevanja v pomnilniku presega preostalo zmogljivost pomnilnika.	• Število uporabljenih pomnilnikov naj bo v okviru trenutno določene količine pomnilnika. • Poenostavite podatke, ki jih želite shraniti, da bodo v okviru razpoložljive zmogljivosti pomnilnika. • Izbrišite podatke, ki jih ne potrebujete več, da naredite prostor za nove podatke.
Napaka argumenta	• Nepravilna specifikacija argumenta za ukaz, ki zahteva argument.	• Popravite argument.
Dimenzija ERROR	• Nezakonita dimenzija, uporabljena med izračuni matrike, vektorja ali seznama.	• Preverite dimenzijo matrike, vektorja ali seznama.
Napaka območja	① Vnos neustrezne vrednosti V-Window. 2 Presegle so nastavitve obsega V-Window pri ponovnem risanju grafa. 3 Vnos neustrezne vrednosti na zaslonu obsega in uporaba te vrednosti za izvedbo. 4 Območje celic v preglednici je bilo prekoračen z lepljenjem, ponovnim priklicem ali drugo operacijo s celicami.	① Spremenite vrednost V-Window, da bo v obsegu. 2 Ponovno narišite z ustreznimi nastavitvami. 3 Vnesite ustrezno vrednost območja. 4 Ponovite postopek in pazite, da ne presežete obsega celic.
Pogoj ERROR	• Izvedba izračuna ali funkcije, preden so izpolnjeni vsi pogoji, potrebni za izvedbo.	• Preverite pogoje in opravite potrebne popravke.
Nerealna NAPAKA	• Izračun, ki da kompleksno število, ko je v nastavitvenem oknu za nastavitev kompleksnega načina določeno Real, čeprav je argument realno število.	• Nastavitev Complex Mode spremenite v nekaj drugega kot Real.
Kompleksno število v seznamu	• Seznam, ki vsebuje kompleksno število, uporabljeno v izračunu ali operaciji, za katero so podatki o kompleksnih številih neveljavni.	• Vse podatke na seznamu spremenite v realna števila.
Kompleks no število v matrici	• Matrika, ki vsebuje kompleksno število, uporabljeno v izračunu ali operaciji, za katero so podatki o kompleksnih številih neveljavni.	• Vse podatke v matrični spremenite v realna števila.
Kompleks na števila v matrične m ali	• Matrika ali vektor, ki vsebuje kompleksno število, uporabljeno v izračunu ali operaciji, za katero so podatki o kompleksnih številih neveljavni.	• Vse podatke v matrici ali vektoru spremenite v realna števila.

vektorske m zapisu		
Kompleks na števila v podatkih	• Podatki, poslani iz funkcije tega kalkulatorja (matrika itd.), vključujejo podatke s kompleksnimi številkami, vendar ustrezna funkcija kalkulatorja, ki jih prejme, ne podpira podatkov, ki vključujejo kompleksna števila.	• Pošljite podatke, ki ne vsebujejo kompleksnih števil.

Sporočilo	Pomen	Ukrep
Ne morem poenostaviti	• Poskusili smo poenostaviti ulomek s funkcijo »Simp« (stran 2-23), vendar poenostavitve ni bilo mogoče izvesti z uporabo navedenega delitelja. Primer: Navedba delitelja 3 za poenostavitev ulomka 4/8.	• Določite drug delitelj ali izvedite funkcijo »Simp« brez določitve delitelja.
Ne morem rešiti! Prilagodite začetno vrednost ali meje. Nato poskusite znova.	• Izračun Solve ni mogel najti rešitve znotraj določenega obsega.	• Spremenite določeno območje. • Popravite vneseni izraz.
Brez spremenljivke	① V grafični funkciji, ki se uporablja za dinamični graf, ni določena nobena spremenljivka. 2 Ni spremenljivke v enačbi Solve.	① Določite spremenljivko za grafično funkcijo. 2 Vnesite enačbo Solve, ki vključuje spremenljivko.
Napaka pri pretvorbi	• Poskus uporabe ukaza za pretvorbo enot med dvema enotama iz različnih kategorij. • Izvedba pretvorbenega izračuna z dvakratno uporabo istega ukaza v pretvorbenem izrazu.	• V izrazu za pretvorbo določite dva različna ukaza, ki sta v isti kategoriji.
Napaka CSV v vrstici [A] ali stolpcu [B]*1	• Uvožena CSV datoteka vsebuje podatke, ki jih ni mogoče pretvoriti.	• Na računalniku preverite podatke v vrstici A in stolpcu B v datoteki in jih spremenite v podatke, ki jih je mogoče pretvoriti.
Napaka USB-priključka*1	• Povezava USB-kabla je bila prekinjena med prenosom podatkov.	• Uporabite USB kabel, da pravilno povežete kalkulator in računalnik (ali drugo napravo).
Napaka COM	• Težava s povezavo kabla ali nastavitvijo parametrov med komunikacijo podatkov programa.	• Preverite, ali je povezava kabla v redu in ali so parametri pravilno nastavljeni.
Napaka pri prenosu	• Težava s kabelsko povezavo ali nastavitvijo parametrov med komunikacijo podatkov.	• Preverite, ali je kabelsko povezavo in parametri pravilno nastavljeni.
Napaka pri sprejemu	• Težava s kabelsko povezavo ali nastavitvijo parametrov med komunikacijo podatkov.	• Preverite, ali je kabelsko povezavo in parametre pravilno nastavljeno.

Pomnilnik je poln	• Pomnilnik sprejemne enote se je med prenosom programskih podatkov napolnil.	• Izbrišite nekaj podatkov, shranjenih v sprejemni enoti, in poskusite znova.

Sporočilo	Pomen	Ukrep
Neveljavna velikost podatkov	• Poskus pošiljanja podatkov, katerih velikost sprejemna naprava ne podpira. Primer: Poskus pošiljanja matrike z več kot 256 vrsticami iz fx-9750GIII na starejši model.	• Preverite, ali so pošiljani podatki velikosti, ki jo sprejemna naprava podpira.
Neveljavna številka podatkov	• Poskus pošiljanja podatkov s številom podatkov, ki ga sprejemna naprava ne podpira. Primer: Poskus pošiljanja seznama 7 iz fx-9750GIII na starejši model, ki podpira samo do seznama 6.	• Pri pošiljanju podatkov navedite številko podatkov, ki jo podpira sprejemna naprava.
Časovna omejitev	• Izračun rešitve ali integracijski izračun ni mogel izpolniti konvergenčnih pogojev.	• Če izvajate izračun Solve, poskusite spremeniti na začetno privzeto ocenjeno vrednost. • Če izvajate integracijski izračun, poskusite spremeniti vrednost *tol* na večjo.
Krožna napaka	• V preglednici je krožna referenca (na primer »=A1« v celici A1).	• Spremenite vsebino celice, da odstranite krožne reference.
Prosimo, ponovno se povežite	• Povezava je bila iz neznanega razloga prekinjena med posodabljanjem operacijskega sistema.	• Ponovno se povežite in poskusite znova.
Podmap v tej mapi ni mogoče prikazati*1	• V načinu **MEMORY** (POMNILNIK) se prikaže mapo pomnilnika z vgrajenim pomnilnikom ravni 3, ki vsebuje mapo ravni 4. (Mapa ravni 4 se prikaže, vendar je ni mogoče odpreti.)	• Uporabite računalnik*2 za shranjevanje vseh datotek, do katerih želite dostopati, v prvih treh ravneh zložljivih map.
Preveč podatkov	• Število podatkovnih elementov je preveliko.	• Izbrišite nepotrebne podatke.
Napaka fragmentacije	• Pred shranjevanjem dodatnih podatkov je treba optimizirati pomnilnik.	• Optimizirajte pomnilnik.
Neveljavno ime	• Ime datoteke, ki ste ga vnesli, vsebuje neveljavne znake.	• Uporabite pravilne znake, da vnesete veljavno ime datoteke.
Neveljaven tip	• Določena je nezakonita vrsta podatkov.	• Določite veljavne podatke.
Pomnilnik je poln	• Pomnilnik je poln.	• Izbrišite nepotrebne podatke.

Napaka v podatkih	• Pojavila se je napaka v podatkih.	• Preverite, ali vnašate pravilne podatke, in poskusite znova.

Sporočilo	Pomen	Ukrep
Napaka datotečneg a sistema*[1]	• Datotečni sistem pomnilnika kalkulatorja je poškodovan ali format pomnilnika za shranjevanje ni tak, da ga kalkulator lahko bere.	• Po prebranju informacij v poglavju „Pomembno!“ spodaj izvedite operacijo „Povrni vse“, kot je opisano v poglavju „Ponastavi“ (stran 12-3). ***Pomembno!*** Z izvedbo postopka Initialize All (Povrzi vse) se izbrišejo vsi podatki v pomnilniku kalkulatorja, vključno z jezikovnimi podatki. Če potrebujete podatke v pomnilniku kalkulatorja, pred izvedbo operacije Initialize All (Povrzi vse) kalkulator priključite na računalnik z USB-kablom in vse podatke, ki jih želite obdržati, kopirajte na trdi disk računalnika. Za več informacij glejte »Izvedba podatkovne komunikacije med kalkulatorjem in osebnim računalnikom« (stran 13-2).

*[1] Samo fx-9860GIII/fx-9750GIII

*[2] Za podrobnosti o uporabi računalnika za izvajanje operacij s datotekami in mapami v pomnilniku glejte „Prenos podatkov med kalkulatorjem in osebnim računalnikom“ (stran 13-4).

2. Območja vnosa

Funkcija	Vnosni razpon za rešitve realnih števil	Notranje števke	Natančnost	Opombe
$sinx$ $cosx$ $tanx$	(DEG) $\|x\| < 9\times(10^9)°$ (RAD) $\|x\| < 5\times 10^7\pi$ rad (GRA) $\|x\| < 1\times 10^{10}$grad	15 številk	Praviloma je natančnost ±1 na 10. mestu.*	Vendar za $tanx$: $\|x\| \neq 90(2n+1)$: DEG $\|x\| \neq \pi/2(2n+1)$: RAD $\|x\| \neq 100(2n+1)$: GRA
$\sin^{-1} x$ $\cos^{-1} x$	$\|x\| < 1$	"	"	
$\tan^{-1} x$	$\|x\| < 1\times 10^{100}$			
$sinhx$ $coshx$	$\|x\| < 230{,}9516564$	"	"	
$tanhx$	$\|x\| < 1\times 10^{100}$			
$\sinh^{-1} x$	$\|x\| < 1\times 10^{100}$	"	"	
$\cosh^{-1}$	$1 < x < 1\times 10^{100}$			
x $\tanh^{-1}$ x	$\|x\| < 1$			
$logx$ Inx	$1\times 10^{-99} < x < 1\times 10^{100}$	"	"	• Kompleksne številke se lahko uporabljajo kot argumenti.
10^x	$-1\times 10^{100} < x < 100$	"	"	
e^x	-1×10^{100} $< x < 230{,}2585092$			• Kompleksne številke se lahko uporabljajo kot argumenti.
'x x	$0 < x < 1\times 10^{100}$	"	"	• Kompleksne številke se lahko uporabljajo kot argumenti.
2	$\|x\| < 1\times 10^{50}$			
$1/x$	$\|x\| < 1\times 10^{100}$, $x\neq 0$	"	"	• Kompleksne številke se lahko uporabljajo kot argumenti.
3 x	$\|x\| < 1\times 10^{100}$			
$x!$	$0 < x < 69$ (x je celo število)	"	"	
nPr nCr	Rezultat $< 1\times 10^{100}$ n, r (n in r sta cela števila) $0 < r < n$, $n < 1\times 10^{10}$	"	"	
Pol (x, y)	$x^2 + y^2 < 1 \times 10^{100}$	"	"	
Rec (r,θ)	$\|r\| < 1\times 10^{100}$ (DEG) $\|\theta\| < 9\times(10^9)°$ (RAD) $\|\theta\| < 5\times 10^7\pi$ rad (GRA) $\|\theta\| < 1\times 10^{10}$ grad	"	"	Vendar za $\tan\theta$: $\|\theta\| \neq 90(2n+1)$: DEG $\|\theta\| \neq \pi/2(2n+1)$: RAD $\|\theta\| \neq 100(2n+1)$: GRA

Funkcija	Vnosni razpon za rešitve realnih števil	Notranje števke	Natančnost	Opombe
° ’ ”	$\lvert a\rvert, b, c < 1\times 10^{100}$ $0 < b, c$	15 številk	Praviloma je natančnost ±1 na 10. mestu.*	
$\longleftarrow$ ° ’ ”	$\lvert x\rvert < 1\times 10^{100}$ Šestdesetiški prikaz: $\lvert x\rvert < 1\times 10^{7}$			
$\hat{}(x^y)$	$x > 0$: $-1\times 10^{100} < y\log x < 100$ $x = 0 : y > 0$ $x < 0 : y = n, \frac{m}{2n+1}$ (m, n sta cela števila) Vendar pa; $-1\times 10^{100} < y \log \lvert x\rvert < 100$	"	"	• Kompleksne številke se lahko uporabljajo kot argumenti.
$\sqrt[x]{y}$	$y > 0 : x \neq 0$ $-1 \times 10^{100} < \frac{1}{x} logija < 100$ $y = 0 : x > 0$ $y < 0 : x = 2n+1, \frac{2n+1}{m}$ ($m \neq 0$; m, n sta cela števila) Vendar pa; $-1 \times 10^{100} < \frac{1}{x}\log \lvert y\rvert < 100$	"	"	• Kompleksne številke se lahko uporabljajo kot argumenti.
ab/c	Skupna vrednost celega števila, številčnika in imenovalca mora biti v obsegu 10 mest (vključno z delilniki).	"	"	

* Pri posameznem izračunu je napaka izračuna± 1 na 10. mestu. (V primeru eksponentnega prikaza je napaka izračuna± 1 na zadnjem pomembnem mestu.) Napake se pri zaporednih izračunih seštevajo, kar lahko povzroči tudi njihovo povečanje. (To velja tudi za notranjih zaporednih izračunov, ki se izvajajo v primeru ^(x^y), $x!$, nPr, nCr itd.)

V bližini singularne točke in točke preloma funkcije so napake kumulativne in lahko postanejo velike.

Funkcija	Vnosno območje
Binarni, osmiški, decimal, heksadecimalno izračun	Vrednosti po pretvorbi sodijo v naslednja območja: DEC: $-2147483648 < x < 2147483647$ BIN: $1000000000000000 < x < 1111111111111111$ (negativno) $0 < x < 111111111111111$ (0, pozitivno) OCT: $20000000000 < x < 37777777777$ (negativno) $0 < x < 17777777777$ (0, pozitivno) HEX: $80000000 < x <$ FFFFFFFF (negativno)

	$0 < x <$ 7FFFFFFF (0, pozitivno)

Način preverjanja (samo fx-9860GIII, fx-9750GIII)

Način za izpite omejuje nekatere funkcije kalkulatorja, kar omogoča njegovo uporabo med izpiti ali testi. Način za izpite uporabljajte samo med dejanskimi izpiti ali testi.

Vstop v način preverjanja vpliva na delovanje kalkulatorja, kot je opisano spodaj.

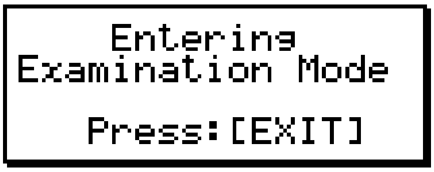
- Onemogočeni so naslednji načini in funkcije: **e** • Način **ACT**, način **MEMORY**, način **E-CON3**, način **PYTHON**, način **PRGM**, vektorski ukazi, programski ukazi (^ (ukaz za izhod), : (ukaz za več stavkov), _ (vrnitev vozila)), prenos podatkov, dodatne aplikacije, dodatni jeziki, dostop do pomnilnika, urejanje imena uporabnika, posodobitev operacijskega sistema, funkcija QR-kode kataloga.
- Uporabniški podatki (glavni pomnilnik) se varnostno kopirajo. Varnostno kopirani podatki se obnovijo, ko zaprete način pregledovanja. Vsi podatki, ustvarjeni med sejo v načinu pregledovanja, se izbrišejo, ko zaprete način pregledovanja.

---

u **Vstop v način pregleda**

1. Pritisnite ! o (OFF), da izklopite kalkulator.
2. Medtem ko držite tipki c in h, pritisnite tipko o.
   - Prikaže se spodnje pogovorno okno.

3. Pritisnite 1 (Da).
   - Preberite sporočilo v prikazanem pogovornem oknu.
4. Pritisnite 2.
   - Prikaže se spodnje pogovorno okno.



5. Pritisnite J .

- Pred vstopom v pregledni način se shranijo samo spodnje nastavitve.
  Vhod/izhod, rezultat Frac, kot, kompleksni način, zaslon, Imp Multi, tip Q1Q3, jezik
- fx-9750GIII: Vstop v izpitni način z izbiro Math (Matematika) za nastavitev Input/Output (Vnos/Izhod) v meniju Setup (Nastavitve) bo povzročilo preklop nastavitve Input/Output (Vnos/Izhod) na Mth/Mix (Matematika/Mešano). Upoštevajte, da v izpitnem načinu ni mogoče izbrati Math (Matematika) za nastavitev Input/Output (Vnos/Izhod).

β

Delovanje kalkulatorja v načinu preverjanja

- Ob vstopu v izpitni način na zaslonu utripa ikona ( ). Hitrost utripanja ikone se približno 15 minut po vstopu v izpitni način upočasni.

Ikona

- Ikona spremeni barve ( ), da označi, da je v teku izračun.
- V načinu pregledovanja je nastavitev sprožilca samodejnega izklopa fiksna na približno 60 minut.
- S pritiskom na a- se prikaže spodnje pogovorno okno. Pogovorno okno prikazuje pretekel čas v načinu pregledovanja.

Pretekel čas lahko ponovno zaženete z eno od spodnjih operacij.
- Pritisnite gumb RESTART.
- Odstranite baterije iz kalkulatorja.
- Izbrišite podatke iz glavnega pomnilnika.
- Ponovno vstopite v način pregledovanja, ko ste že v načinu pregledovanja.

- Spodnja tabela prikazuje, kako določene operacije vplivajo na način pregledovanja.

Če storite to:	Kalkulator ostane v izpitnem načinu.	Podatki, vneseni v načinu pregleda, se ohranijo.
Izklopite napajanje in ga ponovno vklopite	Da	Da
Pritisnite gumb RESTART	Da	Ne
Odstranite baterije iz kalkulatorja	Da	Ne
Izbrišite podatke iz glavnega pomnilnika	Da	Ne

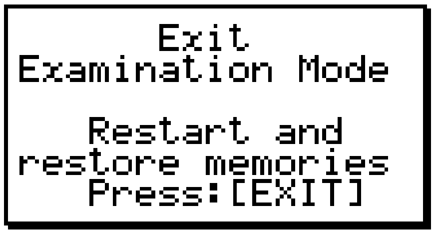
Izhod iz načina pregledovanja

Iz načina pregledovanja lahko izstopite na tri načine.

(1) Izhod iz izpitnega načina s priključitvijo na računalnik

1. Z USB-kablom povežite kalkulator, ki je v izpitnem načinu, z računalnikom.
2. Ko se na kalkulatorju prikaže pogovorno okno »Izberite način povezave«, pritisnite tipko 1 na kalkulatorju.
3. Na računalniku odprite pogon kalkulatorja.

4. Na računalniku kopirajte ali izbrišite vse datoteke, ki so na pogonu kalkulatorja.
5. Prekinite povezavo med kalkulatorjem in računalnikom.
   - Ko zaprete način pregledovanja, se prikaže spodnje pogovorno okno.



(2) Zapustitev načina pregledovanja po preteku 12 ur

Približno 12 ur po vstopu v način pregleda se bo računaločnik ob vklopu samodejno izklopil iz načina pregleda.

Pomembno!

Če pritisnete gumb RESTART ali zamenjate baterije pred vklopom kalkulatorja, se bo ob vklopu ponovno vklopil v način preverjanja, tudi če je minilo 12 ur.

(3) Izhod iz izpitnega načina s povezavo z drugim kalkulatorjem

1. Na kalkulatorju, ki je v načinu preverjanja (kalkulator A), vstopite v način **LINK** in nato pritisnite 4(CABL)2(3PIN).
2. S kablom SB-62 povežite kalkulator A z drugim kalkulatorjem, ki ni v načinu pregleda (kalkulator B).
3. Na kalkulatorju A pritisnite 2(RECV).
4. Na kalkulatorju B* vstopite v način **LINK** in nato pritisnite 3(EXAM)1(UNLK)1(Yes).
   - Prav tako lahko prenesete katero koli podatke iz kalkulatorja B v kalkulator A. Primer: Prenos nastavljenih podatkov v kalkulator A
     1. Na kalkulatorju B vstopite v način **LINK** in nato pritisnite 1(TRAN)1(MAIN)1(SEL).
     2. Z uporabo tipk ② in f izberite „SETUP“.
     3. Pritisnite 1(SEL)6(TRAN)1(Yes).

     * Kalkulator s funkcijo načina preverjanja

- Ikona R bo izginila z zaslona, ko kalkulator zapusti način preverjanja.

u Prikaz pomoči za način preverjanja

Pomoč za izpitni način lahko prikažete v načinu **LINK**.

3(EXAM)2(ENTR) ... Prikaže pomoč o vstopu v način preverjanja.

3(EXAM)3(APP) ... Prikaže pomoč o tem, katere načine in funkcije so onemogočene v načinu pregleda.

3(EXAM)4(EXIT) ... Prikaže pomoč o izhodu iz načina pregleda.

E-CON3 Uporaba

(angleščina)

(fx-9860GIII, fx-9750GIII)

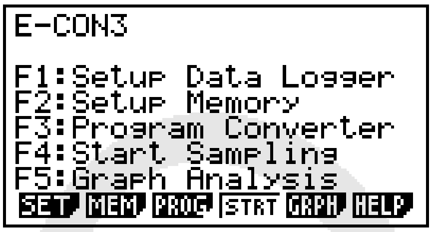
Pomembno!

- Dodatka E-CON2 ne nameščajte na kalkulator, na katerem je že nameščen E-CON3. To lahko povzroči težave pri delovanju.
- Vsa pojasnila v tem poglavju predpostavljajo, da ste v celoti seznanjeni z vsemi varnostnimi ukrepi, terminologijo in postopki delovanja kalkulatorja in podatkovnega zapisovalnika (CMA CLAB* ali CASIO EA-200).
- Aplikacija E-CON3 je zasnovana tako, da izkoristi vse merilne funkcije zapisovalnika podatkov CASIO EA-200. Čeprav lahko deluje na zapisovalniku podatkov CMA CLAB, CLAB nima vmesnika SONIC, mikrofona ali zvočnika, s katerimi je opremljen EA-200.
  Če je kalkulator priključen na zapisovalnik podatkov CLAB, bo poskus konfiguracije nastavitev aplikacije E-CON3 in izvedbe meritev s parametri, ki jih CLAB ne podpira, povzročil napako.
- Če ni izrecno navedeno drugače, se vsi sklici na strani v tem

* Za informacije o CMA in CLAB Data Loggerju obiščite http://cma-science.nl/.

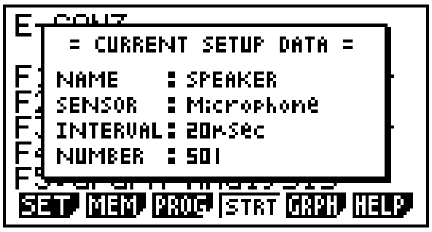
1 Pregled E-CON3

- V glavnem meniju izberite E-CON3, da vstopite v način E-CON3.



Glavni meni E-CON3

- Način „E-CON3“ ponuja spodaj navedene funkcije za preprosto in učinkovitejše vzorčenje podatkov z uporabo podatkovnega zapisovalnika.
  - 1(SET)............ Prikaže zaslon za nastavitev podatkovnega zapisovalnika.
  - 2(MEM)........... Prikaže zaslon za shranjevanje nastavitev podatkovnega zapisovalnika v datoteko
    .
  - 3(PROG)........ Izvede pretvorbo programa.
    - To funkcijo lahko uporabite za pretvorbo nastavitev podatkovnega zapisovalnika, konfiguriranih z E-CON3, v program za nadzor podatkovnega zapisovalnika, ki lahko teče na fx-9860G SD/fx-9860G.
    - Lahko se uporablja tudi za pretvorbo podatkov v program, ki se lahko izvaja na kalkulatorju serije CFX-9850/fx-7400.
  - 4(STRT)......... Začne zbiranje podatkov.
  - 5(GRPH).......... Grafično prikaže podatke, ki jih je zbral podatkovni zapisovalnik, in ponuja orodja za analizo
    grafikonov. Orodja za analizo grafikonov vključujejo izračun periodične frekvence, različne vrste regresije, izračun Fourierove vrste in še več.
  - 6(HELP) .... Prikaže pomoč za E-CON3.
- Če med prikazom glavnega menija E-CON3 pritisnete tipko K (Setup Preview) ali tipko za premikanje kurzorja, se prikaže pogovorno okno za predogled, ki prikazuje vsebino nastavitev v trenutnem pomnilniškem območju za nastavitve.



Za zaprtje pogovornega okna predogleda pritisnite J

Opomba
Za podrobnosti o nastavitvenih podatkih in trenutnem nastavitvenem pomnilniškem prostoru glejte „6 Uporaba nastavitvenega pomnilnika“ (stran 6-1).

O spletni pomoči

S pritiskom na tipko 6(HELP) se prikaže spletna pomoč o načinu E-CON3.

2 Uporaba čarovnika za nastavitev

V tem poglavju je pojasnjeno, kako s pomočjo čarovnika za nastavitev hitro in enostavno konfigurirati nastavitve podatkovnega zapisovalnika, tako da odgovorite na vprašanja, ki se pojavijo.
Če potrebujete večji nadzor nad določenimi parametri vzorčenja, razmislite o uporabi postopka Napredna nastavitev na strani 3-1.

■ Parametri čarovnika za nastavitev

Čarovnik za nastavitve vam omogoča spreminjanje naslednjih treh osnovnih parametrov vzorčenja podatkovnega zapisovalnika v interaktivnem formatu čarovnika.

- Senzor (izberite senzor):
  Izberite senzor CASIO, VERNIER* ali CMA iz menija z možnostmi.
  *Vernier Software & Technology
- Skupni čas vzorčenja:
  Določite vrednost v območju od 0,01 sekunde do 30 dni.
- Enota časa vzorčenja (izberite enoto):
  Kot časovno enoto vrednosti, ki jo vnesete za skupni čas vzorčenja (Total Sampling Time), določite sekunde (sec), minute (min), ure (hour) ali dneve (day).

Opomba
Za nekatere senzorje (vgrajeni mikrofon EA-200, Vernier Photogate itd.) so parametri vzorčenja drugačni od zgoraj navedenih. Razlike med parametri vzorčenja in postopki nastavitve za vsak senzor so opisane v tem poglavju.

Pravila čarovnika za nastavitev

Pri uporabi čarovnika za nastavitev upoštevajte naslednja pravila.

