EN

Scientific Calculator

fx-97SG CW

User's Guide

CASIO Worldwide Education Website

https://edu.casio.com

Manuals are available in multi languages at

https://world.casio.com/manual/calc/

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CASIO

Table of Contents

Before Using the Calculator

Read This First

About This Manual

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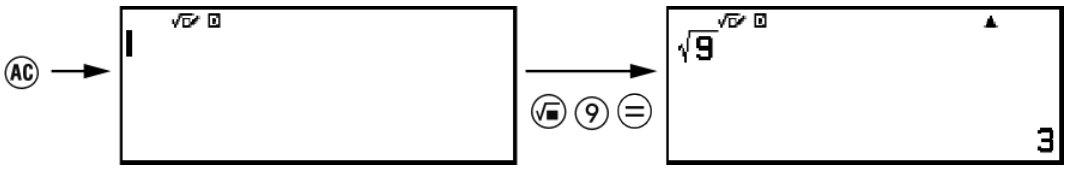
Key Operations

The example below shows how key operations are represented in this manual.

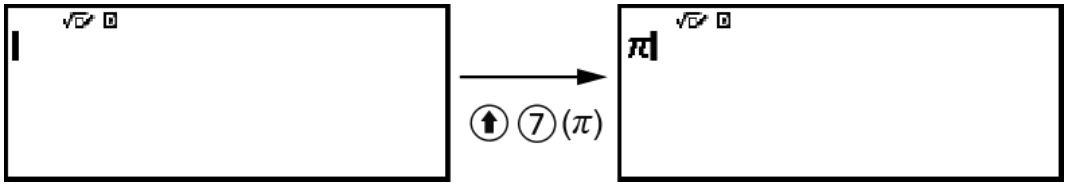
Example 1: (AC) (√) (9) (=)

Keys should be pressed in the sequence shown above (left to right).



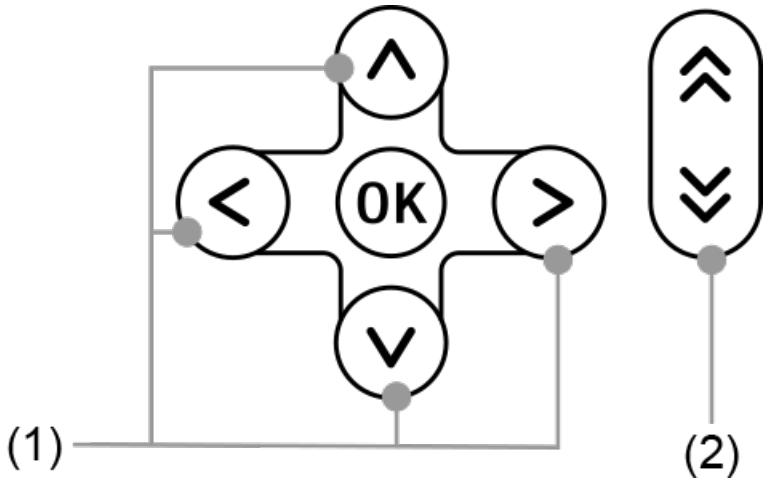
Example 2: (Shift) (7) (π)*

The above indicates you should press (Shift) and then (7), which will input a π symbol. All multiple-key input operations are indicated like this. Key cap markings are shown, followed by the input character or command in parentheses.



* Refer to **"Key Markings" (page 12)** for more information about the key symbols used in this example.

Example 3: ⓐ, ⓥ, ⓒ, ⓑ, ⓔ, ⓕ



- Individual cursor keys indicated by (1) are represented as ⓐ, ⓥ, ⓒ, ⓑ.
- Individual page scroll keys indicated by (2) are represented as ⓔ, ⓕ.

Menu Operations

Some operations in this manual use a simplified form of menu operations, as shown in the examples below.

Example 1

ⓜ – [Other] > [π]

or

Press ⓜ, and then select [Other] > [π].

Actual Operation 1

1. Press ⓜ. 2. Use ⓐ and ⓥ to select [Other], and then press ⓞⓚ. 3. Use ⓐ and ⓥ to select [π], and then press ⓞⓚ.

Example 2

ⓗ – Calculate

or

Press ⌂, select the Calculate app icon, and then press OK.

Actual Operation 2

1. Press ⌂.
2. Use the cursor keys (^, v, <, >) to select the Calculate app icon, and then press OK.

OK Key and = Key

The OK key and = key perform the same operation. In this manual, OK is used for selecting or applying a setting, while = is used for executing a calculation. Note, however, that it makes no difference whether you press OK or = for operations where either OK or = is shown.

Examples

If you are not instructed to use a specific calculator app or to configure particular settings for an example operation, the app and settings below are assumed.

Calculator app: Calculate

Settings: Initial default calculator settings

For information about returning the calculator to its initial default settings, see **"Initializing the Calculator" (page 6)**.

Initializing the Calculator

Important!

- The procedure below initializes all calculator settings, except for Contrast and Auto Power Off. Also clears all data stored in calculator memory.

1. Press ⌂ to display the HOME screen.
2. Use the cursor keys (^, v, <, >) to select a calculator app icon, and then press OK.
3. Press ☰, and then select [Reset] > [Initialize All] > [Yes].
   - This displays the HOME screen.

Calculator "Get Started" Screen

While the HOME screen is displayed, pressing the ☰ key will display the "Get Started" screen, which includes the information below.

- QR Code for accessing the "Get Started" webpage of the Worldwide Education Service (**https://wes.casio.com/calc/cw/**)
  The Get Started webpage gives you access to the User's Guide and other related information to help you get started with your calculator.
- Calculator ID number (24-character string)

Press ⎋ to return to the HOME screen.

Note

- You can also display the Get Started screen, by selecting it from the SETTINGS menu. See **"Using the SETTINGS Menu" (page 18)**.

Precautions

Safety Precautions

Thank you for purchasing this CASIO product.
Be sure to read the "Safety Precautions" before using this product to ensure that you use it correctly. Be sure to keep all user documentation handy for future reference.

Symbol Examples


The ⃠ symbol indicates something you should not do.


The ● symbol indicates something you must do.

Warning

Indicates something that creates the risk of death or serious personal injury.

■ Display Screen

Do not press the LCD or subject it to strong impact.

Doing so can cause the LCD glass to crack, creating the risk of personal injury.

Should the LCD become cracked, never touch any of the liquid inside.

LCD liquid getting on the skin creates the risk of skin irritation.
Should LCD liquid get into your mouth, immediately rinse your mouth out and contact your physician.
Should LCD liquid get in your eyes or on your skin, rinse with clean water and then contact your physician.

■ Battery Precautions

Should fluid leaking from a battery get on your skin or clothing, immediately rinse it off with clean water.

Battery fluid getting into the eyes creates the risk of eyesight loss, etc.
Rinse the eyes and then immediately contact a physician.

Caution

Indicates something that creates the risk of minor personal injury or physical damage.

Observe the precautions below. Failure to do so can cause a battery to rupture, creating the risk of fire, personal injury, and soiling of nearby objects by leaking fluid.

- Do not try to take a battery apart and never allow a battery to become shorted.
- Do not charge a non-rechargeable battery.
- Do not expose a battery to heat or throw it into fire.

- Use only the specified type of battery.
- Load a battery with its poles (plus (+) and minus (–)) facing correctly.
- Replace the battery as soon as possible after it goes dead.

Battery Precautions

● **Observe the precautions below. Failure to do so can cause the battery to explode or leak flammable liquid or gas.**

- Remove and immediately recycle or dispose of used batteries according to local regulations and keep away from children. Do not dispose of batteries in household trash or incinerate.
- Even used batteries may cause severe injury or death.
- Call a local poison control center for treatment information.
- Use only the type of battery that is specified for this product.
- Do not burn a battery or dispose of it in an incinerator, or by mechanical crushing or cutting.
- Do not subject a battery to excessively high or low temperatures during use, storage, or transport.
- Do not subject a battery to excessively low barometric pressure during use, storage, or transport.
- Remove and immediately recycle or dispose of batteries from equipment not used for an extended period of time according to local regulations.
- Always completely secure the battery compartment.
  If the battery compartment does not close securely, stop using the product, remove the batteries, and keep them away from children.

Handling Precautions

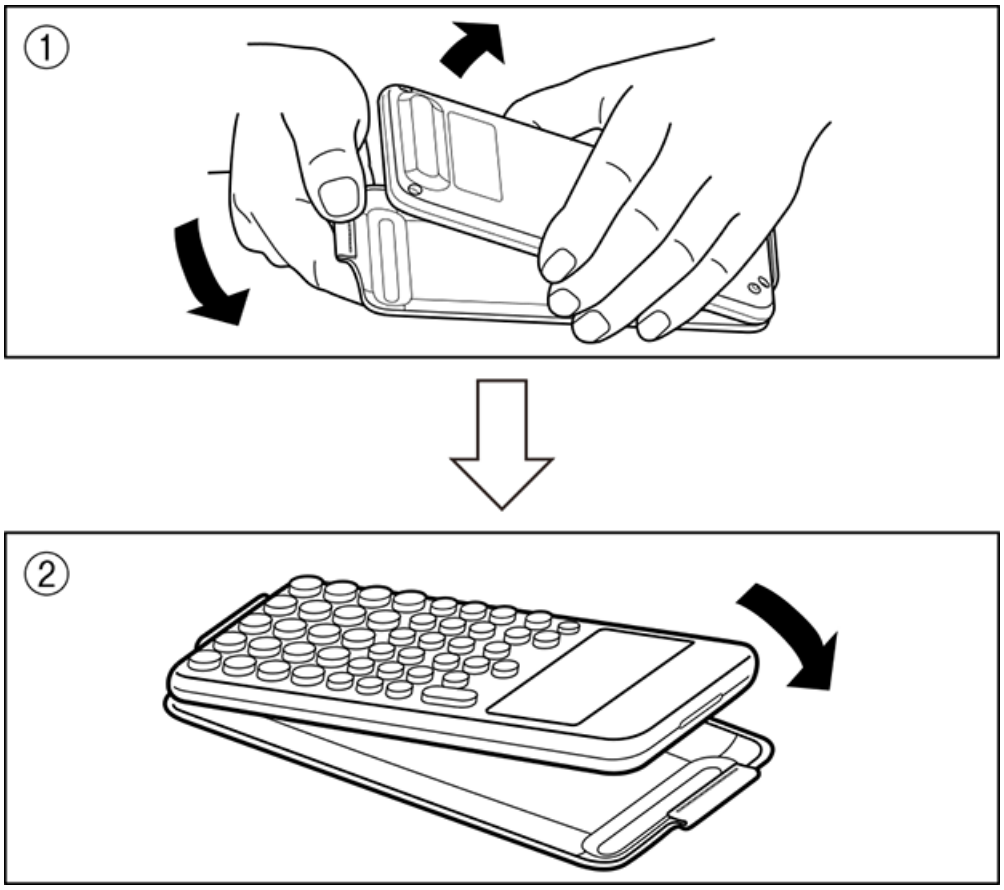
- Even if the calculator is operating normally, replace the battery at least once every two years (R03).
- You will be charged for malfunction or damage due to battery leakage, which is not covered by the warranty.
- The battery that comes with the calculator discharges slightly during shipment and storage. Because of this, it may require replacement sooner than the normal expected battery life.
- Avoid use and storage of the calculator in areas subjected to temperature extremes, and large amounts of humidity and dust.
- Do not subject the calculator to excessive impact, pressure, or bending.
- Never try to take the calculator apart.
- Use a soft, dry cloth to clean the exterior of the calculator.
- Whenever discarding the calculator or batteries, be sure to do so in accordance with the laws and regulations in your particular area.

Getting Started

Attaching and Removing the Front Cover

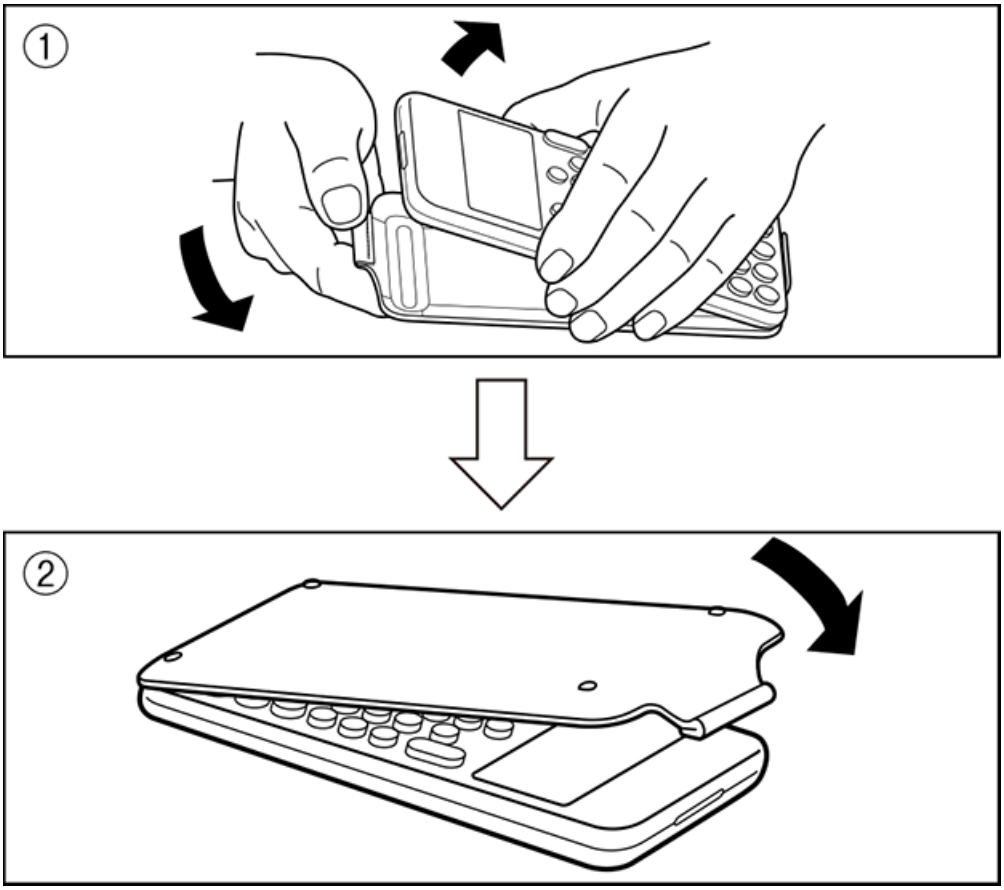
To remove the front cover

Before using the calculator, remove the front cover (①) and attach it to the back (②).



To attach the front cover

When you are not using the calculator, remove the front cover (①) and attach it to the front (②).



Important!

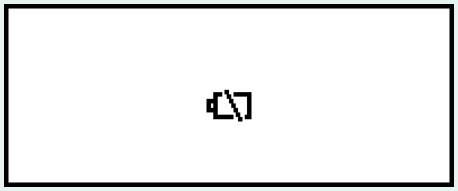
- Always attach the front cover to the calculator whenever you are not using it. Otherwise, accidental operation of the ⏻ key can cause the power to turn on and run down the battery.

Turning Power On and Off

Press ⏻ to turn on the calculator.
Press ⇧ AC (OFF) to turn off the calculator.

Note

- To turn on power, long-press ⏻. To avoid turning on power accidentally, the top of ⏻ key is slightly lower than the other keys.
- If the screen shown below appears right after you turn on power, it means that remaining battery power is low.

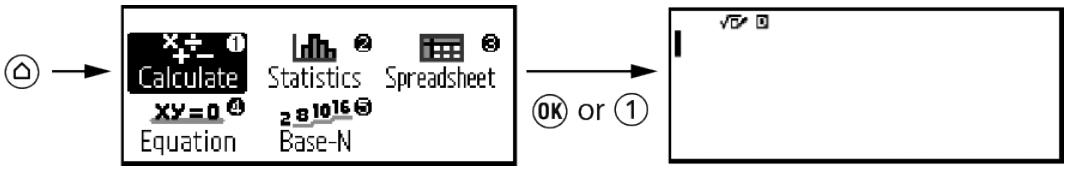


If this screen appears, replace the battery as soon as possible. For details about battery replacement, see **"Replacing the Battery" (page 92)**.

- The calculator also will turn off automatically after approximately 10 minutes or 60 minutes of non-use. Press the ⏻ key to turn the calculator back on.

HOME Screen

Pressing ⌂ displays the HOME screen. The HOME screen shows a list of installed calculator apps.

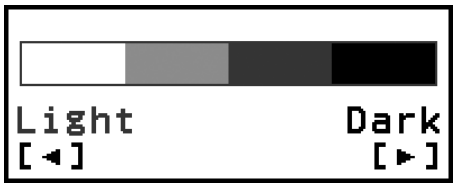


HOME Screen　　Calculate App Screen

For information about installed calculator apps, see **"Installed Calculator App List" (page 17)**.

Adjusting Display Contrast

1. Press ⌂, select a calculator app icon, and then press OK.
2. Press ☰, and then select [System Settings] > [Contrast].



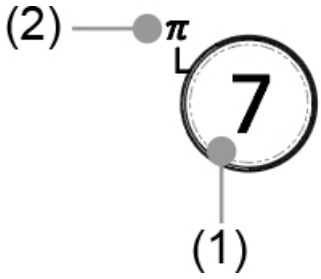
3. Use < and > to adjust display contrast.
4. After the setting is the way you want, press AC.

Important!

- If adjusting display contrast does not improve display readability, it probably means that battery power is low. Replace the battery.

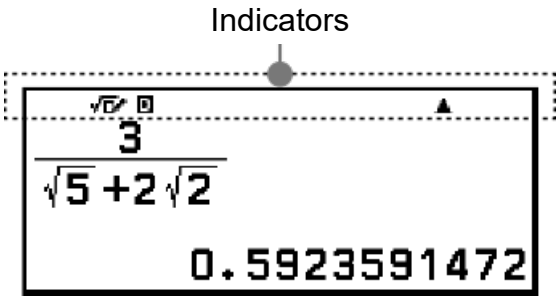
Key Markings

Pressing the ⇧ key followed by a second key performs the alternate function of the second key. The alternate function is indicated by the text printed above the key, on the left.



