EN

fx-100AU PLUS

(2nd edition / NATURAL-V.P.A.M.)

User's Guide

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CASIO®

Table of Contents

Before Using the Calculator

About this Manual

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- Unless specifically stated, all sample operations in this manual assume that the calculator is in its initial default setup. Use the procedure under "Initializing the Calculator" to return the calculator to its initial default setup.
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Initializing the Calculator

Perform the following procedure when you want to initialize the calculator and return the calculation mode and setup to their initial default settings. Note that this operation also clears all data currently in calculator memory.
[SHIFT] [9] (CLR) [3] (All) [=] (Yes)

Precautions

Be sure to read the following safety precautions before using the calculator.

Safety Precautions

⚠ **Battery**
- Keep batteries out of the reach of small children.

• Use only the type of battery specified for this calculator in this manual.

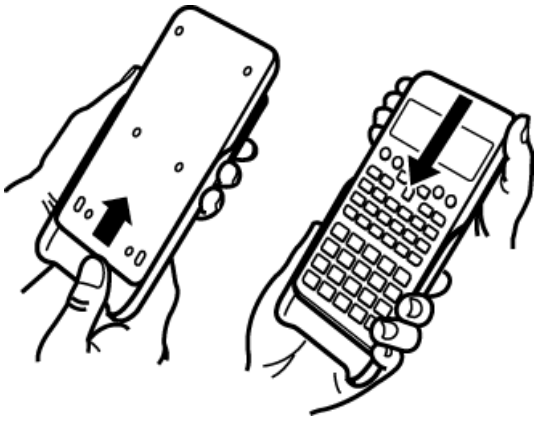
Handling Precautions

- Even if the calculator is operating normally, replace the battery according to the schedule shown below. Continued use after the specified number of years may result in abnormal operation. Replace the battery immediately after display figures become dim.
  fx-100AU PLUS: Every 2 years
- A dead battery can leak, causing damage to and malfunction of the calculator. Never leave a dead battery in the calculator.
- **The battery that comes with the calculator is for factory testing, and it discharges slightly during shipment and storage. Because of these reasons, its battery life may be shorter than normal.**
- Do not use a nickel-based primary battery with this product. Incompatibility between such batteries and product specifications can result in shorter battery life and product malfunction.
- 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

Removing the Hard Case

Before using the calculator, slide its hard case downwards to remove it, and then affix the hard case to the back of the calculator as shown in the illustration below.



Turning Power On and Off

- Press [ON] to turn on the calculator.
- Press [SHIFT] [AC] (OFF) to turn off the calculator.

Note

- The calculator also will turn off automatically after approximately 10 minutes of non-use. Press the [ON] key to turn the calculator back on.

Adjusting Display Contrast

1. Press [SHIFT] [MODE] (SETUP) ▼ [6] (◀CONT▶).

2. Use ◀ and ▶ to adjust display contrast.
3. 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 [SHIFT] or [ALPHA] 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.

(1) Keycap function (2) Alternate function

- Characters enclosed in brackets (┌ ┐) that are the same color as *i* are used in the CMPLX Mode.
- Characters enclosed in brackets (┌ ┐) that are the same color as DEC, HEX, BIN, and OCT are used in the BASE-N Mode.
- The following shows an example of how an alternate function operation is represented in this manual.

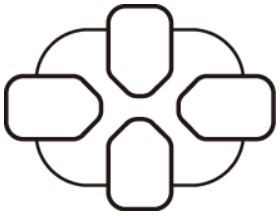
Example: [SHIFT] [sin] (sin^{-1})* 1 [=]

* Indicates the function that is accessed by the key operation ([SHIFT] [sin]) before it. Note that this is not part of the actual key operation you perform.

- The following shows an example of how a key operation to select an on-screen menu item is represented in this manual.

  Example: [1] (COMP)*

  * Indicates the menu item that is selected by the number key operation ([1]) before it. Note that this is not part of the actual key operation you perform.
- The cursor key is marked with four arrows, indicating direction, as shown in the illustration nearby. In this manual, cursor key operation is indicated as ▲, ▼, ◀, and ▶.



Reading the Display

The two-line display makes it possible to view both the input expression and its result at the same time.

(1) Input expression
(2) Calculation result
(3) Indicators

- If a ▶ indicator appears on the right side of the calculation result, it means the displayed calculation result continues to the right. Use ▶ and ◀ to scroll the calculation result display.
- If a ▷ indicator appears on the right side of the input expression, it means the displayed calculation continues to the right. Use ▶ and ◀ to scroll the input expression display. Note that if you want to scroll the input expression while both the ▶ and ▷ indicators are displayed, you will need to press [AC] first and then use ▶ and ◀ to scroll.

Display indicators

This indicator:	Means this:
S	The keypad has been shifted by pressing the [SHIFT] key. The keypad will unshift and this indicator will disappear when you press a key.
A	The alpha input mode has been entered by pressing the [ALPHA] key. The alpha input mode will be exited and this indicator will disappear when you press a key.
M	There is a value stored in independent memory.
STO	The calculator is standing by for input of a variable name to assign a value to the variable. This indicator appears after you press [SHIFT] [RCL] (STO).
RCL	The calculator is standing by for input of a variable name to recall the variable's value. This indicator appears after you press [RCL].
STAT	The calculator is in the STAT Mode.
CMPLX	The calculator is in the CMPLX Mode.
VCT	The calculator is in the VECTOR Mode.
D	The default angle unit is degrees.
R	The default angle unit is radians.
G	The default angle unit is grads.
FIX	A fixed number of decimal places is in effect.
SCI	A fixed number of significant digits is in effect.
Math	Natural Display is selected as the display format.
▼▲	Calculation history memory data is available and can be replayed, or there is more data above/ below the current screen.

Disp	The display currently shows an intermediate result of a multi-statement calculation.

Important!

- For some type of calculation that takes a long time to execute, the display may show only the above indicators (without any value) while it performs the calculation internally.

Using Menus

Some of the calculator's operations are performed using menus. Pressing MODE or hyp, for example, will display a menu of applicable functions. The following are the operations you should use to navigate between menus.

- You can select a menu item by pressing the number key that corresponds to the number to its left on the menu screen.
- The ▼ indicator in the upper right corner of a menu means there is another menu below the current one. The ▲ indicator means another menu above. Use ⏬ and ⏫ to switch between menus.
- To close a menu without selecting anything, press AC.

Calculation Modes and Calculator Setup

Calculation Mode

Before starting a calculation, you must first enter the correct mode as indicated in the table below.

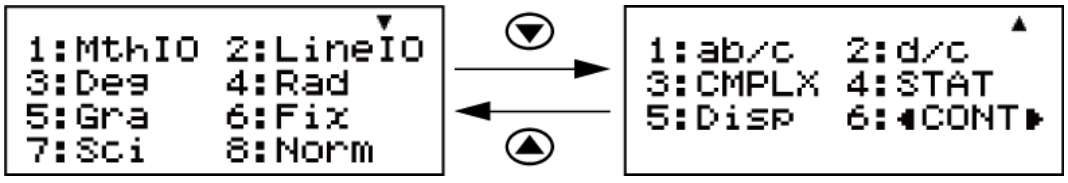
When you want to perform this type of operation:	Perform this key operation:
General calculations	MODE 1 (COMP)
Complex number calculations	MODE 2 (CMPLX)
Statistical and regression calculations	MODE 3 (STAT)
Calculations involving specific number systems (binary, octal, decimal, hexadecimal)	MODE 4 (BASE-N)
Verify a calculation	MODE 5 (VERIF)
Vector calculations	MODE 6 (VECTOR)

Note

- The initial default calculation mode is the COMP Mode.

Configuring the Calculator Setup

Pressing SHIFT MODE (SETUP) displays the setup menu, which you can use to control how the calculations are executed and displayed. The setup menu has two screens, which you can jump between using ▼ and ▲.



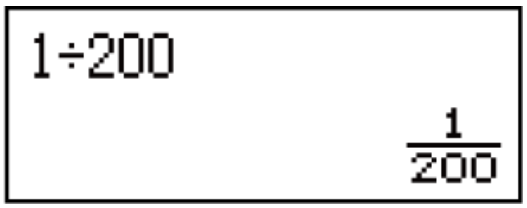
Underlined (___) settings are initial defaults.

Specifying the Display Format

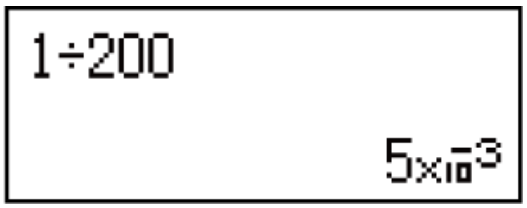
To specify this display format:	Perform this key operation:
Natural Display (MthIO-MathO)	SHIFT MODE (SETUP) 1 (MthIO) 1 (MathO)
Natural Display (MthIO-LineO)	SHIFT MODE (SETUP) 1 (MthIO) 2 (LineO)
Linear Display (LineIO)	SHIFT MODE (SETUP) 2 (LineIO)

Natural Display (MthIO-MathO, MthIO-LineO) causes fractions, irrational numbers, and other expressions to be displayed as they are written on paper.
MthIO-MathO displays input and calculation results using the same format as they are written on paper.
MthIO-LineO displays input the same way as MthIO-MathO, but calculation results are displayed in linear format.
Linear Display (LineIO) causes fractions and other expressions to be displayed in a single line.