- Vzorčni kanal EA-200 je CH1 ali SONIC.
- Vzorčni kanal CLAB je samo CH1.
- Sprožilec za nastavitev čarovnika za nastavitev je vedno tipka w.

u Konfiguracija nastavitev podatkovnega zapisovalnika s pomočjo čarovnika za nastavitev

Preden začnete...

- Preden začnete s postopkom, ki je opisano spodaj, se najprej odločite, ali želite takoj začeti z vzorčenjem z nastavitvami, ki ste jih konfigurirali s pomočjo čarovnika za nastavitev, ali pa želite nastavitve shraniti za poznejše vzorčenje.
- Za informacije o postopkih, potrebnih za začetek vzorčenja in shranjevanje nastavitev, glejte poglavja 6-1, 7-1 in 8-1 tega poglavja (Aplikacija E-CON3). Priporočamo, da najprej preberete celoten postopek in se sklicujete na druge poglavja in strani, kot je navedeno, preden ga dejansko poskusite izvesti.
- Če želite prekiniti čarovnika za nastavitev in preklicati nastavitev, pritisnite

1. Prikažite glavni meni E-CON3 (stran 1-1).
2. Pritisnite 1(SET) in nato 1(WIZ).
   - S tem se zažene čarovnik za nastavitev in prikaže zaslon »Izberite senzor«.
3. Pritisnite eno od naslednjih funkcijskih tipk, da določite proizvajalca senzorja, ki ga uporabljate za merjenje: 1(CASIO), 2(VERNIER), 3(CMA).
   - S pritiskom na katero koli tipko se prikaže ustrezen seznam senzorjev.
4. Določite senzor, ki ga želite uporabiti.
   S puščičnima tipkama f in ② premaknite označitev na senzor, ki ga želite uporabiti, in nato pritisnite w.
   - Če ima senzor, ki ste ga določili, več kot eno možnost (podrobnejše specifikacije, kot so enota vzorčenja, način itd.), se na zaslonu prikaže seznam možnosti. V tem primeru nadaljujte s korakom 5.
   - Če se prikaže zaslon „Vnesite skupni interval vzorčenja“, preskočite na korak 6.
5. Izberite možnosti za senzor, ki ste ga določili v koraku 4.
   S puščičnima tipkama f in ② premaknite označbo na možnost, ki jo želite izbrati, in nato pritisnite w.
   - Če se prikaže zaslon „Input Total Sampling Interval“ (Vnos skupnega intervala vzorčenja), nadaljujte s korakom 6.

   Pomembno!
   Če senzor in/ali možnost, ki ste jo izbrali, zahtevata posebne nastavitve, se na zaslonu prikažejo druga okna, ki niso okno „Input Total Sampling Interval“ (Vnos skupnega intervala vzorčenja). V nadaljevanju je prikazano, kje najdete informacije o postopkih, ki jih morate izvesti za vsako izbiro senzorja/možnosti.

Če izberete ta senzor/možnost:	Za več informacij obiščite:
[CASIO] - [Mikrofon] - [Zvočni valovi in FFT]	„Uporaba čarovnika za nastavitev za konfiguracijo nastavitev za vzorčenje podatkov FFT (frekvenčne karakteristike)“ na strani 2-4
[CASIO] – [Mikrofon] – [Samo FFT]	
[VERNIER] – [Fotokomora] – [Vrata] ali [CMA] – [Fotokomora] – [Vrata]	„Konfiguriranje nastavitev samo za fotokomoro“ na strani 2-5
[VERNIER] – [Fotokomora] – [Sklopka] ali [CMA] – [Fotokomora] – [Sklopka]	„Nastavitev za fotocelico in pametno škripec“ na strani 2-6
[CASIO] – [Zvočnik] – [y=f(x)]	„Izhodna valovna oblika funkcije prek zvočnika“ na strani 2-6

6. Uporabite tipke za vnos številk, da vnesete skupni čas vzorčenja. Vnesite samo vrednost. V koraku 8 tega postopka boste lahko določili enoto (sekunde, minute, ure, dneve) vrednosti, ki jo vnesete tukaj.

   Opomba
   - Pri nekaterih senzorjih ([CASIO] – [Mikrofon] – [Zvočni valovi] itd.) je čas vzorčenja omejen na nekaj sekund. Enota za tak senzor je vedno sekunde, zato se zaslon »Izberi enoto« ne prikaže.
   - Če določite skupno vrednost časa vzorčenja v območju od 10 sekund do 23 ur, 59 minut in 59 sekund, se bo med vzorčenjem izvajalo grafično prikazovanje v realnem času. To je enako kot izbira načina v realnem času na zaslonu »Napredne nastavitve«.

7. Po vnosu želene skupne vrednosti časa vzorčenja pritisnite w. Prikaže se zaslon »Select Unit« (Izberite enoto).
8. S številčnimi tipkami b do 4 določite enoto za vrednost, ki ste jo določili v koraku 6.
   - Prikaže se zaslon za potrditev.
9. Če z vsebino zaslona za potrditev ni težav, pritisnite 1.

   Če želite spremeniti nastavitve, pritisnite 6 ali J S tem se boste vrnili na korak 6 (za nastavitev skupnega intervala vzorčenja), kjer lahko spremenite nastavitve.
   - S pritiskom na 1 se boste vrnili na zadnji zaslon čarovnika za nastavitev.
10. Pritisnite številčne tipke, opisane spodaj, da določite, kaj želite storiti z nastavitvami, ki ste jih konfigurirali.

    b(Začni nastavitev).........Začne vzorčenje z uporabo nastavitev (stran 8-1)

    c(Shrani nastavitve-MEM)   Shrani nastavitve (stran 6-1)

    d(Program za pretvorbo)Pretvori nastavitve v program (stran 7-1)

■ Uporaba čarovnika za nastavitve za konfiguracijo nastavitev za vzorčenje podatkov FFT (frekvenčne karakteristike) (samo EA-200)

Ko izvedete vzorčenje zvoka z vgrajenim mikrofonom EA-200 (z določitvijo [CASIO] - [Mikrofon] kot senzorja), vam čarovnik za nastavitev ponudi tri možnosti: [Zvočna valovna krivulja], [Zvočna valovna krivulja in FFT] ter [Samo FFT]. „Zvočni val“ beleži naslednji dve dimenziji za vzorčene zvočne podatke: pretekel čas (vodoravna os) in glasnost (navpična os). „FFT“ beleži naslednji dve dimenziji: frekvenca (vodoravna os) in glasnost (navpična os).

Spodaj so prikazane nastavitve za snemanje podatkov FFT.

1. Izvedite prva dva koraka postopka iz poglavja „Nastavitev podatkovnega zapisovalnika s pomočjo čarovnika za nastavitev“ na strani 2-2.
2. Na zaslonu »Izberite senzor« izberite [CASIO] – [Mikrofon] – [Zvočni valovi in FFT] ali [CASIO] – [Mikrofon] – [Samo FFT].
   - S tem se prikaže zaslon »Izberite območje FFT«.
   - Za območje FFT lahko izberete eno od štirih nastavitev. Izbrana nastavitev bo samodejno uporabila ustrezne fiksne parametre, prikazane spodaj.

Nastavitev / Parameter	2–1000 Hz: 1	4–2000 Hz: 2	6 - 3000 Hz: 3	8 - 4000 Hz: 4
Frekvenca	2 Hz	4 Hz	6 Hz	8 Hz
Največja frekvenca	1000 Hz	2000 Hz	3000 Hz	4000 Hz
Interval vzorčenja	61μ sek	31μ sek	20μ sek	31μ sek
Število vzorcev	8192	8192	8192	4096

V nadaljevanju je pojasnjen pomen posameznih parametrov.

Frekvenca: Frekvenca v Hz, pri kateri se izvaja vzorčenje

Najvišja frekvenca: zgornja meja vzorčne frekvence (spodnja meja je fiksna na 0 Hz) **Interval vzorčenja:** interval v sekundah (μ), v katerem se izvaja vzorčenje **Število vzorcev:** število izvedenih vzorčenj

3. Za izbiro nastavitve obsega FFT uporabite funkcijski tipki 1 do 4.
   - Izbiranje obsega FFT povzroči prikaz končnega zaslona čarovnika za nastavitev.
4. Za dokončanje postopka izvedite korak 10 v poglavju „Konfiguriranje nastavitev podatkovnega zapisovalnika s pomočjo čarovnika za nastavitev“ na strani 2-2.

■ Uporaba čarovnika za nastavitev za konfiguracijo nastavitve fotocelice

Povezava fotocelice Vernier ali CMA zahteva konfiguracijo nastavitvenih parametrov, ki se nekoliko razlikujejo od parametrov za druge vrste senzorjev.

u Konfiguracija nastavitev za sam Photogate

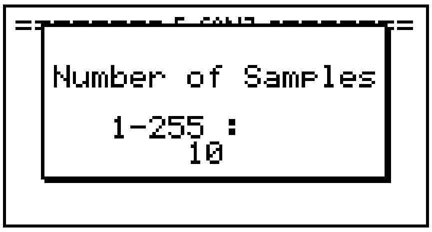
1. V glavnem meniju E-CON3 pritisnite 1(SET)1(WIZ), da zaženete čarovnika za nastavitev.
   - Prikaže se pogovorno okno »Izberite senzor«.
2. Če uporabljate samo Vernier Photogate, izberite [VERNIER] - [Photogate] - [Gate].
   Ko se prikaže pogovorno okno »Izberite kanal«, nadaljujte s korakom 3 tega postopka.
   Če uporabljate samo CMA Photogate, izberite [CMA] - [Photogate] - [Gate]. Ko se prikaže pogovorno okno »Gate Status« (Stanje vrat), nadaljujte s korakom 4 tega postopka.
3. Pritisnite 1 (CH1) ali 2 (SONIC), da določite kanal, na katerega je priključena fotocelica.
   - Prikaže se pogovorno okno „Gate Status“ (Stanje vrat).
4. V pogovornem oknu „Gate Status“ izberite stanje vrat za merjenje s pritiskom na funkcijske tipke (1 do 4).
   - Stanje vrat določa, katero stanje fotocelice naj sproži merjenje časa in katero stanje naj merjenje časa ustavi.

     1 (Odprto-Odprto) ...... Merjenje časa se začne, ko se vrata odprejo, in traja, dokler se ne zaprejo in se ponovno odpre.

     2 (Odprto-Zaprto) ...... Merjenje časa se začne, ko se vrata odprejo, in traja, dokler se ne zaprejo.

     3 (Zapri-Odpri)........... Merjenje časa se začne, ko se vrata zaprejo, in traja, dokler se ne odprejo.

     4 (Zaprtje-zaprtje)...... Merjenje časa se začne, ko se vrata zaprejo, in traja, dokler se ne odprejo in se nato ponovno zapre.
   - Izbiranje stanja vrat povzroči prikaz zaslona za določitev števila vzorcev.



5. Vnesite celo število v območju od 1 do 255, da določite število vzorcev.
6. Izvedite korak 10 (v primeru Vernier Photogate) ali koraka 9 in 10 (v primeru CMA Photogate) v poglavju „Konfiguriranje nastavitev podatkovnega zapisovalnika s pomočjo čarovnika za nastavitev“ (stran 2-2).

u Konfiguracija nastavitev za Photogate in Smart Pulley

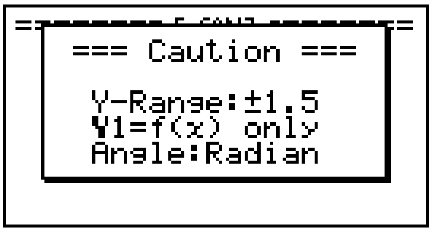
1. V glavnem meniju E-CON3 pritisnite 1(SET)1(WIZ), da zaženete čarovnika za nastavitev.
2. Prikaže se pogovorno okno „Izberite senzor“.
3. Če uporabljate Vernier Photogate s škripcem, izberite [VERNIER] - [Photogate] - [Pulley]. Ko se prikaže pogovorno okno „Select Channel“ (Izberite kanal), nadaljujte s korakom 4 tega postopka.
   Če uporabljate CMA Photogate s škripcem, izberite [CMA] - [Photogate] - [Pulley]. Ko se prikaže pogovorno okno „Input Distance(m)“, nadaljujte s korakom 5 tega postopka.
4. Pritisnite 1(CH1) ali 2(SONIC), da določite kanal, na katerega je priključen Photogate.
   • Prikaže se pogovorno okno »Input Distance(m)« (Vhodna razdalja (m)).
5. V pogovornem oknu »Input Distance(m)« (Vnesena razdalja (m)) vnesite vrednost v območju od 0,1 do 4,0 in nato pritisnite w.
6. Izvedite korak 10 (v primeru fotocelice Vernier) ali koraka 9 in 10 (v primeru fotocelice CMA) v poglavju „Nastavitev podatkovnega zapisovalnika s pomočjo čarovnika za nastavitev“ (stran 2-2).

■ Izhod valovne oblike funkcije prek zvočnika (samo EA-200)

Običajno vam čarovnik za nastavitev pomaga konfigurirati nastavitve za senzorje, priključene na podatkovni zapisovalnik. Če na zaslonu „Izberite senzor“ izberete [CASIO] – [Zvočnik] – [y=f(x)], se EA-200 konfigurira tako, da oddaja zvok, ki ustreza funkciji, ki jo vnesete in grafično prikažete na kalkulatorju.

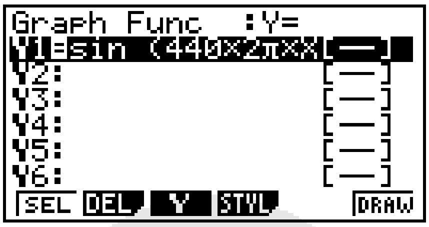
u Konfiguracija nastavitev za izhod zvočnika

1. Povežite kabel za prenos podatkov (SB-62) s komunikacijskim vmesnikom kalkulatorja in vmesnikom MASTER naprave EA-200.
2. Izvedite prva dva koraka postopka iz „Nastavitev podatkovnega zapisovalnika s pomočjo čarovnika za nastavitev“ na strani 2-2.
3. Na zaslonu »Izberi senzor« izberite [CASIO] – [Zvočnik] – [y=f(x)].
   Prikazal se bo zaslon, kot je prikazan spodaj.



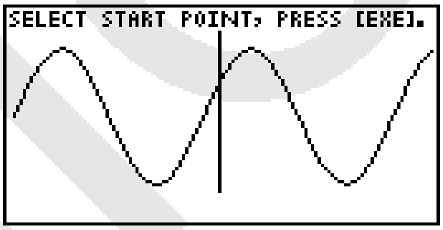
4. Pritisnite w, da preidete na zaslon za nastavitev okna pogleda.
   • Naslednje nastavitve se konfigurirajo samodejno: Ymin = –1,5 in Ymax = 1,5. Te nastavitve ne spreminjajte.
5. Pritisnite w ali J, da preidete na seznam grafičnih funkcij.

6. V vrstici „Y1“ vnesite funkcijo valovne oblike za zvok, ki ga želite vnesti.

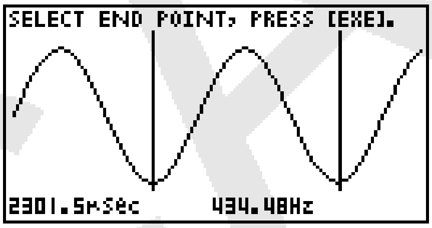


   • Upoštevajte, da je enota kota vedno radian.
   • Vnesite funkcijo, pri kateri je vrednost „Y“ v območju od –1,5 do +1,5.

7. Pritisnite 6(DRAW), da narišete graf funkcije.
   • To prikaže funkcijo in navpično kurzorsko črto, kot je prikazano spodaj. Uporabite graf, da določite območje, ki ga želite izpisati na zvočnik.



8. S puščičnimi tipkami d in e premaknite kurzor na začetno točko izpisa, nato pa pritisnite w, da ga registrirate.
9. S puščičnimi tipkami d in e premaknite kurzor na končno točko izhoda in nato pritisnite w, da ga registrirate.
   • Ko določite začetno in končno točko, se na zaslonu prikaže spodaj prikazano pogovorno okno za izhodno frekvenco.



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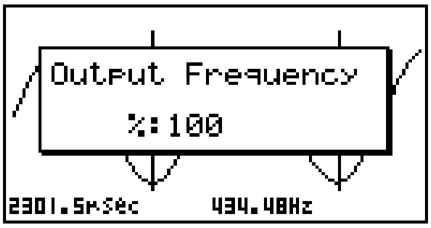


10. Vnesite odstotno vrednost za želeno izhodno frekvenco.
   • Če želite izhodni zvok ohraniti nespremenjen, določite 100 %. Če želite izhodni zvok dvigniti za eno oktavo, vnesite vrednost 200 %. Če želite izhodni zvok znižati za eno oktavo, vnesite vrednost 50 %.
11. Po vnosu vrednosti izhodne frekvence pritisnite w.
   • To izhodno valovno obliko med začetno in končno točko izhodi iz zvočnika EA-200.
   • Če zvok, ki ste ga nastavili, iz kakršnega koli razloga ni mogoče izhoditi, se prikaže sporočilo „Range Error“ (Napaka obsega). V tem primeru pritisnite J, da se vrnete na prejšnje zaslone nastavitev in po potrebi spremenite nastavitve.
12. Za prekinitev izhoda zvoka pritisnite tipko EA-200 [START/STOP].

13. Pritisnite w.
    - Prikaže se zaslon, kot je prikazan spodaj.

14. Izvedite eno od naslednjih dejanj, odvisno od tega, kaj želite storiti.

    Če želite spremeniti izhodno frekvenco in poskusiti znova:
    Pritisnite 1 (Da), da se vrnete v pogovorno okno »Izhodna frekvenca«. Nato ponovite zgornje korake od koraka 10.

    Če želite spremeniti izhodni razpon grafa valovne oblike in poskusiti znova:
    Pritisnite 6 (Ne), da se vrnete na zaslon grafa v koraku 7. Nato ponovite zgornje korake od koraka 8.

    Če želite spremeniti funkcijo:
    Pritisnite 6 (Ne) in nato J, da se vrnete na seznam grafičnih funkcij v koraku 6. Nato ponovite zgornje korake od koraka 6.

    Za izhod iz postopka in vrnitev v glavni meni E-CON3:
    Pritisnite 6 (Ne) in nato dvakrat pritisnite J.

3 Uporaba napredne nastavitve

Napredna nastavitev vam omogoča popoln nadzor nad številnimi parametri, ki jih lahko prilagodite, da nastavite podatkovni zapisovalnik tako, da ustreza vašim posebnim potrebam.

Postopki v tem poglavju opisujejo splošne korake, ki jih morate izvesti pri uporabi napredne nastavitve za konfiguracijo nastavitev podatkovnega zapisovalnika in za vrnitev nastavitev na njihove prvotne privzete vrednosti. Podrobnosti o posameznih nastavitvah in možnostih, ki so na voljo za vsako nastavitev, so navedene v pojasnilih, ki se začnejo na strani 3-3.

■ Napredne nastavitve

u Konfiguracija nastavitev podatkovnega zapisovalnika z uporabo naprednih nastavitev

V nadaljevanju je opisana splošna uporaba naprednih nastavitev. Za več informacij glejte navedene strani.

1. Prikažite glavni meni E-CON3 (stran 1-1).
2. Pritisnite 1(SET). Prikaže se podmeni »Nastavitev podatkovnega zapisovalnika«.
3. Pritisnite 2(ADV). Prikaže se meni Napredna nastavitev.

Meniju napredne nastavitve

4. Če želite na tej točki konfigurirati prilagojeno sondo, pritisnite (Custom Probe). Nato sledite korakom v poglavju „Konfiguriranje prilagojene sonde“ na strani 4-1.
   - Povzetek lahko konfigurirate tudi med postopkom v poglavju »Konfiguriranje nastavitev kanala« na strani 3-3.
   - Prilagojene konfiguracije sonde, ki ste jih shranili v pomnilnik, lahko izberete s pomočjo kanala v koraku 5 spodaj.
5. Za nastavitev drugih parametrov uporabite funkcijski tipki Napredna nastavitev, opisani spodaj.
   - b(Kanal) ....Prikaže zaslon, ki prikazuje senzorje, ki so trenutno dodeljeni vsakemu kanalu (CH1, CH2, CH3, SONIC, Mic). V tem pogovornem oknu lahko spremenite tudi dodelitve senzorjev. Za več informacij glejte „Nastavitev kanala“ na strani 3-3.
   - c(Vzorec)...........Prikaže zaslon za izbiro načina vzorčenja in za določanje intervala vzorčenja, števila vzorcev in načina ogrevanja. Ko je za „Način“ izbrana možnost „Hiter“, ta pogovorno okno prikaže tudi nastavitev za vklop in izklop grafa FFT (frekvenčne značilnosti). Za več informacij glejte „Nastavitev vzorčenja“ na strani 3-5.

- d(Sprožilec)........Prikaže zaslon za konfiguracijo pogojev za začetek vzorčenja (sprožilec). Za več informacij glejte „Nastavitev sprožilca“ na strani 3-8.
- 4 (Graf)............Prikaže zaslon za konfiguracijo nastavitev grafa. Za več informacij glejte „Nastavitev grafa“ na strani 3-13.

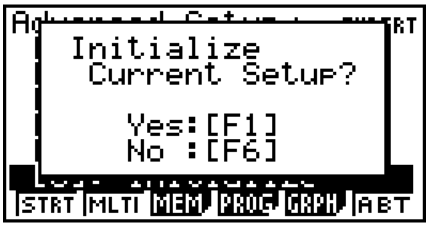
- Nastavitve na zgornjih zaslonih za nastavitev (b do 4) lahko vrnete s postopkom, opisanim v poglavju „Vrnitev nastavitvenih parametrov na privzete vrednosti“.

6. Po konfiguraciji nastavitev lahko uporabite funkcionalne tipke, opisane spodaj, za začetek vzorčenja ali izvedbo drugih operacij.
   - 1(STRT). .... Začne vzorčenje z uporabo nastavitve (stran 8-1).
   - 2(MLTI) .... Začne vzorčenje v načinu MULTIMETER z uporabo nastavitve (stran 5-1).
   - 3(MEM). .... Shrani nastavitve (stran 6-1).
   - 4(PROG)......... Pretvori nastavitve v program (stran 7-1).
   - 5(GRPH). .... Grafično prikaže podatke, ki jih je zajel zapisovalnik podatkov, in ponuja orodja za analizo grafikonov (stran 10-1).
   - 6(ABT) .... Prikaže informacije o različici naprave za beleženje podatkov, ki je trenutno priključena na kalkulator.

u Za vrnitev nastavljenih parametrov na privzete vrednosti

Če želite vrniti parametre nastavitev v trenutnem pomnilniku nastavitev na njihove prvotne privzete vrednosti, izvedite naslednji postopek.

1. Ko je na zaslonu prikazan meni Napredna nastavitev (stran 3-1), pritisnite 6 (Povrni privzete nastavitve).



2. V odgovor na potrditveno sporočilo, ki se prikaže, pritisnite 1(Yes) (Da), da inicializirate nastavitve.
   - Če želite potrditveno sporočilo izbrisati brez inicializacije nastavitev, pritisnite 6(Ne).

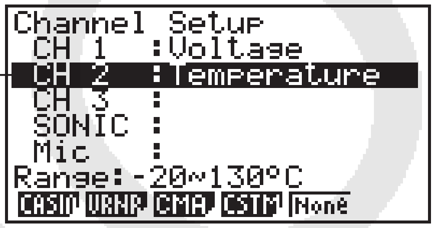
■ Nastavitev kanalov

Na zaslonu Nastavitev kanalov so prikazani senzorji, ki so trenutno dodeljeni posameznim kanalom (CH1, CH2, CH3, SONIC, Mic).

u Konfiguriranje nastavitev kanalov

1. Ko je na zaslonu prikazan meni Napredna nastavitev (stran 3-1), pritisnite b(Kanal).
   • Prikaže se zaslon Nastavitev kanalov.

Trenutno izbrani kanal



Zaslon Nastavitve kanalov

2. S puščičnima tipkama f in ② premaknite označitev na kanal, katerega nastavitve želite spremeniti.
3. Kaj morate storiti naprej, je odvisno od trenutno izbranega kanala.
   • CH1, CH2 ali CH3
   Pritisnite funkcijska tipka, da prikažete meni senzorjev, ki jih lahko dodelite izbranemu kanalu.
   1(CASIO).......... Prikaže meni senzorjev CASIO.
   2(VRNR)........... Prikaže meni senzorjev Vernier.
   3(CMA)............. Prikaže meni senzorjev CMA.
   4(CSTM)........... Prikaže meni po meri izdelanih sond.
   5(Nič)................ To tipko pritisnite, če želite zapustiti kanal brez dodeljenega senzorja .
   • SONIC kanal (samo EA-200)
   Pritisnite funkcijska tipka, da prikažete meni senzorjev, ki jih lahko dodelite temu kanalu.
   1(CASIO).......... Prikaže meni senzorjev CASIO, vendar je mogoče izbrati le »Motion« (Gibanje). .
   2(VRNR)........... Prikaže meni senzorjev Vernier. Izberete lahko „Motion“ ali „Fotocelica“.

Opomba

• V meniju, ki se prikaže po izbiri »Motion« (Gibanje) v meniju senzorja CASIO ali Vernier, izberite »meters« (metri) ali »feet« (čevlji) kot enoto vzorčenja.

• Po izbiri »Motion« (Gibanje) v meniju senzorja CASIO ali Vernier lahko s tipko K vklopite »smoothing« (izravnavanje, popravek merilne napake) (prikaže se »-Smooth«) ali ga izklopite (»-Smooth« se ne prikaže).

- V meniju, ki se prikaže po izbiri »Photogate« kot senzorja, izberite [Gate] ali [Pulley].

  [Gate] ....To možnost izberite, če uporabljate samo senzor Photogate.

  [Pulley] ....To možnost izberite, če uporabljate senzor Photogate skupaj s pametno jermenico.

5(Nič) .... Izberite to možnost, če želite onemogočiti kanal SONIC.

- Mikrofonni kanal (samo EA-200)

Za ta kanal je senzor samodejno nastavljen na vgrajeni (zunanji) mikrofon. Vendar morate konfigurirati nastavitve, opisane spodaj.

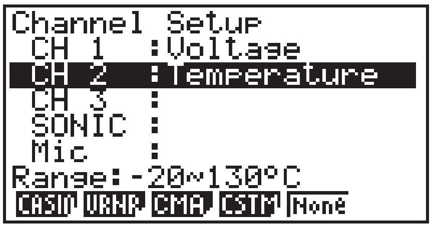
1(Snd)............... Izberite to možnost, da posnamete pretekel čas in glasnost v dvodimenzionalnih
vzorčene zvočne podatke (pretekel čas na vodoravni osi, glasnost na navpični osi).

2(FFT)............... Izberite to možnost, če želite snemati frekvenco in glasnost 2-dimenzionalnih vzorčene zvočne podatke (frekvenca na vodoravni osi, glasnost na navpični osi).

5(Nič) .... Izberite to možnost, da onemogočite mikrofon.

4. Ponovite koraka 2 in 3 tolikokrat, kolikor je potrebno, da nastavite vse želene kanale.
5. Ko so vse nastavitve takšne, kot želite, pritisnite w.
   - S tem se vrnete v meni Napredne nastavitve.