(1) Keycap function: 7
(2) Alternate function: ⇧7(π)

Indicators

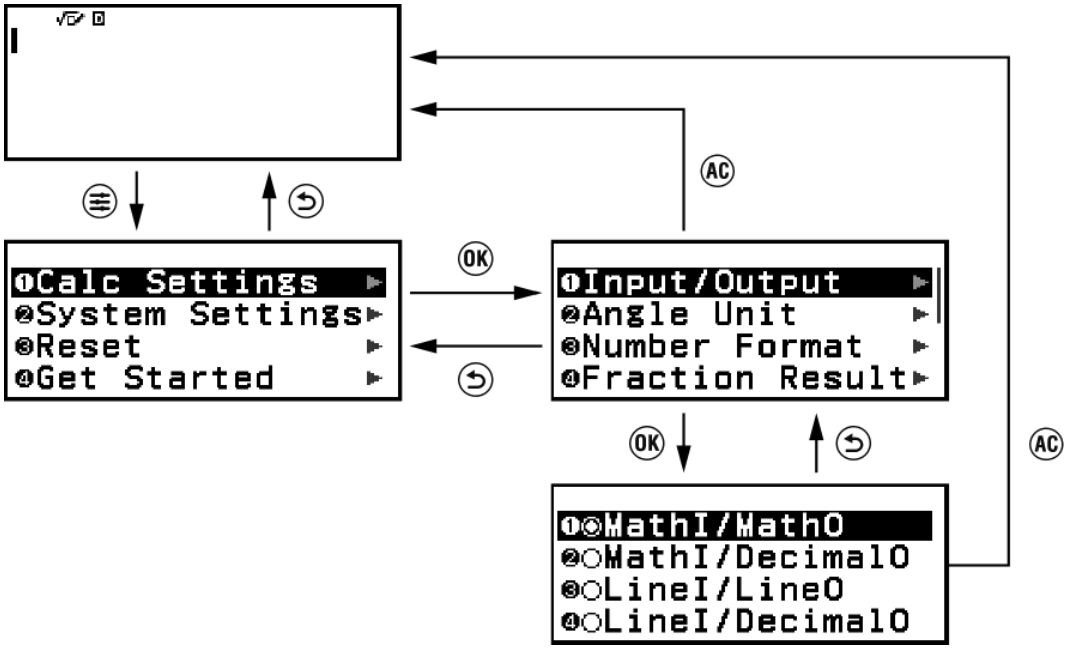


The table below describes indicators that appear at the top of the screen.

This indicator:	Means this:
S	The keypad has been shifted by pressing the ⓘ key. The keypad will unshift and this indicator will disappear when you press a key.
√▭	MathI/MathO or MathI/DecimalO is selected for Input/Output on the SETTINGS menu.
D / R / G	Current setting of Angle Unit (D: Degree, R: Radian, or G: Gradian) on the SETTINGS menu.
FIX	A fixed number of decimal places is in effect.
SCI	A fixed number of significant digits is in effect.
i/∠	Current setting of Complex Result (i : a+bi or ∠: $r\angle\theta$) on the SETTINGS menu.
▲ / ▼	There is previous (▲) or following (▼) calculation history for the currently displayed calculation result.

Using Menus

Many of the operations of your calculator are performed using menu screens. The example below shows operations starting from the menu screen that appears when you press ☰.

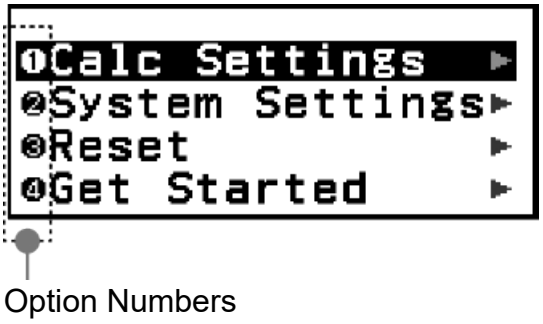


Selecting a Menu Item

There are two ways to select an item on a menu.

- **Method 1:** Use the cursor keys to move the highlighting to the item you want to use and then press [OK].
- **Method 2:** Press the key* that corresponds to the number or symbol to the left of the item you want to select.

The number or symbol to the left of an item is its "Option Number".

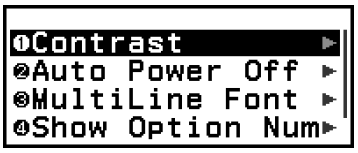


- You can use Option Numbers to select a menu by pressing its corresponding number or symbol key even if its menu is not currently displayed.
- Option Numbers are displayed when "On" is selected for the **Show Option Num (page 23)** setting on the SETTINGS menu and not displayed when "Off" is selected. The default setting is On. Note that menu operations you execute by pressing number and symbol keys remain in effect even when "Off" is selected for the Show Option Num setting.

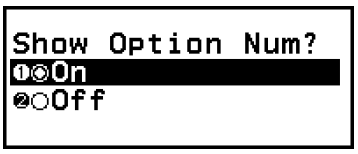
Example of Menu Operations Using Option Numbers

1. Press ⌂, select the Calculate app icon, and then press OK.
   - This displays the Calculate app's initial screen.

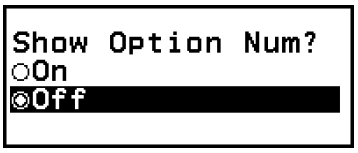
2. Press ☰, and then press ② to select [System Settings].
   - This displays the menu items included under [System Settings].



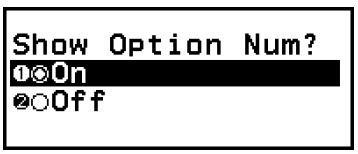
3. Press ④ to select [Show Option Num].



4. Press ②(Off).
   - This turns off the Show Option Num setting, which causes the Option Numbers to the left of the menu items to disappear.



5. Press AC to close the menu.
6. Perform the following key operation: press ☰, ②(System Settings), ④(Show Option Num), ①(On).
   - This turns on the Show Option Num setting, which causes the Option Numbers to reappear.



7. Press AC to close the menu.

Navigating Between Menu Hierarchies

The "▶" indicator to the right of a menu item means that there are lower hierarchy levels under that item. Selecting the menu item and pressing OK

or ▷ navigates the next lower level of the hierarchy. To return to the next upper level of the hierarchy, press ↩.

Note

- If you are in a lower level of the hierarchy of a one-column menu, you can press ◁ in addition to ↩ to return to the next higher level.

Selecting a Menu Item with a Radio Button (○/◉)

When the display shows a list of multiple options, each option will have a radio button (○ or ◉) to its left. ◉ indicates the currently selected option.

To configure the setting of a radio button menu item

1. Highlight the applicable menu item and then press OK.
   - What happens next depends on the type of menu item you selected.
     - If there are no more settings to configure for the menu item you selected, the radio button next to it will change to ◉.
     - The menu item you selected has more settings to configure, a screen for selecting the menu item setting will appear. In this case, proceed to step 2.
2. On the setting screen, highlight the setting you want and then press OK.
   - This returns to the menu item screen in step 1, with the radio button next to the menu item you previously selected changed to ◉.

Scrolling Between Screens

A scroll bar will appear along the right side of the display when there are so many menu items that they do not fit on one screen.

- Use ⏫ and ⏬ to scroll between screens.
- Use △ and ▽ to scroll line-by-line.

To close the menu and return to the screen displayed before the menu

Press AC.

Note

- You can close a menu displayed by pressing ☰, 2nd, 📖, ∞, or ⬆ FORMAT (🔄) by pressing AC. If the displayed menu is one that appears immediately after launching a particular calculator app or if it is an app-specific menu, you cannot close it by pressing AC. In that case, you must press ↩ to close the menu.

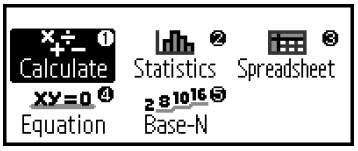
Calculator Apps and Menus

Calculator Apps

Selecting a Calculator App

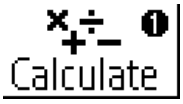
Select a calculator app that is suitable for the type of calculation you want to perform.

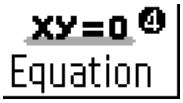
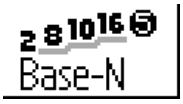
1. Press ⌂ to display the HOME screen.
   - For information about each calculator app, see the **"Installed Calculator App List" (page 17)**.



2. Use the cursor keys to move the highlighting to the icon of the app you want to start up, and then press OK.
   Alternatively, you can press a key that is shown in the upper right corner of the icon to start up an app.
   - If 1 is shown in the upper right corner of the icon, press 1.

Installed Calculator App List

Icon	Description
 (Calculate)	General calculations
 (Statistics)	Statistical and regression calculations
 (Spreadsheet)	Spreadsheet calculations

 (Equation)	Simultaneous equations and higher-order equations
 (Base-N)	Calculations involving specific number systems (binary, octal, decimal, hexadecimal)

Using the SETTINGS Menu

To display the SETTINGS menu, press ☰ while using a calculator app. The SETTINGS menu includes the menu items below.

Calc Settings	Includes menu items for configuring calculation settings, such as the display format for calculation results.
System Settings	Includes menu items for configuring calculator operation settings, such as contrast adjustment.
Reset	Includes menu items for performing various types of reset operations.
Get Started	Displays the Get Started screen. For more information, see **"Calculator "Get Started" Screen" (page 6)**.

Note

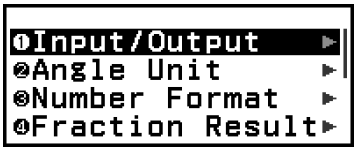
- Pressing ☰ while the HOME screen is displayed will display the Get Started screen instead of the SETTINGS menu.
- Depending on the screen displayed by the calculator app, pressing ☰ may not display the SETTINGS menu.

Changing Calculator Settings

1. Press ⌂, select a calculator app icon, and then press OK.

2. Press ☰ to display the SETTINGS menu.

3. Use ^ and v to select Calc Settings or System Settings, and then press OK.
   - This displays a list of setting items included on the selected menu. The screen here shows an example of what appears when [Calc Settings] is selected.



   - See **"Items and Available Setting Options" (page 19)** for the setting items included for [Calc Settings] and [System Settings].
4. Use ^ and v to highlight the item whose setting you want to change, and then press OK.
   - This displays a list of setting options for the item you selected. The screen here shows an example of what appears when [Input/Output] is selected.

5. Use ^ and v to highlight the option you want, and then press OK.
6. After the setting is the way you want, press AC.

Items and Available Setting Options

"◆" indicates the initial default setting.

Calc Settings > Input/Output

Specifies the format to be used by the calculator for expression input and calculation result output.

MathI/MathO◆	Input: Natural Textbook; Output: Fraction*1
MathI/DecimalO	Input: Natural Textbook; Output: Converted to decimal value

LineI/LineO	Input: Linear*2; Output: Decimal or fraction
LineI/DecimalO	Input: Linear*2; Output: Converted to decimal value

*1 Decimal output is applied when fraction format cannot be output for some reason.

*2 All calculations, including fractions and functions are input in a single line. Same output format as that for models without Natural Textbook Display (S-V.P.A.M. models, etc.)

Input/output format display examples:

MathI/MathO
(initial default setting)

MathI/DecimalO
(Number Format: Norm1:1.23×10⁻³)

(Number Format: Norm2:0.00123)

LineI/LineO

LineI/DecimalO
(Number Format: Norm2:0.00123)

Calc Settings > Angle Unit

Degree◆; Radian; Gradian
Specifies degree, radian or gradian as the angle unit for value input and calculation result display.

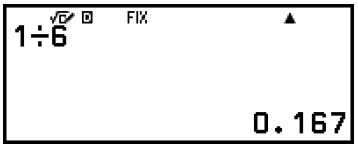
Calc Settings > Number Format

Specifies the number of digits for display of a calculation result.

Fix: The value you specify (from 0 to 9) controls the number of decimal places for displayed calculation results. Calculation results are rounded off to the specified digit before being displayed.

Example: 1 ÷ 6
(Fix3:0.123)

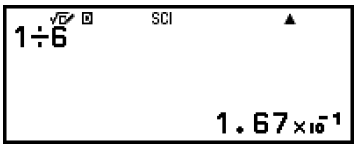
1 ÷ 6 SHIFT = (≈)*



Sci: The value you specify (from 1 to 10) controls the number of significant digits for displayed calculation results. Calculation results are rounded off to the specified digit before being displayed.

Example: 1 ÷ 6
(Sci3 :1.23×10^{-1})

1 ÷ 6 SHIFT = (≈)*



Norm: Displays calculation results in exponential format when they fall within the ranges below.
Norm 1: $10^{-2} > |x|, |x| \geq 10^{10}$, Norm 2◆: $10^{-9} > |x|, |x| \geq 10^{10}$

Example: 1 ÷ 200
(Norm1:1.23×10^{-3})

1 ÷ 200 SHIFT = (≈)*

(Norm2:0.00123)

1 ÷ 200 SHIFT = (≈)*

* Pressing SHIFT = (≈) instead of = after inputting a calculation will display the calculation result in decimal form.

Calc Settings > Fraction Result

Mixed Number; Improp Fraction◆
Specifies either mixed number or improper fraction for display of fractions in calculation results.

Calc Settings > Complex Result

a+$b$$\boldsymbol{i}$◆; $r\angle\theta$
Specifies either rectangular coordinates or polar coordinates for Equation app polynomial solutions.

Note

- An $\boldsymbol{i}$ indicator is displayed at the top of the screen while a+$b\boldsymbol{i}$ is selected for the Complex Result setting. ∠ is displayed while $r\angle\theta$ is selected.

Calc Settings > Decimal Mark

Dot◆; Comma
Specifies whether to display a dot or a comma for the calculation result decimal mark. A dot is always displayed during input. When dot is selected as the decimal mark, the separator for multiple results is a comma (,). When comma is selected, the separator is a semicolon (;).

Calc Settings > Digit Separator

On; Off◆
Specifies whether or not a separator character should be used in calculation results.

Calc Settings > FORMAT Key

You can toggle what happens when FORMAT is pressed between the two operations described below.

a b/c ↔ Decimal◆	Each press of FORMAT toggles the displayed calculation result between a form that includes fraction and decimal form. Press ⇧ FORMAT (⟳) to display the FORMAT menu.
Format Menu	Press FORMAT to display the FORMAT menu. Each press of ⇧ FORMAT (⟳) toggles the displayed calculation result between a form that includes fraction and decimal form.

System Settings > Contrast

See **"Adjusting Display Contrast" (page 12)**.

System Settings > Auto Power Off

10 Min.◆; 60 Min.
Specify the amount of time until Auto Power Off is triggered.

System Settings > MultiLine Font

Normal Font◆; Small Font
Specifies the display font size when LineI/LineO or LineI/DecimalO is selected for Input/Output. Up to four lines can be displayed while Normal Font is selected, and up to six lines can be displayed with Small Font.

System Settings > Show Option Num

On◆; Off
Specifies whether to show Option Numbers (numbers and symbols to the left of menu items) on menus and dialogs. For details about Option Numbers, see **"Selecting a Menu Item" (page 14)**.

System Settings > QR Code

Specifies the version of the QR Code displayed when ⊛ is pressed.
Version 3: Indicates QR Code Version 3.
Version 11◆: Indicates QR Code Version 11.

Reset > Settings & Data

See **"To initialize calculator settings" (page 24)**.

Reset > Variable Memory

See **"Clearing the Contents of All Memories" (page 38)**.

Reset > Initialize All

See **"Initializing the Calculator" (page 6)**.

Get Started

See **"Calculator "Get Started" Screen" (page 6)**.

To initialize calculator settings

Important!

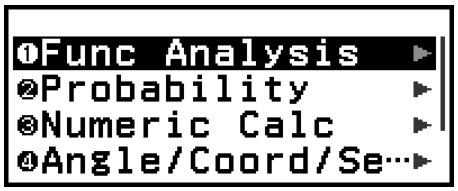
- The procedure below initializes all calculator settings, except for Contrast and Auto Power Off. Also clears all data except for variable memory and Ans data.

1. Press ⌂, select a calculator app icon, and then press OK.
2. Press ☰, and then select [Reset] > [Settings & Data] > [Yes].
   - This displays the HOME screen.

Using the CATALOG Menu and CATALOG List

CATALOG Menu

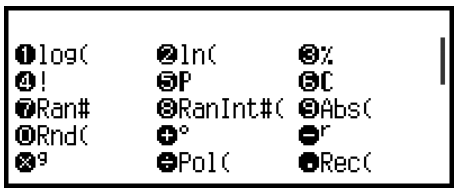
Press ⌨ to display the CATALOG menu like the one shown below. This menu shows categories of the commands, functions, and symbols in accordance with the calculator app you are currently using and the current status (displayed screen or current settings) of the app.



Example: CATALOG menu of the Calculate app

CATALOG List

Pressing ⇧⌨(☰) displays the CATALOG list like the one shown below instead of the CATALOG menu. By pressing the key indicated in a black circle (●) on this list, you can input the command, function or symbol followed by the circle.



Example: CATALOG list of the Calculate app

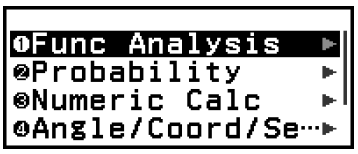
Example Operations

Example: To calculate 20% of 30 in the Calculate app

Using the CATALOG menu:

30⊗20

⊡



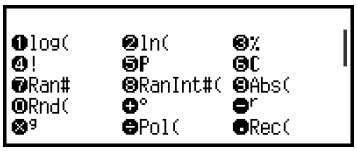
[Probability] > [%]

=

Using the CATALOG list:

30⊗20

▲⊡(☰)



③*=

* Items that appear on the CATALOG list vary depending on the current settings and the app you are using. Because of this, "%" may not always be input with the same key. Be sure to find the function, command or symbol you want to input on the CATALOG list and press the appropriate key.

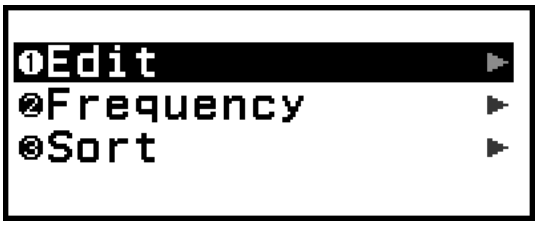
Note

- For information about all commands, functions, and symbols that can be input from the CATALOG menu, see **"Advanced Calculations" (page 46)**.
- For information about the commands, functions, and symbols specific to each calculator app, refer to the calculator app descriptions in **"Using Calculator Apps" (page 56)**.

Using the TOOLS Menu

The TOOLS menu that appears when you press ⋯ includes menu items for performing functions specific to each calculator app and for configuring settings.

Example: TOOLS menu for the Calculate app



Examples: TOOLS menu for the Statistics app

Note

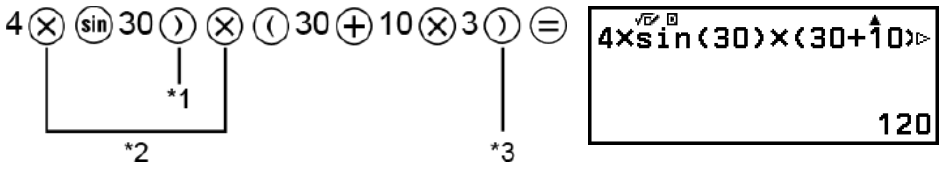
- The menu items below are common to multiple calculator apps.
  - Undo (See **"Undo Operations" (page 29)**.)

Inputting Expressions and Values

Basic Input Rules

When you press = the priority sequence of the input calculation will be evaluated automatically and the result will appear on the display.

4 × sin 30 × (30 + 10 × 3) = 120



*1 Input of the closing parenthesis is required for sin and other functions that include parentheses.

*2 These multiplication symbols (×) can be omitted.