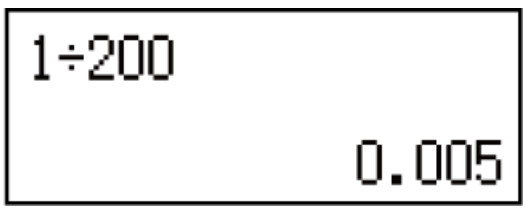
Examples:
MthIO-MathO



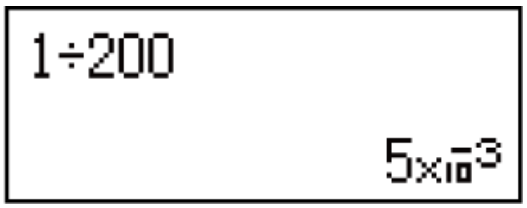
MthIO-LineO
(Number Format: Norm 1)



MthIO-LineO
(Number Format: Norm 2)



LineIO
(Number Format: Norm 1)



Note

- The calculator switches to Linear Display automatically whenever you enter the STAT, BASE-N, or VECTOR Mode.

Specifying the Default Angle Unit

To specify this as the default angle unit:	Perform this key operation:
Degrees	SHIFT MODE (SETUP) 3 (Deg)
Radians	SHIFT MODE (SETUP) 4 (Rad)
Grads	SHIFT MODE (SETUP) 5 (Gra)

90°= π/2 radians = 100 grads

Specifying the Number Format

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

To specify this:	Perform this key operation:
Number of Decimal Places	SHIFT MODE (SETUP) 6 (Fix) 0 - 9
Number of Significant Digits	SHIFT MODE (SETUP) 7 (Sci) 0 - 9
Exponential Display Range	SHIFT MODE (SETUP) 8 (Norm) 1 (Norm 1) or 2 (Norm 2)

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: (LineIO) 100 ÷ 7 = 14.286 (Fix 3)
14.29 (Fix 2)

Sci: The value you specify (from 0 to 9) controls the number of significant digits for displayed calculation results. Calculation results are rounded off to the specified digit before being displayed.
Example: (LineIO) 1 ÷ 7 = 1.4286×10^{-1} (Sci 5)
1.429×10^{-1} (Sci 4)
$1.428571429 \times 10^{-1}$ (Sci 0)

Norm: Selecting one of the two available settings (Norm 1, Norm 2) determines the range in which results will be displayed in exponential format. Outside the specified range, results are displayed using non-exponential format.
Norm 1: $10^{-2} > |x|, |x| \geqq 10^{10}$
Norm 2: $10^{-9} > |x|, |x| \geqq 10^{10}$
Example: (LineIO) 1 ÷ 200 = 5×10^{-3} (Norm 1)
0.005 (Norm 2)

Specifying the Fraction Display Format

To specify this fraction display format:	**Perform this key operation:**
Mixed	SHIFT MODE (SETUP) ▼ 1 (ab/c)
Improper	SHIFT MODE (SETUP) ▼ 2 (d/c)

Specifying the Complex Number Format

To specify this complex number format:	**Perform this key operation:**
Rectangular Coordinates	SHIFT MODE (SETUP) ▼ 3 (CMPLX) 1 ($a+b\boldsymbol{i}$)
Polar Coordinates	SHIFT MODE (SETUP) ▼ 3 (CMPLX) 2 ($r\angle\theta$)

Specifying the Stat Format

Specifies whether or not to display a FREQ (frequency) column in the STAT Mode Statistics Editor.

To specify this:	**Perform this key operation:**
Show FREQ Column	SHIFT MODE (SETUP) ▼ 4 (STAT) 1 (ON)

Hide FREQ Column	SHIFT MODE(SETUP)▼ 4(STAT)2(OFF)

Specifying the Decimal Point Display Format

Specifies whether to display a dot or a comma for the calculation result decimal point. A dot is always displayed during input.

To specify this decimal point display format:	Perform this key operation:
Dot (.)	SHIFT MODE(SETUP)▼ 5(Disp)1(Dot)
Comma (,)	SHIFT MODE(SETUP)▼ 5(Disp)2(Comma)

Note

- When dot is selected as the decimal point, the separator for multiple results is a comma (,). When comma is selected, the separator is a semicolon (;).

Adjusting Display Contrast

SHIFT MODE(SETUP)▼ 6(◀CONT▶)
See "Getting Started" for details.

Initializing Calculator Settings

Perform the following procedure to initialize the calculator, which returns the calculation mode to COMP and returns all other settings, including setup menu settings, to their initial defaults.
SHIFT 9(CLR)1(Setup)=(Yes)

This setting:	Is initialized to this:
Calculation Mode	COMP
Display Format	MthIO-LineO
Angle Unit	Deg
Number Format	Norm 2
Fraction Display Format	d/c

Complex Number Format	$a+b\boldsymbol{i}$
Stat Format	OFF
Decimal Point	Dot

Inputting Expressions and Values

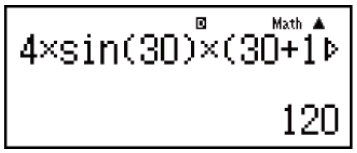
Basic Input Rules

Calculations can be input in the same form as they are written. When you press [=] the priority sequence of the input calculation will be evaluated automatically and the result will appear on the display.

Example 1: 4 × sin30 × (30 + 10 × 3) = 120

4 [×] [sin] 30 [)] [×] [(] 30 [+] 10 [×] 3 [)] [=]

*1 *2 *3



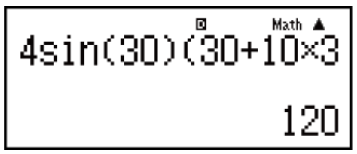
*1 Input of the closing parenthesis is required for sin, sinh, and other functions that include parentheses.

*2 These multiplication symbols (×) can be omitted. A multiplication symbol can be omitted when it occurs immediately before an opening parenthesis, immediately before sin or other function that includes parentheses, immediately before the Ran# (random number) function, or immediately before a variable (A, B, C, D, E, F, M, X, Y), scientific constants, π or e.

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

Example 2: Input example omitting [×]*2 and [)]*3 operations in the above example.

4 [sin] 30 [)] [(] 30 [+] 10 [×] 3 [=]



Important!

- If you execute a calculation that includes both division and multiplication operations in which a multiplication sign has been omitted, parentheses will be inserted automatically as shown in the examples below.
  - When a multiplication sign is omitted immediately before an open parenthesis or after a closed parenthesis.

Examples: 6 ÷ 2 (1 + 2) → 6 ÷ (2 (1 + 2))

6 ÷ A (1 + 2) → 6 ÷ (A (1 + 2))

1 ÷ (2 + 3) sin(30) → 1 ÷ ((2 + 3) sin(30))

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

Examples: 6 ÷ 2π → 6 ÷ (2π)

2 ÷ 2$\sqrt{2}$ → 2 ÷ (2$\sqrt{2}$)

4π ÷ 2π → 4π ÷ (2π)

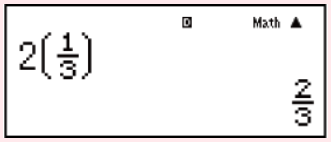
- When inputting a function that uses commas (such as Pol, Rec, and RanInt#), be sure to input the closed parentheses required by the expression. If you do not input closed parentheses, parentheses may not be inserted automatically as described above.

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

$2 \times \frac{1}{3}$ (MthIO-LineO)

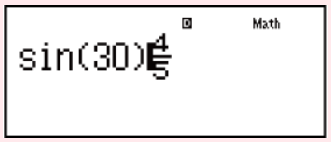
[▼] 1 [▼] 3 [◀][◀][◀][◀] 2

[=]

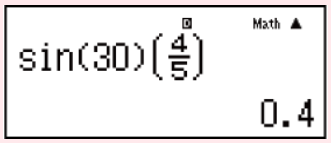


$\sin(30) \times \frac{4}{5}$ (MthIO-LineO)

[▼] 4 [▼] 5 [◀][◀][◀][◀] [sin] 30 [)]



[=]



Note

- If the calculation becomes longer than the screen width during input, the screen will scroll automatically to the right and the ◀ indicator will appear on the display. When this happens, you can scroll back to the left by using [◀] and [▶] to move the cursor.
- When Linear Display is selected, pressing [▲] will cause the cursor to jump to the beginning of the calculation, while [▼] will jump to the end.
- When Natural Display is selected, pressing [▶] while the cursor is at the end of the input calculation will cause it to jump to the beginning, while pressing [◀] while the cursor is at the beginning will cause it to jump to the end.
- You can input up to 99 bytes for a calculation. Each numeral, symbol, or function normally uses one byte. Some functions require three to 13 bytes.

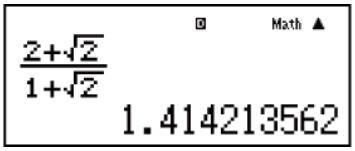
- The cursor will change shape to ■ when there are 10 bytes or less of allowed input remaining. If this happens, end calculation input and then press [=].

Inputting with Natural Display

Selecting Natural Display makes it possible to input and display fractions and certain functions (x^2, x^3, $x^{\blacksquare}$, $\sqrt{\blacksquare}$, $\sqrt[3]{\blacksquare}$, $\sqrt[\blacksquare]{\square}$, x^{-1}, $10^{\blacksquare}$, $e^{\blacksquare}$, Abs) just as they are written in your textbook.

Example: $\dfrac{2+\sqrt{2}}{1+\sqrt{2}}$ (MthIO-LineO)

[Print] 2 [+] [√] 2 [▶] [▶] 1 [+] [√] 2 [=]



Important!

- Certain types of expressions can cause the height of an input expression to be greater than one display line. The maximum allowable height of an input expression is two display screens (31 dots × 2). Further input will become impossible if the height of the calculation you are inputting exceeds the allowable limit.
- Nesting of functions and parentheses is allowed. Further input will become impossible if you nest too many functions and/or parentheses. If this happens, divide the calculation into multiple parts and calculate each part separately.