   Opomba
   - Ko izberete kanal na zaslonu Nastavitve kanala, se v spodnji vrstici zaslona prikaže območje vzorčenja izbranega kanala.



V zgornjem primeru se na zaslonu prikaže območje temperaturnega senzorja, dodeljenega CH2.

Če je vrednost območja vzorčenja prevelika, da bi se prilegala na zaslon, se prikaže le del vrednosti, ki se prilega na zaslon.

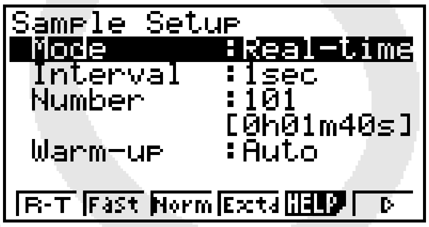
- Kadar postanejo trenutne nastavitve vzorčenja (stran 3-5) in sprožitve (stran 3-8) nezdružljive zaradi spremembe nastavitev kanala, se te nastavitve samodejno vrnejo na prvotne privzete vrednosti. Če na primer izberete kanal Mic z nastavitvijo Channel Setup, medtem ko je za način vzorčenja izbrana možnost „Extended“, se način vzorčenja samodejno spremeni v „Fast“ (kar je prvotna privzeta nastavitev, ko je izbran kanal Mic). Za informacije o kanalih, ki jih lahko izberete za vsak način vzorčenja, glejte „Nastavitev vzorčenja“ (stran 3-5).

■ Vzorec nastavitve

Na zaslonu Nastavitev vzorca lahko konfigurirate številne nastavitve, ki nadzorujejo vzorčenje.

u Konfiguracija nastavitev vzorčenja

1. Ko je na zaslonu prikazan meni Napredna nastavitev (stran 3-1), pritisnite c(Vzorec).
   - Prikaže se zaslon Nastavitev vzorčenja, na katerem je označena vrstica „Način“, kar pomeni, da lahko izberete način vzorčenja.



2. Izberite način vzorčenja, ki ustreza vrsti vzorčenja, ki ga želite izvesti.

To storite tako:	Pritisnite to tipko:	Za izbiro tega načina:
Grafični prikaz podatkov v realnem času, ko se vzorčijo	1(R-T)	V realnem času
Vzorec visokohitrostnih pojavov (zvok itd.)	2(Hitro)	Hitro
Opravljanje vzorčenja v daljšem časovnem obdobju (vreme itd.)	4(Podaljšano)	Podaljšano*
Vzorčenje zvoka z vgrajenim mikrofonom (samo EA-200)	6(g) 1(Snd)	Zvok
Zabeležite čas nastanka določenega sprožilnega dogodka kot absolutno vrednost, ki se začne z 0, kar je čas začetka vzorčenja.	6(g) 2(Clck)	Ura
Opravite periodično vzorčenje od začetnega sprožilnega dogodka do končnega sprožilnega dogodka.	6(g) 3(Priod)	Obdobje
Opravite vzorčenje, ki ni opisano zgoraj.	3(Norm)	Normalno

* Med izvajanjem meritev v razširjenem načinu se EA-200 v stanju pripravljenosti preklopi v stanje mirovanja z izklopljeno napajanje.

- Upoštevajte, da izbrani način določa tudi kanale, ki jih lahko uporabljate.

Način vzorčenja:	Izbirni kanal(i)
V realnem času, razširjeno, normalno	CH1, CH2, CH3, SONIC
Hiter	CH1, mikrofon
Zvok	Mikrofon
Ura, obdobje	CH1

3. Če želite spremeniti nastavitev intervala vzorčenja, premaknite označitev na »Interval«. Nato pritisnite
1, da se prikaže pogovorno okno za določitev intervala vzorčenja.
   - Obseg vrednosti, ki jih lahko izberete, je odvisen od trenutne nastavitve načina vzorčenja.

Če je izbran ta način vzorčenja:	To je dovoljen razpon nastavitev:
V realnem času	0,2 do 299 sek
Hitro	20 do 500μ sekund
Podaljšano	5 do 240 min
Obdobje	Samo „=Trigger“ (vnos vrednosti ni potreben)
Zvok	20 do 27μ sek
Ura	Samo „=Trigger“ (vnos vrednosti ni potreben)
Normal	0,0005 do 299 sek

4. Če želite spremeniti nastavitev števila vzorcev, premaknite označitev na „Število“. Nato pritisnite 1, da se prikaže pogovorno okno za določitev števila vzorcev.
   - Skupni čas vzorčenja, prikazan na dnu pogovornega okna, se izračuna tako, da se vrednost „Interval vzorčenja“, ki ste jo določili v koraku 3, pomnoži s številom vzorcev, ki ga določite tukaj.

   Pomembno!
   - Ko so izpolnjeni vsi naslednji pogoji, se namesto nastavitve »Število« prikaže nastavitev »Razdalja«. Za informacije o konfiguraciji nastavitve »Razdalja« glejte »Konfiguracija nastavitve Razdalja« (stran 3-7).
     - Nastavitev kanala (stran 3-3): 2(VRNR) – [Fotocelica] – [Sklopka],
       3(CMA) – [Fotokomora] – [Sklopka]
     - Način vzorčenja (stran 3-5): Ura

5. Če želite spremeniti nastavitev časa ogrevanja, premaknite označbo na »Warm-up«. Nato izvedite eno od spodaj opisnih funkcijskih tipk.

   Opomba
   - Nastavitev „Warm-up“ se ne prikaže na zaslonu Sample Setup, če je trenutno izbran način vzorčenja „Fast“, „Sound“ ali „Extended“.

To storite tako:	Pritisnite to tipko:
Nastavite čas ogrevanja za vsak senzor samodejno	1(Auto)
Ročno vnesite čas ogrevanja v sekundah	2(Ročno)
Onemogočite čas ogrevanja	3(Nič)

   Pomembno!
   - Ko je izpolnjen naslednji pogoj, se namesto nastavitve „Segrevanje“ prikaže nastavitev „FFT graf“. Za informacije o konfiguraciji nastavitve „FFT graf“ glejte „Konfiguracija nastavitve FFT graf“ (stran 3-7).
     - Način vzorčenja (stran 3-5): Hitro

6. Ko so vse nastavitve takšne, kot želite, pritisnite w.
   - S tem se vrnete v meni Napredne nastavitve.

   Opomba
   - Kadar postanejo trenutne nastavitve Nastavitve kanala (stran 3-3) in Nastavitve sprožilca (stran 3-8) nezdružljive zaradi spremembe nastavitev Nastavitve vzorca, se te nastavitve samodejno vrnejo na prvotne privzete vrednosti. Če na primer v nastavitvah vzorčenja izberete »Realtime« kot način vzorčenja, medtem ko je v nastavitvah kanalov izbran kanal mikrofona in je v nastavitvah sprožilca za »Vir« izbran »Mikrofon«, se izbira kanala mikrofona v nastavitvah kanalov prekliče, nastavitev »Vir« v nastavitvah sprožilca pa se spremeni v »[EXE] tipka«.
   Za informacije o kanalih, ki jih je mogoče izbrati za vsak način vzorčenja, glejte korak 2 v poglavju „Konfiguriranje nastavitev vzorčenja“. Za informacije o sprožilnih , ki jih je mogoče izbrati za vsak način vzorčenja, glejte „Nastavitev sprožilca“ (stran 3-8).

u Konfiguracija nastavitve razdalje

Namesto koraka 3 postopka v poglavju „Nastavitev vzorčenja“ pritisnite 1, da se prikaže pogovorno okno za določitev razdalje, ki jo utež prevozi v metrih.

- Določite vrednost v območju od 0,1 do 4 metre.

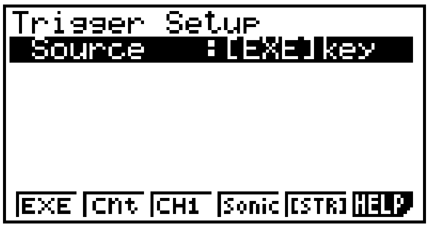
u Konfiguracija nastavitve grafa FFT

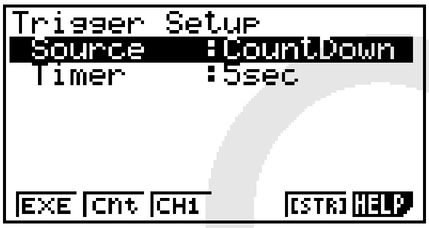
Namesto koraka 5 postopka v razdelku »Nastavitev vzorčenja«, pritisnite 1, da se prikaže pogovorno okno za vklop in izklop grafa frekvenčnih karakteristik (FFT Graph).

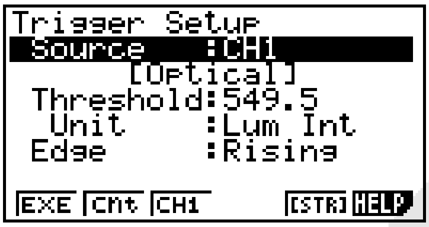
To storite tako:	Pritisnite to tipko:
Vklopite grafični prikaz frekvenčnih značilnosti po vzorčenju	1(Vklopljeno)
Izklopite prikaz grafa frekvenčnih značilnosti po vzorčenju	2(Izklopljeno)

■ Nastavitev sprožilca

Na zaslonu Trigger Setup (Nastavitev sprožilca) lahko določite dogodek, ki sproži začetek vzorčenja (delovanje tipke w itd.). Dogodek, ki sproži začetek vzorčenja, se imenuje »vir sprožilca« in je na zaslonu Trigger Setup (Nastavitev sprožilca) označen kot »Source« (Vir).







V naslednji tabeli so opisani vsi šest razpoložljivih virov sprožilcev.

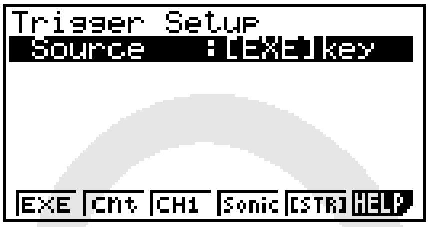
Če želite začeti vzorčenje, ko se to zgodi:	Izberite ta sprožilni vir:
Ko je pritisnjena tipka w	Tipka [EXE]
Po odštevanju določenega števila sekund	Odštevanje
Ko vhod na CH1 doseže določeno vrednost	CH1
Ko vhod na kanalu SONIC doseže določeno vrednost (samo EA-200)	SONIC
Ko vgrajeni mikrofon zazna zvok (samo EA-200)	Mikrofon
Ko je pritisnjena tipka [START/STOP] (samo EA-200)	Tipka [START
Ko pritisnete [Button] (samo CLAB)	Tipka [START

Opomba
Viri sprožilcev, ki jih lahko izberete, so odvisni od načina vzorčenja, izbranega v nastavitvah vzorčenja (stran 3-5).

Za ta način vzorčenja:	Izberete lahko naslednje sprožilne vire:
Realtime	Tipka [EXE], odštevanje
Hitro	[EXE] tipka, odštevanje, CH1, mikrofon
Normal	[EXE] tipka, odštevanje, CH1, SONIC, [START] tipka
Podaljšano	Tipka [EXE]
Zvok	[EXE] tipka, odštevanje, mikrofon
Ura	CH1
Obdobje	CH1

u Nastavitev nastavitev sprožilca

1. Ko je na zaslonu prikazan meni Advanced Setup (stran 3-1), pritisnite d(Trigger).
   - Prikaže se zaslon Trigger Setup (Nastavitve sprožilca) z označeno vrstico „Source“ (Vir).



   - Elementi funkcijskega menija, ki se prikažejo v menijski vrstici, so odvisni od načina vzorčenja, izbranega v nastavitvah vzorčenja (stran 3-5). Zgornji zaslon prikazuje funkcijski meni, ko je kot način vzorčenja izbran »Normalno«.

2. S funkcijskimi tipkami izberite želeni vir sprožilca.
   - Spodaj so prikazani sprožilni viri, ki jih je mogoče izbrati za vsak način vzorčenja.

Način vzorčenja	Vir sprožilca
Realni čas	1(EXE): [EXE] tipka, 2(Cnt): odštevanje
Hitro	1(EXE): tipka [EXE], 2(Cnt): odštevanje, 3(CH1), 5(Mic)
Normal	1(EXE): tipka [EXE], 2(Cnt): odštevanje, 3(CH1), 4(Sonic), 5(STR): tipka [START]
Zvok	1(EXE): tipka [EXE], 2(Cnt): odštevanje, 5(Mic)

   - Vir sprožilca je vedno »[EXE] tipka«, kadar je način vzorčenja »Razširjen«, in »CH1«, kadar je način vzorčenja »Ura« ali »Obdobje«.

3. Izvedite eno od naslednjih operacij v skladu z izbiro sprožilca, ki ste jo izbrali v koraku 2.

Če je to vir sprožilca:	Naredite naslednje:
[EXE] tipka	Pritisnite w, da zaključite nastavitev sprožilca in se vrnete v meni Napredne nastavitve.
Odštevanje	Določite čas začetka odštevanja. Glejte „Določanje časa začetka odštevanja“ spodaj.
CH1	Določite mejno vrednost sprožilca in smer sprožilca. Glejte „Določanje mejne vrednosti sprožilca in vrste sprožilca“, „Konfiguriranje nastavitev mejne vrednosti sprožilca, začetnega roba sprožilca in končnega roba sprožilca“ na strani 3-11 ali „Konfiguriranje nastavitev začetka in konca sprožilca fotokomora“ na strani 3-12.
SONIC	Določite prag sprožitve in raven senzorja gibanja. Glejte „Določanje praga sprožitve in ravni senzorja gibanja“ na strani 3-12.
Mikrofon	Določite občutljivost mikrofona. Glejte „Določanje občutljivosti mikrofona“ spodaj.
Tipka [START	Pritisnite w, da zaključite nastavitev sprožilca in se vrnete v meni Napredne nastavitve.

u Za določitev časa začetka odštevanja

1. Premaknite označbo na „Timer“.
2. Pritisnite 1(Čas), da se prikaže pogovorno okno za določitev časa začetka odštevanja.
3. Vnesite vrednost v sekundah od 1 do 10.
4. Pritisnite w, da zaključite nastavitev sprožilca in se vrnete v meni Napredne nastavitve.

u Za določitev občutljivosti mikrofona

1. Premaknite označitev na »Sense« in nato pritisnite eno od funkcijskih tipk, opisano

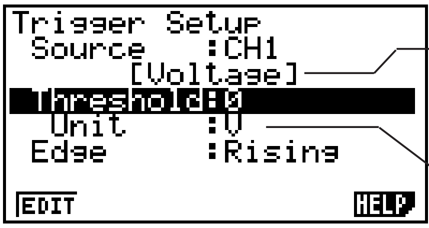
Za izbiro te ravni občutljivosti mikrofona:	Pritisnite to tipko:
Nizka	1 (nizka)
Srednja	2 (Srednja)
Visoka	3 (visoko)

2. Pritisnite w, da zaključite nastavitev sprožilca in se vrnete v meni Napredne nastavitve

u Za določitev mejne vrednosti sprožilca in vrste sprožilnega roba

Če je kot način vzorčenja določeno „Hitro“, „Normalno“ ali „Ura“ (stran 3-5), izvedite naslednje korake.

1. Premaknite označitev na »Prag«.
2. Pritisnite 1(EDIT), da prikažete pogovorno okno za določitev mejne vrednosti sprožilca, ki je vrednost, ki jo morajo podatki doseči, preden se začne vzorčenje.



Senzor, dodeljen CH1 ali SONIC v nastavitvah kanalov (stran 3-3)

Merilna enota, ki jo podpira dodeljeni senzor

3. Vnesite želeno vrednost in pritisnite w.
4. Premaknite označitev na „Edge“ (Rob).
5. Pritisnite eno od funkcijskih tipk, opisano spodaj.

Za izbiro tega tipa roba:	Pritisnite to tipko:
Padanje	1(Padec)
Dvig	2(Dvig)

6. Pritisnite w, da zaključite nastavitev sprožilca in se vrnete v meni Napredne nastavitve (stran 3-1).

u Za konfiguracijo nastavitev praga sprožilca, začetnega roba sprožilca in končnega roba sprožilca

Izvedite naslednje korake, ko je kot način vzorčenja določeno „Obdobje“ (stran 3-5).

1. Premaknite označitev na „Prag“.
2. Pritisnite 1(EDIT), da prikažete pogovorno okno za določitev vrednosti praga sprožilca, ki je vrednost, ki jo morajo podatki doseči, preden se začne vzorčenje.
3. Vnesite želeno vrednost.
4. Premaknite označitev na „Začetek do“.
5. Pritisnite eno od funkcijskih tipk, opisano spodaj.

Za izbiro tega tipa roba:	Pritisnite to tipko:
Padanje	1(Padec)
Dvig	2(Vzpon)

6. Premaknite označitev na „Končni rob“.
7. Pritisnite eno od funkcijskih tipk, opisano spodaj.

Za izbiro tega tipa roba:	Pritisnite to tipko:
Padanje	1(Padec)
Dvig	2(Dvig)

8. Pritisnite w, da zaključite nastavitev sprožilca in se vrnete v meni Napredne nastavitve (stran 3-1).

u Nastavitev začetka in konca sprožilca Photogate

Če je kot vir sprožilca Photogate izbran CH1, izvedite naslednje korake.

1. Premaknite označitev na „Začetek do“.
2. Pritisnite eno od funkcijskih tipk, opisano spodaj.

Za določitev tega stanja Photogate:	Pritisnite to tipko:
Fotocelica zaprta	1(Zapri)
Fotocelica odprta	2(Odprto)

3. Premaknite označbo na „End Gate“.
4. Pritisnite eno od funkcijskih tipk, opisano

Za določitev tega stanja fotokomore:	Pritisnite to tipko:
Fotocelica zaprta	1(Zapri)
Fotocelica odprta	2(Odprto)

5. Pritisnite   Pritisnite w, da zaključite nastavitev sprožilca in se vrnete v meni Advanced Setup (stran 3-1).

u Za določitev mejne vrednosti sprožilca in ravni senzorja gibanja

1. Premaknite označbo na „Prag“.
2. Pritisnite 1(EDIT), da se prikaže pogovorno okno za določitev mejne vrednosti sprožilca, ki je vrednost, ki jo morajo podatki doseči, preden se začne vzorčenje.
3. Vnesite želeno vrednost in pritisnite w.
4. Premaknite označbo na „Raven“.

Za izbiro te vrste ravni:	Pritisnite to tipko:
Spodaj	1(Spodaj)
Zgoraj	2(Abv)

6. Pritisnite w, da zaključite nastavitev sprožilca in se vrnete v meni Advanced Setup (stran

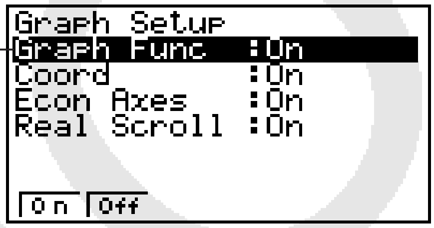
■ Nastavitve grafa

Na zaslonu Nastavitve grafa lahko konfigurirate nastavitve za graf, ki se ustvari po končanem vzorčenju. Z nastavitvami Vzorec (stran 3-5) lahko vklopite ali izklopite grafično prikazovanje.

u Konfiguriranje nastavitev grafa

1. Ko je na zaslonu prikazan meni Napredne nastavitve (stran 3-1), pritisnite 4 (Graf).
   • Prikaže se zaslon Nastavitve grafa.

Trenutno izbrana postavka



Zaslon Graph Setup

2. Če želite spremeniti nastavitev prikaza imena vira podatkov grafa, s puščičnima tipkama f in 2 premaknite označitev na »Graph Func« (Funkcija grafa). Nato pritisnite eno od funkcijskih tipk, opisano spodaj.

Za določitev te nastavitve prikaza imena vira podatkov grafa:	Pritisnite to tipko:
Prikaži ime izvornih podatkov	1(Vklopljeno)
Skrij ime izvornih podatkov	2(Izklopljeno)

   • Ko so podatki grafa shranjeni v datoteki s podatki vzorca, se kot ime izvornih podatkov prikaže ime datoteke. Ko so podatki grafa shranjeni v trenutnem podatkovnem območju, se prikaže ime kanala.

   Opomba
   • Za podrobnosti o pomnilniku vzorčnih podatkov in trenutnem podatkovnem območju glejte „9 Uporaba pomnilnika vzorčnih podatkov“.

3. Če želite spremeniti nastavitev prikaza koordinat operacije sledenja, s puščičnima tipkama f in 2 premaknite označbo na „Coord“. Nato pritisnite eno od spodaj opisnih funkcijskih tipk.

Če želite določiti to nastavitev prikaza koordinat za sledenje:	Pritisnite to tipko:
Prikaz koordinat sledenja	1(Vklopljeno)
Skrij koordinate sledenja	2(Izklopljeno)

4. Če želite spremeniti nastavitev prikaza numeričnih osi, s puščičnima tipkama f in 2 premaknite označbo na »Econ Axes« (Ekonomske osi). Nato pritisnite eno od spodaj opisnih funkcijskih tipk.

Za določitev te nastavitve prikaza osi:	Pritisnite to tipko:
Prikaz osi	1(Vklopljeno)
Skrij osi	2(Izklopljeno)

5. Če želite spremeniti nastavitev pomikanja v realnem času, s puščičnima tipkama f in ② premaknite označbo na »RealScroll«. Nato pritisnite eno od funkcijskih tipk, opisano spodaj.

Za določitev te nastavitve pomikanja v realnem času:	Pritisnite to tipko:
Pomikanje v realnem času vklopljeno	1(Vklopljeno)
Pomikanje v realnem času izklopljeno	2(Izklopljeno)

6. Pritisnite w, da zaključite nastavitev grafa in se vrnete v meni Napredne

4 Uporaba prilagojene sonde

Postopke v tem poglavju lahko uporabite za konfiguracijo prilagojene sonde za uporabo z napravo za beleženje podatkov.

Pomembno!

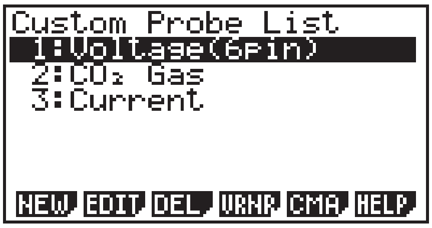
- Senzorji (CASIO, Vernier, CMA), ki se prikažejo na seznamu med nastavitvijo kanala (stran 3-3) so standardni senzorji v načinu E-CON3. Če želite uporabiti senzor, ki ni vključen v seznam, konfigurirajte nastavitve prilagojene sonde.
- Senzor z izhodno napetostjo v območju od 0 do 5 voltov je mogoče konfigurirati z E-CON3 kot prilagojeno sondo. Uporaba senzorjev z izhodno napetostjo zunaj tega območja ni podprta.

■ Konfiguracija nastavitve prilagojene sonde

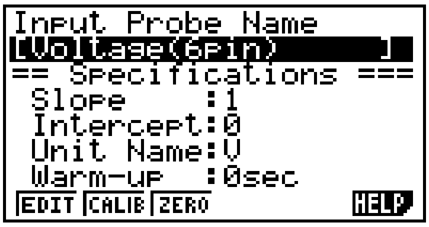
Za konfiguracijo nastavitve merilne sonde po meri morate vnesti vrednosti za konstante fiksne linearne interpolacijske formule ($ax + b$). Potrebne konstante so naklon (a) in presečišče (b). x v zgornjem izrazu ($ax + b$) je vzorčena vrednost napetosti (območje vzorčenja: 0 do 5 voltov).

u Konfiguracija nastavitve merilne sonde po meri

1. V glavnem meniju E-CON3 (stran 1-1) pritisnite 1(SET) in nato c(ADV), da se prikaže meni Napredne nastavitve.
   - Za več informacij glejte „3 Uporaba naprednih nastavitev“.
2. V meniju Napredne nastavitve (stran 3-1) pritisnite (Po meri sonda), da prikažete seznam po meri sond.



   - Če je seznam po meri prazen, se prikaže sporočilo „No Custom Probe“ (Ni po meri).
3. Pritisnite 1(NEW).
   - Prikaže se zaslon za nastavitev merilne sonde po meri, kot je prikazan spodaj.



   - Začetna privzeta nastavitev za ime sonde je „Napetost (6-pinski)“. Prvi korak pri konfiguriranju nastavitev po meri sonde je spremeniti to ime v drugo. Če želite privzeto ime pustiti takšno, kot je, preskočite koraka 4 in 5.
4. Pritisnite 1 (EDIT).
   - S tem vstopite v način urejanja imena sonde.

5. Vnesite do 18 znakov za ime merilne sonde po meri in nato pritisnite E.
   - S tem se označitev premakne na »Slope« (Naklon).
6. Uporabite funkcionalne tipke, opisane spodaj, za konfiguracijo nastavitev prilagojene sonde.
   - Če želite spremeniti nastavitev elementa, najprej s tipkama f in ② premaknite označbo na element. Nato s funkcijskimi tipkami izberite želeno nastavitev.

   (1) Naklon
   Pritisnite 1(EDIT), da vnesete naklon za linearno interpolacijsko formulo.

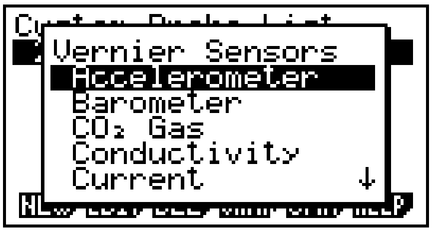
   (2) Presek
   Pritisnite 1(EDIT), da vnesete presečišče za linearno interpolacijsko formulo.

   (3) Ime enote
   Pritisnite 1(EDIT), da vnesete do osem znakov za ime enote.

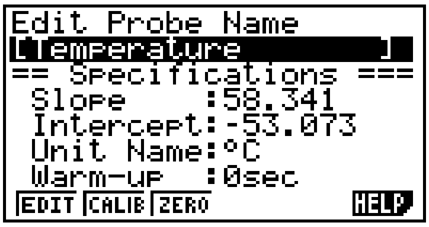
   (4) Ogrevanje
   Pritisnite 1 (EDIT), da vnesete čas ogrevanja.
7. Pritisnite w in vnesite številko pomnilnika (od 1 do 99).
   - S tem shranite nastavitve merilne sonde in se vrnete na seznam merilnih sond, ki zdaj vsebuje novo nastavitev merilne sonde, ki ste jo konfigurirali.

u **Za priklic specifikacij senzorja Vernier ali CMA in konfiguracijo nastavitev po meri**

1. Izvedite prva dva koraka postopka iz poglavja „Konfiguriranje nastavitev po meri“ na strani 4-1.
2. Pritisnite 4(VRNR) ali 5(CMA).
   - Prikaže se seznam senzorjev.



3. S tipkama f in ② premaknite označitev na senzor, katerega nastavitve želite uporabiti kot osnovo za nastavitve merilne sonde, nato pa pritisnite w.
   - Ime in specifikacije izbranega senzorja se prikažejo na zaslonu za nastavitev prilagojene sonde.