*3 The closing parenthesis immediately before the = operation can be omitted.

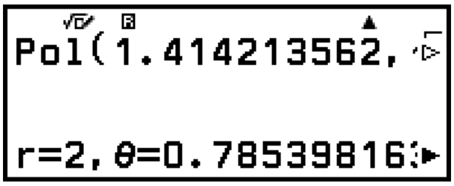
Moving the Cursor to the Beginning or End of an Input Expression

While inputting an expression, you can press ^ to make the cursor jump to the beginning of the expression or v to jump to the end of the expression.

Input Expression and Calculation Result "More" Indicator (▶, ▷)

If you see a pointer (▶ or ▷) symbol on the right side of either an input expression line or calculation result line, it means the displayed line continues to the right. Use < and > to scroll the line left and right.

- When you see ▶ at the right end of a calculation result line, you can jump to the end of the result by pressing v. To jump to the beginning of a calculation result line, press ^.
- Note that if you want to scroll the input expression while both the ▶ and ▷ indicators are displayed, you will need to press ↩ or AC first and then use < and > to scroll.



Parentheses Auto Complete

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 closing parenthesis.
  Example: $6 \div 2(1 + 2) \rightarrow 6 \div (2(1 + 2))$
- When a multiplication sign is omitted immediately before a variable, a constant, etc.
  Example: $6 \div 2\pi \rightarrow 6 \div (2\pi)$

Input Limit Indication

The cursor will change shape to ▮ when there are 10 bytes or less of allowed input remaining. If this happens, end calculation input and then press ⊜.

Inputting an Expression Using Natural Textbook Format (MathI/MathO or MathI/DecimalO Only)

Expressions that include fractions and/or special functions such as √ can be input in natural textbook format by using templates that appear when certain keys are pressed, or when you input certain functions from the CATALOG menu.

Example: $3\frac{1}{2} + 5\frac{3}{2}$

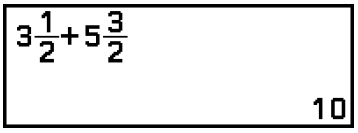
1. Press ⇧ ⊟ (■⊟).
   - This inputs a mixed number template.

2. Input values into the integer, numerator, and denominator areas of the template.

3 ⊳ 1 ⊽ 2 

3. Do the same to input the remainder of the expression.

(▶)(+)(⬆)(⌨)(■⇆)5(▶)3(▼)2(=)



Note

- While the input cursor is located within the input area of a template (mixed numbers), pressing (⬆)(▶) jumps to the position immediately following (to the right of) the template, while pressing (⬆)(◀) jumps to the position immediately before (to the left of) it.
- You can always tell the current location of the cursor within a template because the blank framed area or the characters where it is located will be dark black. Everything else in the calculation expression will be dark gray.

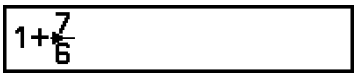
Undo Operations

To undo the last key operation, press (○○○), select [Undo], and then press (OK).
To redo a key operation you have just undone, press (○○○), select [Undo], and then press (OK) again.

Using Values and Expressions as Arguments

Example: To input $1 + \frac{7}{6}$ and then change it to $1 + \sqrt{\frac{7}{6}}$

1(+)7(⌨)6(◀)(◀)(⬆)(⌫)(INS)



(√■)

Pressing (⬆)(⌫)(INS) in the above example causes $\frac{7}{6}$ to be the argument of the function input by the next key operation (√).

Overwrite Input Mode (Linel/LineO or Linel/DecimalO Only)

In the overwrite mode, text you input replaces the text at the current cursor location. You can toggle between the insert and overwrite modes by performing the operation: (⬆)(⌫)(INS). The cursor appears as "▌" in the insert mode and as "▁" in the overwrite mode.

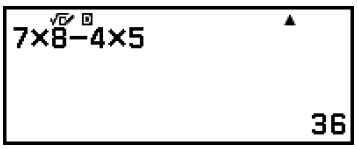
Basic Calculations

Arithmetic Calculations

Use the ⊕, ⊖, ⊗, and ÷ keys to perform arithmetic calculations.

Example: 7 × 8 − 4 × 5 = 36

7⊗8⊖4⊗5⊜



Fraction Calculations

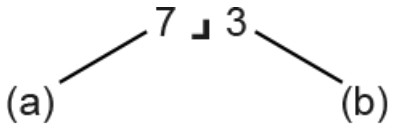
Note that the input method for fractions depends on the current Input/Output setting on the SETTINGS menu.

To input $\frac{7}{3}$ (improper fraction)

(Input/Output: MathI/MathO or MathI/DecimalO)

▤7⌄3 or 7▤3	$\frac{7}{3}$

(Input/Output: LineI/LineO or LineI/DecimalO)

7▤3	

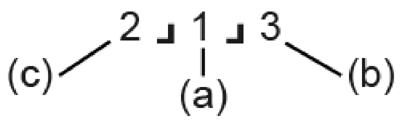
(a) Numerator, (b) Denominator

To input $2\frac{1}{3}$ (mixed number)

(Input/Output: MathI/MathO or MathI/DecimalO)

⇧▤(■▥)2>1⌄3	$2\frac{1}{3}$

(Input/Output: LineI/LineO or LineI/DecimalO)

2⊟1⊟3	

(a) Numerator, (b) Denominator, (c) Integer Part

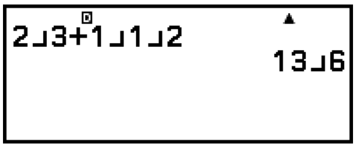
Example: $\frac{2}{3} + 1\frac{1}{2} = \frac{13}{6}$

(Input/Output: MathI/MathO)

2⊟3▷⊕⇧⊟(■⊟)1▷1▽2⊜

(Input/Output: LineI/LineO)

2⊟3⊕1⊟1⊟2⊜



Note

- Fractions in calculation results are displayed after being reduced to their lowest terms.

To convert a calculation result format to improper fraction or mixed number, press ⇧FORMAT(↻). For more information, see **"Improper Fraction and Mixed Number Conversion" (page 43)**.

Fraction Format Calculation Results

A calculation result whose total number of digits used in the mixed number (including integer, numerator, denominator, and separator symbol ⌟) is greater than 10 cannot be displayed using fraction format. In this case, the calculation result is displayed as a decimal value.

Example 1: 1⌟1⌟123456 = 123457⌟123456

(Input/Output: LineI/LineO)

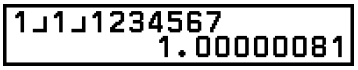
1⊟1⊟123456⊜

Since the total number of digits of the value 1⌟1⌟123456 is 10, the result is displayed as a fraction value.

Example 2: 1⌟1⌟1234567 (= 1234568⌟1234567) = 1.00000081

(Input/Output: LineI/LineO)

1⑮1⑮1234567⑭



Since the total number of digits of the value 1⌟1⌟1234567 is 11, the result is displayed as a decimal value.

Note

- Mixing fractions and decimal values in a calculation while something other than MathI/MathO is selected will cause the result to be displayed as a decimal value.

Powers, Power Roots, and Reciprocals

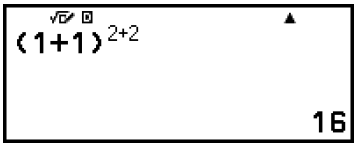
Use the keys below to input power functions, power root functions, and reciprocal function.
Power functions: ⓭(square), ⓮(n^{th} power)
Power root functions: ⓪(square root), ⓫⓪($\sqrt[\square]{\square}$) (n^{th} root)
Reciprocal function: ⓫⓮($\blacksquare^{-1}$)

Example 1: $(5^2)^3 = 15625$

⑨5⓭⑩⓮3⑭

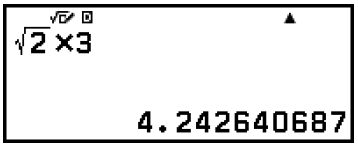
Example 2: $(1 + 1)^{2+2} = 16$

⑨1⑬1⑩⓮2⑬2⑭



Example 3: $\sqrt{2} \times 3 = 4.242640687...$

⓪2⑥⑦3⑭

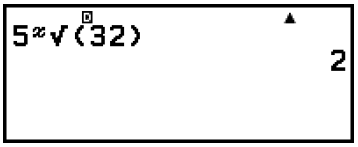


Example 4: $\sqrt[5]{32} = 2$
(Input/Output: MathI/MathO)

(Shift)(√) (▪√□) 5(>)32(=)

(Input/Output: LineI/LineO)

5(Shift)(√) (▪√□) 32())(=)



Example 5: $10^{-1} = \frac{1}{10}$

(Input/Output: MathI/MathO)

10(Shift)(□) (▪$^{-1}$)(=)

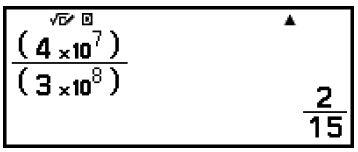
(×10□) Key (Power of 10)

Use the (×10□) key to calculate power of 10. Pressing (×10□) inputs the function $_{\times 10^{\square}}$. This function takes arguments before and after it with the form $a_{\times 10^{n}}$ (n is an integer) and returns the result of 10^n multiplied by a.

To calculate $\frac{4 \times 10^7}{3 \times 10^8}$

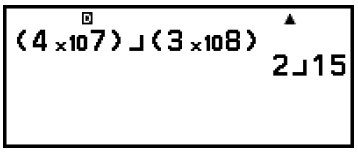
Example 1: (Input/Output: MathI/MathO)

4(×10□)7(>)(▬)3(×10□)8(=)



Example 2: (Input/Output: LineI/LineO)

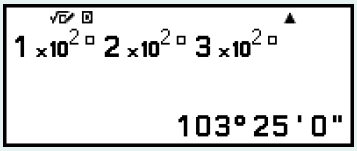
4(×10□)7(▬)3(×10□)8(=)



Note

- Parentheses will be inserted automatically as shown in the examples above. Note, however, that parentheses will not be inserted automatically if you input the sexagesimal symbol (□) immediately after $_{\times 10^{\square}}$.

1(×10^x)2(>)(⬆)(+)(°’”)2(×10^x)2(>)(⬆)(+)(°’”)
3(×10^x)2(>)(⬆)(+)(°’”)(=)



Pi, Natural Logarithm Base e

Pi

Input π by pressing (⬆)(7)(π).
π is displayed as 3.141592654, but π = 3.14159265358979323846 is used for internal calculations.

Natural Logarithm Base e

Input e by pressing (⬆)(8)(e).
Natural Logarithm Base e is displayed as 2.718281828, but e = 2.718281828459045235360 2 is used for internal calculations.

Calculation History and Replay

Calculation History

An ▲ and/or ▼ at the top of the screen indicates more calculation history content above and/or below. You can scroll through calculation history contents using (^) and (v).

Apps that support calculation history: Calculate, Base-N

Example

2 + 2 = 4

2(+)2(=)

3 + 3 = 6

3(+)3(=)

(^)
(Scrolls back.)

Note

- Calculation history data is all cleared whenever you press ⏻ or ⌂, when you change the calculator app, when you change the Input/Output setting, or whenever you perform a Reset operation ("Settings & Data" or "Initialize All").

Replay

While a calculation result is on the display, you can press ◁, ▷ or ↩ to edit the expression you used for the previous calculation.

Example

4 × 3 + 2 = 14

4 ⊗ 3 ⊕ 2 ⊜

4 × 3 − 7 = 5

(Continuing) ◁ ⌫ ⌫ ⊖ 7 ⊜

Note

- If ◀ (left) or ▶ (right) is displayed on either end or both ends of a calculation result line, you can use ◁ and ▷ to scroll the line left and right. If this happens, press ↩ or AC first, and then use ◁ and ▷ to edit the expression.

Using Memory Functions

Answer Memory (Ans)

The last calculation result obtained is stored in Ans (answer) memory.

Using Ans Memory to Perform a Series of Calculations

Example: To divide the result of 3 × 4 by 30

3 ⊗ 4 ⊜

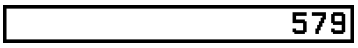
(Continuing) ÷ 30 ⊜

Inputting Ans Memory Contents into an Expression

Example: To perform the calculations shown below:

123 + 456 = 579　　789 – 579 = 210

123 ⊕ 456 ⊜

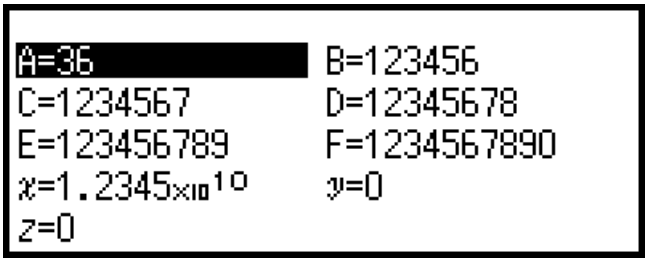


(Continuing) 789 ⊖ Ans ⊜

Variables (A, B, C, D, E, F, *x*, *y*, *z*)

You can store values to variables and use the variables in calculations.

Variable List Screen



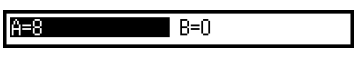
Pressing ⑫ displays a screen that shows the values currently stored to variables A, B, C, D, E, F, *x*, *y*, and *z*. On this screen, values are always displayed using the "Norm 1" Number Format. To close the screen, press ⑤ or AC.

Example 1: To store the result of 3 + 5 to variable A

1. Execute the calculation.

3 ⊕ 5 ⊜

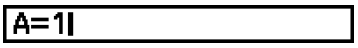
2. Press ⑫, and then select [A=] > [Store].
   - This stores the result of 3 + 5 (which is 8) to variable A.
3. Press ⑫.



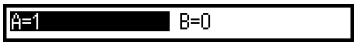
Example 2: To change the contents of variable A to 1

1. Press ⑫, and then highlight [A=].

2. Press ①.
   - This displays the editing screen with 1 entered.

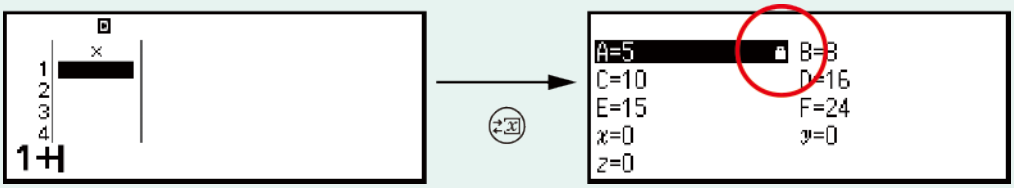


3. Press =.

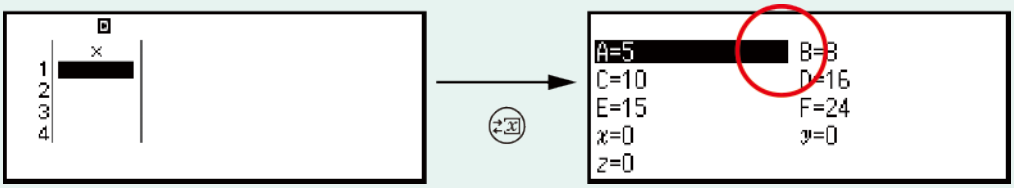


Note

- In place of the operation in step 2 above, you can press OK and then select [Edit]. This displays the editing screen with nothing input. Input the value you want and then press =.
- Depending on the operation you were performing immediately before pressing to display the variable list screen, you cannot change the contents of a variable from the variable list screen. In this case, a lock ( ) icon appears when you highlight a variable on the variable list screen, indicating that the highlighted variable cannot be edited.
  For example, if you press while inputting data in the Statistics Editor of the **Statistics app (page 56)**, the icon appears on the right of the highlighted variable, which means the variable cannot be edited.

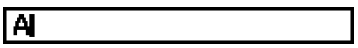


On the Statistics Editor, press to stop inputting data and then press . The icon disappears, and you will be able to edit the variable.



Example 3: To recall the contents of variable A
(Continuing from step 2 of Example 1)

1. Press , and then select [A=] > [Recall].
   - This inputs "A".



2. Press =.
   - This recalls the value of variable A.

Example 4: To multiply the contents of variable A by 10
(Continuing from step 2 of Example 1)

⇧ ④ (A)* ⊗ 10 ⊜

* Input a variable as shown here: press ⇧ and then press the key that corresponds to the desired variable name. To input x as the variable name, you can press ⇧ ⓪ (x) or ⓧ.

Clearing the Contents of All Memories

Ans memory and variable contents are retained even if you press AC, change the calculator app, or turn off the calculator.
Perform the procedure below when you want to clear the contents of all memories.

1. Press ⌂, select a calculator app icon, and then press OK.
2. Press ☰, and then select [Reset] > [Variable Memory] > [Yes].

Changing Calculation Result Format

Toggling Calculation Results between Fraction and Decimal

Each press of (FORMAT) while a calculation result is displayed toggles the result between a decimal value and a fraction.

Note

- Toggling calculation result display formats by pressing only (FORMAT) is supported when "a b/c ↔ Decimal" (initial default) is selected for the FORMAT Key setting on the SETTINGS menu. If "Format Menu" is selected for the FORMAT Key setting, press (SHIFT)(FORMAT)(↻).

Example: 3 ÷ 2 = $\frac{3}{2}$ = 0.5 (Input/Output: MathI/MathO)

3(÷)2(=)

(FORMAT)

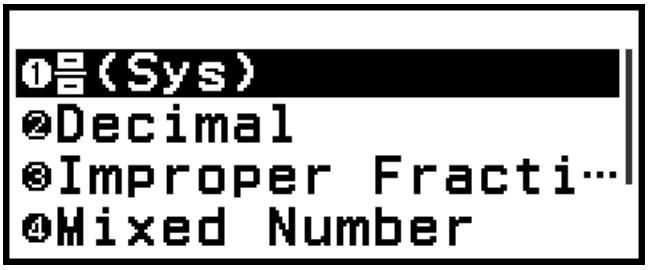
(FORMAT)

To obtain a decimal value calculation result while MathI/MathO or LineI/LineO is selected

Press (SHIFT)(=)(≈) instead of (=) after inputting a calculation.

Changing the Display Format of Calculation Results (FORMAT Menu)

Pressing (SHIFT)(FORMAT)(↻)* displays the FORMAT menu, which you can use to change the display format of calculation results.



* When "↔ Decimal" (initial default) is selected for the FORMAT Key setting on the SETTINGS menu. If "Format Menu" is selected for the FORMAT Key setting, press FORMAT.

FORMAT Menu List

This menu item:	Converts to this format:
(Sys)	Fraction
Decimal	Decimal
Rectangular Coord	Rectangular coordinates
Polar Coord	Polar coordinates
Improper Fraction	Improper fraction
Mixed Number	Mixed number
ENG Notation	Engineering notation (a×10^n format, n = exponent divisible by 3)
Sexagesimal	Degree, minute, second (Sexagesimal)

Note

- The menu items that appear when ⬆ FORMAT (↻) is pressed depend on the currently displayed calculation result. Also, if a calculation result that cannot be converted is displayed, the menu will not appear when you press ⬆ FORMAT (↻).