Note

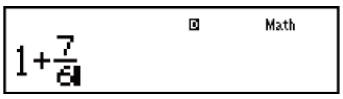
- When you press [=] and obtain a calculation result using Natural Display, part of the expression you input may be cut off. If you need to view the entire input expression again, press [AC] and then use [◀] and [▶] to scroll the input expression.

Using Values and Expressions as Arguments (Natural Display only)

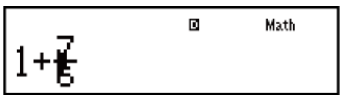
A value or an expression that you have already input can be used as the argument of a function. After you have input $\frac{7}{6}$, for example, you can make it the argument of $\sqrt{\ }$, resulting in $\sqrt{\frac{7}{6}}$.

Example: To input $1 + \frac{7}{6}$ and then change it to $1 + \sqrt{\frac{7}{6}}$ (MthIO-LineO)

1 [+] 7 [▤] 6



[◀] [◀] [◀] [◀] [SHIFT] [DEL](INS)



[√■]

As shown above, the value or expression to the right of the cursor after [SHIFT] [DEL](INS) are pressed becomes the argument of the function that is specified next. The range encompassed as the argument is everything up to the first open parenthesis to the right, if there is one, or everything up to the first function to the right (sin(30), log(4), etc.)
This capability can be used with the following functions: [▤], [SHIFT] [▤] (■/■), [SHIFT] [$x^{\blacksquare}$] ($\sqrt[\blacksquare]{\square}$), [SHIFT] [log] ($10^{\blacksquare}$), [SHIFT] [ln] ($e^{\blacksquare}$), [√■], [$x^{\blacksquare}$], [SHIFT] [√■] ($\sqrt[3]{\blacksquare}$), [Abs].

Overwrite Input Mode (Linear Display only)

You can select either insert or overwrite as the input mode, but only while Linear Display is selected. 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 operations: [SHIFT] [DEL](INS). The cursor appears as "|" in the insert mode and as "_" in the overwrite mode.

Note

- Natural Display always uses the insert mode, so changing display format from Linear Display to Natural Display will automatically switch to the insert mode.

Correcting and Clearing an Expression

To delete a single character or function:
Move the cursor so it is directly to the right of the character or function you want to delete, and then press [DEL].
In the overwrite mode, move the cursor so it is directly under the character or function you want to delete, and then press [DEL].

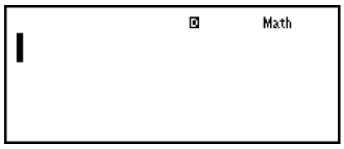
To insert a character or function into a calculation:
Use ◀ and ▶ to move the cursor to the location where you want to insert the character or function and then input it. Be sure always to use the insert mode if Linear Display is selected.

To clear all of the calculation you are inputting:
Press AC.

Basic Calculations

Use the [MODE] key to enter the COMP Mode when you want to perform basic calculations.

[MODE] [1] (COMP)



Toggling Calculation Results

Each press of [S⇔D] will toggle the currently displayed calculation result between its decimal form and fraction form.

Example 1: $1 \div 5 = 0.2 = \frac{1}{5}$ (MthIO-LineO)

[1] [÷] [5] [=] 0.2 [S⇔D] $\frac{1}{5}$

Example 2: $1 \div 5 = 0.2 = \frac{1}{5}$ (LineIO)

[1] [÷] [5] [=] 0.2 [S⇔D] 1⌟5

Example 3: $1 - \frac{4}{5} = \frac{1}{5} = 0.2$ (LineIO)

[1] [−] [4] [▭] [5] [=] 1⌟5 [S⇔D] 0.2

Important!

- With certain calculation results, pressing the [S⇔D] key will not convert the displayed value.
- You cannot switch from decimal form to mixed fraction form if the total number of digits used in the mixed fraction (including integer, numerator, denominator, and separator symbols) is greater than 10.

Note

- With Natural Display (MathO), pressing [SHIFT] [=] instead of [=] after inputting a calculation will display the calculation result in decimal form.

Fraction Calculations

Note that the input method for fractions is different, depending upon whether you are using Natural Display or Linear Display.

Example 1: $\frac{2}{3} + \frac{1}{2} = \frac{7}{6}$

(MthIO-LineO) 2 [▭] 3 [▶] [+] 1 [▭] 2 [=] $\frac{7}{6}$

or [▭] 2 [▼] 3 [▶] [+] [▭] 1 [▼] 2 [=] $\frac{7}{6}$

(LineIO) 2 [▭] 3 [+] 1 [▭] 2 [=] 7⌟6

Example 2: $4 - 3\frac{1}{2} = \frac{1}{2}$

(MthIO-LineO) 4 [−] [SHIFT] [▭] (■▭) 3 [▶] 1 [▼] 2 [=] $\frac{1}{2}$

(LineIO) 4 [−] 3 [▭] 1 [▭] 2 [=] 1⌟2

Note

- Mixing fractions and decimal values in a calculation while Linear Display is selected will cause the result to be displayed as a decimal value.
- Results of calculations that mix fraction and decimal values are always decimal.
- Fractions in calculation results are displayed after being reduced to their lowest terms.

To switch a calculation result between improper fraction and mixed fraction form:

Perform the following key operation: [SHIFT] [S⇔D] ($a\frac{b}{c} \leftrightarrow \frac{d}{c}$)

To switch a calculation result between fraction and decimal form:

Press [S⇔D].

Percent Calculations

Inputting a value and pressing SHIFT (%) causes the input value to become a percent.

Example 1: 150 × 20% = 30

150 × 20 SHIFT (%) = 30

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

660 ÷ 880 SHIFT (%) = 75

Example 3: Increase 2500 by 15% (2875)

2500 + 2500 × 15 SHIFT (%) = 2875

Example 4: Decrease 3500 by 25% (2625)

3500 − 3500 × 25 SHIFT (%) = 2625

Degree, Minute, Second (Sexagesimal) Calculations

You can perform calculations using sexagesimal values, and convert values between sexagesimal and decimal.
Performing an addition or subtraction operation between sexagesimal values, or a multiplication or division operation between a sexagesimal value and a decimal value will cause the result to be displayed as a sexagesimal value.
You also can convert between sexagesimal and decimal.
The following is the input format for a sexagesimal value: {degrees} °’” {minutes} °’” {seconds} °’”.

Note

- You must always input something for the degrees and minutes, even if they are zero.

Example 1: 2°20’30” + 39’30” = 3°00’00”

2 °’” 20 °’” 30 °’” + 0 °’” 39 °’” 30 °’” = 3°0’0”

Example 2: Convert 2°15’18” to its decimal equivalent.

2 °’” 15 °’” 18 °’” =	2°15’18”
(Converts sexagesimal to decimal.) °’”	2.255
(Converts decimal to sexagesimal.) °’”	2°15’18”

Multi-Statements

You can use the colon character (:) to connect two or more expressions and execute them in sequence from left to right when you press =.

Example: 3 + 3 : 3 × 3

3 + 3 ALPHA x^3 (:) 3 × 3 =	6
=	9

Using Engineering Notation

A simple key operation transforms a displayed value to engineering notation.

Example 1: Transform the value 1234 to engineering notation, shifting the decimal point to the right.

1234 =	1234
ENG	1.234×10^{3}
ENG	1234×10^{0}

Example 2: Transform the value 123 to engineering notation, shifting the decimal point to the left.

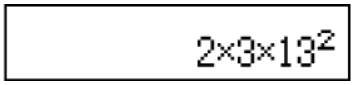
123 =	123
SHIFT ENG (←)	0.123×10^{3}
SHIFT ENG (←)	0.000123×10^{6}

Prime Factorization

In the COMP Mode, a positive integer no more than 10 digits long can be factored to prime factors.

Example 1: To perform prime factorization on 1014

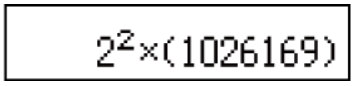
1014 [=] 1014

[SHIFT] [°'''] (FACT) 

When you perform prime factorization on a value that includes a factor that is prime number with more than three digits, the part that cannot be factored will be enclosed in parentheses on the display.

Example 2: To perform prime factorization on 4104676 (= $2^2 \times 1013^2$)

4104676 [=] 4104676

[SHIFT] [°'''] (FACT) 

Any one of the following operations will exit prime factorization result display.

- Pressing [SHIFT] [°'''] (FACT) or [=].
- Pressing any of the following keys: [ENG] or [°'''].
- Using the setup menu to change the angle unit setting (Deg, Rad, Gra) or the display digits setting (Fix, Sci, Norm).

Note

- You will not be able to execute prime factorization while a decimal value, fraction, or negative value calculation result is displayed. Trying to do so will cause a math error (Math ERROR).
- You will not be able to execute prime factorization while the result of a calculation that uses Pol, Rec is displayed.

Calculation History and Replay

Calculation History

In the COMP, CMPLX, or BASE-N Mode, the calculator remembers up to approximately 200 bytes of data for the newest calculation.
You can scroll through calculation history contents using [▲] and [▼].

Example:

1 + 1 = 2	1 [+] 1 [=]	2
2 + 2 = 4	2 [+] 2 [=]	4

3 + 3 = 6	3 [+] 3 [=]	6
	(Scrolls back.) [▲]	4
	(Scrolls back again.) [▲]	2

Note

- Calculation history data is all cleared whenever you press [ON], when you change to a different calculation mode, when you change the display format, or whenever you perform the following operations: [SHIFT] [9] (CLR) [1] (Setup) [=] (Yes), [SHIFT] [9] (CLR) [3] (All) [=] (Yes).