   - Da zaključite ta postopek, izvedite korake 4 do 7 v poglavju „Nastavitev merilne sonde po meri“ (stran 4-1).

■ Samodejna kalibracija prilagojene sonde

Samodejna kalibracija samodejno popravi vrednosti naklona in presečišča prilagojene nastavitve sonde na podlagi dveh dejanskih vzorcev.

Pomembno!

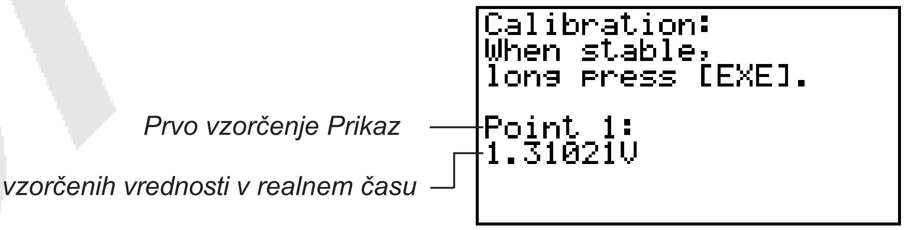
- Preden izvedete spodnji postopek, morate pripraviti dva pogoja, katerih merilne vrednosti so znane.
- Pri vnosu referenčne vrednosti v koraku 5 spodnjega postopka vnesite natančno znano merilno vrednost pogoja, ki ga boste vzorčili v koraku 4. Pri vnosu referenčne vrednosti v koraku 7 spodnjega postopka vnesite natančno znano merilno vrednost pogoja, ki ga boste vzorčili v koraku 6.

u Samodejna kalibracija merilne sonde po meri

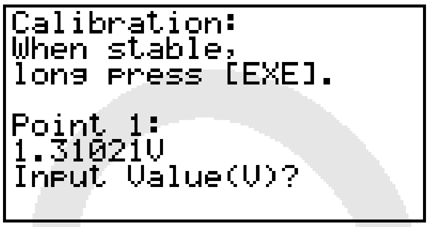
1. Povežite kalkulator in zapisovalnik podatkov ter povežite prilagojeno sondo, ki jo želite samodejno kalibrirati, s CH1 zapisovalnika podatkov.
2. Kaj morate najprej storiti, je odvisno od tega, ali konfigurirate novo prilagojeno sondo za kalibracijo ali urejate konfiguracijo obstoječe prilagojene sonde.

   Če konfigurirate novo prilagojeno sondo:
   - Izvedite korake 1 do 6 postopka v poglavju „Konfiguracija nastavitev merilne sonde po meri“ na strani 4-1.
   - Samodejna kalibracija bo samodejno nastavila naklon in presečišče, zato jih ni treba določiti v koraku 6 zgornjega postopka.

   Če urejate konfiguracijo obstoječe prilagojene sonde:
   - Izvedite korake 1 do 3 postopka pod »Urejanje nastavitev prilagojene sonde« na strani 4-6.
3. Pritisnite 2(CALIB).
   - S tem se bo začela prva operacija vzorčenja s senzorjem, priključenim na CH1 podatkovnega zapisovalnika, nato pa se bo prikazal zaslon, kot je prikazan spodaj.



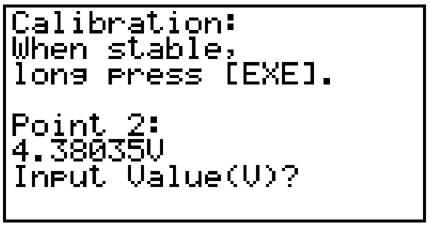
4. Ko se vzorčena vrednost stabilizira, nekaj sekund pridržite tipko w.
   - Tako se bo prva vzorčena vrednost registrirala in prikazala na zaslonu. V tem trenutku se bo na dnu zaslona pojavil kurzor, pripravljen za vnos referenčne vrednosti.



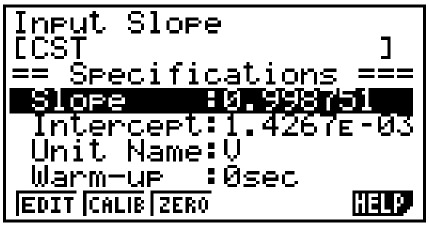
5. Z uporabo tipkovnice vnesite referenčno vrednost za prvo vzorčeno vrednost in nato pritisnite w.
   - To povzroči, da se vzorčenje druge vrednosti izvede samodejno in prikaže enak zaslon, kot je bil prikazan v koraku 3.

Drugi postopek vzorčenja

6. Ko se vzorčena vrednost stabilizira, nekaj sekund pridržite tipko w.
   - S tem se registrira druga vzorčena vrednost in prikaže na zaslonu. Na dnu zaslona se prikaže kurzor, ki je pripravljen za vnos referenčne vrednosti.



7. Z uporabo tipkovnice vnesite referenčno vrednost za drugo vzorčeno vrednost in nato pritisnite w.
   - S tem se vrnete na zaslon za nastavitev merilne sonde.
   - E-CON3 bo izračunal vrednost naklona in presečišča na podlagi dveh referenčnih vrednosti, ki ste jih vnesli, in samodejno konfiguriral nastavitve. Samodejno konfigurirane vrednosti se bodo prikazale na zaslonu za nastavitev merilne sonde, kjer jih lahko pregledate.



8. Pritisnite w in vnesite številko pomnilnika od 1 do 99.
   - S tem shranite nastavitve merilne sonde in se vrnete na seznam

■ Nastavitev ničle prilagojene sonde

Ta postopek nastavi ničlo prilagojene sonde in nastavi njeno vrednost presečišča na podlagi dejanskega vzorca z uporabo ustrezne prilagojene sonde.

u Nastavitev ničle prilagojene sonde

1. Povežite kalkulator in zapisovalnik podatkov ter povežite merilno sondo, ki jo želite nastaviti na ničlo, s kanalom CH1 zapisovalnika podatkov.

2. Kaj morate najprej narediti, je odvisno od tega, ali konfigurirate novo prilagojeno sondo za nastavitev ničle ali urejate konfiguracijo obstoječe prilagojene sonde.

   Če konfigurirate novo prilagojeno sondo:

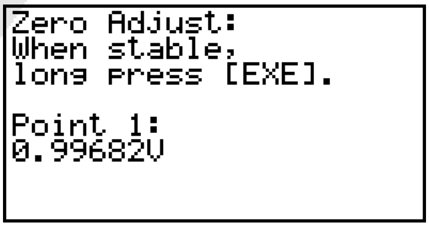
   - Izvedite korake 1 do 6 postopka v poglavju „Konfiguracija nastavitev merilne sonde po meri“ na strani 4-1.
   - Samodejna kalibracija bo samodejno nastavila presečišče, zato ga ni treba določiti v koraku 6 zgoraj navedenega postopka.

   Če urejate konfiguracijo obstoječe prilagojene sonde:

   - Izvedite korake 1 do 3 postopka pod »Urejanje nastavitev merilne sonde po meri« na strani 4-6.

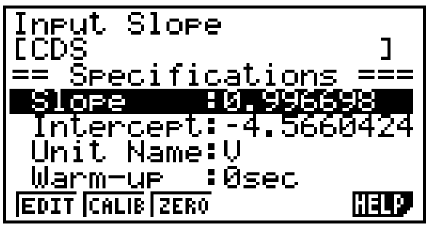
3. Pritisnite 3(ZERO).

   - S tem se bo začelo vzorčenje s senzorjem, priključenim na CH1 podatkovnega zapisovalnika, nato pa se bo prikazal zaslon, kot je prikazan spodaj.



4. Na točki, na kateri želite izvesti nastavitev ničle (točka, na kateri je prikazana vrednost ustrezna vrednost nastavitve ničle), pritisnite w.

   - S tem se vrnete na zaslon nastavitve merilne sonde.
   - E-CON3 bo samodejno nastavil vrednost prestrezanja na podlagi vzorčene vrednosti. Samodejno nastavljena vrednost se bo prikazala na zaslonu za nastavitev merilne sonde, kjer jo lahko pregledate.



5. Pritisnite w in vnesite številko pomnilnika od 1 do 99.

   - S tem shranite nastavitve merilne sonde in se vrnete na seznam

■ Upravljanje nastavitev po meri sonde

Uporabite postopke v tem poglavju za urejanje in brisanje obstoječih nastavitev po meri.

u Urejanje nastavitev po meri sonde

1. Prikažite seznam prilagojenih sond.
2. Izberite nastavitev merilne sonde, katere konfiguracijo želite urediti.
   - Z uporabo tipk za premikanje kurzorja f in ② označite ime želenega merilnega senzorja.
3. Pritisnite 2(EDIT).
   - Prikaže se zaslon za konfiguracijo nastavitve merilne sonde.
   - Če želite urediti nastavitev merilne sonde, izvedite postopek od koraka 6 v poglavju „Konfiguriranje nastavitve merilne sonde“ na strani 4-1.

u Če želite izbrisati nastavitev merilne sonde

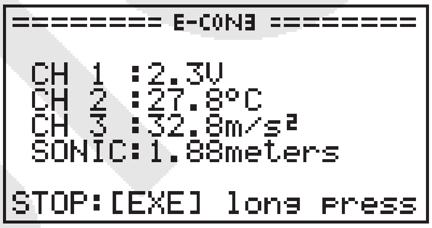
1. Prikažite seznam prilagojenih sond.
2. Izberite nastavitev merilne sonde, ki jo želite izbrisati.
   - Z uporabo tipk za premikanje kurzorja f in ② označite ime želene nastavitve merilne sonde.
3. Pritisnite 3(DEL).
4. V odgovor na potrditveno sporočilo, ki se prikaže, pritisnite 1(Da), da izbrišete nastavitev merilne sonde.
   - Če želite potrditveno sporočilo izbrisati, ne da bi kaj izbrisali, pritisnite 6(Ne).

5 Uporaba načina MULTIMETER

Na zaslonu Channel Setup (Nastavitev kanala) (stran 3-3) lahko konfigurirate kanal tako, da se vzorčenje v načinu MULTIMETER naprave za beleženje podatkov sproži z delovanjem kalkulatorja.

u Uporaba načina MULTIMETER

1. Povežite kalkulator in zapisovalnik podatkov ter priključite željene senzorje na ustrezne kanale zapisovalnika podatkov.
2. V meniju Napredne nastavitve (stran 3-1) uporabite zaslon Nastavitve kanalov (stran 3-3), da konfigurirate nastavitve senzorjev za vsak kanal, ki ga boste uporabljali.
3. Po konfiguraciji nastavitev senzorjev pritisnite w, da se vrnete v meni Napredne nastavitve (stran 3-1), nato pa pritisnite 2(MLTI).
   - S tem se začne vzorčenje v načinu MULTIMETER zapisovalnika podatkov in prikaže seznam vzorčnih vrednosti za vsak kanal.



   - Prikazani vzorčni podatki se osvežijo v intervalih 0,5 sekunde.
   - Senzorjev ne priključite na noben drug kanal razen tistih, ki ste jih določili v koraku 2.
   - Podatki, vzorčeni v načinu MULTIMETER, se ne shranijo v pomnilnik.
4. Za zaključek vzorčenja v načinu MULTIMETER pritisnite tipko w.

6 Uporaba nastavitvenega pomnilnika

Če nastavite podatke za beleženje podatkov s pomočjo čarovnika za nastavitev ali napredne nastavitve, se podatki shranijo v »trenutnem pomnilniškem prostoru za nastavitve«. Trenutna vsebina trenutnega pomnilniškega prostora za nastavitve se prepiše, ko ustvarite druge podatke za nastavitev.
Če želite, lahko uporabite pomnilnik nastavitev, da shranite vsebino trenutnega pomnilniškega območja nastavitev v pomnilnik kalkulatorja in tako preprečite, da bi bila prepisana.

■ Shranjevanje nastavitev

Nastavitev se lahko shrani, če je izpolnjen kateri koli od naslednjih pogojev.

- Po konfiguraciji nove nastavitve s čarovnikom za nastavitev
  Glejte korak 8 v poglavju „Konfiguriranje nastavitev podatkovnega zapisovalnika s pomočjo čarovnika za nastavitev“ na strani 2-2.
- Po konfiguraciji nove nastavitve z napredno nastavitvijo
  Za več informacij glejte korak 6 v poglavju „Konfiguriranje nastavitev podatkovnega zapisovalnika z napredno nastavitvijo“ na strani 3-1.
- Medtem ko je na zaslonu glavni meni E-CON3 (stran 1-1)
  Če med prikazom glavnega menija E-CON3 izvedete operacijo shranjevanja nastavitev, se shrani vsebina trenutnega pomnilniškega območja nastavitev (ki je bila konfigurirana s pomočjo čarovnika za nastavitve ali naprednih nastavitev).

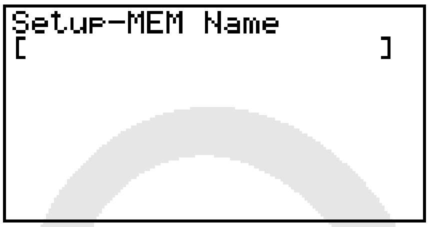
Podrobnosti o shranjevanju nastavitev so navedene spodaj.

u Shranjevanje nastavitev

1. Če je na zaslonu prikazan končni zaslon čarovnika za nastavitve, nadaljujte s korakom 2. Če ni, začnite postopek shranjevanja z izvedbo ene od funkcijskih tipk, opisano spodaj.
   ✓ Če je na zaslonu prikazan meni Napredne nastavitve (stran 3-1), pritisnite 3(MEM).
   ✓ Če je na zaslonu glavni meni E-CON3 (stran 1-1), pritisnite 2(MEM).
   - Če izvedete katero koli od zgornjih dejanj, se prikaže seznam nastavitvenega pomnilnika.

   - Če je pomnilnik nastavitev prazen, se prikaže sporočilo „No Setup-MEM“.

2. Če začnete z zadnjim zaslonom čarovnika za nastavitev, pritisnite c (Shrani nastavitve-MEM). Če začnete z drugim zaslonom, pritisnite 2 (SHRANI).
   - Prikaže se zaslon za vnos imena nastavitve.



3. Vnesite do 18 znakov za ime nastavitve.
4. Pritisnite w in vnesite številko pomnilnika (od 1 do 99).
   - Če začnete z zadnjim zaslonom čarovnika za nastavitev, se nastavitev shrani in prikaže se sporočilo »Končano!«. Pritisnite w, da se vrnete na zadnji zaslon čarovnika za nastavitev.
   - Če začnete v meniju Napredne nastavitve (stran 3-1) ali glavnem meniju E-CON3 (stran 1-1), se nastavitve shranijo in vrnete se na seznam pomnilnika nastavitev, ki vključuje ime, ki ste mu ga dodelili.

   Pomembno!
   - Ker vsaki nastavitvi dodelite ime nastavitve in številko datoteke, lahko po želji več nastavitvam dodelite isto ime.

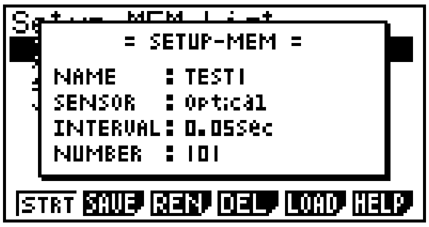
■ Uporaba in upravljanje nastavitev v pomnilniku nastavitev

Vse shranjene nastavitve so prikazane v seznamu pomnilnika nastavitev. Po izbiri nastavitve v seznamu jo lahko uporabite za vzorčenje podatkov ali jo uredite.

u Predogled shranjenih podatkov nastavitev

Z naslednjim postopkom lahko preverite vsebino nastavitve, preden jo uporabite za vzorčenje.

1. V glavnem meniju E-CON3 (stran 1-1) pritisnite 2(MEM), da prikažete seznam pomnilnika nastavitev.
2. Z uporabo tipk f in ② označite ime želene nastavitve.
3. Pritisnite K (Predogled nastavitve).
   - Prikaže se pogovorno okno za predogled.



4. Za zaprtje pogovornega okna za predogled pritisnite J

u Za priklic nastavitve in njeno uporabo za vzorčenje

Preden začnete vzorčenje z napravo za beleženje podatkov, izvedite naslednje korake.

1. Povežite kalkulator z napravo za beleženje podatkov.
2. Vklopite napajanje podatkovnega zapisovalnika.
3. V skladu z nastavitvami, ki jih nameravate uporabiti, priključite ustrezen senzor na ustrezen kanal podatkovnega zapisovalnika.
4. Pripravite predmet, katerega podatke želite meriti.
5. V glavnem meniju E-CON3 (stran 1-1) pritisnite 2(MEM), da prikažete seznam nastavitev v pomnilniku.
6. Z uporabo tipk f in ② označite ime nastavitve, ki jo želite.
7. Pritisnite 1(STRT).
8. V odgovor na potrditveno sporočilo, ki se prikaže, pritisnite 1.

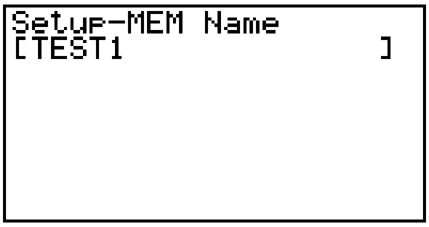
- S pritiskom na tipko w nastavite zapisovalnik podatkov in začnete vzorčenje.
- Če želite potrditveno sporočilo izbrisati brez vzorčenja, pritisnite 6.

Opomba

- Za informacije o operacijah, ki jih lahko izvajate med vzorčenjem, glejte „Operacije med vzorčenjem“ na strani 8-2.

u Spreminjanje imena nastavitvenih podatkov

1. V glavnem meniju E-CON3 (stran 1-1) pritisnite 2(MEM), da prikažete seznam nastavitev pomnilnika.
2. Z uporabo tipk za premikanje kurzorja f in ② označite ime nastavitve, ki jo želite.
3. Pritisnite 3(REN).
   - Prikaže se zaslon za vnos imena nastavitve.



4. Vnesite do 18 znakov za ime nastavitve in nato pritisnite w.
   - S tem spremenite ime nastavitve in se vrnete na seznam pomnilnika nastavitev.

u Za brisanje podatkov nastavitev

1. V glavnem meniju E-CON3 (stran 1-1) pritisnite 2(MEM), da prikažete seznam pomnilnika nastavitev.
2. Z uporabo tipk za premikanje kurzorja f in ② označite ime želene nastavitve.
3. Pritisnite 4(DEL).
4. V odgovor na potrditveno sporočilo, ki se prikaže, pritisnite 1(Da), da nastavitev izbrišete.
   - Če želite potrditveno sporočilo izbrisati, ne da bi kaj izbrisali, pritisnite 6(Ne).

u Za priklic nastavitvenih podatkov

Povrnitev nastavitvenih podatkov jih shrani v trenutni pomnilnik nastavitev. Nastavitve lahko nato uredite v naprednih nastavitvah. Ta funkcija je uporabna, ko morate izvesti nastavitev, ki se nekoliko razlikuje od tiste, ki ste jo shranili v pomnilnik.

1. V glavnem meniju E-CON3 (stran 1-1) pritisnite 2(MEM), da prikažete seznam pomnilnika nastavitev.
2. Z uporabo tipk f in ② označite ime želene nastavitve.
3. Pritisnite 5(LOAD).
4. V odgovor na potrditveno sporočilo, ki se prikaže, pritisnite 1(Yes), da prikličete nastavitev.
   - Če želite potrditveno sporočilo izbrisati, ne da bi priklicali nastavitev, pritisnite 6(Ne).

   Opomba

   - Povrnitev nastavitvenih podatkov nadomesti vse druge podatke, ki so trenutno v pomnilniku trenutne nastavitve.

7 Uporaba pretvornika programov

Program Converter pretvori nastavitve podatkovnega zapisovalnika, ki ste jih konfigurirali s pomočjo čarovnika za nastavitve ali naprednih nastavitev, v program, ki ga lahko zaženete na kalkulatorju. Program Converter lahko uporabite tudi za pretvorbo nastavitev v program, združljiv s serijo CFX-9850/fx-7400.*[1] *[2]

*[1] Za informacije o uporabi pretvorjenega programa glejte dokumentacijo, priloženo znanstvenemu kalkulatorju ali EA-200.

*[2] Za informacije o podprtih modelih serij CFX-9850 in fx-7400 glejte spletno pomoč (PROGRAM CONVERTER HELP).

■ Pretvorba nastavitve v program

Nastavitev se lahko pretvori v program, če je izpolnjen kateri koli od naslednjih pogojev.

- Po konfiguraciji nove nastavitve s čarovnikom za nastavitve
  Glejte korak 8 v poglavju „Konfiguriranje nastavitev podatkovnega zapisovalnika s pomočjo čarovnika za nastavitev“ na strani 2-2.

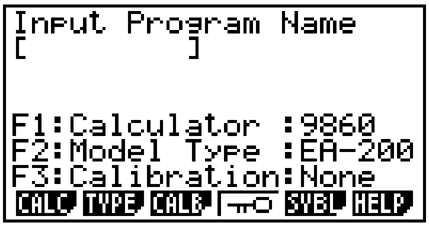
- Po konfiguraciji nove nastavitve z napredno nastavitvijo
  Za več informacij glejte korak 6 v poglavju „Konfiguriranje nastavitev podatkovnega zapisovalnika z napredno nastavitvijo“ na strani 3-1.

- Medtem ko je na zaslonu glavni meni E-CON3 (stran 1-1)
  Če med prikazom glavnega menija E-CON3 izvedete pretvorbo programa, se pretvori vsebina trenutnega pomnilniškega območja nastavitev (ki je bila konfigurirana s pomočjo čarovnika za nastavitev ali napredne nastavitve).

Postopek pretvorbe programa je v vseh zgoraj navedenih primerih enak.

u Pretvorba nastavitve v program

1. Zaženite pretvorbo tako, da izvedete eno od spodaj opisnih tipk.
   ✓ Če je na zaslonu prikazan končni zaslon čarovnika za nastavitev, pritisnite d(Pretvori program).
   ✓ Če je na zaslonu prikazan meni Napredna nastavitev (stran 3-1), pritisnite 4(PROG).
   ✓ Če je na zaslonu glavni meni E-CON3 (stran 1-1), pritisnite 3(PROG).
   - Po izvedbi katere koli od zgoraj navedenih operacij se na zaslonu prikaže zaslon programskega pretvornika.



2. Vnesite do osem znakov za ime programa.

   Opomba
   Z uporabo začetnih privzetih nastavitev pretvornika programov boste ustvarili program, kot je prikazan spodaj.

   • Povezani znanstveni kalkulator: serija fx-9860
   • Povezani zapisovalnik podatkov: EA-200
   • Kalibracija: Ni
   • Geslo: Ni

   Če želite te nastavitve uporabiti takšne, kot so, brez spreminjanja, preskočite korake od 3 do 7 in preidite neposredno na korak 8. Če želite spremeniti katero koli od nastavitev, izvedite ustrezne postopke v korakih od 3 do 7.

3. Določite model znanstvenega kalkulatorja, ki ga želite povezati s programom. Izvedite eno od naslednjih tipk, da povežete program z znanstvenim kalkulatorjem.

Če želite program povezati s tem kalkulatorjem:	Izvedite to tipko:
Serija fx-9860	1(CALC) 1(9860)
Serija CFX-9850	1(CALC) 2(9850)
Serija fx-7400	1(CALC) 3(7400)

   • Številčni del modela znanstvenega kalkulatorja, ki ga določite, se bo pojavil v vrstici „F1:” na zaslonu pretvornika programa.

   Opomba
   Za informacije o 1(CALC)4(→ 38K) glejte „Pretvarjanje programa serije CFX-9850 v program, združljiv s serijo fx-9860“ (stran 7-4).

4. Določite model podatkovnega zapisovalnika (EA-100 ali EA-200), ki ga želite povezati s programom. Izvedite eno od naslednjih tipk, da povežete program s podatkovnim zapisovalnikom.

Za povezavo programa s tem podatkovnim zapisovalnikom:	Izvedite to tipko:
EA-200	2(TYPE) 1(200)
EA-100	2(TIP) 2(100)

   • Številčni del številke modela podatkovnega zapisovalnika, ki ga določite, se bo pojavil v vrstici „F2:” na zaslonu pretvornika programa.

   Pomembno!
   • Upoštevajte, da se zmogljivosti EA-100 in EA-200 razlikujejo. Zaradi tega morate upoštevati, da program EA-200, pretvorjen v program EA-100 in uporabljen za vzorčenje z nastavitvijo EA-100, morda ne bo dal želenih rezultatov.

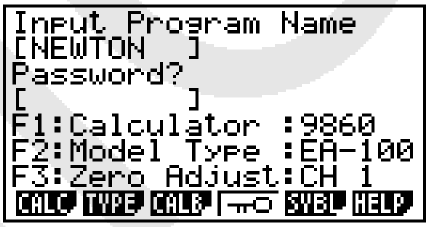
5. Če nameravate uporabiti prilagojeno sondo, priključeno na CH1 podatkovnega zapisovalnika, določite, ali je treba izvesti kalibracijo ali nastavitev ničle. Izvedite eno od naslednjih tipk za konfiguracijo želenih nastavitev.

Za izvedbo te operacije:	Izvedite to tipko:
Kalibracija prilagojene sonde CH1	3(CALB) 1(CALIB)
Nastavitev ničle merilne sonde CH1	3(CALB) 2(ZERO)
Brez kalibracije	3(CALB) 3(Nič)

• Operacija, ki jo določite, se bo pojavila v vrstici „F3:" na zaslonu pretvornika programa.

6. Če želite program zaščititi z geslom, pritisnite 4 ().

• To bo povzročilo, da se bo pod poljem za vnos imena programa pojavilo vprašanje



7. Vnesite do osem znakov za geslo.

• Če si premislite o dodelitvi gesla, pritisnite J. S tem se bo polje za vnos gesla izbrisalo in vnos gesla preklican.

8. Ko je vse tako, kot želite, pritisnite w, da program pretvorite v skladu z nastavitvami.

• Ko je pretvorba končana, se prikaže sporočilo »Complete!« (Končano!). Da izbrišete sporočilo in se vrnete na zaslon, ki je bil prikazan v koraku 1, pritisnite w ali J.

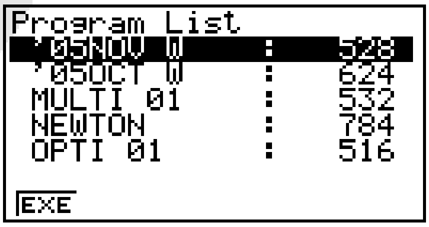
■ Pretvorba programa serije CFX-9850 v program, združljiv s serijo fx-9860

Če želite program za upravljanje EA-200, ustvarjen na kalkulatorju serije CFX-9850 (za uporabo na CFX-9850), uporabljati na E-CON3, morate program pretvoriti v program fx-9860. Pretvorbo lahko izvedete s programskim pretvornikom.