Conversion Sample Operation

Example: $3 \div 2 = \frac{3}{2} = 1.5 = 1\frac{1}{2}$

In this example, we will convert a calculation result displayed as an improper fraction to a decimal value and then to a mixed number. Finally,

we will cancel the conversion and go back to the original calculation result. (Input/Output: MathI/MathO, Fraction Result: Improp Fraction)

1. Execute the calculation 3 ÷ 2.

3⊡2⊜

2. To convert the calculation result to a decimal value, press ⇧ FORMAT (⇄), select [Decimal], and then press ⊜.

3. To convert the calculation result to a mixed number, press ⇧ FORMAT (⇄), select [Mixed Number], and then press ⊜.

4. To cancel conversion, press ⊜.
   - This displays the original calculation result from step 1.

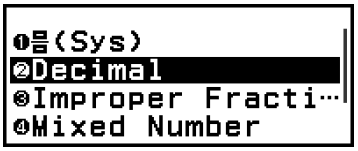
Fraction and Decimal Conversion

You can use the operation below to convert a calculation result to a decimal value and a fraction.

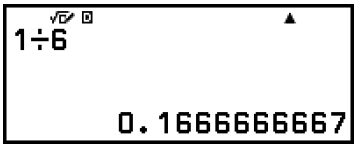
Example: 1 ÷ 6 = $\frac{1}{6}$ = 0.1666666667 (Input/Output: MathI/MathO)

1⊡6⊜

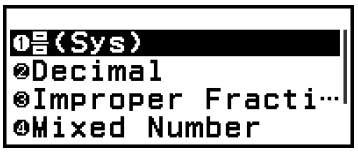
⇧ FORMAT (⇄) ▽
(Select [Decimal].)



[OK]
(Converts to a decimal value.)



[SHIFT][FORMAT]([↻])



[OK]
(Coverts to fraction format.)

Important!

- With certain calculation results, selecting [(Sys)] on the FORMAT menu will not convert the displayed value.

To obtain a decimal value calculation result while MathI/MathO or LineI/LineO is selected

Press [SHIFT][=]([≈]) instead of [=] after inputting a calculation.

Rectangular and Polar Coordinate Conversion

You can convert a complex number calculation result to rectangular coordinates ([SHIFT][FORMAT]([↻]) – [Rectangular Coord]) or polar coordinates ([SHIFT][FORMAT]([↻]) – [Polar Coord]). This conversion operation can be performed in the following case.

- While an Equation app higher-order equation solution is displayed (provided that On is selected for the [∞] – [Complex Roots] setting of the Equation app)

For an actual sample conversion operation, see the sections below.
"Converting a Complex Number Solution to Rectangular or Polar Coordinates" (page 85)

Improper Fraction and Mixed Number Conversion

You can convert the currently displayed fraction or decimal value (decimal value that is convertible to a fraction by this calculator) calculation result to a mixed number or an improper fraction.

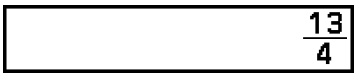
Example 1: $\frac{13}{4} = 3\frac{1}{4}$

(Input/Output: MathI/MathO, Fraction Result: Improp Fraction)

13⊞4⊜

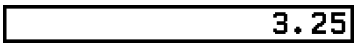
(⇧)(FORMAT)(⟳) – [Mixed Number]

(⇧)(FORMAT)(⟳) – [Improper Fraction]

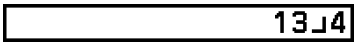


Example 2: $3.25 = \frac{13}{4} = 3\frac{1}{4}$ (Input/Output: LineI/LineO)

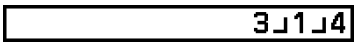
3⊡25⊜



(⇧)(FORMAT)(⟳) – [Improper Fraction]



(⇧)(FORMAT)(⟳) – [Mixed Number]



Engineering Notation

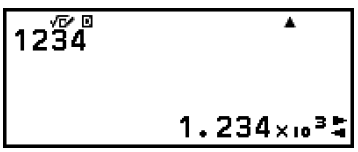
You can convert the exponent part of a displayed calculation result value to a power of ten that is a multiple of 3, and displays the result.

Example: Transform the value 1234 to engineering notation, shifting the decimal mark to the right, and then to the left.

1. Input 1234, and then press ⊜.

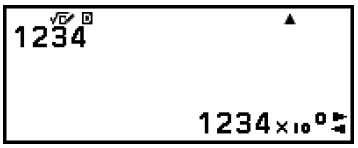
2. Perform the operation below to enter the ENG Conversion Mode.

(⇧)(FORMAT)(⟳) – [ENG Notation]

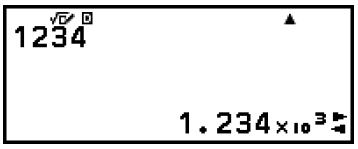


- Entering the ENG Conversion Mode converts the calculation result to engineering notation and causes ↹ to appear to its right.
- In the ENG Conversion Mode, you can use ◁ and ▷ to shift the decimal point of the mantissa.

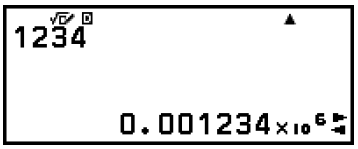
▷



◁



◁



3. To exit the ENG Conversion Mode, press ↩.
   - This exits the ENG Conversion Mode and causes ↹ to disappear from the display.

   - You can also exit the ENG Conversion Mode by pressing OK or AC.

Note

- Normal calculations are not possible while in the ENG Conversion Mode. To start a new calculation, exit the ENG Conversion Mode.

Sexagesimal Conversion (Degree, Minute, Second Calculations)

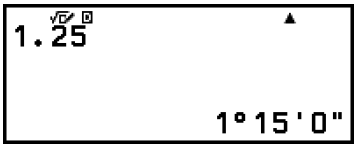
You can convert a decimal value calculation result to a sexagesimal value.

Converting a Decimal Value Calculation Result to a Sexagesimal Value

Example: 1.25 = 1°15’0”

1 . 25 =

(⇧)(FORMAT)(↻) – [Sexagesimal]

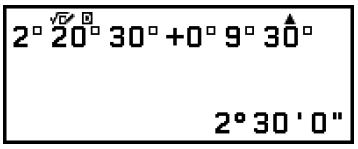


Inputting and Calculating with a Sexagesimal Value

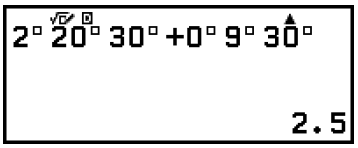
In addition to converting a displayed value to a sexagesimal value, you can also input sexagesimal values and use them in calculations.
The syntax below is for inputting a sexagesimal value:
{degrees} (⇧)(+)(°’’’) {minutes} (⇧)(+)(°’’’) {seconds} (⇧)(+)(°’’’)
Note that you must always input something for the degrees and minutes, even if they are zero.

Example: To perform the calculation 2°20’30” + 9’30”. Next, convert the calculation result to a decimal value.

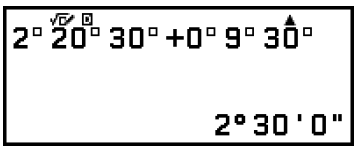
2(⇧)(+)(°’’’)20(⇧)(+)(°’’’)30(⇧)(+)(°’’’)(+)
0(⇧)(+)(°’’’)9(⇧)(+)(°’’’)30(⇧)(+)(°’’’)(=)



(Convert to a decimal value.)
(⇧)(FORMAT)(↻) – [Decimal]



(Return to sexagesimal display.)
(⇧)(FORMAT)(↻) – [Sexagesimal]



Advanced Calculations

This section describes commands, functions, and symbols that are common to all of the calculator apps. The order used here to present commands, functions, and symbols is the same order in which they are displayed on the CATALOG menu that appears when you press ⓜ.

Note

- There are also calculator app-specific CATALOG menu items, which are not shown here. See the chapter for each calculator app for more information about app-specific menu items.
- Depending on the calculator app you are using and the screen displayed by the calculator app, you may not be able to input some commands, functions, or symbols. Commands, functions, and symbols that cannot be input do not appear on the CATALOG menu.
- The commands, functions, and symbols described here are not available in the Base-N app.
- Pressing ⓢⓜ(☰) displays a list of up to 15 commands, functions, and symbols per a screen (CATALOG list) instead of the CATALOG menu. For more information, see **"CATALOG List" (page 24)**.

Function Analysis

This section explains commands and functions that you can input after performing the operation: ⓜ – [Func Analysis].

Logarithm(log)

Use ⓛⓞⓖ or ⓜ – [Func Analysis] > [Logarithm(log)] to input "log".

Example: $\log_{10}1000 = \log 1000 = 3$

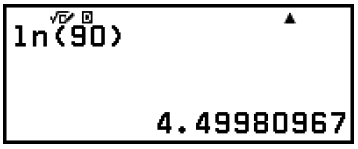
ⓛⓞⓖ1000⑂⑂

Natural Logarithm

Use ⓢⓛⓞⓖ(ln) or ⓜ – [Func Analysis] > [Natural Logarithm] to input "ln".

Example: ln 90 (= $\log_e 90$) = 4.49980967

(⇧)(log)(ln)90)(=)



Probability

This section explains commands and functions that you can input after performing the operation: (▤) – [Probability].

%

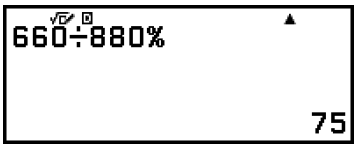
Inputting a value followed by % command causes the input value to become a percent.

Example 1: 150 × 20% = 30

150(×)20
(▤) – [Probability] > [%]
(=)

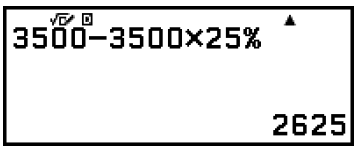
Example 2: Calculate what percentage of 880 is 660. (75%)

660(÷)880
(▤) – [Probability] > [%]
(=)



Example 3: Discount 3500 by 25%. (2625)

3500(−)3500(×)25
(▤) – [Probability] > [%]
(=)



Factorial(!)

This function obtains the factorials of a value that is zero or a positive integer.

Example: (5 + 3)! = 40320

((5(+)3)

(▤) – [Probability] > [Factorial(!)]
(=)

Permutation(P), Combination(C)

Permutation ($_nP_r$) and combination ($_nC_r$) functions.

Example: To determine the number of permutations and combinations possible when selecting four people from a group of 10

Permutations:

10
(OPTN) – [Probability] > [Permutation(P)]
4(=)

Combinations:

10
(OPTN) – [Probability] > [Combination(C)]
4(=)

Random Number

This function generates a pseudo random number in the range of 0.000 to 0.999. The result is displayed as a fraction when MathI/MathO is selected for Input/Output on the SETTINGS menu.

Example: To obtain random three-digit integers

1000
(OPTN) – [Probability] > [Random Number]
(=)

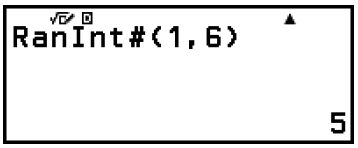
(The result differs with each execution.)

Random Integer

This function generates a pseudo random integer between a specified start value and end value.

Example: To generate random integers in the range of 1 to 6

(OPTN) – [Probability] > [Random Integer]
1(↑)(,)6)
(=)



(The result differs with each execution.)

Numeric Calculations

This section explains commands and functions that you can input after performing the operation: (OPTN) – [Numeric Calc].

Absolute Value

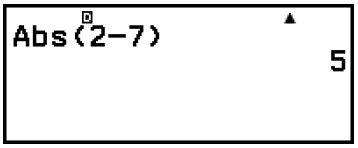
When you are performing a real number calculation, this function simply obtains the absolute value.

Example: |2 − 7| = Abs(2 − 7) = 5
(Input/Output: MathI/MathO)

(⚙) – [Numeric Calc] > [Absolute Value]
2⊖7=

(Input/Output: LineI/LineO)

(⚙) – [Numeric Calc] > [Absolute Value]
2⊖7)=

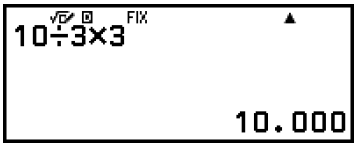


Round Off

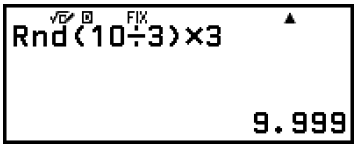
Using the Round Off function (Rnd) causes decimal fraction values of the argument to be rounded in accordance with the current Number Format setting. For example, the internal and displayed result of Rnd(10 ÷ 3) is 3.333 when the Number Format setting is "Fix3:0.123". Using the Norm1:1.23×10⁻³ or Norm2:0.00123 setting cause the argument to be rounded off at the 11th digit of the mantissa part.

Example: To perform the following calculations when "Fix3:0.123" is selected for the number of display digits: 10 ÷ 3 × 3 and Rnd(10 ÷ 3) × 3
(Input/Output: MathI/DecimalO, Number Format: Fix3:0.123)

10÷3×3=



(⚙) – [Numeric Calc] > [Round Off]
10÷3)×3=



Angle Unit, Polar/Rectangular Coordinate, Sexagesimal

This section explains commands, functions, and symbols that you can input after performing the operation: (⚙) – [Angle/Coord/Sexa].

Degrees, Radians, Gradians

These functions specify the angle unit.
° specifies degree, ʳ radian, and ᵍ gradian.
You can input each function using the menu items below.

- ⚙ – [Angle/Coord/Sexa] > [Degrees]
- ⚙ – [Angle/Coord/Sexa] > [Radians]
- ⚙ – [Angle/Coord/Sexa] > [Gradians]

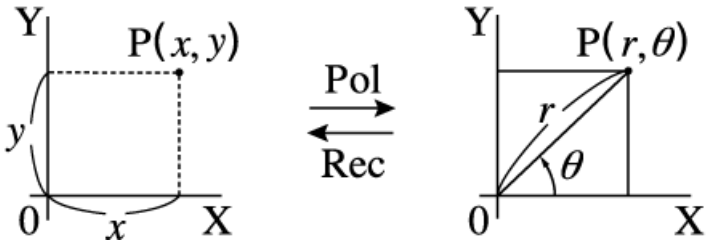
Example: π/2 radians = 90° (Angle Unit: Degree)

⬆ ⑦ (π) ▤ 2 ▶
⚙ – [Angle/Coord/Sexa] > [Radians]
=

Rect to Polar, Polar to Rect

"Pol(" converts rectangular coordinates to polar coordinates, while "Rec(" converts polar coordinates to rectangular coordinates.

$\mathrm{Pol}(x, y) = (r, \theta)$ $\mathrm{Rec}(r, \theta) = (x, y)$



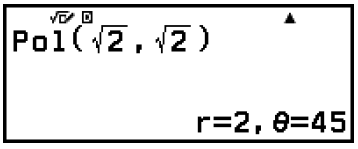
- Specify the Angle Unit on the SETTINGS menu before performing calculations.
- The calculation result for r and θ and for x and y are each stored respectively to variables x and y.
- Calculation result θ is displayed in the range of $-180° < \theta \leq 180°$.

Note

- Pol(and Rec(can be used on the calculation screen of the calculator apps below.
  Calculate, Statistics

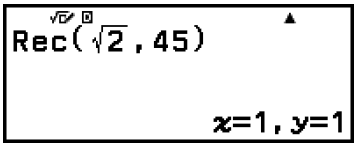
Example 1: To convert rectangular coordinates $(\sqrt{2}, \sqrt{2})$ to polar coordinates (Input/Output: MathI/MathO, Angle Unit: Degree)

⚙ – [Angle/Coord/Sexa] > [Rect to Polar]
√ 2 ▶ ⬆) (,) √ 2 ▶) =



Example 2: To convert polar coordinates ($\sqrt{2}$, 45°) to rectangular coordinates (Input/Output: MathI/MathO, Angle Unit: Degree)

(menu) – [Angle/Coord/Sexa] > [Polar to Rect]
(√)2(>)(shift)(,)(,) 45)(=)



Degrees, Minutes, Seconds

You can use the keys or the menu item below to input the sexagesimal symbol (°).

(shift)(+)(°,,,)

(menu) – [Angle/Coord/Sexa] > [Degs Mins Secs]

For details, see **"Sexagesimal Conversion (Degree, Minute, Second Calculations)" (page 44)**.

Hyperbolic, Trigonometric

This section explains hyperbolic and trigonometric functions.

Hyperbolic Functions

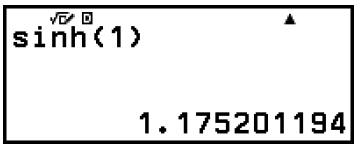
Hyperbolic functions can be input using the menu items below.

(menu) – [Hyperbolic/Trig] > [sinh], [cosh], [tanh], [$\sinh^{-1}$], [$\cosh^{-1}$], or [$\tanh^{-1}$]

The angle unit setting does not affect calculations.

Example: sinh 1 = 1.175201194

(menu) – [Hyperbolic/Trig] > [sinh] 1)(=)



Trigonometric Functions

Trigonometric functions can be input using the keys or menu items below.

Key	Menu Item
(sin)	(menu) – [Hyperbolic/Trig] > [sin]
(cos)	(menu) – [Hyperbolic/Trig] > [cos]
(tan)	(menu) – [Hyperbolic/Trig] > [tan]
(shift)(sin)($\sin^{-1}$)	(menu) – [Hyperbolic/Trig] > [$\sin^{-1}$]

⇧ cos ($\cos^{-1}$)	⊞ – [Hyperbolic/Trig] > [$\cos^{-1}$]
⇧ tan ($\tan^{-1}$)	⊞ – [Hyperbolic/Trig] > [$\tan^{-1}$]

Specify the Angle Unit on the SETTINGS menu before performing calculations.

Example: sin 30 = $\frac{1}{2}$ (Angle Unit: Degree)

sin 30) =

Others

Functions and symbols that can be input with the calculator keys can also be input using the [Other] menu. Use ⊞ – [Other] to display the function and symbol menu. For example, to input Ans, you could either press Ans or perform the following operation: ⊞ – [Other] > [Ans].
The table below shows the [Other] menu item that corresponds to each key operation.

Menu Item		Key
Ans		Ans
π		⇧ 7 (π)
e		⇧ 8 (e)
$\sqrt{\ }$(		$\sqrt{\blacksquare}$
$\sqrt[x]{\ }$(		⇧ $\sqrt{\blacksquare}$ ($\sqrt[\blacksquare]{\square}$)
-1	*1	⇧ $\blacksquare^{\square}$ ($\blacksquare^{-1}$)
2	*2	$\blacksquare^{2}$
^(		$\blacksquare^{\square}$
-	*3	⇧ − ((-))
,		⇧) (,)

(	ⓒ
)	ⓞ

*1 Reciprocal
*2 Square
*3 Minus sign

Using QR Code Functions

Using QR Code Functions

Your calculator can display QR Code symbols that can be read by a smart device.