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 - 7 = 5

	4 [×] 3 [+] 2 [=]	14
	(Continuing) [◀] [DEL] [DEL] [−] 7 [=]	5

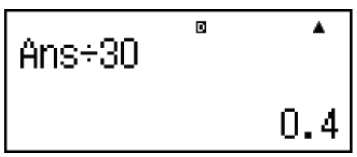
Using Memory Functions

Answer Memory (Ans)/Previous Answer Memory (PreAns)

The last calculation result obtained is stored in Ans (answer) memory. The calculation result obtained prior to the last one is stored in PreAns (previous answer) memory. Displaying the result of a new calculation will move current Ans memory contents to PreAns memory and store the new calculation results in Ans memory. PreAns memory can be used only in the COMP Mode. PreAns memory contents are cleared whenever the calculator enters another mode from the COMP Mode.

Using Ans Memory to Perform a Series of Calculations

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

	3 [×] 4 [=]	12
	(Continuing) [÷] 30 [=]	

Inputting Ans Memory Contents into an Expression

Example: To perform the calculations shown below:

123 + 456 = 579　　789 - 579 = 210

(MthIO-LineO)

123 [+] 456 [=]　　579

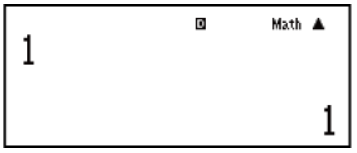
(Continuing) 789 [−] [Ans] [=]

Using PreAns Memory

Example: For $T_{k+2} = T_{k+1} + T_k$ (Fibonacci sequence), determine the sequence from T_1 to T_5. Note however, that $T_1 = 1$ and $T_2 = 1$.

$T_1 = 1$

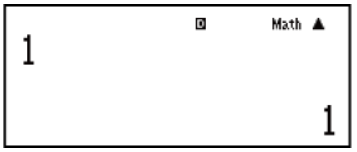
1 [=]



(Ans = T_1 = 1)

$T_2 = 1$

1 [=]



(Ans = T_2 = 1, PreAns = T_1 = 1)

$T_3 = T_2 + T_1 = 1 + 1$

[Ans] [+] [ALPHA] [Ans] (PreAns) [=]

(Ans = T_3 = 2, PreAns = T_2 = 1)

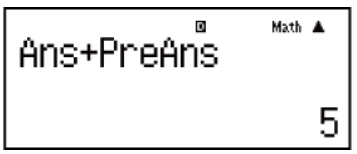
$T_4 = T_3 + T_2 = 2 + 1$

[=]

(Ans = T_4 = 3, PreAns = T_3 = 2)

$T_5 = T_4 + T_3 = 3 + 2$

[=]



Result: The sequence is {1, 1, 2, 3, 5}.

Variables (A, B, C, D, E, F, M, X, Y)

Your calculator has nine preset variables named A, B, C, D, E, F, M, X, and Y.
You can assign values to variables and use the variables in calculations.

Example:

To assign the result of 3 + 5 to variable A

3 [+] 5 [SHIFT] [RCL] (STO) [(−)] (A) 8

To multiply the contents of variable A by 10

(Continuing) [ALPHA] [(−)] (A) [×] 10 [=] 80

To recall the contents of variable A

(Continuing) [RCL] [(−)] (A) 8

To clear the contents of variable A

0 [SHIFT] [RCL] (STO) [(−)] (A) 0

Independent Memory (M)

You can add calculation results to or subtract results from independent memory.
The "M" indicator appears on the display when there is any value other than zero stored in independent memory.

Example:

To clear the contents of M

0 [SHIFT] [RCL] (STO) [M+] (M) 0

To add the result of 10 × 5 to M

(Continuing) 10 [×] 5 [M+] 50

To subtract the result of 10 + 5 from M

(Continuing) 10 [+] 5 [SHIFT] [M+] (M-) 15

To recall the contents of M

(Continuing) [RCL] [M+] (M) 35

Note

- Variable M is used for independent memory.

Clearing the Contents of All Memories

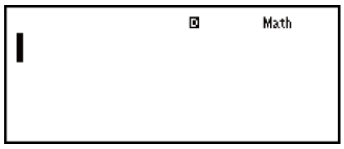
Ans memory, independent memory, and variable contents are retained even if you press [AC], change the calculation mode, or turn off the calculator.
PreAns memory contents are retained even if you press [AC] and turn off the calculator without exiting the COMP Mode.
Perform the following procedure when you want to clear the contents of all memories.

[SHIFT] [9] (CLR) [2] (Memory) [=] (Yes)

Function Calculations

Use the MODE key to enter the COMP Mode when you want to perform function calculations.

MODE 1 (COMP)



Note: Using functions can slow down a calculation, which may delay display of the result. Do not perform any subsequent operation while waiting for the calculation result to appear. To interrupt an ongoing calculation before its result appears, press AC.

Pi (π), Natural Logarithm Base e

π is displayed as 3.141592654, but π = 3.14159265358980 is used for internal calculations.

e is displayed as 2.718281828, but e = 2.71828182845904 is used for internal calculations.

Trigonometric Functions

Specify the angle unit before performing calculations.

Example 1: sin 30° = 0.5 (LineIO) (Angle unit: Deg)

sin 30) = 0.5

Example 2: $\sin^{-1}$ 0.5 = 30° (LineIO) (Angle unit: Deg)

SHIFT sin ($\sin^{-1}$) 0 • 5) = 30

Hyperbolic Functions

Input a function from the menu that appears when you press hyp.
The angle unit setting does not affect calculations.

Example 1: sinh 1 = 1.175201194

hyp 1 (sinh) 1) = 1.175201194

Example 2: $\cosh^{-1} 1 = 0$

hyp 5 ($\cosh^{-1}$) 1) = 0

Angle Unit Conversion

°, ʳ, ᵍ : These functions specify the angle unit. ° specifies degrees, ʳ radians, and ᵍ grads.
Input a function from the menu that appears when you perform the following key operation: SHIFT Ans (DRG▶).

Example: $\pi/2$ radians = 90°, 50 grads = 45° (Angle unit: Deg)

(SHIFT x10ˣ (π) ÷ 2) SHIFT Ans (DRG▶) 2 (^{r}) = 90

50 SHIFT Ans (DRG▶) 3 (^{g}) = 45

Exponential Functions

Note that the input method is different depending upon whether you are using Natural Display or Linear Display.

Example: To calculate $e^5 \times 2$ to three significant digits (Sci 3)

SHIFT MODE (SETUP) 7 (Sci) 3

(MthIO-LineO) SHIFT ln ($e^{\blacksquare}$) 5 ▶ × 2 = 2.97×10^2

(LineIO) SHIFT ln ($e^{\blacksquare}$) 5) × 2 = 2.97×10^2

Logarithmic Functions

Example 1: $\log_{10} 1000 = \log 1000 = 3$

log 1000) = 3

Example 2: To calculate ln 90 (= $\log_e 90$) to three significant digits (Sci 3)

SHIFT MODE (SETUP) 7 (Sci) 3
ln 90) = 4.50×10^0

Power Functions and Power Root Functions

Note that the input methods for $x^{\blacksquare}$, $\sqrt{\blacksquare}$, $\sqrt[3]{\blacksquare}$, and $\sqrt[\blacksquare]{\square}$ are different depending upon whether you are using Natural Display or Linear Display.

Example 1: $1.2 \times 10^3 = 1200$ (MthIO-LineO)

1 • 2 × 10 $x^{\blacksquare}$ 3 = 1200

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

(1 + 1) $x^{\blacksquare}$ 2 + 2 = 16

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

(5 x^2) x^3 = 15625

Example 4: $\sqrt[5]{32} = 2$

(MthIO-LineO) SHIFT $x^{\blacksquare}$ ($\sqrt[\blacksquare]{\square}$) 5 ▶ 32 = 2

(LineIO) 5 SHIFT $x^{\blacksquare}$ ($\sqrt[\blacksquare]{\square}$) 32) = 2

Example 5: To calculate $\sqrt{2} \times 3$ (= 4.242640687...) to three decimal places (Fix 3)

SHIFT MODE (SETUP) 6 (Fix) 3

(MthIO-LineO) $\sqrt{\blacksquare}$ 2 ▶ × 3 = 4.243

(LineIO) $\sqrt{\blacksquare}$ 2) × 3 = 4.243

Example 6: $\sqrt[3]{5} + \sqrt[3]{-27} = -1.290024053$

(LineIO) SHIFT $\sqrt{\blacksquare}$ ($\sqrt[3]{\blacksquare}$) 5) +
SHIFT $\sqrt{\blacksquare}$ ($\sqrt[3]{\blacksquare}$) (−) 27) = -1.290024053

Example 7: $\dfrac{1}{\frac{1}{3} - \frac{1}{4}} = 12$

(LineIO) (3 x^{-1} − 4 x^{-1}) x^{-1} = 12

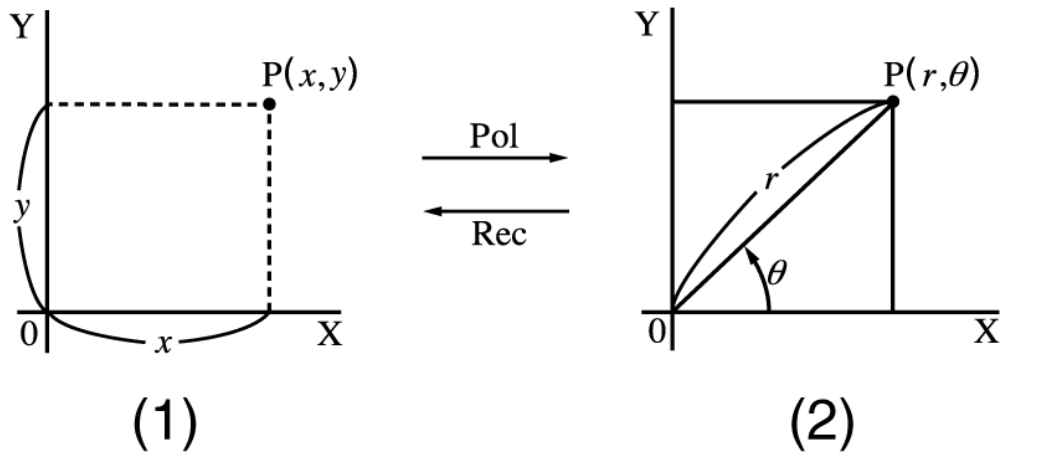
Note

- The following functions cannot be input in consecutive sequence: x^2, x^3, $x^{\blacksquare}$, x^{-1}. If you input 2 [x^2] [x^2], for example, the final [x^2] will be ignored. To input 2^{2^2}, input 2 [x^2], press the [◀] key, and then press [x^2] (MthIO-LineO).
- x^2, x^3, x^{-1} can be used in complex number calculations.