Program za nadzor EA-200 za serijo CFX-9850 → Pretvorba → Program za nadzor EA-200 za serijo fx-9860

u Pretvorba programa

1. Prenesite program za upravljanje EA-200, ustvarjen za serijo CFX-9850, v glavni pomnilnik fx-9860.
   - Uporabite kabel, ki je priložen fx-9860, da povežete njegovo 3-pinsko serijsko vrata s 3-pinskimi serijskimi vrati CFX-9850. Za podrobnosti glejte „Poglavje 13 Podatkovna komunikacija“.
2. Izvedite korak 1 iz poglavja »Pretvorba nastavitve v program« na strani 7-1, ki prikaže zaslon pretvornika programa.
3. Pritisnite 1(CALC) in nato 4(→ 38K).
   - Prikaže se seznam programov, ki so trenutno v glavnem pomnilniku.



4. Z uporabo f in ② premaknite označitev programa, ki ga želite pretvoriti, in nato pritisnite 1(EXE) ali w.
   - Po končani pretvorbi se prikaže zaslon za vnos imena programa.

5. Vnesite do osem znakov za ime programa.
   - Če želite program zaščititi z geslom, po vnosu imena programa izvedite koraka 6 in 7 iz poglavja »Pretvorba nastavitve v program«.
6. Pritisnite w, da začnete pretvorbo programa.
   - Ko je pretvorba končana, se prikaže sporočilo »Končano!«. Za izbris sporočila pritisnite w ali J.

8 Začetek vzorčenja

V tem poglavju je opisano, kako z nastavitvijo, konfigurirano v načinu E-CON3, začeti vzorčenje z napravo za beleženje podatkov.

■ Preden začnete...

Preden začnete z vzorčenjem z zapisovalnikom podatkov, izvedite naslednje korake.

1. Povežite kalkulator z napravo za beleženje podatkov.
2. Vklopite napajanje podatkovnega zapisovalnika.
3. V skladu z nastavitvijo, ki jo nameravate uporabiti, priključite ustrezen senzor na ustrezen kanal podatkovnega zapisovalnika.
4. Pripravite predmet, katerega podatke želite vzorčiti.

■ Začetek vzorčenja

Vzorčenje se lahko začne, če je izpolnjen kateri koli od naslednjih pogojev.

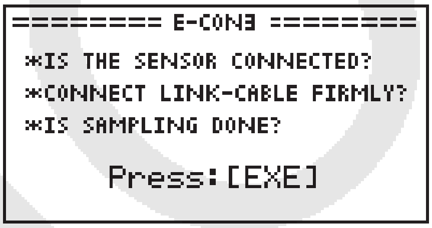
- Po konfiguraciji nove nastavitve s pomočjo čarovnika za nastavitev
  Glejte korak 8 v poglavju „Konfiguriranje nastavitev podatkovnega zapisovalnika s pomočjo čarovnika za nastavitev“ na strani 2-2.
- Po konfiguraciji nove nastavitve z napredno nastavitvijo
  Glejte korak 6 v poglavju „Konfiguriranje nastavitev podatkovnega zapisovalnika z napredno nastavitvijo“ na strani 3-1.
- Medtem ko je na zaslonu glavni meni E-CON3 (stran 1-1)
  Če začnete vzorčenje, medtem ko je na zaslonu glavni meni E-CON3, se vzorčenje izvede na podlagi vsebine trenutnega pomnilnika nastavitev (ki je bil konfiguriran s pomočjo čarovnika za nastavitve ali naprednih nastavitev).
- Medtem ko je na zaslonu seznam nastavitvenega pomnilnika
  Na seznamu pomnilnika nastavitev lahko izberete želeno nastavitev in nato začnete vzorčenje.

V nadaljevanju so opisani postopki za prve tri zgoraj navedene pogoje. Za informacije o začetku vzorčenja iz seznama pomnilnika nastavitev glejte „Povrnitev nastavitve in njena uporaba za vzorčenje“ na strani 6-3.

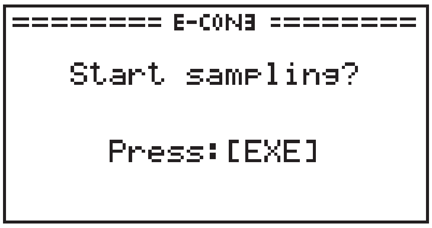
u Za začetek vzorčenja

1. Začnite vzorčenje z izvedbo ene od spodaj opisnih funkcijskih tipk.
    - ✓ Če je na zaslonu prikazan končni zaslon čarovnika za nastavitve, pritisnite b(Začni nastavitev).
    - ✓ Če je na zaslonu prikazan meni Napredne nastavitve (stran 3-1), pritisnite 1(STRT).
    - ✓ Če je na zaslonu glavni meni E-CON3 (stran 1-1), pritisnite 4(STRT).

    - Po izvedbi katere koli od zgornjih operacij se na zaslonu prikaže potrditveno okno za začetek vzorčenja, kot je prikazano spodaj.



2. Pritisnite w.
    - S tem nastavite zapisovalnik podatkov z uporabo nastavitvenih podatkov v trenutnem pomnilniškem območju nastavitev.
    - Med nastavitvijo podatkovnega zapisovalnika se na zaslonu prikaže sporočilo »Nastavljanje podatkovnega zapisovalnika...«. Nastavitev lahko kadarkoli prekinete, ko se prikaže to sporočilo, tako da pritisnete AC .
    - Po končani nastavitvi zapisovalnika podatkov se prikaže spodnji zaslon.



3. Pritisnite w, da začnete vzorčenje.
    - Zasloni, ki se prikažejo med vzorčenjem in po končanem vzorčenju, so odvisni od podrobnosti nastavitve (način vzorčenja, nastavitev sprožilca itd.). Podrobnosti so navedene v poglavju „Postopki med vzorčenjem“ spodaj.

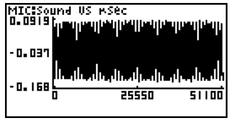
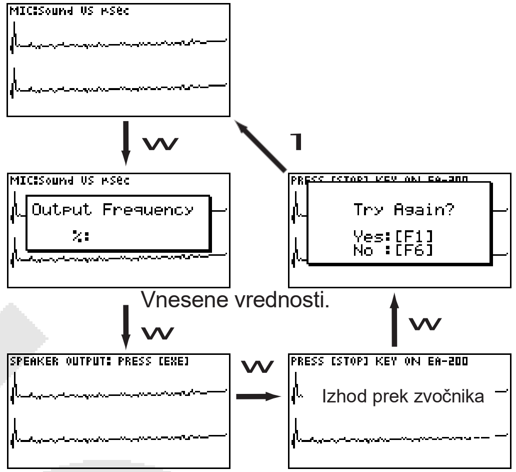
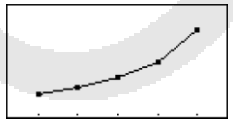
u Operacije med vzorčenjem

Pošiljanje ukaza za začetek vzorčenja iz kalkulatorja v podatkovni zapisovalnik sproži naslednjo zaporedje.

> Nastavitev prenosa podatkov→ Začetek vzorčenja→ Konec vzorčenja → Prenos vzorčnih podatkov iz podatkovnega zapisovalnika v kalkulator

Tabela na naslednji strani prikazuje, kako pogoji sprožitve in tip senzorja, določeni v nastavitvenih podatkih, vplivajo na zgornji potek.

Začetek vzorčenja

Način	1. Nastavitev podatkovnega zapisovalnika	2. Začetek stanja pripravljenosti	3. Vzorčenje	4. Grafični prikaz
V realnem času	======== E-CON3 ======== Setting Data Logger... Cancel:[AC]	======== E-CON3 ======== Start sampling? Press:[EXE]	→	 Vzorčene vrednosti se shranijo kot trenutni vzorčni podatki.
Hitro			======== E-CON3 ======== Sampling... Cancel:[AC] • Spodnji zaslon se prikaže, ko se kot sprožilec uporabi CH1, SONIC ali Mic. ======== E-CON3 ======== When sampling is done ,press [EXE] key.	**• Ko je način = Zvok** Grafični zaslon ne prikazuje vseh vzorčenih vrednosti, temveč le delni predogled. 
Normal				
Zvok				
Razširjen			======== E-CON3 ======== Sampling... View:[F1] Stop:[F6] S pritiskom na 1 preidete na »4. Grafični prikaz«. S pritiskom na w se vrnete na „3. Vzorčenje“.	
Obdobje			======== E-CON3 ======== When sampling is done ,press [EXE] key.	**• Ko je število vzorcev = 1** ======== E-CON3 ======== 0.5614sec Pri uporabi foto-vrat-skobljice je mogoče ustvariti naslednje tri vrste grafikonov. 1. Graf časa in razdalje 2. Graf časa in hitrosti 3. Graf časa in pospeška **• Ko je število vzorcev > 1**  Vrednosti vzorcev so shranjene samo kot podatki seznama.
Ura				

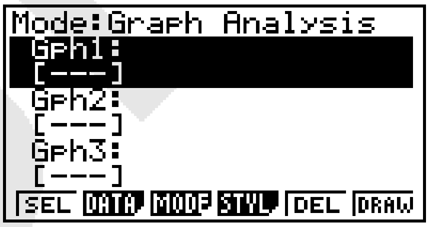
9 Uporaba pomnilnika vzorčnih podatkov

Izvedba vzorčenja podatkovnega zapisovalnika iz načina E-CON3 povzroči, da se vzorčeni rezultati shranijo v „območju trenutnih podatkov“ pomnilnika E-CON3. Za vsak kanal se shranijo ločeni podatki, podatki za določen kanal v območju trenutnih podatkov pa se imenujejo „trenutni podatki“ tega kanala.
Vsakič, ko izvedete vzorčenje, se trenutni podatki kanala(-ov), ki ga(-jih) uporabljate, nadomestijo z novo vzorčenimi podatki. Če želite shraniti niz trenutnih podatkov in preprečiti, da bi jih nadomestilo novo vzorčenje, shranite podatke v pomnilnik vzorčnih podatkov pod drugim imenom datoteke.

■ Upravljanje datotek vzorčnih podatkov

u Shranjevanje trenutnih vzorčnih podatkov v datoteko

1. V glavnem meniju E-CON3 (stran 1-1) pritisnite 5(GRPH).
   • Prikaže se zaslon Grafični način.

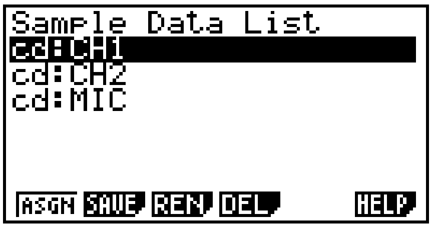


Zaslon Grafični način

   • Za podrobnosti o zaslonu Grafični način glejte „10 Uporaba grafičnih analiznih orodij za grafično prikazovanje podatkov“.

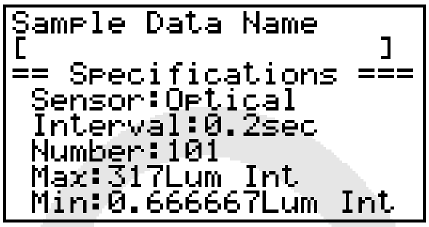
2. Pritisnite 2(DATA).
   • Prikaže se zaslon Seznam vzorčnih podatkov.

Seznam trenutnih datotek s podatki
„cd“ pomeni „trenutni podatki“.
Besedilo na desni strani dvopičja označuje ime kanala.



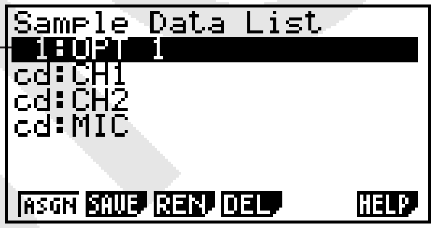
VzorčenjePodatkiSeznamZaslon

3. S puščičnima tipkama f in ② premaknite označitev na trenutno datoteko s podatki, ki jo želite shraniti, in nato pritisnite 2(SAVE).
   • Prikaže se zaslon za vnos imena datoteke.



4. Vnesite do 18 znakov za ime datoteke s podatki in nato pritisnite w.
   • Prikaže se pogovorno okno za vnos številke pomnilnika.
5. Vnesite številko pomnilnika v območju od 1 do 99 in nato pritisnite w.
   • S tem shranite vzorčne podatke na mesto, ki ga določa vnesena številka pomnilnika.

Datoteka vzorčnih podatkov, ki jo shranite, je na zaslonu prikazana v naslednjem formatu:
<številka pomnilnika>:<ime datoteke>.



   • Če določite številko pomnilnika, ki se že uporablja za shranjevanje datoteke s podatki, se prikaže potrditveno sporočilo, v katerem vas vpraša, ali želite obstoječo datoteko nadomestiti z novo datoteko s podatki. Pritisnite 1, da nadomestite obstoječo datoteko s podatki, ali 6, da se vrnete v pogovorno okno za vnos številke pomnilnika v koraku 4.
6. Za vrnitev v glavni meni E-CON3 (stran 1-1) dvakrat pritisnite J.

   Opomba
   • V koraku 3 zgornjega postopka lahko izberete drugo datoteko poleg trenutne datoteke in jo shranite pod drugo številko pomnilnika. Imena datoteke ni treba spreminjati, če uporabite drugo številko datoteke.

u Preimenovanje obstoječe datoteke z vzorčnimi podatki

Opomba

• S tem postopkom ne morete preimenovati imena trenutne datoteke s podatki.

1. V glavnem meniju E-CON3 (stran 1-1) pritisnite 5(GRPH).
   • Prikaže se zaslon Graph Mode (Grafični način).
2. Pritisnite 2(DATA).
   • Prikaže se zaslon Seznam vzorčnih podatkov.
3. S pomočjo tipk f in ② premaknite izbrano na datoteko, ki jo želite preimenovati, in nato pritisnite 3(REN).
   • Prikaže se zaslon za vnos imena datoteke.
4. Vnesite do 18 znakov za novo ime datoteke in nato pritisnite w.
   • S tem se vrnete na zaslon Seznam vzorčnih podatkov.
5. Za vrnitev v glavni meni E-CON3 (stran 1-1) dvakrat pritisnite J.

u Za izbris datoteke z vzorčnimi podatki

1. V glavnem meniju E-CON3 (stran 1-1) pritisnite 5(GRPH).
   • Prikaže se zaslon Graph Mode (Grafični način).
2. Pritisnite 2(DATA).
   • Prikaže se zaslon Sampling Data List (Seznam vzorčnih podatkov).
3. S puščičnima tipkama f in ② premaknite označitev na datoteko s podatki, ki jo želite izbrisati, in nato pritisnite 4(DEL).
4. V odgovor na potrditveno sporočilo, ki se prikaže, pritisnite 1(Yes), da izbrišete datoteko s podatki.
   • Če želite izbrisati potrditveno sporočilo, ne da bi izbrisali datoteko s podatki, pritisnite 6 (Ne).
   • S tem se vrnete na zaslon Seznam vzorčnih podatkov.
5. Če se želite vrniti v glavni meni E-CON3 (stran 1-1), dvakrat pritisnite J.

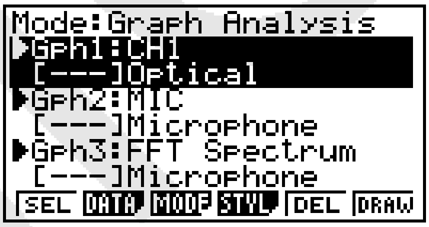
10 Uporaba orodij za grafično analizo za grafično prikazovanje podatkov

Orodja za grafično analizo omogočajo analizo grafikonov, narejenih na podlagi vzorčenih podatkov.

■ Dostop do orodij za analizo grafikonov

Do orodij za analizo grafov lahko dostopate na enega od dveh načinov, opisana spodaj.

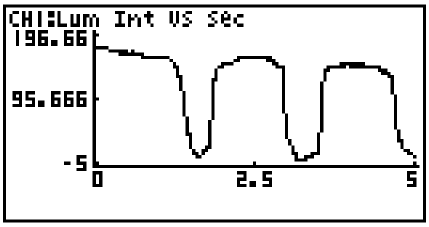
u **Dostop do orodij za analizo grafov iz zaslona Graph Mode (Način grafov), ki se prikaže s pritiskom** na 5**(GRPH) v glavnem meniju E-CON3 (stran 1-1)**



Zaslon Graph Mode

- Glavni meni se prikaže po izvedbi vzorčenja. V tem trenutku pritisnite 5(GRPH).
- Ko dostopate do orodij za analizo grafov s to metodo, lahko izbirate med različnimi drugimi načini analize. Za več informacij o drugih načinih analize glejte „Izbiranje načina analize in risanje grafa“ (stran 10-2).

u **Dostop do orodij za analizo grafov iz zaslona grafa, narisanega po izvedbi vzorčenja iz čarovnika za nastavitev ali iz naprednih nastavitev (način v realnem času)**



Zaslon grafa

- V tem primeru se podatki prikažejo v grafu po končanem vzorčenju, kalkulator pa samodejno odpre orodja za analizo grafov. Glejte „Ključne operacije na zaslonu grafa“ na strani 11-1.

■ Izbiranje načina analize in risanje grafa

Ta razdelek vsebuje podrobni postopek, ki zajema vse korake od izbire načina analize do risanja grafa.

Opomba

- Koraki od 4 do 6 niso nujni in jih lahko po želji preskočite. Preskočite kateri koli korak samodejno uporabi začetne privzete vrednosti za svoje nastavitve.
- Če preskočite korak 2, je privzeti način analize tisti, katerega ime je prikazano v zgornji vrstici zaslona Graph Mode (Način grafa).

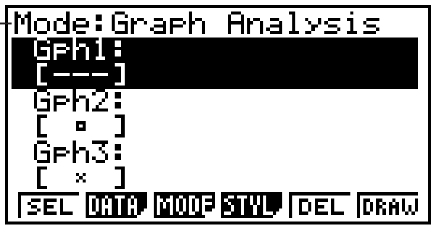
u Izbiranje načina analize in risanje grafa

1. V glavnem meniju E-CON3 (stran 1-1) pritisnite 5(GRPH).
   - Prikaže se zaslon Graph Mode.
2. Pritisnite 3(MODE) in izberite želeni način analize iz menija, ki se prikaže.

To storite tako:	Izvedite naslednjo operacijo v meniju:	Za izbiro tega načina:
Hkrati prikaži tri sklope vzorčenih podatkov	[Norm]	Analiza grafa
Grafično prikazovanje vzorčenih podatkov skupaj z grafičnim prikazom prve in druge derivate	[diff]	d/dt & d^2 /dt^2
Prikaži grafe različnih vzorčenih podatkov v zgornjem in spodnjem oknu za primerjavo	[CMPR]/[GRPH]	Primerjava grafa
Izhod vzorčenih podatkov iz zvočnika, prikaz grafa surovih podatkov v zgornjem oknu in izhodne valovne oblike v spodnjem oknu (samo EA-200)	[CMPR]/[Snd]	Primerjava zvoka
Prikaži graf vzorčenih podatkov v zgornjem oknu in graf njegove prve izpeljane funkcije v spodnjem oknu	[CMPR]/[d/dt]	Primerjaj d/dt
Prikaži graf vzorčenih podatkov v zgornjem oknu in graf njegove druge izvedenke v spodnjem oknu	[CMPR]/[d^2 /dt^2]	Primerjaj d^2 /dt^2

- Ime trenutno izbranega načina se prikaže v zgornji vrstici zaslona Graph Mode.

Ime načina analize



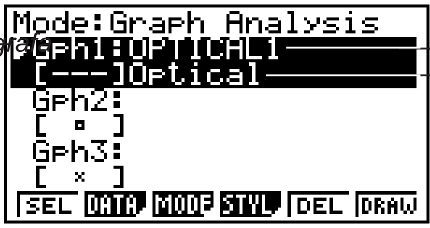
3. Pritisnite 2(DATA).
   - Prikaže se zaslon Seznam vzorčenih podatkov.

4. Določite vzorčene podatke za grafično prikazovanje.

a. Z uporabo tipk za premikanje kurzorja f in ② premaknite označitev na ime datoteke z vzorčnimi podatki, ki jo želite izbrati, in nato pritisnite 1(ASGN) ali w.

- S tem se vrnete na zaslon Grafični način, ki prikazuje ime izbrane datoteke z vzorčnimi podatki.

Kazalnik vklopa/izklopa grafa



Vzorecpodatkidatotekaime

Ime senzorja, uporabljenega za vzorčenje

Zaslon Grafični način

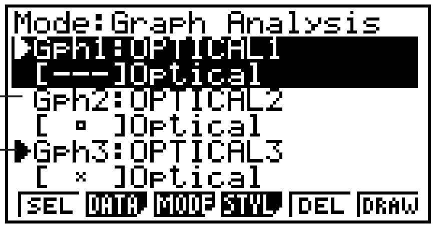
b. Ponovite zgornji korak a, da določite vzorčne datoteke za druge grafe, če obstajajo.

- Če v koraku 2 izberete »Analiza grafa« kot način analize, morate določiti vzorčne datoteke za tri grafe. Če v koraku 2 izberete »Primerjava grafa« kot način analize, morate določiti vzorčne datoteke za dva grafa. Pri drugih načinih morate določiti samo eno vzorčno datoteko.
- Za podrobnosti o delovanju zaslona »Seznam vzorčnih podatkov« glejte »9 Uporaba pomnilnika vzorčnih podatkov«.

5. Vklopite grafični prikaz za vsakega od grafikonov, navedenih na zaslonu Graph Mode (Grafični način).

a. Na zaslonu Graph Mode (Način grafa) z uporabo tipk f in ② izberite graf, nato pa pritisnite 1(SEL), da vklopite ali izklopite grafično prikazovanje.

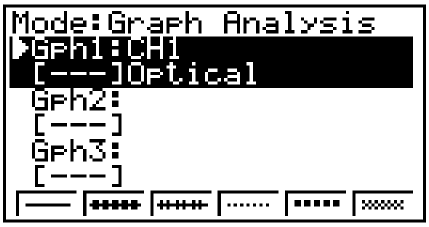
Grafični prikaz je izklopljen. Grafični prikaz je vklopljen.



b. Ponovite korak a, da vklopite ali izklopite vsak grafikon, naveden na zaslonu Graph Mode (Način grafa).

6. Izberite stil grafa, ki ga želite uporabiti.

a. Na zaslonu Graph Mode (Način grafa) s pomočjo tipk f in ② premaknite označitev na graf (Gph1, Gph2 itd.), katerega slog želite določiti, in nato pritisnite 4(STYL). S tem se bo spremenil meni funkcij, kot je prikazano spodaj.

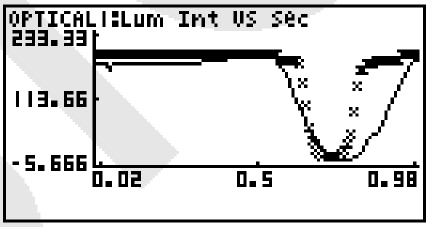


b. Uporabite funkcionalne tipke, da določite želeni slog grafa.

Za določitev tega sloga grafa:	Pritisnite to tipko:
Črtasti grafikon s pikami (•) kot označevalci podatkov	1 (——)
Črtni grafikon s kvadratnimi ( ) označevalci podatkov	2 (■■■■)
Črtni grafikon z X (×) označevalci podatkov	3 (××××)
Razpršen diagram s pikastimi (•) označevalci podatkov	4 (······)
Razpršeni grafikon s kvadratnimi ( ) kazalci podatkov	5 (■■■■■)
Razpršeni grafikon z X (×) označevalci podatkov	6 (×××××)

c. Ponovite koraka a in b, da določite slog za vsak graf na zaslonu Graph Mode (Način grafa).

7. Na zaslonu Graph Mode (Način grafa) pritisnite 6(DRAW) ali w.
   - Tako se grafični prikaz(i) narišejo v skladu z nastavitvami, ki ste jih konfigurirali v korakih od 2 do 6.



Zaslon Graph

   - Ko je na zaslonu prikazan zaslon Graph, funkcijski gumbi omogočajo povečavo in druge funkcije, ki pomagajo pri analizi grafa.

     Za podrobnosti o delovanju funkcijskih tipk na zaslonu Grafični prikaz glejte naslednji razdelek.

u Če želite preklicati izbiro vzorčenih podatkov, dodeljenih za grafično prikazovanje na zaslonu Graph Mode (Grafični način)

1. Na zaslonu Graph Mode (Način grafa) s pomočjo tipk za premikanje kurzorja f in ② premaknite označitev na graf (Gph1, Gph2 itd.), katerega vzorčene podatke želite izbrisati.
2. Pritisnite 5(DEL).
   - S tem boste razveljavili izbiro vzorčnih podatkov, dodeljenih označenemu grafu.

11 Orodje za analizo grafa Delovanje zaslona grafa

V tem poglavju so opisane različne operacije, ki jih lahko izvedete na grafičnem zaslonu po risanju grafa.
Te operacije lahko izvedete na grafičnem zaslonu, ki je bil ustvarjen z operacijo vzorčenja ali z operacijo, opisano v poglavju „Izbiranje načina analize in risanje grafa“ na strani 10-2.

■ Ključne operacije na grafičnem zaslonu

Na grafičnem zaslonu lahko uporabite tipke, opisane v spodnji tabeli, za analizo (CALC) grafikonov z branjem podatkovnih točk vzdolž grafikona (Trace) in povečavo določenih delov grafikona (Zoom).

Tipka Operacija	Opis
!1(TRCE)	Na grafu prikaže kazalec sledenja skupaj s koordinatami trenutne lokacije kurzorja. Sledenje se lahko uporabi tudi za pridobivanje periodične frekvence določenega območja na grafu in dodelitev te frekvence spremenljivki. Glejte „Uporaba sledenja“ na strani 11-3.
!2(ZOOM)	Zažene povečavo, s katero lahko povečate ali pomanjšate graf vzdolž osi x ali osi y. Glejte „Uporaba povečave“ na strani 11-4.
!3(V-WIN)	Prikaže funkcijski meni posebnih ukazov okna pogleda za grafični zaslon v načinu E-CON3. Podrobnosti o posameznih ukazih najdete v poglavju „Konfiguriranje parametrov okna View Window “ na strani 11-14.
!4(SKTCH)	Prikaže meni, ki vsebuje naslednje ukaze: Cls, Plot, F-Line, Text, PEN, Vert in Hztl. Podrobnosti o posameznih ukazih najdete v poglavju 5-10 Spreminjanje videza grafa v poglavju 5 tega priročnika.
K1(PICT)	Shrani trenutno prikazani graf kot grafično sliko. Shranjeno grafično sliko lahko ponovno prikličete in jo prekrivate z drugim grafom, da ju primerjate. Podrobnosti o teh postopkih najdete v poglavju 5-4 Shranjevanje grafa v pomnilniku slik v poglavju 5 tega priročnika.
K2(LMEM)	Prikaže meni funkcij za shranjevanje vrednosti vzorcev v določenem obsegu grafa v seznam. Glejte „Pretvarjanje vzorčenih podatkov v podatke seznama“ na strani 11-5.
K3(EDIT)	Prikaže meni funkcij za povečavo in urejanje določenega grafa, kadar grafični zaslon vsebuje več grafov. Glejte „Delovanje z več grafi“ na strani 11-10.