Important!

- The operations in this section assume that the smart device being used has a QR Code reader that can read multiple QR Code symbols, and it can connect to the Internet.
- Scanning a QR Code displayed by this calculator with a smart device will cause the smart device to access the CASIO website.

Note

- QR Code appears on the display whenever you press ⓠ while any one of the screens below is displayed.
  - HOME screen
  - SETTINGS menu screen
  - Error screens
  - Calculation result screens in any calculator app
  - Table screens in any calculator app
  - Spreadsheet app screen

  For details, visit the CASIO website (**https://wes.casio.com**).

Displaying a QR Code

Example: To display the QR Code for a calculation result in the calculator's Calculate app and scan it with a smart device

1. In the Calculate app, perform some calculation.
2. Press ⓠ to display the QR Code.
   - The numbers in the lower right corner of the display show the current QR Code number and the total number of QR Code symbols. To display the next QR Code, press ⓥ or ⓞⓚ.

   Note

   - To return to a previous QR Code, press ⓥ or ⓞⓚ as many times as required to scroll forward until it appears.

3. Use a smart device to scan the QR Code on the calculator display.
   - For information about how to scan a QR Code, refer to the user documentation of the QR Code reader you are using.

If You Experience Difficulty Scanning a QR Code

While the QR Code is displayed, use ⊖ and ⊕ to adjust the display contrast of the QR Code. This contrast adjustment affects QR Code displays only.

Important!

- Depending on the smart device and/or QR Code reader app being used, you may experience problems scanning the QR Code symbols produced by this calculator.
- When the "QR Code" setting on the SETTINGS menu is "Version 3", the calculator apps that can display QR Code symbols are limited. If you try to display a QR Code in an app that does not support QR Code display, the message "Not Supported (Version 3)" will appear. However, the QR Code produced by this setting is easier to scan with a smart device.
- For more information, visit the CASIO website (**https://wes.casio.com**).

Using Calculator Apps

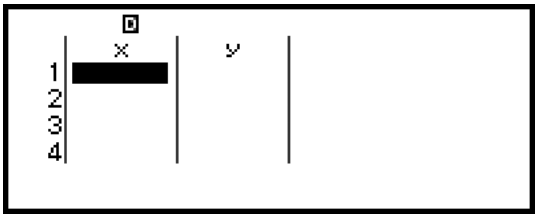
Statistical Calculations

The Statistics app calculates various statistical values based on single-variable (x) or paired-variable (x, y) data.

General Procedure for Performing a Statistical Calculation

1. Press ⌂, select the Statistics app icon, and then press OK.
2. On the menu that appears, select [1-Variable] (single-variable) or [2-Variable] (paired-variable), and then press OK.
   - This displays the Statistics Editor.

Single-variable



Paired-variable

3. Display the Freq (frequency) column as needed.
   - For details, see **"Freq (Frequency) Column" (page 57)**.
4. Input data.
   - For details, see **"Inputting Data with Statistics Editor" (page 57)**.
5. After you finish inputting data, press OK.
   - This causes the menu below to appear.

Single-variable

Paired-variable

6. Select the menu item for the operation you want to perform.
   - Select [1-Var Results], [2-Var Results], or [Reg Results] to see a list of calculation results based on the data you entered. For details, see **"Displaying Statistical Calculation Results" (page 60)**.
   - To display a statistical calculation screen for performing calculations based on the input data, select [Statistics Calc]. For details, see **"Using Statistical Calculation Screen" (page 64)**.

Note

- To return to the Statistics Editor from a statistical calculation screen, press AC and then ⮌.

Inputting Data with Statistics Editor

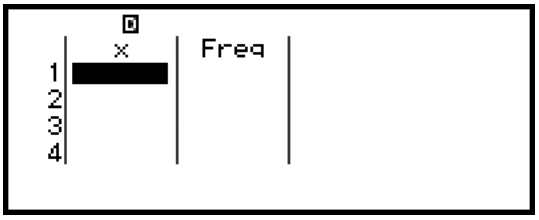
Statistics Editor displays one, two, or three columns: single-variable (x), single-variable and frequency (x, Freq), paired-variable (x, y), paired-variable and frequency (x, y, Freq). The number of data rows that can be input depends on the number of columns: 160 rows for one column, 80 rows for two columns, 53 rows for three columns.

Important!

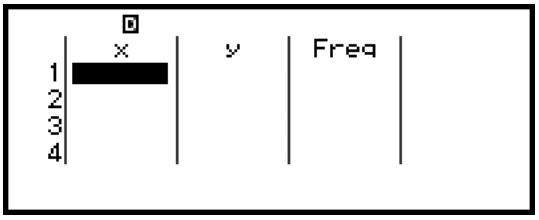
- All data currently input in the Statistics Editor is deleted whenever you perform any of the operations below.
  - Switching the statistical calculation type between single-variable and paired-variable
  - Changing the Frequency setting on the TOOLS menu
- Statistical calculations can take considerable time when there are a large number of data items.

Freq (Frequency) Column

If you turn on the Frequency setting on the TOOLS menu, a column labeled "Freq" will also be included on the Statistics Editor. You can use the Freq column to specify the frequency (the number of times the same sample appears in the data group) of each sample value.



Single-variable



Paired-variable

To display the Freq column

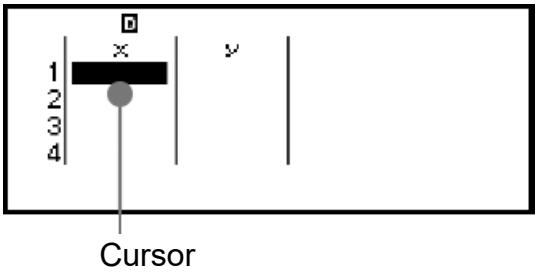
1. While the Statistics Editor is displayed, press ⋯ and then select [Frequency] > [On].
2. Press AC to return to the Statistics Editor.

To hide the Freq column

1. While the Statistics Editor is displayed, press ⋯ and then select [Frequency] > [Off].
2. Press AC to return to the Statistics Editor.

Rules for Inputting Sample Data on the Statistics Editor

Data you input is inserted into the cell where the cursor is located. Use the cursor keys to move the cursor between cells.

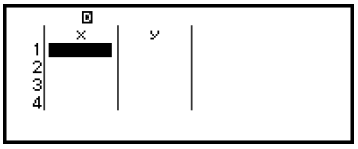


Cursor

After inputting a value, press =. This registers the value and displays up to six of its digits in the cell.

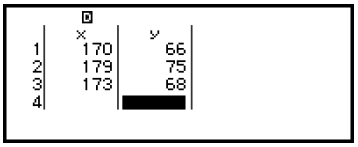
Example 1: To select paired-variable and input the following data: (170, 66), (179, 75), (173, 68)

1. Press ⌂, select the Statistics app icon, and then press OK.
2. Select [2-Variable], and then press OK.



3. Use the operation below to input data.

170=179=173=▼▶
66=75=68=



Note

- On the Statistics Editor, you can store the value in a cell to a variable. For example, performing the following operation while the screen in step 3 is displayed above will store 68 to variable A: ▲ (⇄) – [A=] > [Store]. For details about variables, see **"Variables (A, B, C, D, E, F, *x*, *y*, *z*)" (page 36)**.

Editing Sample Data

To replace the data in a cell

On the Statistics Editor, move the cursor to the cell containing the data you want to edit, input the new data, and then press =.

To delete a row

On the Statistics Editor, move the cursor to the row you want to delete and then press DEL.

To insert a row

1. On the Statistics Editor, move the cursor to the row that will be under the row you will insert.
2. Perform the following operation: ⋯ – [Edit] > [Insert Row].

To delete all Statistics Editor contents

On the Statistics Editor, perform the following operation: ⋯ – [Edit] > [Delete All].

Sorting Data

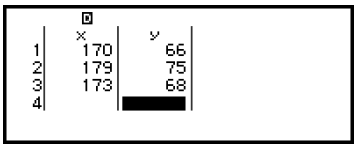
You can sort Statistics Editor data in ascending or descending order on its *x*, *y*, or Freq-column values.

Important!

- Note that after you change the data sort sequence, you will not be able to return it to its original sequence.

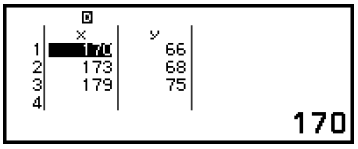
Example 2: To sort the data input in **Example 1 (page 58)** in ascending order on the x column, and then in descending order on the y column

1. Use the procedure in Example 1 to input the data.



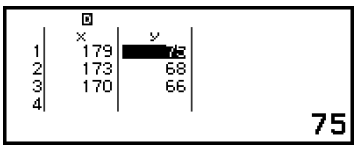
2. Sort the data in ascending order on the x column.

⑀ – [Sort] > [x Ascending]



3. Sort the data in descending order on the y column.

⑀ – [Sort] > [y Descending]



Displaying Statistical Calculation Results

Displaying Single-Variable Statistical Calculation Results

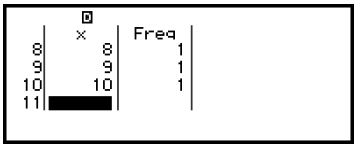
The 1-Var Results screen shows a list of various statistical values (such as mean and population standard deviation) calculated based on single-variable data. This section describes the operation required to display the 1-Var Results screen.

Example 3: To input the data below and display single-variable statistical calculation results

x	1	2	3	4	5	6	7	8	9	10
Freq	1	2	1	2	2	2	3	4	2	1

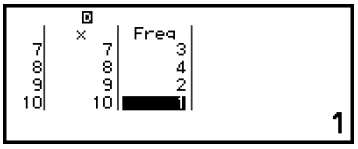
1. Press ⌂, select the Statistics app icon, and then press OK.
2. Select [1-Variable], and then press OK.
   - This displays the Statistics Editor.
3. Press ⑀ and then select [Frequency] > [On].
   - Press AC to return to the Statistics Editor.
4. Input data into the x-column.

1=2=3=4=5=6=7=8=9=10=



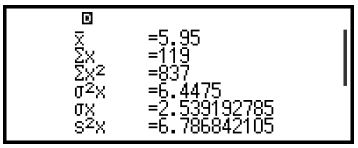
5. Input data into the Freq column.

⏷⏵⏷2=⏷2=2=2=3=4=2=

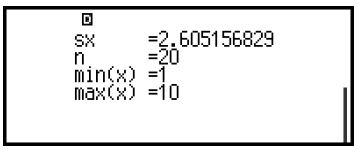


6. Press [OK].

7. Select [1-Var Results], and then press [OK].
   - This displays the 1-Var Results screen.



⏷ (or ⏬)



   - For the meanings of the variables shown on the 1-Var Results screen, see the **"List of Statistical Value Variables and Statistical Calculation Functions" (page 67)**.
8. Press ⮌ or [AC] to return to the Statistics Editor.

Displaying Paired-Variable Statistical Calculation Results

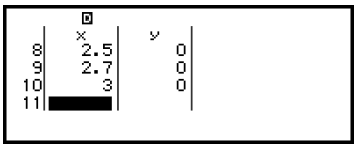
The 2-Var Results screen shows a list of various statistical values (such as mean and population standard deviation) calculated based on paired-variable data. This section describes the operation required to display the 2-Var Results screen.

Example 4: To input the data below and display paired-variable statistical calculation results

x	1.0	1.2	1.5	1.6	1.9	2.1	2.4	2.5	2.7	3.0
y	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.0

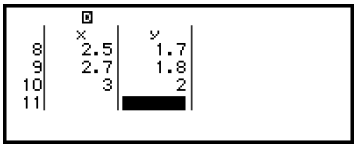
1. Press ⌂, select the Statistics app icon, and then press [OK].
2. Select [2-Variable], and then press [OK].
   - This displays the Statistics Editor.
3. Input data into the x-column.

1=1.2=1.5=1.6=1.9=
2.1=2.4=2.5=2.7=3=



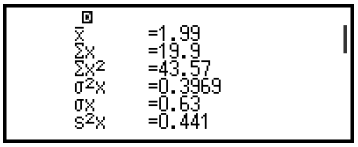
4. Input data into the y-column.

⏷⏵1=1.1=1.2=1.3=1.4=
1.5=1.6=1.7=1.8=2=

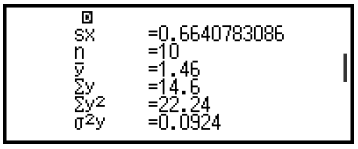


5. Press [OK].

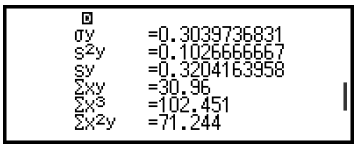
6. Select [2-Var Results], and then press [OK].
   - This displays the 2-Var Results screen.



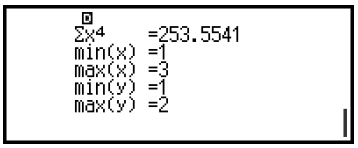
⏷ (or ⏬)



⏷ (or ⏬)



⏷ (or ⏬)



   - For the meanings of the variables shown on the 2-Var Results screen, see the **"List of Statistical Value Variables and Statistical Calculation Functions" (page 67)**.
7. Press [⮌] or [AC] to return to the Statistics Editor.

Displaying Regression Calculation Results

The Reg Results screen displays a list of regression calculation results (coefficients of regression equations) based on paired-variable data. This section describes the operation required to display the Reg Results screen.

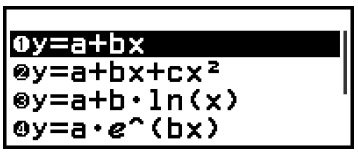
Example 5: To use the paired-variable data input in **Example 4 (page 61)** and display the results of the two regression calculations shown below

- The regression equation "$y = a + bx$" coefficients (a, b), and the correlation coefficient (r) when linear regression is performed on the data
- The regression equation "$y = a + bx + cx^2$" coefficients (a, b, c) when quadratic regression is performed on the data

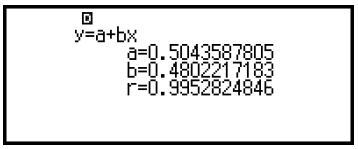
Note

- For information about regression calculation types supported by the Statistics app, see the **"Supported Regression Type List" (page 63)**.

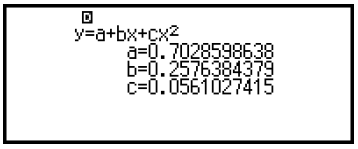
1. Perform steps 1 through 5 of the procedure under **Example 4 (page 61)**.
2. Select [Reg Results], and then press [OK].
   - This displays the regression type menu.



3. Select [y=a+bx], and then press [OK].
   - This displays the linear regression Reg Results screen.



4. Press [↩] or [AC] to return to the Statistics Editor.
5. Press [OK], and then select [Reg Results] > [y=a+bx+cx^2].
   - This displays quadratic regression Reg Results screen.



6. Press [↩] or [AC] to return to the Statistics Editor.
   - For the meanings of the variables shown on the Reg Results screen, see the **"List of Statistical Value Variables and Statistical Calculation Functions" (page 67)**.

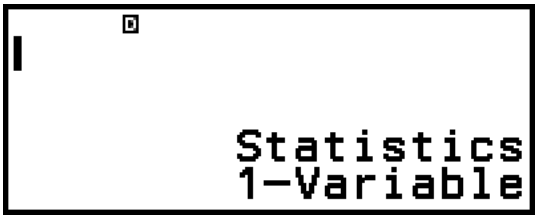
Supported Regression Type List

Regression Type	Regression Equation (regression type menu item)
Linear Regression	y = a + bx

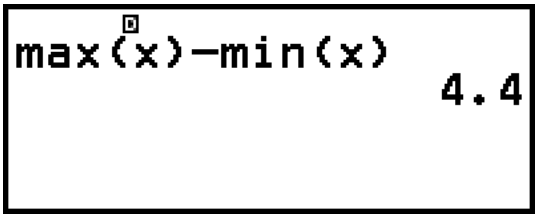
Quadratic Regression	$y = a + bx + cx^2$
Logarithmic Regression	$y = a + b \cdot \ln(x)$
e exponential Regression	$y = a \cdot e^{(bx)}$
ab exponential Regression	$y = a \cdot b^x$
Power Regression	$y = a \cdot x^b$
Inverse Regression	$y = a + b/x$

Using Statistical Calculation Screen

You can use the statistical calculation screen to recall individual statistical values and use the values in calculations.



Screen without calculation expression input



Example calculation

To recall a statistical value, use a variable representing the statistical value you want to recall (for example, x mean: $\bar{x}$, x population standard deviation: σ_x, x maximum value: max(x), and so on). For more information about these variables, see the **"List of Statistical Value Variables and Statistical Calculation Functions" (page 67)**.

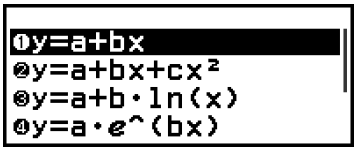
Displaying a Statistical Calculation Screen

Single-variable

1. While the Statistics Editor is displayed, press [OK].
2. On the menu that appears, select [Statistics Calc] and then press [OK].

Paired-variable

1. While the Statistics Editor is displayed, press [OK].
2. On the menu that appears, select [Statistics Calc] and then press [OK].
   - This displays the regression type menu (see the **"Supported Regression Type List" (page 63)**).



3. On the menu, select the regression type you want and then press [OK].

   - In the example above, use the displayed menu to select [y=a+bx] (Linear regression).

To return to the Statistics Editor from a statistical calculation screen

Press [AC], and then [⮌].

Calculation Example Using the Statistical Calculation Screen

Example 6: To determine the sum of the sample data (Σx) and mean ($\bar{x}$) of the single-variable data input in **Example 3 (page 60)**

1. Perform steps 1 through 6 of the procedure under **Example 3 (page 60)**.
2. Select [Statistics Calc], and then press [OK].

3. Calculate the sum of the sample data (Σx).

[▤] – [Statistics] > [Summation] > [Σx]
[=]

4. Calculate the mean ($\bar{x}$).

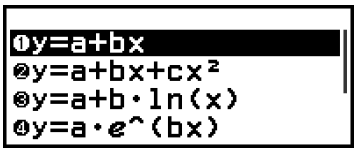
[▤] – [Statistics] > [Mean/Var/Dev···] > [$\bar{x}$]
[=]

Note

- To display the 1-Var Results screen from the statistical calculation screen above, press ⑩ and then select [1-Var Results]. To return to the statistical calculation screen from the 1-Var Results screen, press ⑤ or AC.

Example 7: To determine the coefficients (a, b) and correlation coefficient (r) of the linear regression equation "$y = a + bx$" based on the paired-variable data input in **Example 4 (page 61)**

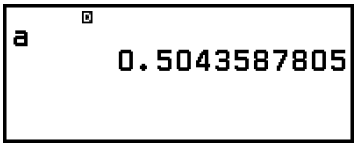
1. Perform steps 1 through 5 of the procedure under **Example 4 (page 61)**.
2. Select [Statistics Calc], and then press OK.
   - This displays the regression type menu.