Rectangular-Polar Coordinate Conversion

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

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



(1) Rectangular Coordinates (Rec)
(2) Polar Coordinates (Pol)

Specify the angle unit before performing calculations.
The calculation result for r and θ and for x and y are each assigned respectively to variables X and Y.
Calculation result θ is displayed in the range of $-180° < \theta \leqq 180°$.

Example 1: To convert rectangular coordinates $(\sqrt{2}, \sqrt{2})$ to polar coordinates (Angle unit: Deg)
(MthIO-LineO)

[SHIFT] [+](Pol) [√■] 2 [▶] [SHIFT] [)](,) [√■] 2 [▶] [)] [=] $r = 2, \theta = 45$

(LineIO)

[SHIFT] [+](Pol) [√■] 2 [)] [SHIFT] [)](,) [√■] 2 [)] [)] [=]

$r = 2$
$\theta = 45$

Example 2: To convert polar coordinates ($\sqrt{2}$, 45°) to rectangular coordinates (Angle unit: Deg)
(MthIO-LineO)

SHIFT (−)(Rec) √ 2 ▶ SHIFT) (,) 45) = X = 1, Y = 1

Factorial Function (!)

Example: (5 + 3)! = 40320

(5 + 3) x! = 40320

Absolute Value Function (Abs)

Note that the input method is different depending upon whether you are using Natural Display or Linear Display.

Example: |2 - 7| × 2 = 10
(MthIO-LineO)

Abs 2 − 7 ▶ × 2 = 10

(LineIO)

Abs 2 − 7) × 2 = 10

Random Number (Ran#)

Function that generates a pseudo random number in the range of 0.000 to 0.999.
The result is displayed as a fraction when Natural Display is selected.

Example: Generate three 3-digit random numbers.
The random 3-digit decimal values are converted to 3-digit integer values by multiplying by 1000.

1000 SHIFT • (Ran#) = 634

= 92

= 175

(Results shown here are for illustrative purposes only. Actual results will differ.)

Random Integer (RanInt#)

For input of the function of the form RanInt#(a, b), which generates a random integer within the range of a to b.

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

ALPHA • (RanInt) 1 SHIFT) (,) 6) =	2
=	6
=	1

(Results shown here are for illustrative purposes only. Actual results will differ.)

Permutation (nPr) and Combination (nCr)

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

Permutations:	10 SHIFT × (nPr) 4 =	5040
Combinations:	10 SHIFT ÷ (nCr) 4 =	210

Rounding Function (Rnd)

The argument of this function is made a decimal value and then rounded in accordance with the current number of display digits setting (Norm, Fix, or Sci).
With Norm 1 or Norm 2, the argument is rounded off to 10 digits.
With Fix and Sci, the argument is rounded off to the specified digit.
When Fix 3 is the display digits setting, for example, the result of 10 ÷ 3 is displayed as 3.333, while the calculator maintains a value of 3.33333333333333 (15 digits) internally for calculation.
In the case of Rnd(10÷3) = 3.333 (with Fix 3), both the displayed value and the calculator's internal value become 3.333.
Because of this a series of calculations will produce different results depending on whether Rnd is used (Rnd(10÷3) × 3 = 9.999) or not used (10 ÷ 3 × 3 = 10.000).

Example: To perform the following calculations when Fix 3 is selected for the number of display digits: 10 ÷ 3 × 3 and Rnd(10 ÷ 3) × 3 (LineIO)

[SHIFT] [MODE] (SETUP) [6] (Fix) [3]
10 [÷] 3 [×] 3 [=] 10.000

[SHIFT] [0] (Rnd) 10 [÷] 3 [)] [×] 3 [=] 9.999

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

Greatest Common Divisor (GCD)

GCD determines the greatest common divisor of two values.

Example: To determine the greatest common divisor of 28 and 35

[ALPHA] [×] (GCD) 28 [SHIFT] [)] (,) 35 [)] [=] 7

Least Common Multiple (LCM)

LCM determines the least common multiple of two values.

Example: To determine the least common multiple of 9 and 15

[ALPHA] [÷] (LCM) 9 [SHIFT] [)] (,) 15 [)] [=] 45

Metric Conversion

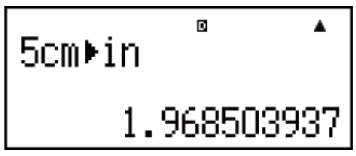
The calculator's built-in metric conversion commands make it simple to convert values from one unit to another. You can use the metric conversion commands in any calculation mode except for BASE-N.
To input a metric conversion command into a calculation, press [SHIFT] [8] (CONV) and then input the two-digit number that corresponds to the command you want.

Example 1: To convert 5 cm into inches (LineIO)

[AC] 5 [SHIFT] [8] (CONV)

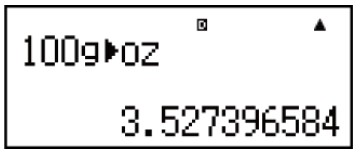
```
CONVERSION
Number 01~40?
              [__]
```

0 2 (cm ▸ in) =



Example 2: To convert 100 g into ounces (LineIO)

AC 100 SHIFT 8 (CONV) 2 2 (g ▸ oz) =



Example 3: To convert -31°C into Fahrenheit (LineIO)

AC (−) 31 SHIFT 8 (CONV) 3 8 (°C ▸ °F) =

The following shows the two-digit numbers for each of the metric conversion commands.

01: in ▸ cm	02: cm ▸ in	03: ft ▸ m	04: m ▸ ft
05: yd ▸ m	06: m ▸ yd	07: mile ▸ km	08: km ▸ mile
09: n mile ▸ m	10: m ▸ n mile	11: acre ▸ m^2	12: m^2 ▸ acre
13: gal (US) ▸ ℓ	14: ℓ ▸ gal (US)	15: gal (UK) ▸ ℓ	16: ℓ ▸ gal (UK)
17: pc ▸ km	18: km ▸ pc	19: km/h ▸ m/s	20: m/s ▸ km/h
21: oz ▸ g	22: g ▸ oz	23: lb ▸ kg	24: kg ▸ lb
25: atm ▸ Pa	26: Pa ▸ atm	27: mmHg ▸ Pa	28: Pa ▸ mmHg
29: hp ▸ kW	30: kW ▸ hp	31: kgf/cm^2 ▸ Pa	32: Pa ▸ kgf/cm^2
33: kgf • m ▸ J	34: J ▸ kgf • m	35: lbf/in^2 ▸ kPa	36: kPa ▸ lbf/in^2
37: °F ▸ °C	38: °C ▸ °F	39: J ▸ cal	40: cal ▸ J

Conversion formula data is based on the "NIST Special Publication 811 (2008)".

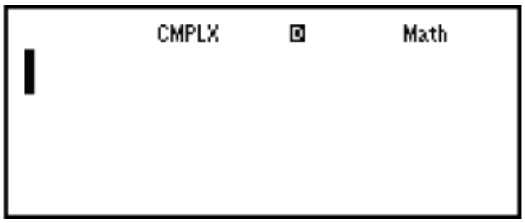
Note

- The J ▶ cal command performs conversion for values at a temperature of 15°C.

Using Calculation Modes

Complex Number Calculations (CMPLX)

To perform complex number calculations, first press [MODE] [2] (CMPLX) to enter the CMPLX Mode.



You can use either rectangular coordinates (a+$b$$i$) or polar coordinates ($r\angle\theta$) to input complex numbers.
Complex number calculation results are displayed in accordance with the complex number format setting on the setup menu.

Example 1: (2 + 6i) ÷ (2i) = 3 - i (Complex number format: a+$b$$i$)

[(] 2 [+] 6 [ENG] (i) [)] [÷] [(] 2 [ENG] (i) [)] [=] 3-i

Example 2: $\sqrt{2}\angle 45$ = 1 + i (MthIO-LineO) (Angle unit: Deg)
(Complex number format: a+bi)

[√] 2 [▶] [SHIFT] [(−)] (∠) 45 [=] 1+i

Example 3: $\sqrt{2}$ + $\sqrt{2}i$ = $2\angle 45$ (MthIO-LineO) (Angle unit: Deg)
(Complex number format: $r\angle\theta$)

[√] 2 [▶] [+] [√] 2 [▶] [ENG] (i) [=] $2\angle 45$

Note

- If you are planning to perform input and display of the calculation result in polar coordinate format, specify the angle unit before starting the calculation.
- The θ value of the calculation result is displayed in the range of $-180° < \theta \leqq 180°$.
- Display of the calculation result while Linear Display is selected will show a and bi (or r and θ) on separate lines.