Tipka Operacija	Opis
K4(CALC)	Prikaže meni, v katerem lahko grafični prikaz vzorčnega rezultata pretvorite v funkcijo z uporabo Fourierove vrste in izvedete regresijo, da določite trend grafa. Glejte „Uporaba Fourierove vrste razširitve za pretvorbo valovne oblike v funkcijo“ na strani 11-6 in „Izvajanje regresije“ na strani 11-8.
K5(Y=fx)	Prikaže seznam grafičnih funkcij, ki omogoča izbiro grafa Y=f(x) za prekrivanje grafa vzorčenih rezultatov. Glejte „Prekrivanje grafa Y=f(x) na grafu vzorčenih rezultatov“ na strani 11-9.
K6(SPKR)	Zažene operacijo za izhod določenega obsega grafa valovne oblike zvočnih podatkov iz zvočnika (samo EA-200). Glejte „Izhod določenega obsega grafa iz zvočnika“ na strani 11-12.

■ Pomikanje po grafičnem zaslonu

Če med prikazom grafa pritisnete tipke za premikanje kurzorja, se graf pomika v levo, desno, navzgor ali navzdol.

Opomba

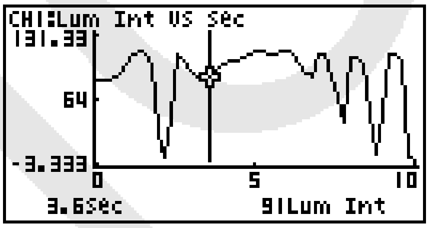
- Tipke za premikanje kurzorja opravljajo različne operacije poleg pomikanja, medtem ko poteka operacija s sledjo ali grafikonom. Da v tem primeru izvedete operacijo pomikanja grafa, pritisnite J, da prekličete operacijo s sledjo ali grafikonom, nato pa pritisnite tipke za premikanje kurzorja.

■ Uporaba sledenja

Sledenje prikaže križec na prikazanem grafu skupaj s koordinatami trenutnega položaja kurzorja. S pomočjo tipk za premikanje kurzorja lahko premikate kazalec po grafu. Sledenje lahko uporabite tudi za pridobivanje vrednosti periodične frekvence za določen razpon in dodelitev razpona (časa) in vrednosti periodične frekvence v ločenih vrednostih alfa-pomnilnika.

u Uporaba sledenja

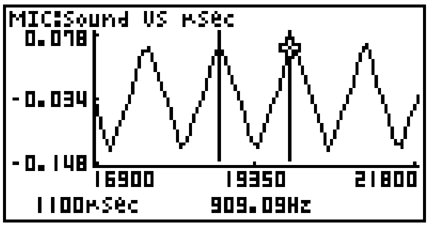
1. Na grafičnem zaslonu pritisnite !1(TRCE).
   • S tem se na grafu prikaže kazalec sledenja. Na zaslonu se prikažejo tudi koordinate trenutne lokacije kazalca sledenja.



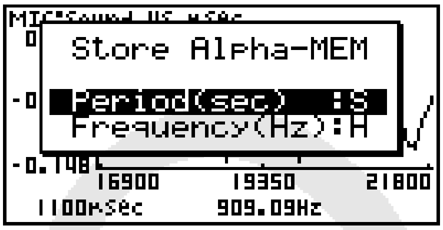
2. S puščičnimi tipkami d in e premaknite kazalec sledenja po grafu na želeno mesto.
   • Vrednosti koordinat se spreminjajo v skladu z gibanjem kazalca sledenja.
   • Kazalec sledenja lahko kadarkoli zaprete s pritiskom na tipko J

u Za pridobitev vrednosti periodične frekvence

1. Za začetek sledenja uporabite postopek iz zgornjega poglavja „Uporaba sledenja“.
2. Premaknite kazalec sledenja na začetno točko območja, katerega periodično frekvenco želite pridobiti, in nato pritisnite w.
3. Premaknite kazalec sledenja na končno točko območja, katerega periodično frekvenco želite pridobiti.
   • Tako se na dnu zaslona prikažeta vrednost obdobja in periodične frekvence na začetni točki, ki ste jo izbrali v koraku 2.



4. Pritisnite w, da vrednosti obdobja in periodične frekvence dodelite spremenljivkam Alpha-Memory.
   - Prikaže se pogovorno okno za določitev imen spremenljivk za vrednosti [Obdobje] in [Frekvenca].



   - Začetne privzete nastavitve imen spremenljivk so „S“ za obdobje in „H“ za periodično frekvenco. Če želite spremeniti ime spremenljivke, s puščičnimi tipkami navzgor in navzdol premaknite označitev na element, ki ga želite spremeniti, in nato pritisnite ustrezno črkovno tipko.
5. Ko je vse tako, kot želite, pritisnite w.
   - S tem shranite vrednosti in zaprete operacijo sledenja.
   - Za podrobnosti o uporabi Alpha-Memory glejte „Spremenljivke (Alpha Memory)“ na strani 2-7 v poglavju 2 tega priročnika.

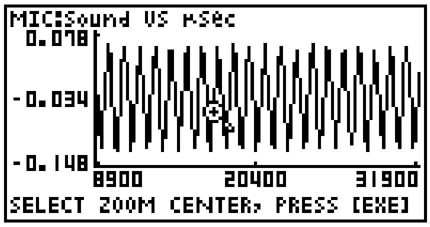
■ Uporaba povečave

Zoom omogoča povečanje ali pomanjšanje velikosti grafa vzdolž osi x ali osi y.

Opomba
- Če je na zaslonu več grafikonov, spodnji postopek poveča vse. Za informacije o povečanju posameznega grafikona, če je na zaslonu več grafikonov, glejte „Delovanje z več grafikoni“ na strani 11-10.

u Povečanje grafa

1. Na grafičnem zaslonu pritisnite !2(ZOOM).
   - S tem se v sredini zaslona prikaže kurzor v obliki povečevalnega stekla ( ).



2. S pomočjo tipk za premikanje kurzorja premaknite kurzor v obliki povečevalnega stekla na mesto na zaslonu, ki ga želite imeti v središču povečanega ali pomanjšanega zaslona.

3. Pritisnite w.
   - S tem se povečevalno steklo skrije in vstopite v način povečave.
   - Tipke za premikanje kurzorja izvajajo naslednje operacije v načinu povečave.

Za to:	Pritisnite to tipko za premikanje kurzorja:
Povečajte sliko grafa vodoravno	e
Zmanjšajte velikost grafa v vodoravni smeri	d
Povečajte sliko grafa navpično	f
Zmanjšajte velikost grafa v navpični smeri.	②

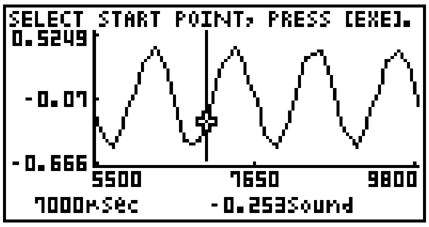
4. Za izhod iz načina povečave

■ Pretvorba vzorčenih podatkov v seznam podatkov

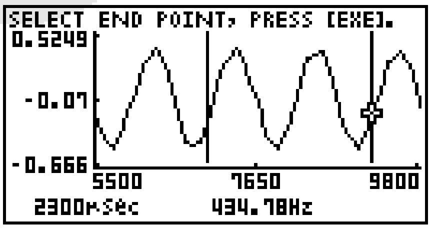
Uporabite naslednji postopek, da pretvorite vzorčene podatke v določenem obsegu grafa v seznam podatkov.

u Pretvorba vzorčenih podatkov v podatke v obliki seznama

1. Na grafičnem zaslonu pritisnite K, nato pa 2(LMEM).
   - Prikaže se meni [LMEM].
2. Pritisnite 2(SEL).
   - Prikaže se kazalec za izbiro območja na grafu.
3. Premaknite kazalec sledenja na začetno točko območja, ki ga želite pretvoriti v seznam podatkov, in nato pritisnite w.



4. Premaknite kazalec sledenja na končno točko območja, ki ga želite pretvoriti v seznam podatkov, in nato pritisnite w.
   - Prikaže se pogovorno okno za določitev seznamov, v katerih želite shraniti časovne podatke in vzorčene podatke.



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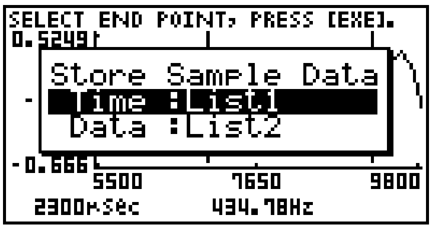


   - Začetni privzeti seznami sta Seznam 1 za čas in Seznam 2 za vzorčne podatke. Če želite preklopiti na drug seznam (Seznam 1 do Seznam 26), s puščičnimi tipkami navzgor in navzdol premaknite označbo na seznam, ki ga želite spremeniti, in nato vnesite ustrezno številko seznama.

5. Ko je vse tako, kot želite, pritisnite w.
   • S tem shranite sezname in prikaže se sporočilo »Končano!«. Pritisnite w, da se vrnete na grafični zaslon.
   • Podrobnosti o uporabi podatkov seznama najdete v »Poglavju 3 Funkcija seznama«.

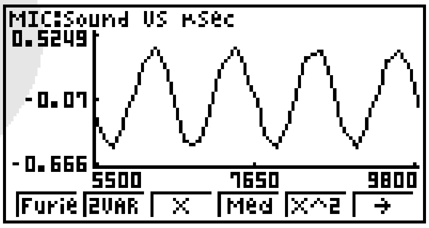
   Opomba
   • Če v koraku 2 namesto 2 (SEL) pritisnete 1 (Vse), se celoten graf pretvori v seznam podatkov. V tem primeru se takoj, ko pritisnete 1 (Vse), prikaže pogovorno okno »Shrani vzorčne podatke«.

■ Uporaba Fourierove vrste za pretvorbo valovne oblike v funkcijo

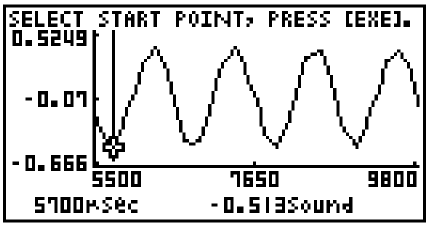
Fourierjeva vrsta je učinkovita za preučevanje zvokov, saj jih izraža kot funkcije. V nadaljevanju je postopek, ki predpostavlja, da je na grafičnem zaslonu že grafikon vzorčenih zvočnih podatkov.

u **Izvedba Fourierove vrste**

1. Na zaslonu grafa pritisnite K, nato pa 4(CALC).
   • Na dnu zaslona se prikaže meni [CALC].

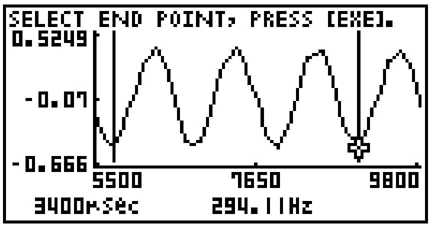


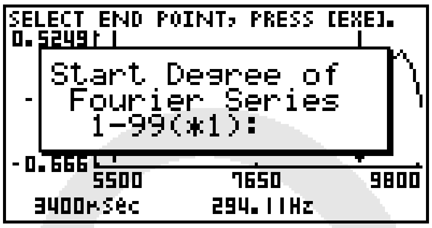
2. Pritisnite 1(Furie).
   • Prikaže se kazalec za izbiro grafičnega območja.
3. Premaknite kazalec na začetno točko območja, za katerega želite izvesti razvoj v Fourierjevo vrsto, in nato pritisnite w.



4. Premaknite kazalec sledenja na končno točko območja, za katerega želite izvesti razvoj Fourierove vrste, in nato pritisnite w.

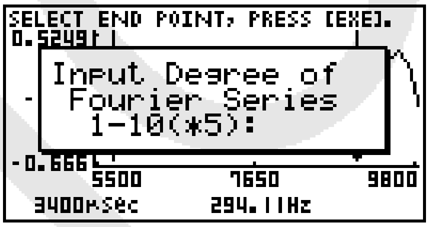
   • Prikaže se pogovorno okno za določitev začetnega stopnja Fourierove vrste.





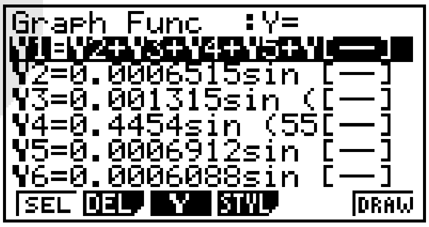
5. Vnesite vrednost v območju od 1 do 99 in nato pritisnite w.

   • Prikaže se pogovorno okno za vnos stopnje Fourierove vrste.

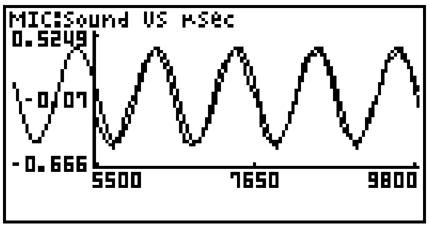


6. Vnesite vrednost v območju od 1 do 10 in nato pritisnite w.

   • Prikaže se seznam grafičnih funkcij z rezultatom izračuna.



7. S pritiskom na 6 (DRAW) se prikaže graf funkcije.



   • Tako lahko primerjate razširjeni grafikon funkcije in izvirni grafikon, da vidite, ali sta enaka.

Opomba

Ko v koraku 7 pritisnete 6(DRAW), se graf rezultata razširitve Fourierove vrste morda ne bo pravilno poravnal z izvirnim grafom, na katerega je prekrit. V tem primeru premaknite izvirni graf, da se poravna s prekritim grafom.

Za informacije o tem, kako premakniti izvirni graf, glejte „Premikanje določenega grafa na zaslonu z več grafi“ (stran 11-12).

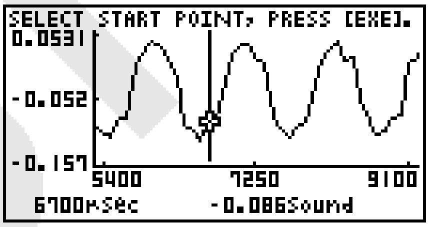
■ Izvedba regresije

Za izvedbo regresije za območje, določeno s sledilnim kazalcem, lahko uporabite spodnji postopek. Podprti so vsi naslednji tipi regresije: linearna, med-med, kvadratna, kubična, kvadratna, logaritemska, eksponentna, potenčna, sinusna in logistična.

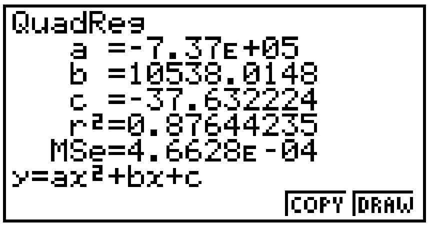
Podrobnosti o teh vrstah regresije najdete na straneh 6-12 do 6-14 v poglavju 6 tega priročnika. tega priročnika.
Naslednji postopek prikazuje, kako izvesti kvadratno regresijo. Enake splošne korake lahko uporabite tudi za izvedbo drugih vrst regresije.

u Izvedba kvadratne regresije

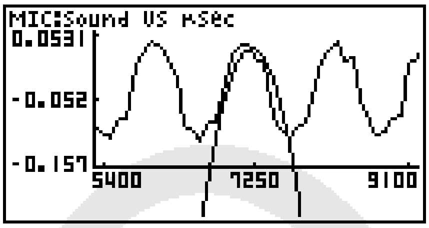
1. Na grafičnem zaslonu pritisnite K, nato pa 4(CALC).
   • Na dnu zaslona se prikaže meni [CALC].
2. Pritisnite 5(X^2).
   • To prikaže kazalec sledenja za izbiro območja na grafu.



3. Premaknite kazalec sledenja na začetno točko območja, za katerega želite izvesti kvadratno regresijo, in nato pritisnite w.
4. Premaknite kazalec sledenja na končno točko območja, za katerega želite izvesti kvadratno regresijo, in nato pritisnite w.
   • Prikaže se zaslon z rezultati kvadratne regresije.



5. Pritisnite 6 (DRAW).
   - S tem se nariše kvadratni regresijski graf in se prekriva s prvotnim grafom.



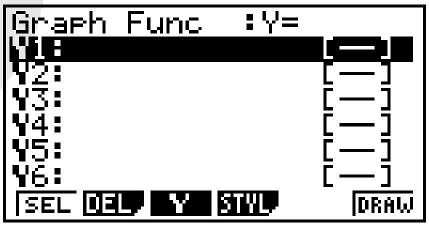
   - Če želite prekriti kvadratni regresijski graf izbrisati, pritisnite !4(SKTCH) in nato 1(Cls).

■ Prekrivanje grafa Y=f(x) z grafom vzorčenih rezultatov

Če želite prekrivati graf Y=f(x) z grafom vzorčenih rezultatov, uporabite naslednji postopek.

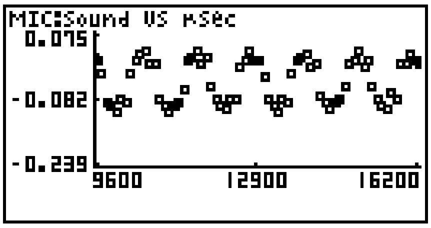
u Za prekrivanje grafa Y=f(x) na obstoječi graf

1. Na zaslonu grafa pritisnite K, nato pa 5(Y=fx).
   - Prikaže se seznam grafičnih funkcij. Vse funkcije, ki ste jih prej vnesli v seznam grafičnih funkcij, se prikažejo v tem trenutku.



2. Vnesite funkcijo, ki jo želite grafično prikazati.
   - Za vnos funkcije uporabite tipki f in ②, da premaknete označitev na vrstico, v katero želite vpisati funkcijo, nato pa uporabite tipke kalkulatorja za vnos. Pritisnite w, da shranite funkcijo.
3. Na seznamu grafičnih funkcij določite, katere funkcije želite prikazati v grafu.
   - Grafični prikaz je vklopljen za vsako funkcijo, katere simbol „=” je označen. Če želite grafični prikaz funkcije vklopiti ali izklopiti, uporabite tipki f in ② za premikanje označbe na funkcijo in nato pritisnite 1(SEL).

4. Ko so nastavitve seznama grafičnih funkcij konfigurirane po vaših željah, pritisnite 6(DRAW).
   - To prekriva grafe vseh funkcij, za katere je grafični prikaz vklopljen, nad grafom, ki je bil prvotno na grafičnem zaslonu.



Izvirni graf

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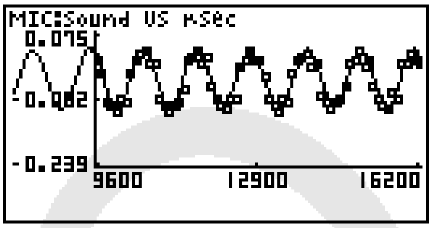


Prekrit z grafom Y=f(x)

   - Če želite izbrisati prekrivni graf, pritisnite !4(SKTCH) in nato 1(Cls).

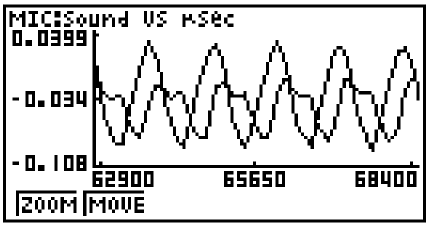
   Pomembno!
   - Zgornji posnetek zaslona v koraku 4 prikazuje funkcijo, ki je bila izračunana in shranjena z izvedbo regresije na grafu, narisanem na podlagi vzorčenih podatkov. Upoštevajte, da prekrivanje grafa Y=f(x) na grafu vzorčenih podatkov ne povzroči samodejnega risanja regresijskega grafa na podlagi vzorčenih podatkov.

■ Delo z več grafi

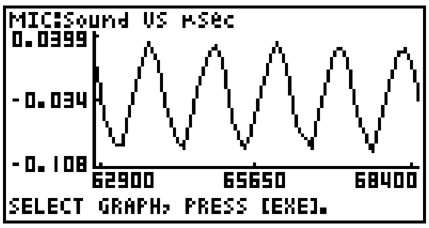
Postopki v tem poglavju pojasnjujejo, kako lahko povečate ali premaknete določen graf, ko je na zaslonu več grafov.

u Povečanje določenega grafa na zaslonu z več grafi

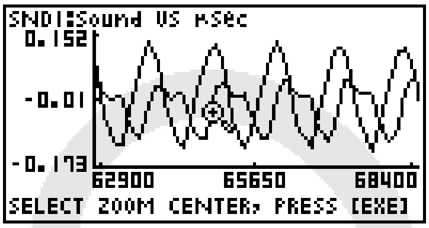
1. Ko zaslon z grafi vsebuje več grafov, pritisnite K in nato 3(EDIT).
   - Na dnu zaslona se prikaže meni [EDIT].



2. Pritisnite 1(ZOOM).
   - Tako se prikaže le eden od grafikonov, ki so bili prvotno na zaslonu grafikonov.

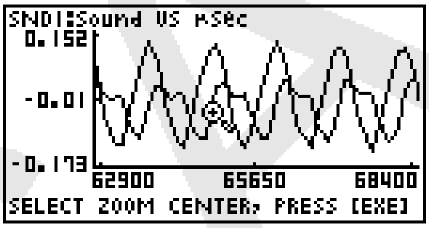


3. S pomočjo tipk f in ② za premikanje kurzorja preklopite med grafikoni, dokler se ne prikaže želeni grafikon, nato pritisnite w.
   - S tem vstopite v način povečave in se ponovno prikažejo vsi grafi, skupaj s kurzorjem v obliki povečevalnega stekla ( ) na sredini zaslona.



4. S puščičnimi tipkami premaknite kurzor z lupo na mesto na zaslonu, ki ga želite imeti v središču povečanega ali pomanjšanega zaslona.
5. Pritisnite w.
   - S tem se povečevalno steklo skrije in vstopite v način povečave.
   - Tipke za premikanje kurzorja izvajajo naslednje operacije v načinu povečave.

To storite tako:	Pritisnite to tipko za premikanje kurzorja:
Povečajte sliko grafa vodoravno	e
Zmanjšajte velikost grafa vodoravno	d
Povečajte sliko grafa navpično	f
Zmanjšajte velikost grafa navpično	②



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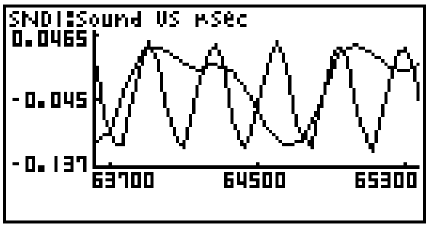
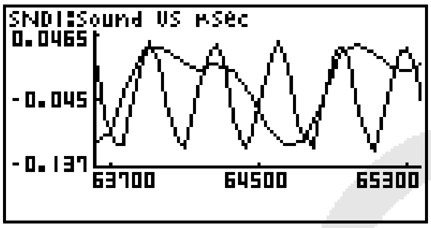


6. Za izhod iz načina povečave

u **Premikanje posameznega grafa na zaslonu z več grafi**

1. Ko zaslon grafa vsebuje več grafov, pritisnite K in nato 3(EDIT).
   • Prikaže se meni [EDIT].
2. Pritisnite 2(MOVE).
   • Prikaže se le eden od grafov, ki so bili prvotno na grafičnem zaslonu.
3. Z uporabo tipk f in ② se pomikajte po grafikonih, dokler se ne prikaže želeni grafikon, nato pa pritisnite w.
   • S tem vstopite v način premikanja in se ponovno prikažejo vsi grafi.
4. Z uporabo kurzorskih tipk d in e premikajte graf levo in desno, z uporabo kurzorskih tipk f in ②
   za premikanje grafa navzgor in navzdol.



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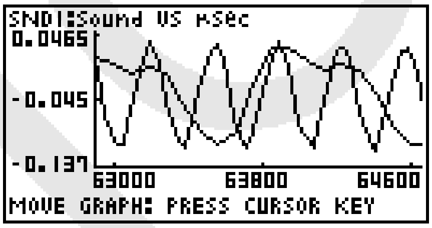


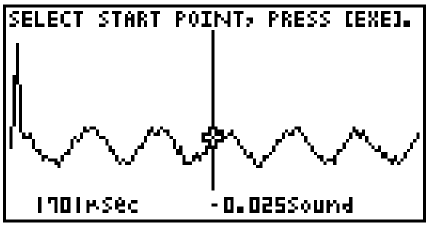
5. Za izhod iz načina premikanja pritisnite J

■ Izpis določenega območja grafa iz zvočnika (samo EA-200)

Za izhod določenega območja grafa valovne oblike zvočnih podatkov iz zvočnika uporabite naslednji postopek.

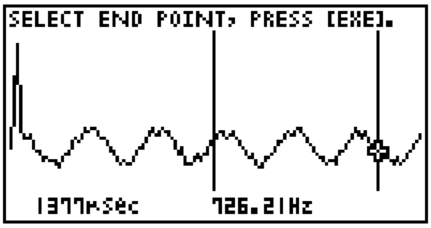
u **Za izpis grafa iz zvočnika**

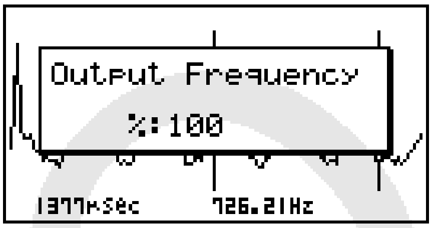
1. Na zaslonu grafa pritisnite K, nato pa 6(SPKR).
   • Prikaže se kazalec za izbiro območja na grafu.



2. Premaknite kazalec sledenja na začetno točko območja, ki ga želite izpisati iz zvočnika, in nato pritisnite w.

3. Premaknite kazalec sledenja na končno točko območja, ki ga želite predvajati prek zvočnika, in nato pritisnite w.
   - Ko določite začetno in končno točko, se na zaslonu prikaže spodnje pogovorno okno za izhodno frekvenco.



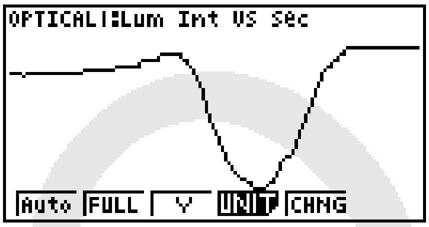


4. Vnesite odstotno vrednost za želeno izhodno frekvenco.
   - Specifikacija izhodne frekvence je odstotna vrednost. Če želite izhodni zvok ohraniti nespremenjen, določite 100 %. Če želite izhodni zvok dvigniti za eno oktavo, vnesite vrednost 200 %. Če želite izhodni zvok znižati za eno oktavo, vnesite vrednost 50 %.
5. Po vnosu vrednosti izhodne frekvence pritisnite w.
   - To izhodno valovno obliko med začetno in končno točko iz zvočnika EA-200.
   - Če zvoka, ki ste ga nastavili, iz kakršnega koli razloga ni mogoče izpisati, se prikaže sporočilo „Range Error“ (Napaka obsega). V tem primeru pritisnite J, da se vrnete na prejšnje zaslone nastavitev in po potrebi spremenite nastavitve.
6. Za prekinitev izhoda zvoka pritisnite tipko EA-200 [START/STOP].
7. Pritisnite w.
   - Prikaže se zaslon, kot je prikazan spodaj.