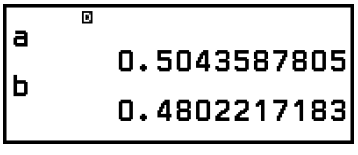
3. Select [y=a+bx], and then press OK.

4. Determine the coefficients (a, b) and correlation coefficient (r) of the regression equation "$y = a + bx$".

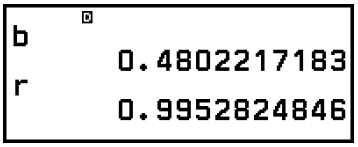
⑨ – [Statistics] > [Regression] > [a] =



⑨ – [Statistics] > [Regression] > [b] =



⑨ – [Statistics] > [Regression] > [r] =



- To select a different regression type, press ⑩ and then select [Select Reg Type]. This displays the regression type menu from step 2.

To display the 2-Var Results screen from a statistical calculation screen

Press ⑩ and then select [2-Var Results].

To display the Reg Results screen from a statistical calculation screen

Press ⑩ and then select [Reg Results].

List of Statistical Value Variables and Statistical Calculation Functions

You can use the CATALOG menu to recall variables representing statistical values and functions used for statistical calculations.

Note

- For single-variable statistical calculations, the variables marked with an asterisk (*) are available.
- For the calculation formula used for each variable and command, see **"Statistical Calculation Formula" (page 70)**.

④ – [Statistics] > [Summation]

Σx*, Σy ..... sum of the sample data
Σx^2*, Σy^2 ..... sum of squares of the sample data
Σxy ..... sum of products of the x-data and y-data
Σx^3 ..... sum of cubes of the x-data
$\Sigma x^2 y$ ..... sum of (x-data squares × y-data)
Σx^4 ..... sum of biquadrate of the x-data

④ – [Statistics] > [Mean/Var/Dev…]

$\bar{x}$*, $\bar{y}$ ..... mean
$\sigma^2{}_x$*, $\sigma^2{}_y$ ..... population variance
σ_x*, σ_y ..... population standard deviation
$s^2{}_x$*, $s^2{}_y$ ..... sample variance
s_x*, s_y ..... sample standard deviation
n* ..... number of items

④ – [Statistics] > [Min/Max] (Single-Variable Data Only)

min(x)* ..... minimum value
max(x)* ..... maximum value

④ – [Statistics] > [Min/Max] (Paired-Variable Data Only)

min(x), min(y) ..... minimum value
max(x), max(y) ..... maximum value

④ – [Statistics] > [Regression] (Paired-Variable Data Only)

For quadratic regression
a, b, c ..... regression coefficients for quadratic regression

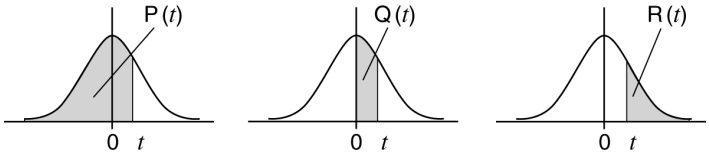
$\hat{x}_1$, $\hat{x}_2$ ..... Functions for determining x_1 and x_2 estimated values for an input y-value. For the argument, input the value of y immediately before the $\hat{x}_1$ or $\hat{x}_2$ function.
$\hat{y}$ ..... Function for determining the y estimated value for an input x-value. For the argument, input the value of x immediately before this function.

For non-quadratic regression
a, b ..... regression coefficients
r ..... correlation coefficient
$\hat{x}$ ..... Function for determining x estimated value for an input y-value. For the argument, input the value of y immediately before this function.
$\hat{y}$ ..... Function for determining the y estimated value for an input x-value. For the argument, input the value of x immediately before this function.
For an example of the operation to determine estimated values, see **"Calculating Estimated Values (Paired-Variable Data Only)" (page 69)**.

Performing Normal Distribution Calculations (Single-Variable Data Only)

While single-variable statistical calculation is selected, you can perform normal distribution calculation using the functions shown below from the menu that appears when you press ⓜ and then select [Statistics] > [Norm Dist].

P(, Q(, R(... These functions take the argument t and determine a probability of standard normal distribution as illustrated below.



►t ..... This function is preceded by the argument x. It calculates the standard variate for data value x using the mean value ($\bar{x}$) and population standard deviation (σ_x) of data input with the Statistics Editor.

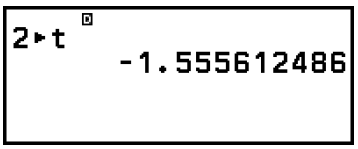
$$x \blacktriangleright t = \frac{x - \bar{x}}{\sigma x}$$

Example 8: For the single-variable data input in **Example 3 (page 60)**, determine the normalized variate when x = 2, and P(t) at that point.

1. Perform steps 1 through 6 of the procedure under **Example 3 (page 60)**.
2. Select [Statistics Calc], and then press ⓞⓚ.

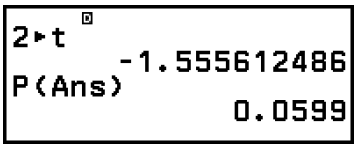
3. Calculate the normalized variate when x = 2.

2
(menu) – [Statistics] > [Norm Dist] > [▶t]
(=)



4. Calculate P(t).

(menu) – [Statistics] > [Norm Dist] > [P(]
(Ans)) (=)

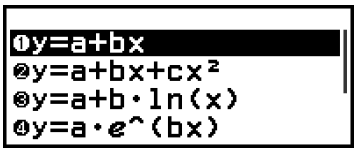


Calculating Estimated Values (Paired-Variable Data Only)

Based on the regression equation obtained by paired-variable statistical calculation, the estimated value of y can be calculated for a given x-value. The corresponding x-value (two values, x_1 and x_2, in the case of quadratic regression) also can be calculated for a value of y in the regression equation.

Example 9: To determine the estimated value for y when x = 5.5 in the regression equation produced by linear regression of the data input in **Example 4 (page 61)**

1. Perform steps 1 through 5 of the procedure under **Example 4 (page 61)**.
2. Select [Statistics Calc], and then press (OK).
   - This displays the regression type menu.



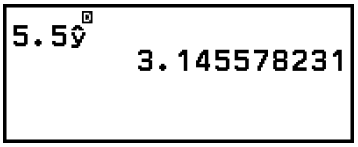
3. Select [y=a+bx], and then press (OK).

4. Input the x-value (5.5), and then input "$\hat{y}$", which is the function to determine the estimated value of y.

5⊡5

⏨ – [Statistics] > [Regression] > [$\hat{y}$]

5. Press =.



Statistical Calculation Formula

Single-Variable Statistical Calculation Formula

$$\bar{x} = \frac{\Sigma x}{n}$$

$$\sigma x = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n}}$$

$$s_x = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n - 1}}$$

Paired-Variable Statistical Calculation Formula

$$\bar{x} = \frac{\Sigma x}{n}$$

$$\sigma x = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n}}$$

$$s_x = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n - 1}}$$

$$\bar{y} = \frac{\Sigma y}{n}$$

$$\sigma y = \sqrt{\frac{\Sigma (y - \bar{y})^2}{n}}$$

$$s_y = \sqrt{\frac{\Sigma (y - \bar{y})^2}{n - 1}}$$

Regression Calculation Formula

Linear Regression (y = a + bx)

$$a = \frac{\Sigma y - b \cdot \Sigma x}{n}$$

$$b = \frac{n \cdot \Sigma xy - \Sigma x \cdot \Sigma y}{n \cdot \Sigma x^2 - (\Sigma x)^2}$$

$$r = \frac{n \cdot \Sigma xy - \Sigma x \cdot \Sigma y}{\sqrt{\{n \cdot \Sigma x^2 - (\Sigma x)^2\}\{n \cdot \Sigma y^2 - (\Sigma y)^2\}}}$$

$$\hat{x} = \frac{y - a}{b}$$

$$\hat{y} = a + bx$$

Quadratic Regression ($y = a + bx + cx^2$)

$$a = \frac{\Sigma y}{n} - b\left(\frac{\Sigma x}{n}\right) - c\left(\frac{\Sigma x^2}{n}\right)$$

$$b = \frac{Sxy \cdot Sx^2x^2 - Sx^2y \cdot Sxx^2}{Sxx \cdot Sx^2x^2 - (Sxx^2)^2}$$

$$c = \frac{Sx^2y \cdot Sxx - Sxy \cdot Sxx^2}{Sxx \cdot Sx^2x^2 - (Sxx^2)^2}$$

$$Sxx = \Sigma x^2 - \frac{(\Sigma x)^2}{n}$$

$$Sxy = \Sigma xy - \frac{(\Sigma x \cdot \Sigma y)}{n}$$

$$Sxx^2 = \Sigma x^3 - \frac{(\Sigma x \cdot \Sigma x^2)}{n}$$

$$Sx^2x^2 = \Sigma x^4 - \frac{(\Sigma x^2)^2}{n}$$

$$Sx^2y = \Sigma x^2y - \frac{(\Sigma x^2 \cdot \Sigma y)}{n}$$

$$\hat{x}_1 = \frac{-b + \sqrt{b^2 - 4c(a - y)}}{2c}$$

$$\hat{x}_2 = \frac{-b - \sqrt{b^2 - 4c(a - y)}}{2c}$$

$$\hat{y} = a + bx + cx^2$$

Logarithmic Regression ($y = a + b \cdot \ln(x)$)

$$a = \frac{\Sigma y - b \cdot \Sigma \ln x}{n}$$

$$b = \frac{n \cdot \Sigma (\ln x) y - \Sigma \ln x \cdot \Sigma y}{n \cdot \Sigma (\ln x)^2 - (\Sigma \ln x)^2}$$

$$r = \frac{n \cdot \Sigma (\ln x) y - \Sigma \ln x \cdot \Sigma y}{\sqrt{\{n \cdot \Sigma (\ln x)^2 - (\Sigma \ln x)^2\}\{n \cdot \Sigma y^2 - (\Sigma y)^2\}}}$$

$$\hat{x} = e^{\frac{y - a}{b}}$$

$$\hat{y} = a + b \ln x$$

e Exponential Regression ($y = a \cdot e\text{^}(bx)$)

$$a = \exp\left(\frac{\Sigma \ln y - b \cdot \Sigma x}{n}\right)$$

$$b = \frac{n \cdot \Sigma x \ln y - \Sigma x \cdot \Sigma \ln y}{n \cdot \Sigma x^2 - (\Sigma x)^2}$$

$$r = \frac{n \cdot \Sigma x \ln y - \Sigma x \cdot \Sigma \ln y}{\sqrt{\{n \cdot \Sigma x^2 - (\Sigma x)^2\}\{n \cdot \Sigma (\ln y)^2 - (\Sigma \ln y)^2\}}}$$

$$\hat{x} = \frac{\ln y - \ln a}{b}$$

$$\hat{y} = a e^{bx}$$

ab Exponential Regression ($y = a \cdot b\text{^}x$)

$$a = \exp\left(\frac{\Sigma \ln y - \ln b \cdot \Sigma x}{n}\right)$$

$$b = \exp\left(\frac{n \cdot \Sigma x \ln y - \Sigma x \cdot \Sigma \ln y}{n \cdot \Sigma x^2 - (\Sigma x)^2}\right)$$

$$r = \frac{n \cdot \Sigma x \ln y - \Sigma x \cdot \Sigma \ln y}{\sqrt{\{n \cdot \Sigma x^2 - (\Sigma x)^2\}\{n \cdot \Sigma (\ln y)^2 - (\Sigma \ln y)^2\}}}$$

$$\hat{x} = \frac{\ln y - \ln a}{\ln b}$$

$$\hat{y} = a b^x$$

Power Regression ($y = a \cdot x\text{^}b$)

$$a = \exp\left(\frac{\Sigma \ln y - b \cdot \Sigma \ln x}{n}\right)$$

$$b = \frac{n \cdot \Sigma \ln x \ln y - \Sigma \ln x \cdot \Sigma \ln y}{n \cdot \Sigma (\ln x)^2 - (\Sigma \ln x)^2}$$

$$r = \frac{n \cdot \Sigma \ln x \ln y - \Sigma \ln x \cdot \Sigma \ln y}{\sqrt{\{n \cdot \Sigma (\ln x)^2 - (\Sigma \ln x)^2\}\{n \cdot \Sigma (\ln y)^2 - (\Sigma \ln y)^2\}}}$$

$$\hat{x} = e^{\frac{\ln y - \ln a}{b}}$$

$$\hat{y} = a x^b$$

Inverse Regression ($y = a + b/x$)

$$a = \frac{\Sigma y - b \cdot \Sigma x^{-1}}{n}$$

$$b = \frac{Sxy}{Sxx}$$

$$r = \frac{Sxy}{\sqrt{Sxx \cdot Syy}}$$

$$Sxx = \Sigma (x^{-1})^2 - \frac{(\Sigma x^{-1})^2}{n}$$

$$Syy = \Sigma y^2 - \frac{(\Sigma y)^2}{n}$$

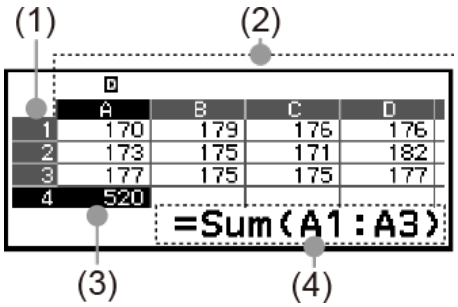
$$Sxy = \Sigma (x^{-1}) y - \frac{\Sigma x^{-1} \cdot \Sigma y}{n}$$

$$\hat{x} = \frac{b}{y - a}$$

$$\hat{y} = a + \frac{b}{x}$$

Using Spreadsheet

The Spreadsheet app makes it possible to perform calculations using a 45-row × 5-column (cell A1 to E45) spreadsheet.
To perform the operations in this section, first launch the Spreadsheet app. Press ⌂, select the Spreadsheet app icon, and then press OK. This displays the spreadsheet screen.



(1) Row numbers (1 to 45)
(2) Column letters (A to E)
(3) Cursor: Indicates the currently selected cell. The row number and column letter of the currently selected cell are displayed in black, and the other cell row numbers and column letters are displayed in dark gray.
(4) Edit box: Shows the contents of the cell where the cursor is currently located.

Important!

- Any time you change the calculator app, turn off the calculator or press the ON key, every input into the spreadsheet is cleared.

Inputting and Editing Cell Contents

You can input a constant or a formula into each 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 expression (such as 7+3, sin30, A1×2, etc.) that does not have an equal sign (=) in front of it.
Formulas: A formula that starts with an equal sign (=), such as =A1×2, is executed as it is written.

Note

- A maximum of 49 bytes can be input into a cell (number of bytes before the input is confirmed by pressing =) that is being edited. How the number of bytes is counted is shown below.
  - Numerals, variables, symbols: 1 byte per character

- Commands, functions: 1 byte each
  Each entire command or function is counted as one byte. For example, the following are one byte: "√(", "Sum(".

• The number of bytes consumed after the input is confirmed is as shown below, according to the contents entered in each cell.
  - Constants: 14 bytes, regardless of the number of input digits*
  - Formulas: Number of input bytes (49 bytes maximum) + 15 bytes
  * If you enter a constant with 11 or more significant digits, the value will be converted to 10 significant digits when the input is confirmed.
  Example: If you input 12345678915 (11 digits), the value will be converted to $1.234567892 \times 10^{10}$ (10 digits).

To display the remaining input capacity

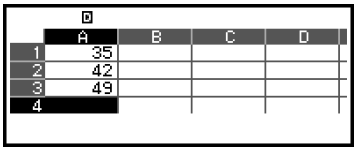
Press ⋯, select [Available Memory], and then press OK.

Inputting a Constant and Formula into a Cell

Example 1: Into cells A1, A2, and A3, input constants 7×5, 7×6, and A2+7 respectively. And then, input the following formula into cell B1: =A1+7.

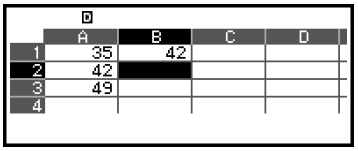
1. Move the cursor to cell A1.
2. Perform the key operation below.

7⊗5=7⊗6=▲④(A)②⊕7=



3. Move the cursor to cell B1, and then perform the key operation below.

▤ – [Spreadsheet] > [=]
▲④(A)①⊕7=



Note

- On the spreadsheet screen, you can store the value in a cell to a variable. For example, performing the following operation while the screen in step 3 is displayed will store 42 (calculation result of the formula input into cell B1) to variable A: ^ ⇄ – [A=] > [Store]. For details about variables, see **"Variables (A, B, C, D, E, F, x, y, z)" (page 36)**.
- You can specify whether a formula in the edit box should be displayed as it is or as its calculation result value. See **"Spreadsheet App Setting Items" (page 79)**.

To edit existing cell data

1. Move the cursor to the cell whose contents you want to edit, and then press OK.

- Instead of pressing [OK], you can also perform the operation below.
  [⋯] – [Edit Cell]
- Cell contents in the edit box will change from align right to align left. A text cursor (|) will appear in the edit box so you can edit its contents.

2. Use [<] and [>] to move the text cursor around the contents of the cell, and edit them as required.
3. To finalize and apply your edits, press [=].

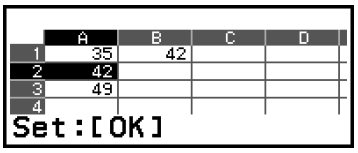
To input a cell reference name using the Grab command

The Grab command can be used in place of manual reference name (such as A1) input using a key operation to select and input a cell you want to reference.

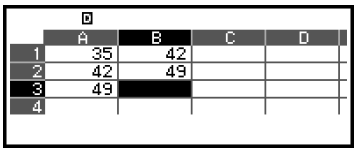
Example 2: Continuing from Example 1, input the following formula into cell B2: =A2+7.

1. Move the cursor to cell B2.
2. Perform the operation below.

[▭] – [Spreadsheet] > [=]
[▭] – [Spreadsheet] > [Grab]
[<]



[OK] [+] 7 [=]



Cell Relative and Absolute References

There are two types of cell reference: relative and absolute.

Relative cell reference

The cell reference (A1) in a formula like =A1+7 is a relative reference, which means that it changes depending on the cell where the formula is located. If the formula =A1+7 is originally located in cell B1, for example, copying and then pasting to cell C3 will result in =B3+7 being input into cell C3. Since the copy and paste operation moves the formula one column (B to C) and two rows (1 to 3) the A1 relative cell reference in the formula is moved one column and two rows to B3. 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 cell reference

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 no matter where you paste them, you need to create an absolute cell reference name. To create an absolute cell reference, put a dollar sign ($) in front of the column name and/or row number. You can use one of three different absolute cell references: absolute column with relative row ($A1), relative column with absolute row (A$1), or absolute row and column (A1).

To input the absolute cell reference symbol ($)

While inputting a formula into a cell, press ⓜ and then select [Spreadsheet] > [$].