CMPLX Mode Calculation Examples

Example 1: $(1 - i)^{-1} = \frac{1}{2} + \frac{1}{2}i$ (MthIO-LineO) (Complex number format: $a+bi$)

[(] 1 [−] [ENG] (i) [)] [x^{-1}] [=] $\frac{1}{2}+\frac{1}{2}i$

Example 2: $(1 + i)^4 + (1 - i)^2 = -4 - 2i$ (MthIO-LineO)

[(] 1 [+] [ENG] (i) [)] [$x^{\square}$] 4 [▶] [+] [(] 1 [−] [ENG] (i) [)] [x^2] [=] -4-2i

Example 3: To obtain the conjugate complex number of $2 + 3i$ (Complex number format: $a+bi$)

[SHIFT] [2] (CMPLX) [2] (Conjg) 2 [+] 3 [ENG] (i) [)] [=] 2-3i

Example 4: To obtain the absolute value and argument of $1 + i$ (MthIO-LineO) (Angle unit: Deg)
Absolute Value (Abs):

[Abs] 1 [+] [ENG] (i) [=] 1.414213562

Argument (arg):

[SHIFT] [2] (CMPLX) [1] (arg) 1 [+] [ENG] (i) [)] [=] 45

Using a Command to Specify the Calculation Result Format

Either of two special commands ($\blacktriangleright r\angle\theta$ or $\blacktriangleright a+bi$) can be input at the end of a calculation to specify the display format of the calculation results. The command overrides the calculator's complex number format setting.

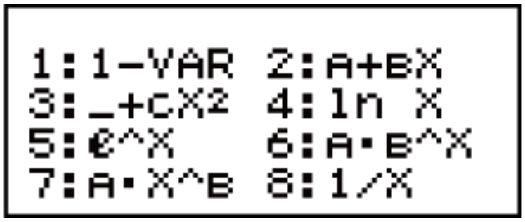
Example: $\sqrt{2} + \sqrt{2}i = 2\angle 45$, $\sqrt{2}\angle 45 = 1 + i$ (MthIO-LineO) (Angle unit: Deg)

[$\sqrt{\square}$] 2 [▶] [+] [$\sqrt{\square}$] 2 [▶] [ENG] (i) [SHIFT] [2] (CMPLX) [3] ($\blacktriangleright r\angle\theta$) [=] $2\angle 45$

[$\sqrt{\square}$] 2 [▶] [SHIFT] [(−)] ($\angle$) 45 [SHIFT] [2] (CMPLX) [4] ($\blacktriangleright a+bi$) [=] 1+i

Statistical Calculations (STAT)

To start a statistical calculation, perform the key operation MODE 3 (STAT) to enter the STAT Mode and then use the screen that appears to select the type of calculation you want to perform.



To select this type of statistical calculation: (Regression formula shown in parentheses)	**Press this key:**
Single-variable (X)	1 (1-VAR)
Paired-variable (X, Y), linear regression (y = A + Bx)	2 (A+BX)
Paired-variable (X, Y), quadratic regression (y = A + Bx + Cx^2)	3 (_+CX^2)
Paired-variable (X, Y), logarithmic regression (y = A + Bln$x$)	4 (ln X)
Paired-variable (X, Y), e exponential regression (y = A e^{Bx})	5 (e^X)
Paired-variable (X, Y), ab exponential regression (y = AB^x)	6 (A•B^X)
Paired-variable (X, Y), power regression (y = Ax^B)	7 (A•X^B)
Paired-variable (X, Y), inverse regression (y = A + B/x)	8 (1/X)

Pressing any of the above keys (1 to 8) displays the Statistics Editor.

Note

- When you want to change the calculation type after entering the STAT Mode, perform the key operation [SHIFT] [1] (STAT) [1] (Type) to display the calculation type selection screen.

Inputting Data

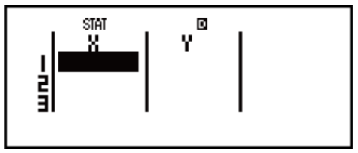
Use the Statistics Editor to input data. Perform the following key operation to display the Statistics Editor: [SHIFT] [1] (STAT) [2] (Data).
The Statistics Editor provides 40 rows for data input when there is an X column only or when there are X and Y columns, 20 rows when there are X and FREQ columns, or 26 rows when there are X, Y, and FREQ columns.

Note

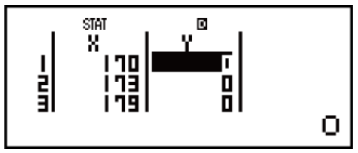
- Use the FREQ (frequency) column to input the quantity (frequency) of identical data items. Display of the FREQ column can be turned on (displayed) or off (not displayed) using the Stat Format setting on the setup menu.

Example 1: To select linear regression and input the following data:
(170, 66), (173, 68), (179, 75)

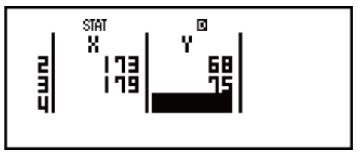
[MODE] [3] (STAT) [2] (A+BX)



170 [=] 173 [=] 179 [=] ▼ ▶



66 [=] 68 [=] 75 [=]



Important!

- All data currently input in the Statistics Editor is deleted whenever you exit the STAT Mode, switch between the single-variable and a paired-variable statistical calculation type, or change the Stat Format setting on the setup menu.
- The following operations are not supported by the Statistics Editor: [M+], [SHIFT] [M+] (M-), [SHIFT] [RCL] (STO). Pol, Rec, and multi-statements also cannot be input with the Statistics Editor.

To change the data in a cell:
In the Statistics Editor, move the cursor to the cell that contains the data you want to change, input the new data, and then press [=].
To delete a line:
In the Statistics Editor, move the cursor to the line that you want to delete and then press [DEL].
To insert a line:
In the Statistics Editor, move the cursor to the location where you want to insert the line and then perform the following key operation:
[SHIFT] [1] (STAT) [3] (Edit) [1] (Ins).
To delete all Statistics Editor contents:
In the Statistics Editor, perform the following key operation:
[SHIFT] [1] (STAT) [3] (Edit) [2] (Del-A).

Statistics Calculation Screen

The Statistics Calculation Screen is for performing statistical calculations with the data you input with the Statistics Editor. Pressing the [AC] key while the Statistics Editor is displayed switches to the Statistics Calculation Screen.

Using the Statistics Menu

While the Statistics Calculation Screen is on the display, press [SHIFT] [1] (STAT) to display the Statistics Menu.
The content to the Statistics Menu depends on whether the currently selected statistical operation type uses a single variable or paired variables.

Single-variable Statistics

Paired-variables Statistics

Statistics Menu Items
Common Items

Select this menu item:	**When you want to obtain this:**
1 (Type)	Display the calculation type selection screen
2 (Data)	Display the Statistics Editor
3 (Sum)	Display the Sum sub-menu of commands for calculating sums
4 (Var)	Display the Var sub-menu of commands for calculating the mean, standard deviation, etc.
Single-variable: 5 (Distr)	Display the Distr sub-menu of commands for normal distribution calculations • For more information, see "Performing Normal Distribution Calculations".
Paired-variable: 5 (Reg)	Display the Reg sub-menu of commands for regression calculations • For details see "Commands when Linear Regression Calculation (A+BX) Is Selected" and "Commands when Quadratic Regression Calculation (_+CX^2) Is Selected".
6 (MinMax)	Display the MinMax sub-menu of commands for obtaining maximum and minimum values

Single-variable (1-VAR) Statistical Calculation Commands
Sum Sub-menu (SHIFT 1 (STAT) 3 (Sum))

Select this menu item:	**When you want to obtain this:**
1 ($\sum x^2$)	Sum of squares of the sample data
2 ($\sum x$)	Sum of the sample data

Var Sub-menu (SHIFT 1 (STAT) 4 (Var))

Select this menu item:	When you want to obtain this:
1 (n)	Number of samples
2 ($\bar{x}$)	Mean of the sample data
3 (σ_x)	Population standard deviation
4 (s_x)	Sample standard deviation

Distr Sub-menu (SHIFT 1 (STAT) 5 (Distr))

1 (P()	This menu can be used to calculate the probability of standard normal distribution. • For details see "Performing Normal Distribution Calculations".
2 (Q()	
3 (R()	
4 ($\blacktriangleright t$)	

MinMax Sub-menu (SHIFT 1 (STAT) 6 (MinMax))

Select this menu item:	When you want to obtain this:
1 (minX)	Minimum value
2 (maxX)	Maximum value
3 (Q1)	First quartile
4 (med)	Median
5 (Q3)	Third quartile

Commands when Linear Regression Calculation (A+BX) Is Selected
Sum Sub-menu (SHIFT 1 (STAT) 3 (Sum))

Select this menu item:	When you want to obtain this:
1 ($\sum x^2$)	Sum of squares of the X-data

2 ($\sum x$)	Sum of the X-data
3 ($\sum y^2$)	Sum of squares of the Y-data
4 ($\sum y$)	Sum of the Y-data
5 ($\sum xy$)	Sum of products of the X-data and Y-data
6 ($\sum x^3$)	Sum of cubes of the X-data
7 ($\sum x^2 y$)	Sum of (X-data squares × Y-data)
8 ($\sum x^4$)	Sum of biquadrate of the X-data

Var Sub-menu (SHIFT 1 (STAT) 4 (Var))

Select this menu item:	**When you want to obtain this:**
1 (n)	Number of samples
2 ($\bar{x}$)	Mean of the X-data
3 (σ_x)	Population standard deviation of the X-data
4 (s_x)	Sample standard deviation of the X-data
5 ($\bar{y}$)	Mean of the Y-data
6 (σ_y)	Population standard deviation of the Y-data
7 (s_y)	Sample standard deviation of the Y-data