8. Če želite ponovno poskusiti z izhodom iz zvočnika, pritisnite 1 (Da). Če želite zapustiti postopek in se vrniti na zaslon z grafom, pritisnite 6 (Ne).
   - S pritiskom na 1 (Da) se vrnete v pogovorno okno „Output Frequency“ (Izhodna frekvenca). Od tam ponovite zgornje korake od koraka 4.

■ Nastavitev parametrov okna za pregled

Če med prikazom grafa pritisnete !3(V-Window), se na dnu zaslona prikaže meni funkcijskih tipk okna za pregled.



Pritisnite funkcijska tipka, ki ustreza parametru okna za pregled, ki ga želite konfigurirati.

Funkcijska tipka	Opis
1(Auto)	Samodejno uporabi naslednje parametre okna pogleda. Elementi osi Y: v skladu z velikostjo zaslona Elementi osi X: v skladu z velikostjo zaslona, ko 1 podatkovni element enakovreden 1 točki; 1 podatek je enakovreden 1 točki v drugih primerih
2(FULL)	Prilagodi velikost grafa, da se v celoti prilega zaslonu.
3(Y)	Prilagodi velikost grafa, tako da se celoten graf prilega na zaslon vzdolž osi Y, brez spreminjanja dimenzij osi X.
4(ENOTA)	Določa enoto številčne osi, ki se prikaže z nastavitvijo Econ Axes na zaslonu za nastavitev grafa (stran 3-13). 1 (μ sek): mikrosekunde 2 (msec): milisekunde 3 (sek): sekunde 4 (DHMS): dnevi, ure, minute, sekunde (1 dan, 2 uri, 30 minut, 5 sekund = 1d2h30m5s) 5 (Auto): samodejna izbira
5(CHNG)	Vklopi ali izklopi prikaz izvornih podatkov na grafičnem zaslonu.

Če želite zapreti meni funkcijskih tipk okna za pregled in se vrniti v standardni meni funkcijskih tipk,

12 Klicanje funkcij E-CON3 iz eActivity

Funkcije E-CON3 lahko pokličete iz eActivity tako, da v datoteko eActivity vključite »Econ strip«. V nadaljevanju so opisani vsi štirje razpoložljivi Econ stripi.

u **Econ SetupWizard strip**

Ta trak pokliče E-CON3 Setup Wizard. Econ Setup Wizard strip omogoča izvedbo naslednje serije operacij iz eActivity: nastavitev podatkovnega zapisovalnika z uporabo Setup Wizard R vzorčenje R grafično prikazovanje.

Opomba

- V primeru Econ SetupWizard strip, „3: Convert Program“ ni na voljo v pogovornem oknu „Complete!“.

u **Trak Econ AdvancedSetup**

Ta trak pokliče zaslon E-CON3 Advanced Setup. Advanced Setup omogoča dostop do skoraj vseh izvedljivih funkcij (razen pretvornika programa), vključno s podrobno nastavitvijo podatkovnega zapisovalnika in izvedbo vzorčenja; grafično prikazovanje in
Orodja za analizo grafov; sočasno vzorčenje z več senzorji v načinu MULTIMETER itd.

Opomba

- Uporaba traku Econ Advanced Setup za konfiguracijo nastavitev povzroči, da se informacije o nastavitvah registrirajo na ustreznem traku. To pomeni, da se pri naslednjem odprtju traku vzorčenje lahko izvede v skladu s prej konfiguriranimi informacijami o nastavitvah.

u **Trak Econ Sampling**

Ta trak izvaja merjenje z zapisovalnikom podatkov. Da shranite nastavitvene podatke zapisovalnika podatkov za ta trak, izvedite postopek Econ Advance Setup, ko trak prvič izvedete.

u **Trak Econ Graph**

Ta trak prikazuje vzorčene podatke, ki so zapisani na traku. Vzorčeni podatki se na trak zapišejo ob prvem izvajanju traku.

u **Econ Strip Kapaciteta pomnilnika Previdnostni ukrepi**

- Kapaciteta pomnilnika vsakega traku Econ je 25 KB. Če izvedete operacijo, ki povzroči preseganje te kapacitete, se bo pojavila napaka. Posebno previdnost je potrebna pri ravnanju z velikim številom vzorcev, ki lahko povzročijo preseganje kapacitete pomnilnika.
- Vedno poskrbite, da je FFT Graph izklopljen, kadar izvajate vzorčenje z mikrofonom. Če pustite FFT Graph vklopljen, se lahko zgodi, da bo zmogljivost pomnilnika presežena.
- Če pride do napake, pritisnite ! a' da se vrnete na zaslon delovnega prostora eActivity in postopek ponovite.
- Za informacije o preverjanju porabe pomnilnika za vsak trak glejte „10-5 Zaslon porabe pomnilnika datoteke eActivity“ v poglavju 10 tega priročnika.

Podrobnosti o delovanju eActivity najdete v poglavju 10 eActivity tega priročnika.

Proizvajalec:
CASIO COMPUTER CO., LTD.
6-2, Hon-machi 1-chome, Shibuya-ku, Tokio 151-8543, Japonska

Odgovoren v Evropski uniji: Casio Europe GmbH
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www.casio-europe.com

CASIO COMPUTER CO., LTD.

6-2, Hon-machi 1-chome
Shibuya-ku, Tokio 151-8543,
Japonska

V izdelku je lahko uporabljen eden ali več naslednjih patentov.
U.S.Pats. 7,927,221 8,214,413

SA2006-B

SL

fx-9860GIII
fx-9750GIII
fx-7400GIII

Strojna oprema

Navodila za uporabo

Spletna stran CASIO Worldwide Education

https://edu.casio.com

Priročniki so na voljo v več jezikih na

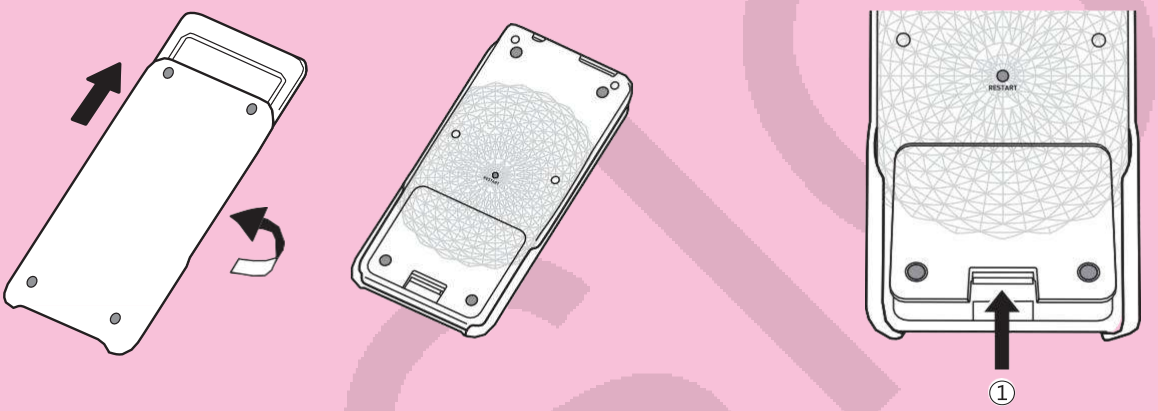
https://world.casio.com/manual/calc/

CASI

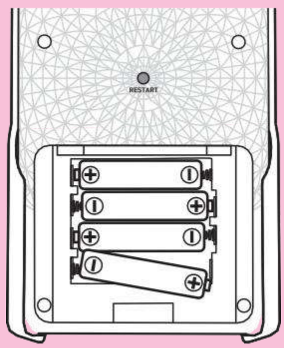
PREDEN PRVIČ UPORABITE KALKULATOR...

Baterije niso vgrajene v kalkulatorju že v tovarni.
Preden prvič uporabite kalkulator, upoštevajte spodnji postopek za vstavljanje baterij in nastavitev kontrasta zaslona.

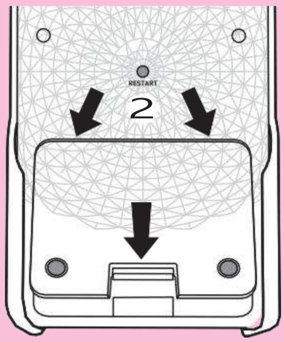
1. Prepričajte se, da ne pritisnete tipke O, nato pa nataknite ohišje na kalkulator in ga obrnite. Odstranite pokrovček baterij iz kalkulatorja tako, da s prstom potegnete na mestu, označenem z ①.



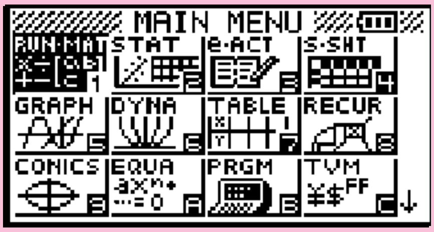
2. Vstavite štiri baterije, ki so priložene kalkulatorju.
   • Prepričajte se, da sta pozitivni (+) in negativni (–) pol baterij pravilno obrnjena.



3. Namestite pokrovček baterij, tako da se njegovi jezički vstavijo v luknji, označeni s številko 2, in obrnite kalkulator z sprednjo stranjo navzgor. Kalkulator se bo samodejno vklopil in prikazal se bo GLAVNI MENI.
   prikaže glavni meni.

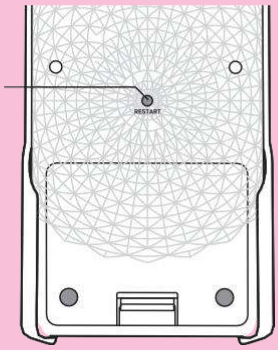


• Če glavni meni, prikazan na desni strani, ni na zaslonu, pritisnite gumb RESTART na zadnji strani kalkulatorja.



Zgornji zaslon prikazuje model fx-9860GIII. Zasloni drugih modelov se lahko nekoliko razlikujejo.

Gumb RESTART



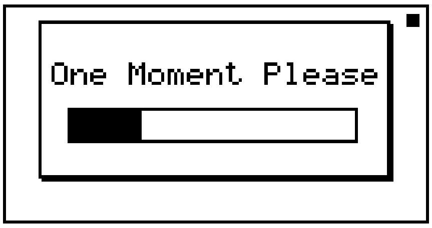
4. S puščičnimi tipkami (fc, d, e) izberite ikono **SYSTEM** in pritisnite w, nato pa pritisnite 1 (◀▶), da se prikaže zaslon za nastavitev kontrasta.

5. Nastavite kontrast.
   • Tipka za premikanje kurzorja e zaslon naredi kontrast temnejši.
   • Tipka za premikanje kurzorja d zaslon naredi svetlejšega.
   • 1(INIT) vrne kontrast zaslona na prvotno privzeto vrednost.

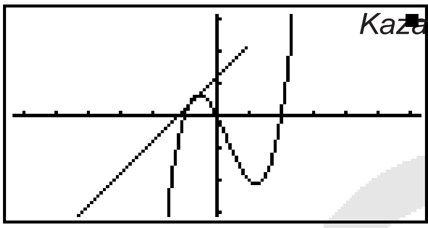
6. Za izhod iz nastavitve kontrasta zaslona pritisnite m.

Varnostni ukrepi pri uporabi tega izdelka

Na zaslonu se prikaže indikator napredka in/ali indikator zasedenosti, kadar kalkulator izvaja izračun, zapisuje v pomnilnik ali bere iz pomnilnika.



Napredek



Kazalnik zasedenosti

Nikoli ne pritisnite gumba RESTART ali ne odstranite baterij iz kalkulatorja, ko je na zaslonu prikazana vrstica napredka ali indikator zasedenosti. To lahko povzroči izgubo vsebine pomnilnika in okvaro kalkulatorja.

Uporabniki fx-9860GIII, fx-9750GIII...

Kalkulator je opremljen s pomnilnikom flash za shranjevanje podatkov. Priporočljivo je, da podatke vedno varnostno kopirate v pomnilnik flash. Podrobnosti o postopku varnostnega kopiranja najdete v poglavju „Uporaba upravitelja pomnilnika“ v ločenem priročniku za uporabo programske opreme.

Varnostne kopije datotek lahko prenesete tudi na računalnik, tako da med kalkulatorjem in računalnikom vzpostavite povezavo USB. Podrobnosti o prenosu datotek z računalnika na kalkulator najdete v poglavju „Poglavje 13 Podatkovna komunikacija“ v ločenem priročniku za uporabo programske opreme.

Varnostni ukrepi pri ravnanju

- Vaš kalkulator je sestavljen iz natančnih komponent. Nikoli ne poskušajte ga razstaviti.
- Izogibajte se padcem kalkulatorja in močnim udarcem.
- Kalkulatorja ne shranjujte in ne puščajte na mestih, izpostavljenih visokim temperaturam ali vlagi ali velikim količinam prahu. Pri izpostavljenosti nizkim temperaturam lahko kalkulator potrebuje več časa za prikaz rezultatov ali celo preneha delovati. Ko se kalkulator vrne na normalno temperaturo, bo ponovno deloval pravilno.
- Med izračunavanjem se zaslon izklopi in tipke ne delujejo. Med uporabo tipkovnice pazite na zaslon, da se prepričate, da vse tipke delujejo pravilno.
- Glavne baterije zamenjajte enkrat letno, ne glede na to, koliko ste kalkulator uporabljali v tem obdobju. Nikoli ne puščajte izpraznjenih baterij v prostoru za baterije. Lahko namreč iztečejo in poškodujejo napravo.
- S tem izdelkom ne uporabljajte primarnih baterij na osnovi niklja. Nezdružljivost takšnih baterij in specifikacij izdelka lahko povzroči krajšo življenjsko dobo baterije in nepravilno delovanje izdelka.
- Baterije hranite izven dosega majhnih otrok. V primeru zaužitja takoj poiščite zdravniško pomoč.
- Za čiščenje naprave ne uporabljajte hlapnih tekočin, kot so razredčila ali bencin. Obrišite jo z mehko, suho krpo ali krpo, navlaženo z raztopino vode in nevtralnega detergenta, ki jo pred tem ožemite.
- Pri brisanju prahu z zaslona bodite vedno previdni, da ga ne opraskate.
- Proizvajalec in njegovi dobavitelji v nobenem primeru ne odgovarjajo vam ali kateri koli drugi osebi za kakršno koli škodo, stroške, izgubljeni dobiček, izgubljene prihranke ali kakršno koli drugo škodo, ki nastane zaradi izgube podatkov in/ali formul, ki nastanejo zaradi okvare, popravil ali zamenjave baterije. Vaša odgovornost je, da pripravite fizične zapise podatkov, da se zaščitite pred takšno izgubo podatkov.
- Baterij, tekočih kristalnih zaslonov ali drugih komponent nikoli ne odstranjujte z izgorevanjem.
- Pri zamenjavi baterij se prepričajte, da je stikalo za vklop nastavljeno na OFF.
- Če je kalkulator izpostavljen močnemu elektrostatičnemu naboju, se lahko poškoduje vsebina njegovega pomnilnika ali prenehajo delovati tipke. V takem primeru izvedite ponastavitev, da izbrišete pomnilnik in ponovno vzpostavite normalno delovanje tipk.
- Če kalkulator iz kakršnega koli razloga preneha delovati pravilno, s tankim, ostro konico pritisnite gumb RESTART na zadnji strani kalkulatorja. Upoštevajte, da se s tem izbrišejo vsi podatki v pomnilniku kalkulatorja.
- Upoštevajte, da lahko močne vibracije ali udarci med izvajanjem programa povzročijo prekinitev izvajanja ali poškodujejo vsebino pomnilnika kalkulatorja.
- Uporaba kalkulatorja v bližini televizorja ali radia lahko povzroči motnje v sprejemu televizijskega ali radijskega signala.
- Preden domnevate, da je naprava okvarjena, pazljivo ponovno preberite ta priročnik za uporabo in se prepričajte, da težava ni posledica nezadostne moči baterije, napak pri programiranju ali napak pri delovanju.

Vse pomembne podatke shranite v fizični obliki!

Velika zmogljivost pomnilnika naprave omogoča shranjevanje velikih količin podatkov.

Upoštevajte pa, da lahko nizka napetost baterij ali nepravilna zamenjava baterij, ki napajajo napravo, povzroči poškodbo ali celo popolno izgubo podatkov, shranjenih v pomnilniku. Na shranjene podatke lahko vpliva tudi močan elektrostatični naboj ali močan udar. Za zaščito pred izgubo podatkov je vaša odgovornost, da shranite varnostne kopije podatkov.

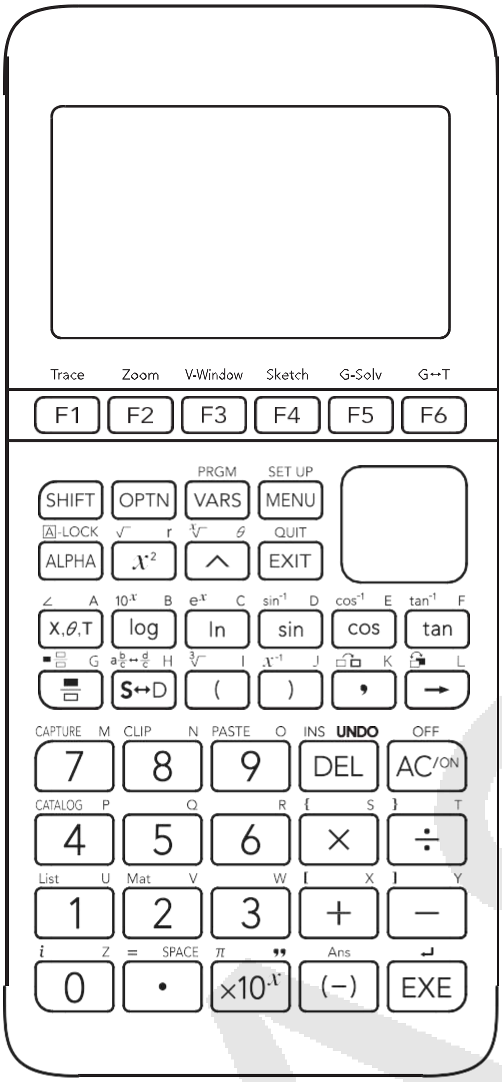
Ker ta kalkulator pri izvajanju notranjih izračunov uporablja neuporabljen pomnilnik kot delovno območje, lahko pride do napake, če ni na voljo dovolj pomnilnika za izvajanje izračunov. Da bi se izognili takim težavam, je priporočljivo, da vedno pustite 1 ali 2 kB pomnilnika prostega (neuporabljenega).

CASIO Computer Co., Ltd. v nobenem primeru ne odgovarja nikomur za posebne, posredne, naključne ali posledične škode v zvezi z nakupom ali uporabo teh materialov ali zaradi njih. Poleg tega CASIO Computer Co., Ltd. ne odgovarja za nobene zahtevke kakršne koli vrste v zvezi z uporabo teh materialov s strani katere koli druge stranke.

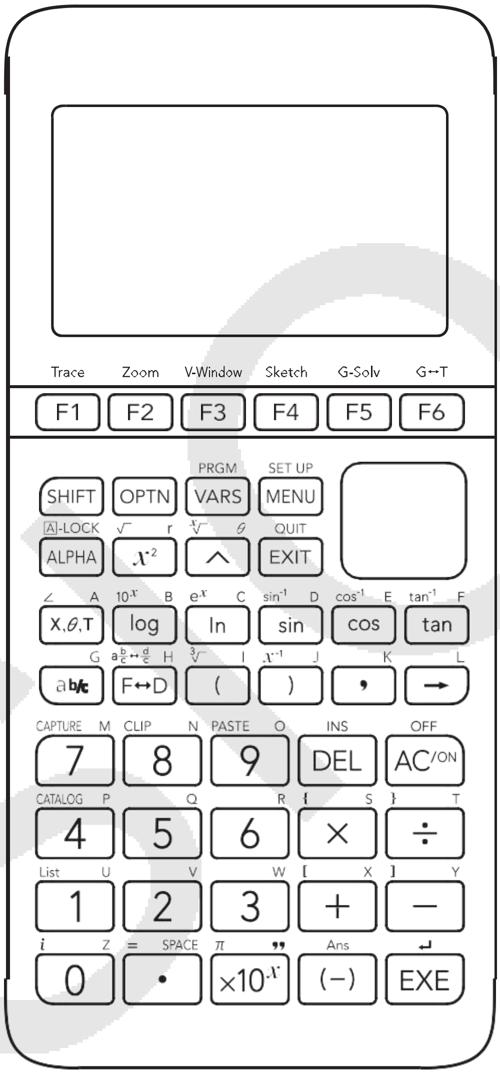
- Vsebina tega priročnika za uporabnika se lahko spremeni brez predhodnega obvestila.
- Brez izrecnega pisnega soglasja proizvajalca ni dovoljeno reproducirati nobenega dela tega priročnika za uporabnika v kakršni koli obliki.
- Vso dokumentacijo za uporabnike hranite na dosegu roke za poznejšo uporabo.

Vsebina

1. Razpored tipk



fx-9860GIII / fx-9750GIII



fx-7400GIII

2. Tehnične

Spremenljivke: 28

Območje izračuna:

$\pm 1 \times 10^{-99}$ do $\pm 9{,}999999999 \times 10^{99}$ in 0. Notranje operacije uporabljajo 15-mestno mantiso.

Eksponentni prikazni razpon: Norma 1: $10^{-2} > |x|, |x| > 10^{10}$
Norm 2: $10^{-9} > |x|, |x| > 10^{10}$

Zmogljivost programa: fx-9860GIII, fx-9750GIII: 62.000 bajtov (maks.)
fx-7400GIII: 20.000 bajtov (maks.)

Zmogljivost pomnilnika: fx-9860GIII, fx-9750GIII: 3 MB (maks.)
fx-7400GIII: brez

Napajanje: štiri baterije velikosti AAA (LR03 (AM4))

Poraba energije: 0,35 W

Približna življenjska doba baterije

300 ur (neprekinjeno prikazovanje glavnega menija)
230 ur neprekinjenega delovanja (5 minut izračunavanja, 55 minut prikazovanja) 1 leto (neuporabljena z izklopljeno napajanje)

- Katera koli od naslednjih možnosti lahko skrajša življenjsko dobo baterije.
  - Zaporedno izvajanje izračunov programa
  - Proizvajalec in tip uporabljene baterije, razlike med posameznimi baterijami
  - Pogoji delovanja (uporabljene aplikacije)
  - Delovanje v načinu pregleda

Samodejno izklapljanje:

Napajanje se samodejno izklopi približno 10 minut ali približno 60 minut po zadnji uporabi.

Temperatura okolice: od 0 °C do 40 °C (od 32 °F do 104 °F)

Dimenzije: 18,7 mm (V)× 83,5 mm (Š)× 175,5 mm (G)
3/4" (V)× 3 1/4" (Š)× 6 7/8" (G)

Približna teža: 190 g (6,7 oz) (vključno z baterijami)

Podatkovne

3-pinski serijski vmesnik

Metoda: Start-stop (asinkronna), poldupleksna

Hitrost prenosa (BPS):

115200 bitov/sekundo (normalno)
38400 bitov/sekundo (ukazi Send38k/Receive38k)

<115200 bitov/sekundo>

Paritet: EVEN

Dolžina bita: 8 bitov

Stop bit:

Pošiljanje: 1 bit

Prejem: 1 bit

Vključuje pariteto (Nobena) 1 bit

X ON/X OFF Nadzor: Ni

<38400 bitov/sekundo>

Paritet: Ni

Dolžina bita: 8 bitov

Stop bit:

Pošiljanje: 3 biti

Sprejem: 2 biti

Vključuje pariteto (ni) 1 bit

X ON/X OFF Nadzor: Ni

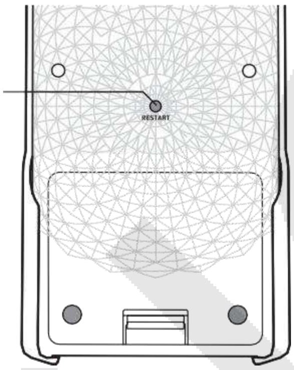
USB-priključek (vsi modeli razen fx-7400GIII)

V skladu s standardi USB 2.0

3. Ponovni zagon in ponastavitev

u Ponovni zagon

Če kalkulator začne delovati nenormalno, ga lahko ponovno zaženete s pritiskom na gumb RESTART. Upoštevajte pa, da gumb RESTART uporabite le v skrajnem primeru. Običajno pritisk na gumb RESTART ponovno zažene operacijski sistem kalkulatorja, tako da se programi, grafične funkcije in drugi podatki v pomnilniku kalkulatorja ohranijo.



Pomembno!

Kalkulator ob izklopu napajanja naredi varnostno kopijo uporabniških podatkov (glavni pomnilnik) in ob ponovnem vklopu napajanja naloži varnostno kopijo podatkov.

Ko pritisnete gumb RESTART, se kalkulator ponovno zažene in naloži varnostno kopijo podatkov. To pomeni, da če pritisnete gumb RESTART po urejanju programa, grafične funkcije ali drugih podatkov, se vsi podatki, ki niso bili varnostno kopirani, izgubijo.

u Ponastavitev

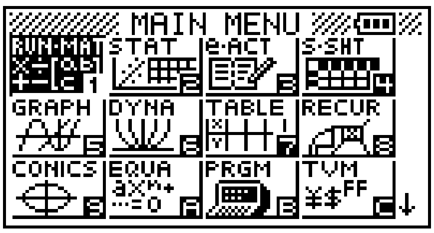
Uporabite ponastavitev, če želite izbrisati vse podatke, ki so trenutno v pomnilniku kalkulatorja, in vrniti vse nastavitve načina na privzete vrednosti.

Pred ponastavitvijo najprej naredite pisno kopijo vseh pomembnih podatkov. Podrobnosti najdete v poglavju „Ponastavitev“ v ločenem priročniku za uporabo programske opreme.

4. Napajanje

Ta kalkulator napaja štiri baterije velikosti AAA (LR03 (AM4)).

Ikona v zgornjem desnem kotu zaslona glavnega menija prikazuje trenutno stanje baterij.



Raven 3
Raven 2
Raven 1
Izpraznjeno

Čim prej zamenjajte baterije, ko se prikaže sporočilo „ “ (Raven 1).

Če se na zaslonu prikaže naslednje sporočilo, takoj izklopite kalkulator in zamenjajte baterije v skladu z navodili.

```
Low Batteries!

Please Replace
```

Če poskušate nadaljevati z uporabo kalkulatorja, se bo ta samodejno izklopil, da bi zaščitil vsebino pomnilnika. Kalkulatorja ne boste mogli ponovno vklopiti, dokler ne zamenjate baterij.

Baterije zamenjajte vsaj enkrat letno, ne glede na to, koliko računalo uporabljate v tem času.