To cut and paste spreadsheet data

1. Move the cursor to the cell whose data you want to cut.
2. Press ⋯, select [Cut & Paste], and then press OK.
   - This enters paste standby. To cancel paste standby, press ↩ or AC.
3. Move the cursor to the cell into which you want to paste the data you just cut, and then press OK.
   - Pasting data simultaneously deletes the data from the cell where you performed the cut operation, and automatically cancels paste standby.

Note

- In the case of a cut and paste operation, cell references do not change when pasted, regardless of whether they are relative or absolute.

To copy and paste spreadsheet data

1. Move the cursor to the cell whose data you want to copy.
2. Press ⋯, select [Copy & Paste], and then press OK.
   - This causes "Paste:[OK]" to appear at the bottom of the screen. You can continue to paste while this message is displayed.
3. Move the cursor to the cell into which you want to paste the data you just copied.
4. Press OK.
   - The contents of the cell you copied are pasted and the cursor moves down to the next cell.
5. If you want to paste the same contents to another cell, repeat steps 3 and 4.
   - If you want to continue pasting to the cell to which the cursor has been moved, just repeat the operation in step 4.

6. To end the paste operation, press ⮌ or AC.

Note

- When you copy the contents of a cell containing a formula with a relative reference, the relative reference will change in accordance with the location of the cell where the contents are pasted.

To delete input data from a specific cell

Move the cursor to the cell whose contents you want to delete and then press ⌫.

To delete the contents of all the cells in a spreadsheet

Press ⋯, select [Delete All], and then press OK.

Using Spreadsheet App Special Commands

In the Spreadsheet app, the commands below can be used inside formulas or constants. These commands are on the menu that appears when you press ▤ and then select [Spreadsheet].

Min(
Returns the minimum of the values in a specified range of cells.
Syntax: Min(start cell:end cell)

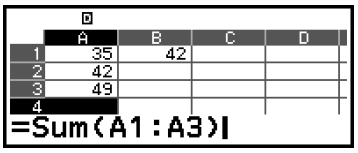
Max(
Returns the maximum of the values in a specified range of cells.
Syntax: Max(start cell:end cell)

Mean(
Returns the mean of the values in a specified range of cells.
Syntax: Mean(start cell:end cell)

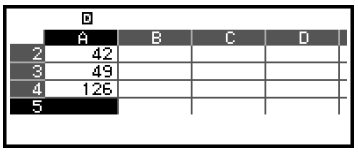
Sum(
Returns the sum of the values in a specified range of cells.
Syntax: Sum(start cell:end cell)

Example 3: Continuing from Example 1, input the formula =Sum(A1:A3), which calculates the sum of cells A1, A2, and A3, into cell A4.
1. Move the cursor to cell A4.
2. Input =Sum(A1:A3).

(⊞) – [Spreadsheet] > [=]
(⊞) – [Spreadsheet] > [Sum]
(⬆)(4)(A)(1)
(⊞) – [Spreadsheet] > [:]
(⬆)(4)(A)(3)(⟩)



3. Press (=).



Batch Inputting the Same Formula or Constant into Multiple Cells

You can use the procedures in this section to input the same formula or constant into a specific series of cells. Use the Fill Formula command to batch input a formula, or Fill Value to batch input a constant.

Note

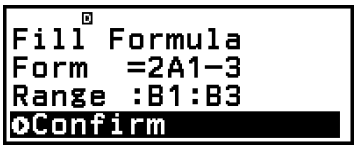
- If the input formula or constant includes a relative reference, the relative reference will be input in accordance with the upper-left cell of the specified range. If the input formula or constant includes an absolute reference, the absolute reference will be input into all of the cells in the specified range.

To batch input the same formula into a series of cells

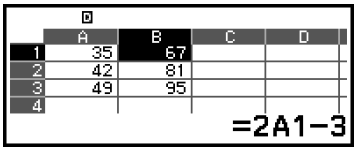
Example 4: Continuing from Example 1, batch input into cells B1, B2, and B3 a formula that doubles the value of the cell to the left and then subtracts 3.

1. Move the cursor to cell B1.
2. Press (⋯), select [Fill Formula], and then press (OK).
   - This displays a Fill Formula screen.
3. In the "Form" line, input the formula =2A1−3: 2(⬆)(4)(A)(1)(−)3(=).
   - Input of the equals symbol (=) at the beginning is not required.
4. In the "Range" line, specify B1:B3 as the range of the batch input.

(OK)(∨)(⌫)(3)(=)



5. To apply the input, press (OK).
   - This inputs =2A1−3 into cell B1, =2A2−3 into cell B2, and =2A3−3 into cell B3.

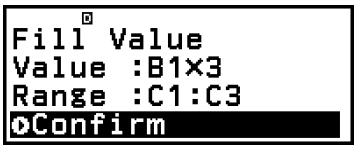


To batch input the same constant into a series of cells

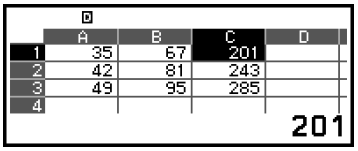
Example 5: Continuing from Example 4, batch input into cells C1, C2, and C3 values that are triple the values in the cells to their left.

1. Move the cursor to cell C1.
2. Press ⋯, select [Fill Value], and then press [OK].
   - This displays a Fill Value screen.
3. In the "Value" line, input the constant B1×3: ↑ 5 (B) 1 × 3 =.
4. In the "Range" line, specify C1:C3 as the range of the batch input.

[OK] ▽ ⌫ 3 =



5. To apply the input, press [OK].
   - This inputs the values of each calculation result into cells C1, C2, and C3.



Spreadsheet App Setting Items

The setting items below are included on the TOOLS menu.
"◆" indicates the initial default setting.

Auto Calc

Specifies whether or not formulas should be re-calculated automatically.
On◆: Enables auto re-calculation.
Off: Disables auto re-calculation.

Show Cell

Specifies whether a formula in the edit box should be displayed as it is or as its calculation result value.
Formula◆: Displays the formula as it is.
Value: Displays the calculation result value of the formula.

Auto Calc and Recalculate

"Auto Calc" is a setting item on the TOOLS menu (see **"Spreadsheet App Setting Items" (page 79)**).
With the Spreadsheet app's initial default setting (Auto Calc: On), formulas in a cell are automatically re-calculated each time the cell contents are edited. Depending on the content of the spreadsheet, auto re-calculation can take a long time to complete. When Auto Calc is disabled (Off), you need to execute re-calculation manually as required.

To execute re-calculation manually

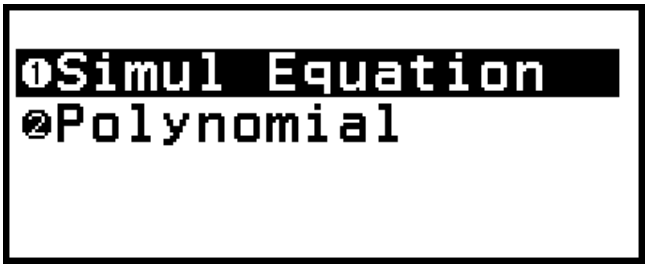
Press ⋯, select [Recalculate], and then press OK.

Note

- Even if the Auto Calc setting is On, you should execute [Recalculate] in the cases below.
  - When the SETTINGS menu is used to change the Angle Unit setting
  - When a cell contains a formula using a variable and the corresponding variable is updated

Equation Calculations

The Equation app includes the two functions described below. After starting up the app, you can use the Equation menu that appears to select the function you want.



Simul Equation: Simultaneous linear equations with two to four unknowns
Polynomial: High-order equations from 2nd to 4th degree

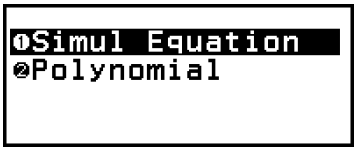
Simultaneous Linear Equations

Here, we explain the general procedure for solving a simultaneous equation with an example that solves a simultaneous linear equation with three unknowns.

Example 1: $\begin{cases} x - y + z = 2 \\ x + y - z = 0 \\ -x + y + z = 4 \end{cases}$

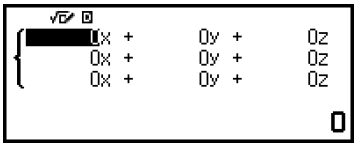
1. Press ⌂, select the Equation app icon, and then press OK.

• This displays the Equation menu.



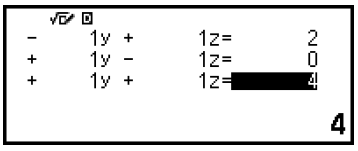
2. Select [Simul Equation], and then press [OK].
   • This displays the number of unknowns menu.

3. Select [3 Unknowns], and then press [OK].
   • This displays the Coefficient Editor.



4. Use the Coefficient Editor to input coefficient values.

1[=][▲][−]((-))1[=]1[=]2[=]
1[=]1[=][▲][−]((-))1[=]0[=]
[▲][−]((-))1[=]1[=]1[=]4[=]



   • Pressing [AC] while the Coefficient Editor is displayed will clear all of the coefficients to zero.
5. Press [=].
   • This will display a solution.

   • While the ▼ indicator is displayed, each press of [▽] (or [=]) will display another solution.

[▽] (or [=])

[▽] (or [=])

   • Pressing [△] or [↩] while the ▲ indicator is displayed causes the previously displayed solution to reappear.

- Pressing ⊜ while the final solution is displayed returns to the Coefficient Editor. To return to the Coefficient Editor while any solution is displayed, press AC.
- Pressing ⮌ while the Coefficient Editor is displayed returns to the number of unknowns menu.

Note

- While the Coefficient Editor is displayed, you can store the currently highlighted value to a variable. Also, while the solution is being displayed, the currently displayed solution can be stored to a variable. For details about variables, see **"Variables (A, B, C, D, E, F, x, y, z)" (page 36)**.

High-order Equations from 2nd to 4th Degree

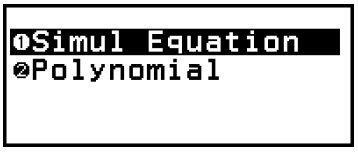
When you solve a high-order equation with the Equation app, the values below are displayed according to the degree of the equation.

- **Quadratic Equation**
  The solution of $ax^2+bx+c=0$ is displayed.
- **Cubic Equation**
  The solution of $ax^3+bx^2+cx+d=0$ is displayed.
- **Quartic Equation**
  The solution of $ax^4+bx^3+cx^2+dx+e=0$ is displayed.

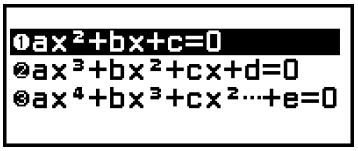
Here we will show an example of a quadratic equation to explain the general procedure for solving a high-order equation.

Example 2: $x^2 + 2x - 2 = 0$
(Input/Output: MathI/MathO)

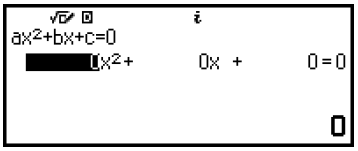
1. Press ⌂, select the Equation app icon, and then press OK.
   - This displays the Equation menu.



2. Select [Polynomial], and then press OK.
   - This displays the number of degrees menu.

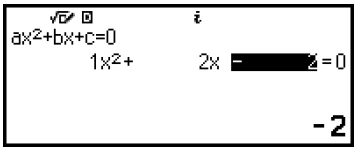


3. Select [$ax^2+bx+c=0$], and then press OK.
   - This displays the Coefficient Editor.



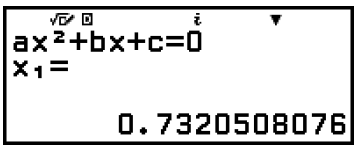
4. Use the Coefficient Editor to input coefficient values.

1=2=(-)2=



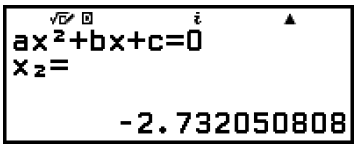
- Pressing AC while the Coefficient Editor is displayed will clear all of the coefficients to zero.

5. Press =.
   - This will display a solution.



- While the ▼ indicator is displayed, each press of ▽ (or =) will display another solution.

▽ (or =)



- Pressing △ or ↩ while the ▲ indicator is displayed causes the previously displayed calculation result to appear again.
- Pressing = while the final calculation result is displayed returns to the Coefficient Editor. To return to the Coefficient Editor while any calculation result is displayed, press AC.
- Pressing ↩ while the Coefficient Editor is displayed returns to the number of degrees menu.

Note

- While the Coefficient Editor is displayed, you can store the currently highlighted value to a variable. Also, while a calculation result (solution or coordinate) is displayed, it can be stored to a variable. For details about variables, see **"Variables (A, B, C, D, E, F, *x*, *y*, *z*)" (page 36)**.

Complex Number Solution Display (Complex Roots)

High-order equations may have complex number solutions. When Polynomial is selected on the Equation menu, you can use the operations below to enable or disable complex number solution display.

⚙ – [Complex Roots] > [On] AC

Enables complex number solution display (initial default setting).

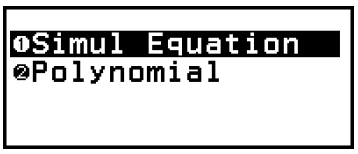
⚙ – [Complex Roots] > [Off] AC

Disables complex number solution display. Inputting and executing an equation that has one or more complex number solutions only will cause the message "No Real Roots" to appear.

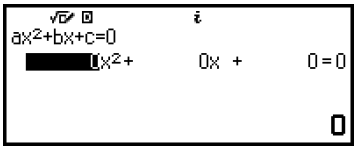
Example 3: $2x^2 + 3x + 4 = 0$

(Input/Output: MathI/MathO, Complex Result: $a+bi$, Complex Roots: On)

1. Press ⌂, select the Equation app icon, and then press OK.
   - This displays the Equation menu.

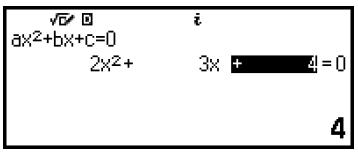


2. Select [Polynomial] > [$ax^2+bx+c=0$].
   - This displays the Coefficient Editor.

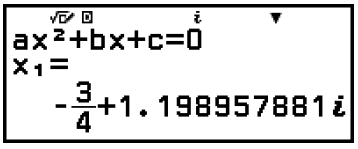


3. Use the Coefficient Editor to input coefficient values.

2=3=4=

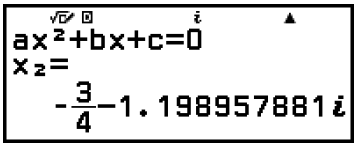


4. Press =.
   - This will display a solution.



5. Display another solution.

▽ (or =)



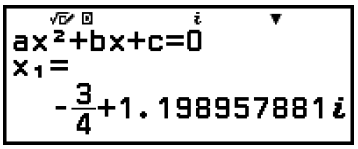
   - Pressing = while the final calculation result is displayed returns to the Coefficient Editor. To return to the Coefficient Editor while any calculation result is displayed, press AC.

Converting a Complex Number Solution to Rectangular or Polar Coordinates

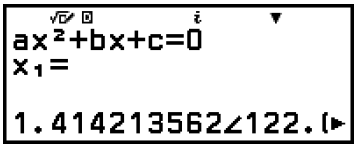
You can use the FORMAT menu that appears when you press ⬆ FORMAT (↻) to convert a complex number solution to rectangular coordinate or polar coordinate format.

Example 4: To convert the complex number solution displayed in **Example 3 (page 83)** to polar coordinate format and then to rectangular coordinate format

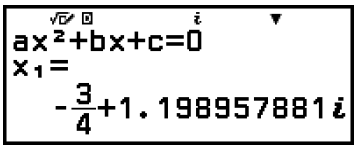
1. Perform steps 1 to 4 of **Example 3 (page 83)**.



2. Press ⬆ FORMAT (↻), select [Polar Coord], and then press OK.
   - This converts the solution to polar coordinate format.

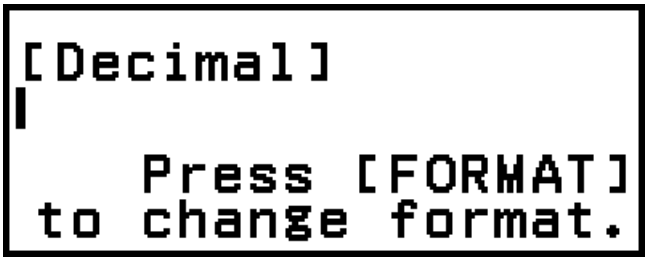


3. Press ⬆ FORMAT (↻), select [Rectangular Coord], and then press OK.
   - This converts the solution to rectangular coordinate format.

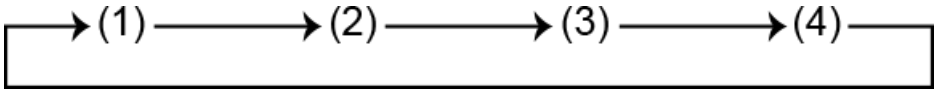


Base-*n* Calculations

When you want to perform calculations using decimal, hexadecimal, binary, and/or octal values, launch the Base-N app. Press ⌂, select the Base-N app icon, and then press OK. The initial default number mode setting when you launch the Base-N app is decimal.



After launching the Base-N app, use FORMAT to switch number modes. Each press of FORMAT cycles through the number modes as shown below.



(1) [Decimal] (2) [Hexadecimal] (3) [Binary] (4) [Octal]

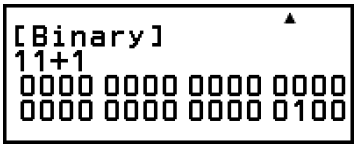
Note

- The subscripts appended to the values shown in the examples indicate the base (number mode) of each value.
  Example: 1_2 ... Binary 1; 1_{16} ... Hexadecimal 1

Example 1: To calculate $11_2 + 1_2$

1. Use FORMAT to change the number mode to [Binary].
2. Perform the calculation $11_2 + 1_2$.

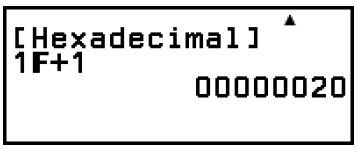
11⊕1=



Example 2: To calculate $1F_{16} + 1_{16}$ in hexadecimal

1. Use FORMAT to change the number mode to [Hexadecimal].
2. Perform the calculation $1F_{16} + 1_{16}$.

1⬆③(F)⊕1=



Note

- Use the following keys to input the letters A through F for hexadecimal values: ⬆④(A), ⬆⑤(B), ⬆⑥(C), ⬆①(D), ⬆②(E), ⬆③(F). You can also input hexadecimal values using the CATALOG menu items shown below.
  CATALOG – [Hex Value] > [A], [B], [C], [D], [E], or [F]
- Note that if you input any character from A through F using the operation below, the character will be treated as a variable name, and not as a hexadecimal value.
  (1) Press VARS to display the variable list screen.
  (2) Select [A=], [B=], [C=], [D=], [E=], or [F=], and then press OK.
  (3) On the menu that appears, select [Recall].
- In the Base-N app, input of fractional (decimal) values and exponents is not supported. If a calculation result has a fractional part, it is cut off.
- Details about input and output ranges (32 bits) are shown below.