Reg Sub-menu (SHIFT 1 (STAT) 5 (Reg))

Select this menu item:	**When you want to obtain this:**
1 (A)	Regression coefficient constant term A
2 (B)	Regression coefficient B
3 (r)	Correlation coefficient r
4 ($\hat{x}$)	Estimated value of X

5 ($\hat{y}$)	Estimated value of Y

MinMax Sub-menu (SHIFT 1 (STAT) 6 (MinMax))

Select this menu item:	When you want to obtain this:
1 (minX)	Minimum value of the X-data
2 (maxX)	Maximum value of the X-data
3 (minY)	Minimum value of the Y-data
4 (maxY)	Maximum value of the Y-data

Commands when Quadratic Regression Calculation (_+CX^2) Is Selected

Reg Sub-menu (SHIFT 1 (STAT) 5 (Reg))

Select this menu item:	When you want to obtain this:
1 (A)	Regression coefficient constant term A
2 (B)	Linear coefficient B of the regression coefficients
3 (C)	Quadratic coefficient C of the regression coefficients
4 ($\hat{x}_1$)	Estimated value of x_1
5 ($\hat{x}_2$)	Estimated value of x_2
6 ($\hat{y}$)	Estimated value of y

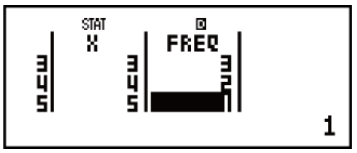
Note

- $\hat{x}$, $\hat{x}_1$, $\hat{x}_2$ and $\hat{y}$ are not variables. They are commands of the type that take an argument immediately before them. See "Calculating Estimated Values" for more information.

Example 2: To input the single-variable data x = {1, 2, 2, 3, 3, 3, 4, 4, 5}, using the FREQ column to specify the number of repeats for each

items ({x_n; freq$_n$} = {1;1, 2;2, 3;3, 4;2, 5;1}), and calculate the mean and population standard deviation.

[SHIFT] [MODE] (SETUP) [▼] [4] (STAT) [1] (ON)
[MODE] [3] (STAT) [1] (1-VAR)
1 [=] 2 [=] 3 [=] 4 [=] 5 [=] [▼] [▶]
1 [=] 2 [=] 3 [=] 2 [=]



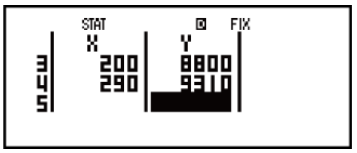
[AC] [SHIFT] [1] (STAT) [4] (Var) [2] ($\bar{x}$) [=] 3

[AC] [SHIFT] [1] (STAT) [4] (Var) [3] (σ_x) [=] 1.154700538

Results: Mean: 3, Population Standard Deviation: 1.154700538

Example 3: To calculate the linear regression and logarithmic regression correlation coefficients for the following paired-variable data and determine the regression formula for the strongest correlation: (x, y) = (20, 3150), (110, 7310), (200, 8800), (290, 9310). Specify Fix 3 (three decimal places) for results.

[SHIFT] [MODE] (SETUP) [▼] [4] (STAT) [2] (OFF)
[SHIFT] [MODE] (SETUP) [6] (Fix) [3]
[MODE] [3] (STAT) [2] (A+BX)
20 [=] 110 [=] 200 [=] 290 [=] [▼] [▶]
3150 [=] 7310 [=] 8800 [=] 9310 [=]



[AC] [SHIFT] [1] (STAT) [5] (Reg) [3] (r) [=] 0.923

[AC] [SHIFT] [1] (STAT) [1] (Type) [4] (ln X)
[AC] [SHIFT] [1] (STAT) [5] (Reg) [3] (r) [=] 0.998

[AC] [SHIFT] [1] (STAT) [5] (Reg) [1] (A) [=] -3857.984

[AC] [SHIFT] [1] (STAT) [5] (Reg) [2] (B) [=] 2357.532

Results: Linear Regression Correlation Coefficient: 0.923
Logarithmic Regression Correlation Coefficient: 0.998
Logarithmic Regression Formula: y = -3857.984 + 2357.532ln$x$

Calculating Estimated Values

Based on the regression formula 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 formula.

Example 4: To determine the estimate value for x when y = -130 in the regression formula produced by logarithmic regression of the data in

Example 3. Specify Fix 3 for the result. (Perform the following operation after completing the operations in Example 3.)

AC (−) 130 SHIFT 1 (STAT) 5 (Reg) 4 ($\hat{x}$) = 4.861

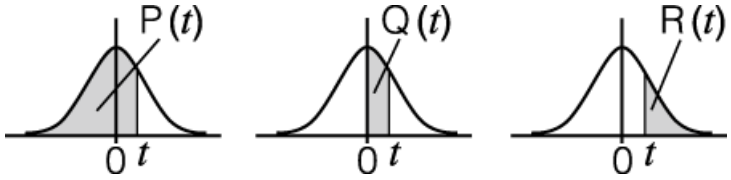
Important!

- Regression coefficient, correlation coefficient, and estimated value calculations can take considerable time when there are a large number of data items.

Performing Normal Distribution Calculations

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 perform the following key operation: SHIFT 1 (STAT) 5 (Distr).

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

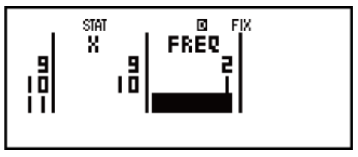


►*t*: This function is preceded by the argument X, and determines the normalized variate $X\blacktriangleright t = \frac{X - \bar{x}}{\sigma x}$.

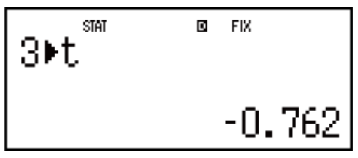
Example 5: For the single variable data {x_n; freq$_n$} = {0;1, 1;2, 2;1, 3;2, 4;2, 5;2, 6;3, 7;4, 9;2, 10;1}, to determine the normalized variate (►t) when x = 3, and P(t) at that point up to three decimal places (Fix 3).

SHIFT MODE (SETUP) ▼ 4 (STAT) 1 (ON)
SHIFT MODE (SETUP) 6 (Fix) 3
MODE 3 (STAT) 1 (1-VAR)

0 = 1 = 2 = 3 = 4 = 5 = 6 = 7 = 9 = 10 = ▼ ▶
1 = 2 = 1 = 2 = 2 = 2 = 3 = 4 = 2 = 1 =



AC 3 SHIFT 1 (STAT) 5 (Distr) 4 (►t) =



SHIFT 1 (STAT) 5 (Distr) 1 (P() Ans) =

Results: Normalized variate (►t): -0.762
P(t): 0.223

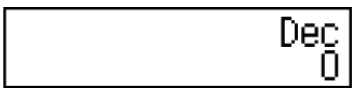
Base-n Calculations (BASE-N)

Press [MODE] [4] (BASE-N) to enter the BASE-N Mode when you want to perform calculations using decimal, hexadecimal, binary, and/or octal values.

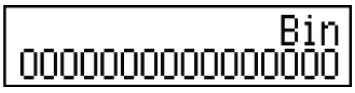
The initial default number mode when you enter the BASE-N Mode is decimal, which means input and calculation results use the decimal number format.
Press one of the following keys to switch number modes: [x^2] (DEC) for decimal, [$x^{\blacksquare}$] (HEX) for hexadecimal, [log] (BIN) for binary, or [ln] (OCT) for octal.

Example 1: To enter the BASE-N Mode, switch to the binary mode, and calculate $11_2 + 1_2$

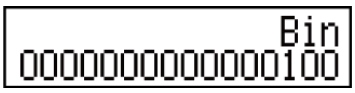
[MODE] [4] (BASE-N)



[log] (BIN)



11 [+] 1 [=]

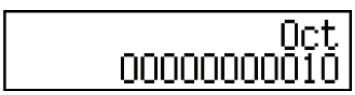


Example 2: Continuing from above, switch to the hexadecimal mode and calculate $1F_{16} + 1_{16}$

[AC] [$x^{\blacksquare}$] (HEX) 1 [tan] (F) [+] 1 [=]

Example 3: Continuing from above, switch to the octal mode and calculate $7_8 + 1_8$

[AC] [ln] (OCT) 7 [+] 1 [=]



Note

- Use the following keys to input the letters A through F for hexadecimal values: (−) (A), °’” (B), hyp (C), sin (D), cos (E), tan (F).
- In the BASE-N Mode, input of fractional (decimal) values and exponents is not supported. If a calculation result has a fractional part, it is cut off.
- The input and output ranges is 16 bits for binary values, and 32 bits for other types of values. The following shows details about input and output ranges.

Base-*n* Mode	**Input/Output Ranges**
Binary	Positive: 0000000000000000 ≦ x ≦ 0111111111111111 Negative: 1000000000000000 ≦ x ≦ 1111111111111111
Octal	Positive: 00000000000 ≦ x ≦ 17777777777 Negative: 20000000000 ≦ x ≦ 37777777777
Decimal	-2147483648 ≦ x ≦ 2147483647
Hexadecimal	Positive: 00000000 ≦ x ≦ 7FFFFFFF Negative: 80000000 ≦ x ≦ FFFFFFFF

Specifying the Number Mode of a Particular Input Value

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

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

AC x^2 (DEC) SHIFT 3 (BASE) ▼ 1 (d) 10 +
SHIFT 3 (BASE) ▼ 2 (h) 10 +
SHIFT 3 (BASE) ▼ 3 (b) 10 +
SHIFT 3 (BASE) ▼ 4 (o) 10 = 36

Converting a Calculation Result to another Type of Value

You can use any one of the following key operations to convert the currently displayed calculation result to another type of value: x^2 (DEC) (decimal), $x^{\blacksquare}$ (HEX) (hexadecimal), log (BIN) (binary), ln (OCT) (octal).