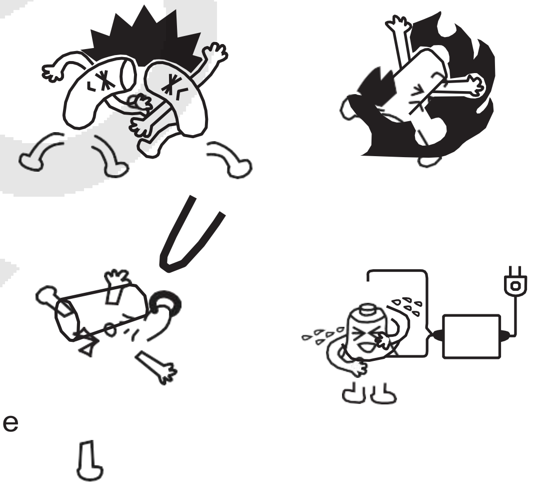
Baterije, ki so priložene temu kalkulatorju, se med prevozom in skladiščenjem nekoliko izpraznijo. Zaradi tega jih bo morda treba zamenjati prej, kot je običajna pričakovana življenjska doba baterij.

■ Zamenjava baterij

Varnostni ukrepi:

Nepravilna uporaba baterij lahko povzroči njihovo poškodbo ali iztekanje, kar lahko poškoduje notranjost kalkulatorja. Upoštevajte naslednje previdnostne ukrepe:

- Prepričajte se, da sta pozitivni (+) in negativni (–) pol vsake baterije obrnjena v pravo smer.
- Nikoli ne mešajte baterij različnih tipov.
- Nikoli ne mešajte starih in novih baterij.
- Nikoli ne puščajte izpraznjenih baterij v prostoru za baterije.
- Baterije odstranite, če kalkulatorja ne nameravate uporabljati dalj časa.
- Nikoli ne poskušajte ponovno napolniti baterij, ki so priložene kalkulatorju.
- Baterij ne izpostavljajte neposredni vročini, ne dopustite, da bi prišlo do kratkega stika, in jih ne poskušajte razstaviti.
  kratkega stika ali jih poskušajte razstaviti.



(Če pride do iztekanja baterije, takoj očistite prostor za baterije v kalkulatorju in pazite, da tekočina iz baterije ne pride v neposreden stik s kožo.)

Baterije hranite izven dosega majhnih otrok. V primeru zaužitja se takoj posvetujte z zdravnikom.

---

u **Zamenjava baterij**

- Nikoli ne vklopite kalkulatorja, če so baterije odstranjene ali niso pravilno vstavljene. To lahko povzroči izbris podatkov iz pomnilnika in nepravilno delovanje kalkulatorja. Če nepravilno ravnanje z baterijami povzroči takšne težave, pravilno vstavite baterije in nato izvedite ponovni zagon, da se nadaljuje normalno delovanje.
- Zamenjajte vse štiri baterije z novimi.

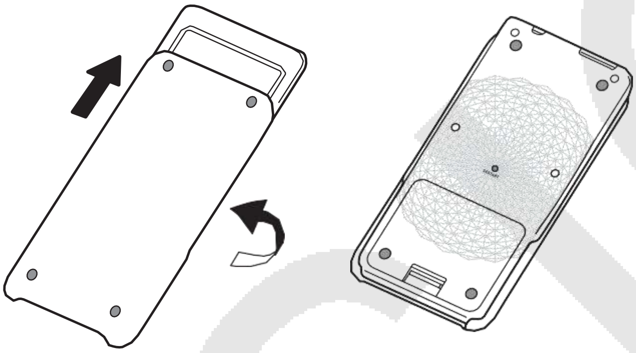
fx-9860GIII, fx-9750GIII:
Če med urejanjem e-aktivnosti izklopite kalkulator in nato zamenjate baterije, se lahko zgodi, da se podatki, ki jih urejate, izbrišejo. Pred izklopom kalkulatorja in zamenjavo baterij nujno shranite podatke e-aktivnosti.

1. Pritisnite ! o(OFF), da izklopite kalkulator.

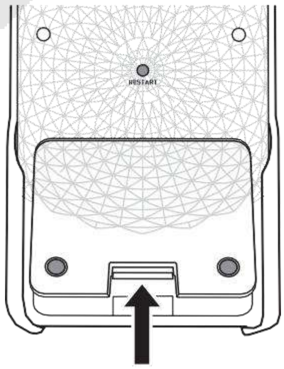
   Opozorilo!

   - Pred zamenjavo baterij se prepričajte, da ste izklopili kalkulator. Zamenjava baterij, ko je naprava vklopljena, bo povzročila izbris podatkov v pomnilniku.

2. Da ne bi po nesreči pritisnili tipko o, najprej namestite ohišje na kalkulator in ga nato obrnite.



3. Odstranite pokrovček baterij iz kalkulatorja tako, da ga potegnete s prstom na mestu, označenem z ①.



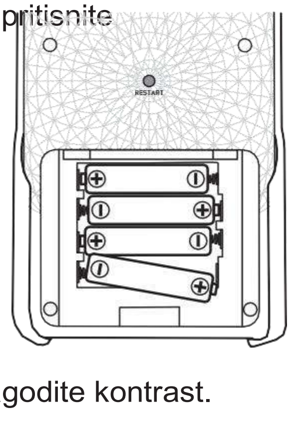
①

4. Odstranite štiri stare baterije.

5. Vstavite nov komplet štirih baterij in se prepričajte, da sta pozitivni (+) in negativni (–) pol naravnana v pravo smer.

6. Namestite pokrov baterijskega predela.

7. Obrnite kalkulator z sprednjo stranjo navzgor in snemite ohišje. Nato pritisnite o, da vklopite napajanje.



- Če so številke na zaslonu po vklopu preveč svetle in težko vidne, prilagodite kontrast.

■ O funkciji samodejnega izklopa

Kalkulator se samodejno izklopi, če v času, ki ga določite za samodejni izklop, ne izvedete nobene operacije. Kot čas za samodejni izklop lahko določite približno 10 minut ali približno 60 minut (glejte „Nastavitve lastnosti napajanja“ v ločenem priročniku za uporabo programske opreme). Za ponovno vklop napajanja pritisnite o.

CASIO®

CASIO COMPUTER CO., LTD.

6-2, Hon-machi 1-chome
Shibuya-ku, Tokio 151-8543,
Japonska

V izdelku je lahko uporabljen eden ali več naslednjih patentov.
U.S.Pats. 7,927,221 8,214,413

SA2407-B

EN

fx-9860GIII
fx-9750GIII
fx-7400GIII

Hardware
User's Guide

CASIO Worldwide Education Website

https://edu.casio.com

Manuals are available in multi languages at

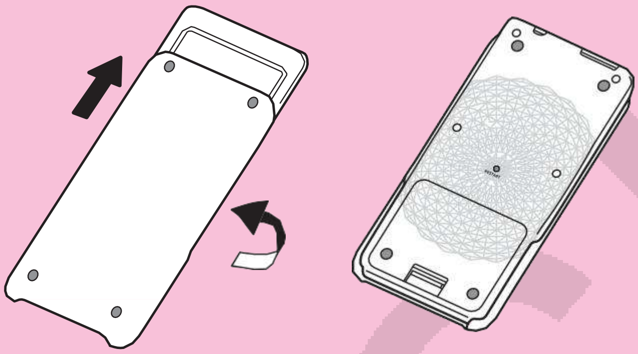
https://world.casio.com/manual/calc/

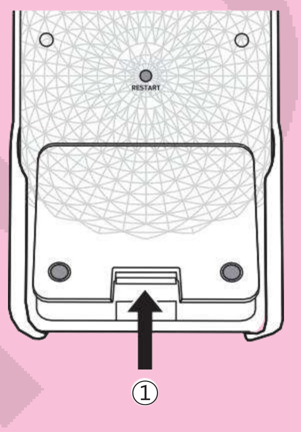
CASIO®

BEFORE USING THE CALCULATOR FOR THE FIRST TIME...

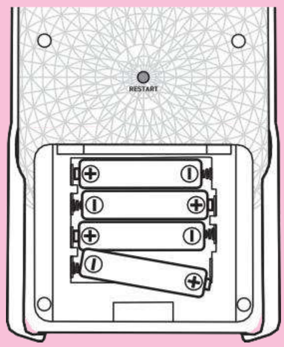
Batteries are not loaded in your calculator at the factory.
Be sure to follow the procedure below to load batteries and adjust the display contrast before trying to use the calculator for the first time.

1. Making sure that you do not accidently press the ○ key, slide the case onto the calculator and then turn the calculator over. Remove the battery cover from the calculator by pulling with your finger at the point marked ①.

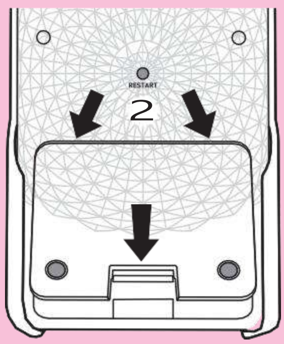




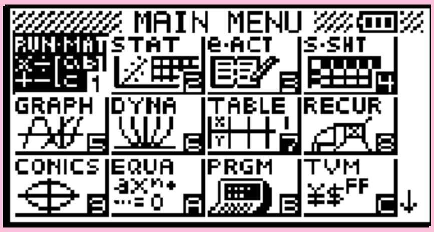
2. Load the four batteries that come with the calculator.
   • Make sure that the positive (+) and negative (–) ends of the batteries are facing correctly.



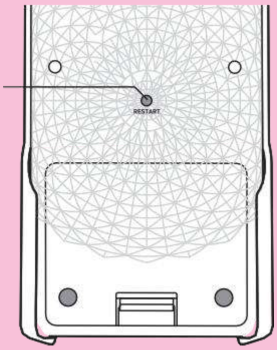
3. Replace the battery cover, making sure that its tabs enter the holes marked 2 and turn the calculator front side up. The calculator will turn on automatically and the MAIN MENU will appear on the display.



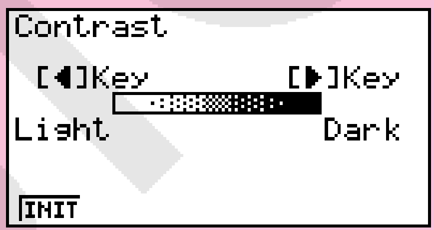
• If the Main Menu shown to the right is not on the display, press the RESTART button on the back of the calculator.



The above screen shows the fx-9860GIII. The appearance of the screens of other models may be slightly different.



4. Use the cursor keys (f, c, d, e) to select the **SYSTEM** icon and press w, then press 1( ) to display the contrast adjustment screen.

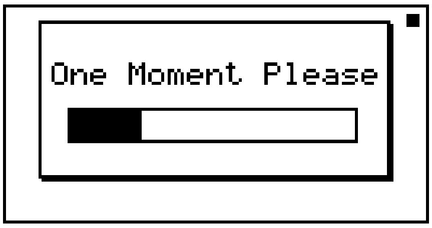


5. Adjust the contrast.
   • The e cursor key makes display contrast darker.
   • The d cursor key makes display contrast lighter.
   • 1(INIT) returns display contrast to its initial default.

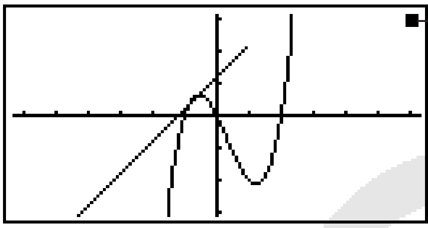
6. To exit display contrast adjustment, press m.

Precautions when Using this Product

A progress bar and/or a busy indicator appear on the display whenever the calculator is performing a calculation, writing to memory, or reading from memory.



Progress bar



Busy indicator

Never press the RESTART button or remove the batteries from the calculator when the progress bar or busy indicator is on the display. Doing so can cause memory contents to be lost and can cause malfunction of the calculator.

fx-9860GIII, fx-9750GIII users...

The calculator is equipped with flash memory for data storage. It is recommended that you always backup your data to flash memory. For details about the backup procedure, see “Using the Memory Manager” in the separate Software User’s Guide.

You can also transfer backup files to a computer by establishing a USB connection between the calculator and a computer. For information about transferring files from a computer to the calculator, see “Chapter 13 Data Communication” in the separate Software User’s Guide.

Handling Precautions

- Your calculator is made up of precision components. Never try to take it apart.
- Avoid dropping your calculator and subjecting it to strong impact.
- Do not store the calculator or leave it in areas exposed to high temperatures or humidity, or large amounts of dust. When exposed to low temperatures, the calculator may require more time to display results and may even fail to operate. Correct operation will resume once the calculator is brought back to normal temperature.
- The display will go blank and keys will not operate during calculations. When you are operating the keyboard, be sure to watch the display to make sure that all your key operations are being performed correctly.
- Replace the main batteries once every one year regardless of how much the calculator is used during that period. Never leave dead batteries in the battery compartment. They can leak and damage the unit.
- Do not use a nickel-based primary battery with this product. Incompatibility between such batteries and product specifications can result in shorter battery life and product malfunction.
- Keep batteries out of the reach of small children. If swallowed, consult a physician immediately.
- Avoid using volatile liquids such as thinner or benzine to clean the unit. Wipe it with a soft, dry cloth, or with a cloth that has been moistened with a solution of water and a neutral detergent and wrung out.
- Always be gentle when wiping dust off the display to avoid scratching it.
- In no event will the manufacturer and its suppliers be liable to you or any other person for any damages, expenses, lost profits, lost savings or any other damages arising out of loss of data and/or formulas arising out of malfunction, repairs, or battery replacement. It is up to you to prepare physical records of data to protect against such data loss.
- Never dispose of batteries, the liquid crystal panel, or other components by burning them.
- Be sure that the power switch is set to OFF when replacing batteries.
- If the calculator is exposed to a strong electrostatic charge, its memory contents may be damaged or the keys may stop working. In such a case, perform the Reset operation to clear the memory and restore normal key operation.
- If the calculator stops operating correctly for some reason, use a thin, pointed object to press the RESTART button on the back of the calculator. Note, however, that this clears all the data in calculator memory.
- Note that strong vibration or impact during program execution can cause execution to stop or can damage the calculator's memory contents.
- Using the calculator near a television or radio can cause interference with TV or radio reception.
- Before assuming malfunction of the unit, be sure to carefully reread this User's Guide and ensure that the problem is not due to insufficient battery power, programming or operational errors.

Be sure to keep physical records of all important data!

The large memory capacity of the unit makes it possible to store large amounts of data.

You should note, however, that low battery power or incorrect replacement of the batteries that power the unit can cause the data stored in memory to be corrupted or even lost entirely. Stored data can also be affected by strong electrostatic charge or strong impact. It is up to you to keep back up copies of data to protect against its loss.

Since this calculator employs unused memory as a work area when performing its internal calculations, an error may occur when there is not enough memory available to perform calculations. To avoid such problems, it is a good idea to leave 1 or 2 kbytes of memory free (unused) at all times.

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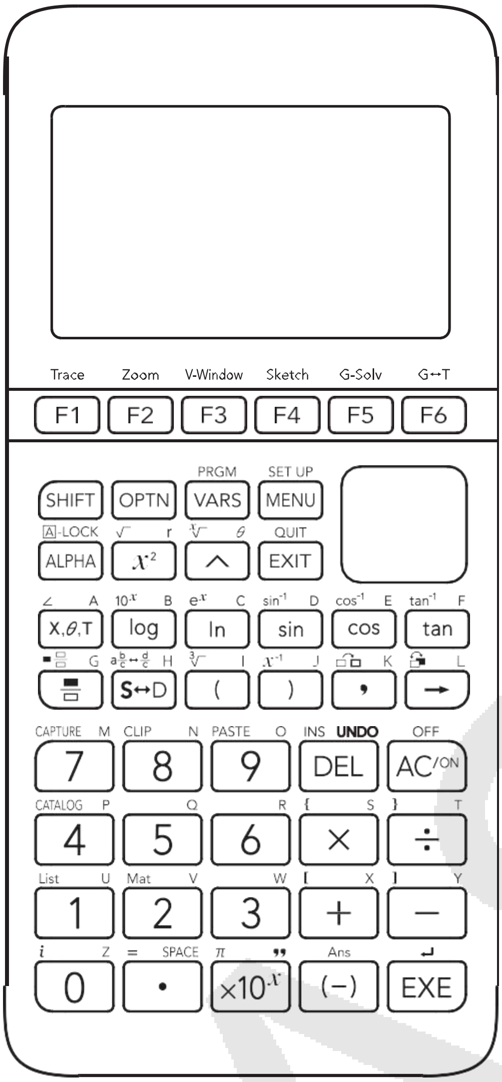
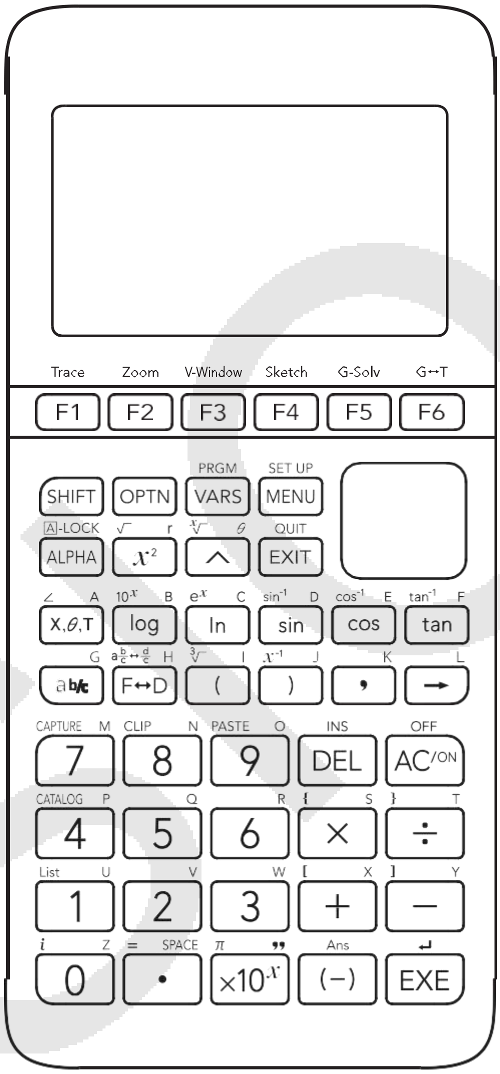
- Be sure to keep all user documentation handy for future reference.

Contents

1. Key Layout



fx-9860GIII / fx-9750GIII



fx-7400GIII

2. Specifications

Variables: 28

Calculation range:

$\pm 1 \times 10^{-99}$ to $\pm 9.999999999 \times 10^{99}$ and 0. Internal operations use 15-digit mantissa.

Exponential display range: Norm 1: $10^{-2} > |x|, |x| > 10^{10}$
Norm 2: $10^{-9} > |x|, |x| > 10^{10}$

Program capacity: fx-9860GIII, fx-9750GIII: 62,000 bytes (max.)
fx-7400GIII: 20,000 bytes (max.)

Storage memory capacity: fx-9860GIII, fx-9750GIII: 3MB (max.)
fx-7400GIII: None

Power supply: Four AAA-size batteries (LR03 (AM4))

Power consumption: 0.35 W

Approximate battery life

300 hours (continuous display of main menu)
230 hours continuous operation (5 minutes calculation, 55 minutes display)
1 year (unused with power off)

- Any of the following can shorten battery life.
  - Sequential program calculation execution
  - Manufacturer and type of battery used, differences between individual batteries
  - Operating conditions (applications used)
  - Examination Mode operation

Auto power off:

Power is automatically turned off approximately 10 minutes or approximately 60 minutes after last operation.

Ambient temperature range: 0°C to 40°C (32°F to 104°F)

Dimensions: 18.7 mm (H) × 83.5 mm (W) × 175.5 mm (D)
3/4" (H) × 3 1/4" (W) × 6 7/8" (D)

Approximate weight: 190 g (6.7 oz) (including batteries)

Data Communications

3-pin serial port

Method: Start-stop (asynchronous), half-duplex

Transmission speed (BPS):

115200 bits/second (normal)

38400 bits/second (Send38k/Receive38k commands)

<115200 bits/second>

Parity: EVEN

Bit length: 8 bits

Stop bit:

Send: 1 bit

Receive: 1 bit

Includes parity (None) 1-bit

X ON/X OFF Control: None

<38400 bits/second>

Parity: None

Bit length: 8 bits

Stop bit:

Send: 3 bits

Receive: 2 bits

Includes parity (None) 1-bit

X ON/X OFF Control: None

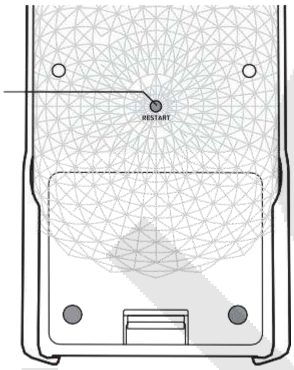
USB port (All models except fx-7400GIII)

In accordance with USB 2.0 standards

3. Restart and Reset

Restart

Should the calculator start to act abnormally, you can restart it by pressing the RESTART button. Note, however, that you should only use the RESTART button only as a last resort. Normally, pressing the RESTART button reboots the calculator's operating system, so programs, graph functions and other data in calculator memory is retained.



Important!

The calculator backs up user data (main memory) when you turn power off and loads the backed up data when you turn power back on.

When you press the RESTART button, the calculator restarts and loads backed up data. This means that if you press the RESTART button after you edit a program, graph function, or other data, any data that has not been backed up will be lost.

Reset

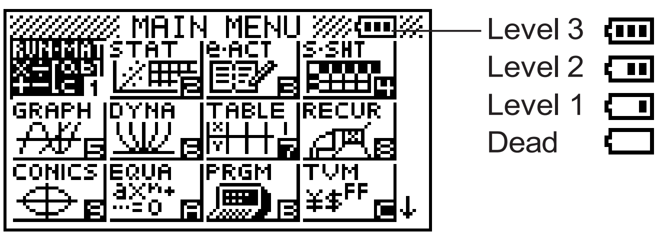
Use reset when you want to delete all data currently in calculator memory and return all mode settings to their initial defaults.

Before performing the reset operation, first make a written copy of all important data. For details, see "Reset" in the separate Software User's Guide.

4. Power Supply

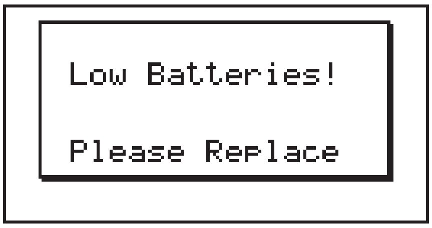
This calculator is powered by four AAA-size (LR03 (AM4)) batteries.

An icon in the upper right corner of the Main Menu screen indicates the current battery level.



Replace batteries as soon as possible whenever (Level 1) is indicated.

If the following message appears on the display, immediately turn off the calculator and replace the batteries as instructed.



If you try to continue using the calculator, it will automatically turn off in order to protect memory contents. You will not be able to turn power back on until you replace batteries.

Be sure to replace the batteries at least once every one year, no matter how much you use the calculator during that time.

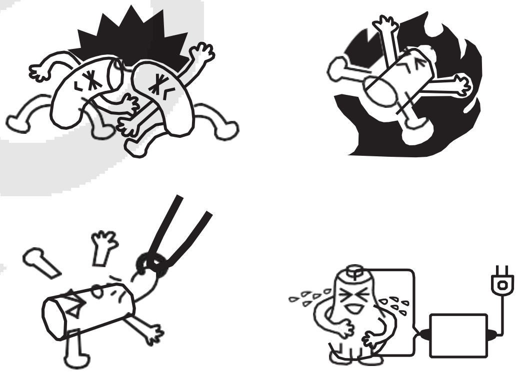
The batteries that come with this calculator discharge slightly during shipment and storage. Because of this, they may require replacement sooner than the normal expected battery life.

■ Replacing Batteries

Precautions:

Incorrectly using batteries can cause them to burst or leak, possibly damaging the interior of the calculator. Note the following precautions:

- Be sure that the positive (+) and negative (–) poles of each battery are facing in the proper directions.
- Never mix batteries of different types.
- Never mix old batteries and new ones.
- Never leave dead batteries in the battery compartment.
- Remove the batteries if you do not plan to use the calculator for long periods.
- Never try to recharge the batteries supplied with the calculator.
- Do not expose batteries to direct heat, let them become shorted, or try to take them apart.



(Should a battery leak, clean out the battery compartment of the calculator immediately, taking care to avoid letting the battery fluid come into direct contact with your skin.)

Keep batteries out of the reach of small children. If swallowed, consult with a physician immediately.

u To replace the batteries

- Never turn on the calculator while the batteries are removed or not loaded correctly. Doing so can cause memory data to be deleted and malfunction of the calculator. If mishandling of batteries causes such problems, correctly load batteries and then perform the restart operation to resume normal operation.
- Be sure to replace all four batteries with new ones.

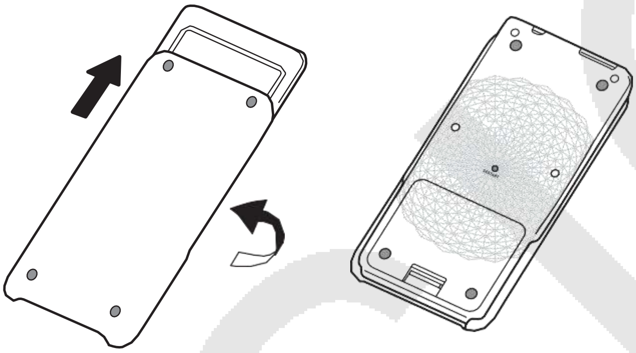
fx-9860GIII, fx-9750GIII:
Turning off the calculator while editing an eActivity and then changing batteries can cause the data you are editing to be deleted. Be sure to save the eActivity data before turning off the calculator and changing batteries.

1. Press ! o(OFF) to turn off the calculator.

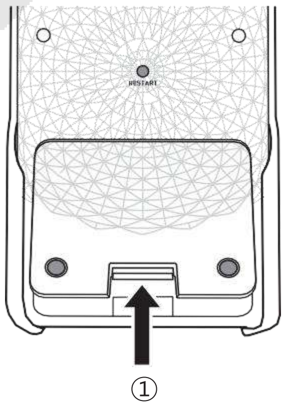
   Warning!

   • Be sure to turn the calculator off before replacing batteries. Replacing batteries with power on will cause data in memory to be deleted.

2. Making sure that you do not accidently press the o key, slide the case onto the calculator and then turn it over.



3. Remove the battery cover from the calculator by pulling with your finger at the point marked ①.

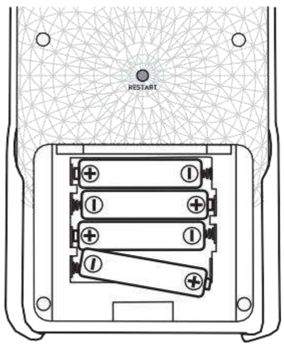


4. Remove the four old batteries.

5. Load a new set of four batteries, making sure that their positive (+) and negative (–) ends are facing in the proper directions.

6. Replace the battery cover.

7. Turn the calculator front side up and slide off its case. Next, press o to turn on power.



• If the figures on the display appear too light and hard to see after you turn on power, adjust the contrast.

■ About the Auto Power Off Function

Calculator power turns off automatically if you do not perform any operation within the Auto Power Off trigger time you specify. You can specify either approximately 10 minutes or approximately 60 minutes as the trigger time (see “Power Properties Settings” in the separate Software User’s Guide). To restore power, press o.

CASIO®

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One or more of the following patents may be used in the product.
U.S.Pats. 7,927,221 8,214,413

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