Base	Range
Binary	Positive: 00000000000000000000000000000000 ≤ x ≤ 01111111111111111111111111111111 Negative: 10000000000000000000000000000000 ≤ x ≤ 11111111111111111111111111111111

Octal	Positive: 00000000000 ≤ x ≤ 17777777777 Negative: 20000000000 ≤ x ≤ 37777777777
Decimal	-2147483648 ≤ x ≤ 2147483647
Hexadecimal	Positive: 00000000 ≤ x ≤ 7FFFFFFF Negative: 80000000 ≤ x ≤ FFFFFFFF

- A Math ERROR occurs when a calculation result is outside the applicable range for the number system being used.

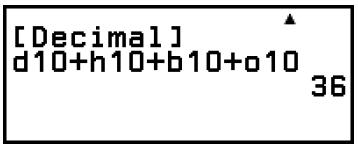
Specifying the Number Mode of a Particular Input Value

You can input a special command immediately before a value to specify the number mode of that value. The special commands are: d (decimal), h (hexadecimal), b (binary), and o (octal).

Example 3: To calculate $10_{10} + 10_{16} + 10_2 + 10_8$ and display the result as a decimal value

1. Use FORMAT to change the number mode to [Decimal].
2. Perform the calculation $10_{10} + 10_{16} + 10_2 + 10_8$.

OPTION – [Base Prefix] > [Decimal(d)] 10+
OPTION – [Base Prefix] > [Hexadecimal(h)] 10+
OPTION – [Base Prefix] > [Binary(b)] 10+
OPTION – [Base Prefix] > [Octal(o)] 10=



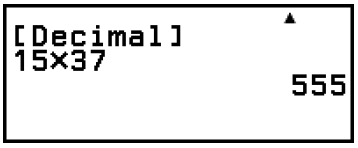
Converting a Calculation Result to Another Type of Value

You can use FORMAT to convert the currently displayed calculation result to another type of value.

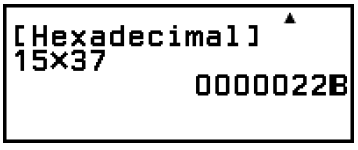
Example 4: To calculate $15_{10} \times 37_{10}$ in the decimal mode, and then convert the result to hexadecimal

1. Use FORMAT to change the number mode to [Decimal].
2. Perform the calculation $15_{10} \times 37_{10}$.

15×37=



3. Use FORMAT to change the number mode to [Hexadecimal].

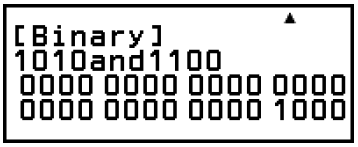


Logical and Negation Operations

Logical and negation operations are performed by pressing ⓞ and selecting [Logic Operation], and then selecting the desired command (Neg, Not, and, or, xor, xnor) from the menu that appears. All of the examples below are performed in the binary mode.

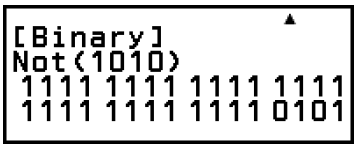
Example 5: To determine the logical AND of 1010_2 and 1100_2 (1010_2 and 1100_2)

1010
ⓞ – [Logic Operation] > [and]
1100=



Example 6: To determine the bitwise complement of 1010_2 (Not(1010_2))

ⓞ – [Logic Operation] > [Not]
1010)=



Note

- In the case of a negative binary, octal or hexadecimal value, the calculator converts the value to binary, takes the two's complement, and then converts back to the original number base. For decimal values, the calculator merely adds a minus sign.

Technical Information

Errors

The calculator will display an error message whenever an error occurs for any reason during a calculation.

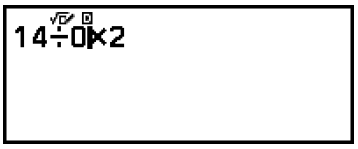
Displaying the Location of an Error

While an error message is displayed, pressing [OK], [↩], or [AC] returns to the screen that was displayed immediately before the error message appeared. The cursor will be positioned at the location where the error occurred, ready for input. Make the necessary corrections to the calculation and execute it again.

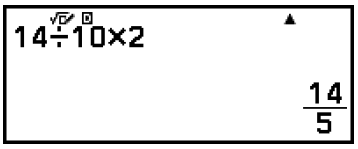
Example: When you input 14 ÷ 0 × 2 by mistake instead of 14 ÷ 10 × 2.

14 ÷ 0 × 2 =

[OK] (or [↩] or [AC])



◀ 1 =



Error Messages

Syntax ERROR

Cause:

- There is a problem with the format of the calculation you are performing.

Action:

- Make necessary corrections.

Math ERROR

Cause:

- The intermediate or final result of the calculation you are performing exceeds the allowable calculation range.

- Your input exceeds the allowable input range (particularly when using functions).
- The calculation you are performing contains an illegal mathematical operation (such as division by zero).

Action:

- Check the input values, reduce the number of digits, and try again.
- When using a variable as the argument of a function, make sure that the variable value is within the allowable range for the function.

Stack ERROR

Cause:

- The calculation you are performing has caused the capacity of the numeric stack or the command stack to be exceeded.

Action:

- Simplify the calculation expression so it does not exceed the capacity of the stack.
- Try splitting the calculation into two or more parts.

Argument ERROR

Cause:

- There is a problem with the argument of the calculation you are performing.

Action:

- Make necessary corrections.

Range ERROR (Spreadsheet app only)

Cause:

- During batch input in the Spreadsheet app, input for Range is outside the allowable range or is a cell name that does not exist.

Action:

- For Range, input a cell name within the range of A1 through E45, using the syntax: "A1:A1".

Circular ERROR (Spreadsheet app only)

Cause:

- There is a circular reference (such as "=A1" in cell A1) in the spreadsheet.

Action:

- Change cell contents to remove the circular references.

Memory ERROR (Spreadsheet app only)

Cause:

- You are attempting to input data that exceeds the allowable input capacity (2,380 bytes).
- You are attempting to input data that results in a chain of consecutive cell references (such as cell A2 referenced from cell A1, cell A3 referenced from cell A2…, etc.) This type of input always causes this error to be generated, even if memory capacity (2,380 bytes) is not exceeded.

Action:

- Delete unneeded data and input data again.
- Minimize input that results in a chain of consecutive cell references.

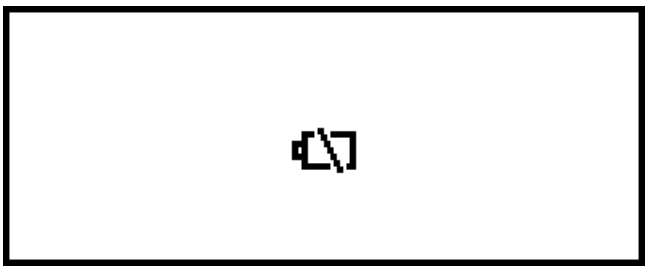
Before Assuming Malfunction of the Calculator...

Note that you should make separate copies of important data before performing these steps.

1. Check the calculation expression to make sure that it does not contain any errors.
2. Make sure that you are using the correct calculator app for the type of calculation you are trying to perform.
   - To check which calculator app you are currently using, press ⌂. This highlights the icon of the calculator app currently in use.
3. If the above steps do not correct your problem, press the ⏻ key.
   - This causes the calculator to perform a routine that checks whether calculation functions are operating correctly. If the calculator discovers any abnormality, it automatically initializes the calculator app and clears memory contents.
4. Return the calculator settings (except for Contrast and Auto Power Off) to their initial default settings by performing the procedure below.
   (1) Press ⌂, select a calculator app icon, and then press OK.
   (2) Press ☰, and then select [Reset] > [Settings & Data] > [Yes].

Replacing the Battery

If the screen shown below appears right after you turn on power, it means that remaining battery power is low.

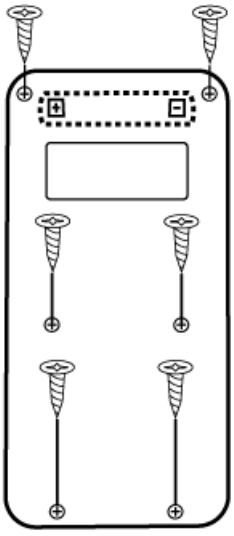


A low battery is also indicated by a dim display, even if contrast is adjusted, or by failure of figures to appear on the display immediately after you turn on the calculator.
If this happens or the above screen appears, replace the battery with a new one.

Important!

- Removing the battery causes all of the calculator's memory contents to be cleared.

1. Press ⬆ AC (OFF) to turn off the calculator.
   - To ensure that you do not accidentally turn on power while replacing the battery, attach the front cover to the front of the calculator.
2. As shown in the illustration, remove the battery cover, remove the battery, and then load a new battery with its plus (+) and minus (−) ends facing correctly.



3. Replace the battery cover.
4. Press ⏻ to turn on the calculator.
5. Initialize the calculator.
   (1) Press ⌂, select a calculator app icon, and then press OK.
   (2) Press ☰, and then select [Reset] > [Initialize All] > [Yes].

- Do not skip the above steps!

Calculation Priority Sequence

The calculator performs calculations according to a calculation priority sequence.

- Basically, calculations are performed from left to right.
- Expressions within parentheses have the highest priority.
- The following shows the priority sequence for each individual command.

1	Parenthetical expressions
2	Functions that have parentheses (sin(, log(, etc., functions that take an argument to the right, functions that require a closing parenthesis after the argument)
3	Functions that come after the input value (x^2, x^{-1}, $x!$, °’ ”, °, ^{r}, ^{g}, %, ►t), powers ($x^{\blacksquare}$), roots ($\sqrt[\blacksquare]{\square}$)
4	Fractions
5	Negative sign ((-)), Base Prefix (d, h, b, o)
6	Statistics app estimated values ($\hat{x}$, $\hat{y}$, $\hat{x}_1$, $\hat{x}_2$)
7	Multiplication where the multiplication sign is omitted
8	Permutation (nPr), combination (nCr)
9	Multiplication (×), division (÷)
10	Addition (+), subtraction (−)
11	and (logical operator)
12	or, xor, xnor (logical operators)

Precautions when a calculation contains negative values

If a calculation contains a negative value, you may need to enclose the negative value in parentheses. If you want to square the value -2, for example, you need to input: $(-2)^2$. This is because x^2 is a function

preceded by a value (Priority 3, above), whose priority is greater than the negative sign, which is a prefix symbol (Priority 5).

Example:

(-)((-))2x^2= $-2^2 = -4$

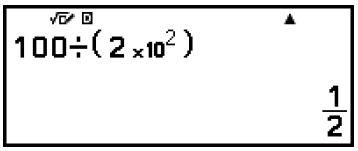
((-))2)x^2= $(-2)^2 = 4$

Precautions when using the EXP key in a calculation

Pressing EXP inputs the function $\times 10^{\square}$, which takes arguments before and after it with the form $a \times 10^n$ (n is an integer) and returns the result of 10^n multiplied by a.

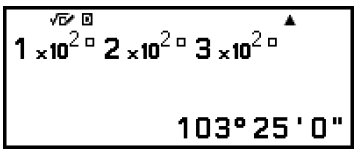
Example:

100÷2EXP2=



When you input the function $\times 10^{\square}$ within a calculation, executing the calculation automatically inserts parentheses as shown in the above example. Note, however, that parentheses will not be inserted automatically if you input the sexagesimal symbol (°) immediately after $\times 10^{\square}$.

1EXP2>+(°)2EXP2>+(°)
3EXP2>+(°)=



Calculation Ranges, Number of Digits, and Precision

The calculation range, number of digits used for internal calculation, and calculation precision depend on the type of calculation you are performing.

Calculation Range and Precision

Calculation Range	$\pm 1 \times 10^{-99}$ to $\pm 9.999999999 \times 10^{99}$ or 0
Number of Digits for Internal Calculation	23 digits

Precision	In general, ±1 at the 10th digit for a single calculation. Precision for exponential display is ±1 at the least significant digit. Errors are cumulative in the case of consecutive calculations.

Function Calculation Input Ranges and Precision

Functions	**Input Range**	
$\sin x$ $\cos x$	Degree	$0 \le \lvert x \rvert < 9 \times 10^{9}$
	Radian	$0 \le \lvert x \rvert < 157079632.7$
	Gradian	$0 \le \lvert x \rvert < 1 \times 10^{10}$
$\tan x$	Degree	Same as $\sin x$, except when $\lvert x \rvert = (2n - 1) \times 90$.
	Radian	Same as $\sin x$, except when $\lvert x \rvert = (2n - 1) \times \pi/2$.
	Gradian	Same as $\sin x$, except when $\lvert x \rvert = (2n - 1) \times 100$.
$\sin^{-1} x$, $\cos^{-1} x$	$0 \le \lvert x \rvert \le 1$	
$\tan^{-1} x$	$0 \le \lvert x \rvert \le 9.999999999 \times 10^{99}$	
$\sinh x$, $\cosh x$	$0 \le \lvert x \rvert \le 230.2585092$	
$\sinh^{-1} x$	$0 \le \lvert x \rvert \le 4.999999999 \times 10^{99}$	
$\cosh^{-1} x$	$1 \le x \le 4.999999999 \times 10^{99}$	
$\tanh x$	$0 \le \lvert x \rvert \le 9.999999999 \times 10^{99}$	
$\tanh^{-1} x$	$0 \le \lvert x \rvert \le 9.999999999 \times 10^{-1}$	
$\log x$, $\ln x$	$0 < x \le 9.999999999 \times 10^{99}$	
10^{x}	$-9.999999999 \times 10^{99} \le x \le 99.99999999$	
$\sqrt{x}$	$0 \le x < 1 \times 10^{100}$	

x^2	$\lvert x\rvert < 1 \times 10^{50}$
x^{-1}	$\lvert x\rvert < 1 \times 10^{100}$; $x \neq 0$
$x!$	$0 \leq x \leq 69$ (x is an integer)
$n\mathrm{P}r$	$0 \leq n < 1 \times 10^{10}$, $0 \leq r \leq n$ (n, r are integers) $1 \leq \{n!/(n-r)!\} < 1 \times 10^{100}$
$n\mathrm{C}r$	$0 \leq n < 1 \times 10^{10}$, $0 \leq r \leq n$ (n, r are integers) $1 \leq n!/r! < 1 \times 10^{100}$ or $1 \leq n!/(n-r)! < 1 \times 10^{100}$
Pol(x, y)	$\lvert x\rvert$, $\lvert y\rvert \leq 9.999999999 \times 10^{99}$ $\sqrt{x^2 + y^2} \leq 9.999999999 \times 10^{99}$
Rec(r, θ)	$0 \leq r \leq 9.999999999 \times 10^{99}$ θ: Same as sin$x$
a°b'c"	$\lvert a\rvert$, b, $c < 1 \times 10^{100}$; $0 \leq b$, c The display seconds value is subject to an error of ±1 at the second decimal place.
a°b'c" = x	0°0'0" ≤ $\lvert x\rvert \leq$ 9999999°59'59" A sexagesimal value outside of the above range is automatically treated as a decimal value.
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: $-1 \times 10^{100} < y\log \lvert x\rvert < 100$
$\sqrt[x]{y}$	$y > 0$: $x \neq 0$, $-1 \times 10^{100} < 1/x \log y < 100$ $y = 0$: $x > 0$ $y < 0$: $x = 2n + 1, \frac{2n+1}{m}$ ($m \neq 0$; m, n are integers) However: $-1 \times 10^{100} < 1/x \log \lvert y\rvert < 100$
$a\ {}^{b}/_{c}$	Total of integer, numerator, and denominator must be 10 digits or less (including separator symbol).
RanInt#(a, b)	$a < b$; $\lvert a\rvert$, $\lvert b\rvert < 1 \times 10^{10}$; $b - a < 1 \times 10^{10}$

- Precision is basically the same as that described under **"Calculation Range and Precision" (page 94)**, above.
- x^y, $\sqrt[x]{y}$, $x!$, $_nP_r$, $_nC_r$ type functions require consecutive internal calculation, which can cause accumulation of errors that occur with each calculation.
- Error is cumulative and tends to be large in the vicinity of a function's singular point and inflection point.

Specifications

Power Requirements:
AAA-size battery R03 × 1

Approximate Battery Life:
2 years (based on one hour of operation per day)

Power Consumption:
0.0008 W

Operating Temperature:
0°C to 40°C (32°F to 104°F)

Dimensions:
13.8 (H) × 77 (W) × 162 (D) mm
$^9/_{16}$" (H) × 3 $^1/_{16}$" (W) × 6 $^3/_8$" (D)

Approximate Weight:
100 g (3.5 oz) including the battery

Frequently Asked Questions

Frequently Asked Questions

■ How can I change a fraction form result produced by a division operation to decimal form?

→ While a fraction calculation result is displayed, press FORMAT, or press ⇧=(≈). For more information, see **"Toggling Calculation Results between Fraction and Decimal" (page 39)**. To have calculation results initially appear as decimal values, change the Input/Output setting on the SETTINGS menu to MathI/DecimalO.

■ What is the difference between Ans memory and variable memory?

→ Each of these types of memory acts like "containers" for temporary storage of a single value.

Ans Memory: Stores the result of the last calculation performed. Use this memory to carry the result of one calculation on to the next.

Variables: This memory is helpful when you need to use the same value multiple times in one or more calculations.

■ How can I find a function I was using with an older CASIO calculator model on this calculator?

→ This calculator's functions can be accessed from the CATALOG menu that appears when you press 4 or the CATALOG list that appears when you press ⇧4(☰). For details, see the sections below.

"Using the CATALOG Menu and CATALOG List" (page 24)

"Advanced Calculations" (page 46)

■ With an older CASIO calculator model, I pressed S⇔D to change the calculation result display format. What should I do with this calculator?

→ Use FORMAT to change the calculation result display format. For details, see **"Changing Calculation Result Format" (page 39)**.

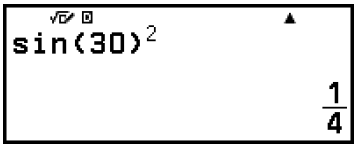
■ How can I find out which calculator app I am currently using?

→ Press ⌂. This causes the icon of the calculator app you are currently using to become highlighted.

■ How do I calculate $\sin^2 x$

→ For example, to calculate $\sin^2 30 = \frac{1}{4}$, enter the calculation below.

sin 30) x² =



■ **Why does the battery icon (🪫) appear right after the calculator is turned on?**

→ The battery icon indicates that battery power is low. If you see this icon, replace the battery as soon as possible. For details about battery replacement, see **"Replacing the Battery" (page 92)**.

■ **How can I return the calculator to its initial default settings?**

→ Perform the procedure below to initialize calculator settings (except for Contrast and Auto Power Off).

(1) Press ⌂, select a calculator app icon, and then press OK.

(2) Press ☰, and then select [Reset] > [Settings & Data] > [Yes].

CASIO®

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