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

AC x^2 (DEC) 15 × 37 =	555
$x^{\blacksquare}$ (HEX)	0000022B
log (BIN)	0000001000101011
ln (OCT)	00000001053

Logical and Negation Operations

Your calculator provides you with logical operators (and, or, xor, xnor) and functions (Not, Neg) for logical and negation operations on binary values. Use the menu that appears when you press SHIFT 3 (BASE) to input these logical operators and functions.

Press this key:	When you want to input this:
1 (and)	Logical operator "and" (logical product), which returns the result of a bitwise AND
2 (or)	Logical operator "or" (logical sum), which returns the result of a bitwise OR
3 (xor)	Logical operator "xor" (exclusive logical sum), which returns the result of a bitwise XOR
4 (xnor)	Logical operator "xnor" (exclusive negative logical sum), which returns the result of a bitwise XNOR
5 (Not)	"Not(" function, which returns the result of a bitwise complement
6 (Neg)	"Neg(" function, which returns the result of a two's complement

All of the following examples are performed in the binary mode (log (BIN)).

Example 1: To determine the logical AND of 1010_2 and 1100_2 (1010_2 and 1100_2)

AC 1010 SHIFT 3 (BASE) 1 (and) 1100 = 0000000000001000

Example 2: To determine the logical OR of 1011_2 and 11010_2 (1011_2 or 11010_2)

AC 1011 SHIFT 3 (BASE) 2 (or) 11010 = 0000000000011011

Example 3: To determine the logical XOR of 1010_2 and 1100_2 (1010_2 xor 1100_2)

AC 1010 SHIFT 3 (BASE) 3 (xor) 1100 = 0000000000000110

Example 4: To determine the logical XNOR of 1111_2 and 101_2 (1111_2 xnor 101_2)

AC 1111 SHIFT 3 (BASE) 4 (xnor) 101 = 1111111111110101

Example 5: To determine the bitwise complement of 1010_2 (Not(1010_2))

AC SHIFT 3 (BASE) 5 (Not) 1010) = 1111111111110101

Example 6: To negate (take the two's complement) of 101101_2 (Neg(101101_2))

AC SHIFT 3 (BASE) 6 (Neg) 101101) = 1111111111010011

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 (base-10) values, the calculator merely adds a minus sign.

Using VERIFY (VERIF)

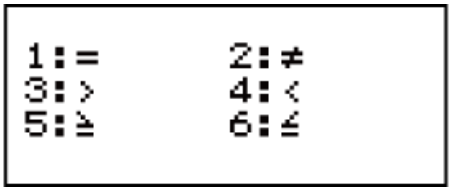
VERIFY is a function you can use to verify whether an input equality or inequality is true (indicated by TRUE) or false (indicated by FALSE). The following shows the general procedure for using VERIFY.

Example: To verify whether $4\sqrt{9} = 12$ is true (MthIO-LineO)

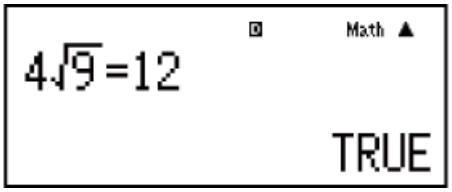
1. Press MODE 5 (VERIF) to enter the VERIFY Mode.

2. Input $4\sqrt{9} = 12$.
   4 √ 9 ▶ SHIFT 6 (VERIFY) 1 (=) 12

- You can select the equality symbol or inequality symbol from the menu that appears when you press [SHIFT] [6] (VERIFY).



3. To verify, press [=].



You can input the following expressions for verification in the VERIFY Mode.

- Equalities or inequalities that include one relational operator $4 = \sqrt{16}$, $4 \neq 3$, $\pi > 3$, $1 + 2 \leqq 5$, $(3 \times 6) < (2 + 6) \times 2$, etc.
- Equalities or inequalities that include multiple relational operators $1 \leqq 1 < 1 + 1$, $3 < \pi < 4$, $2^2 = 2 + 2 = 4 < 6$, $2 + 3 = 5 \neq 2 + 5 = 8$, etc.

Note

- The verification result will cause 1 to be assigned to Ans memory when TRUE and 0 when FALSE.
- The input expression can be a total of 99 bytes, including the left side, right side, and relational operators.
- Any variable (A, B, C, D, E, F, X, Y, M) input into an expression is treated as a value, using the value currently assigned to the variable.
- Pol and Rec functions cannot be used in an expression.
- In the VERIFY Mode, the calculator performs a mathematical operation on the input expression and then displays TRUE or FALSE based on the result. Because of this, calculation error can occur or a mathematically correct result may not be able to be displayed when the input calculation expression includes calculation that approaches the singular point or inflection point of a function, or when the input expression contains multiple calculation operations.

Expression Input Precautions

The following types of expressions cause a Syntax ERROR and cannot be verified.

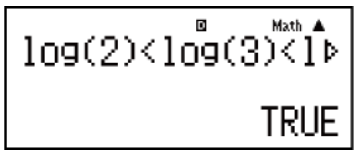
- An expression with nothing on the left side or right side (Example: = $5\sqrt{7}$)

- An expression in which a relational operator is inside of a fraction or function (Example: $\frac{1=1}{2}$, cos (8 ≦ 9))
- An expression in which a relational operator is enclosed in parentheses (Example: 8 < (9 < 10))
- An expression in which multiple relational operators that are not oriented in the same direction (Example: 5 ≦ 6 ≧ 4)
- An expression that contains two of the following operators in any combination (Example: 4 < 6 ≠ 8)
- An expression that contains consecutive relational operators (Example: 5 ≧ > 9)

VERIFY Mode Calculation Examples

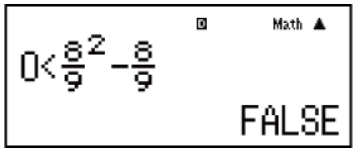
Example 1: To verify log2 < log3 < log4

log 2) SHIFT 6 (VERIFY) 4 (<)
log 3) SHIFT 6 (VERIFY) 4 (<)
log 4) =



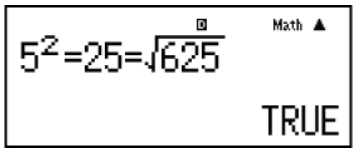
Example 2: To verify 0 < $(\frac{8}{9})^2 - \frac{8}{9}$ (MthIO-LineO)

0 SHIFT 6 (VERIFY) 4 (<)
8 ▤ 9 ▶ x^2 − 8 ▤ 9 =



Example 3: To verify $5^2 = 25 = \sqrt{625}$ (MthIO-LineO)

5 x^2 SHIFT 6 (VERIFY) 1 (=)
25 SHIFT 6 (VERIFY) 1 (=) √ 625 =

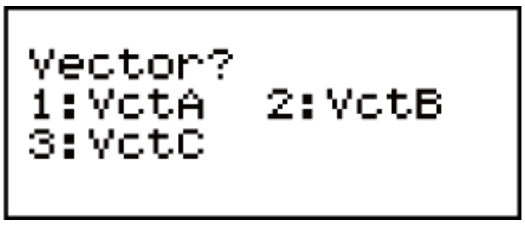


Vector Calculations (VECTOR)

Use the VECTOR Mode to perform 2-dimensional and 3-dimensional vector calculations. To perform a vector calculation, you first assign data to special vector variables (VctA, VctB, VctC), and then use the variables in the calculation as shown in the example below.

Example 1: To assign (1, 2) to VctA and (3, 4) to VctB, and then perform the following calculations: (1, 2) + (3, 4)

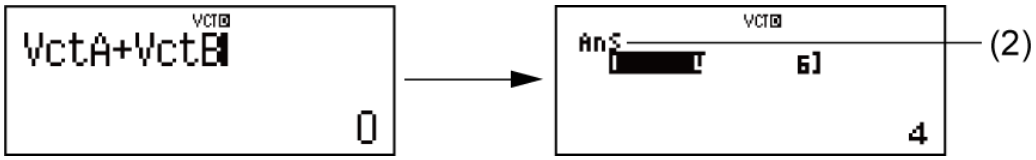
1. Press MODE 6 (VECTOR) to enter the VECTOR Mode.



2. Press 1 (VctA) 2 (2).
   - This will display the Vector Editor for input of the 2-dimensional vector for VctA.

(1) "A" stands for "VctA".

3. Input the elements of VctA: 1 = 2 = .
4. Perform the following key operation:
   SHIFT 5 (VECTOR) 2 (Data) 2 (VctB) 2 (2).
   - This will display the Vector Editor for input of the 2-dimensional vector for VctB.
5. Input the elements of VctB: 3 = 4 = .
6. Press AC to advance to the calculation screen, and perform the calculation (VctA+VctB):
   SHIFT 5 (VECTOR) 3 (VctA) + SHIFT 5 (VECTOR) 4 (VctB) = .
   - This will display the VctAns screen with the calculation results.



(2) "Ans" stands for "VctAns".

Note: "VctAns" stands for "Vector Answer Memory". See "Vector Answer Memory" for more information.

Vector Answer Memory

Whenever the result of a calculation executed in the VECTOR Mode is a vector, the VctAns screen will appear with the result. The result also will be assigned to a variable named "VctAns".

The VctAns variable can be used in calculations as described below.

- To insert the VctAns variable into a calculation, perform the following key operation: SHIFT 5 (VECTOR) 6 (VctAns).
- Pressing any one of the following keys while the VctAns screen is displayed will switch automatically to the calculation screen: +, −,

[×], [÷]. The calculation screen will show the VctAns variable followed by the operator or function for the key you pressed.

Assigning and Editing Vector Variable Data

Important!

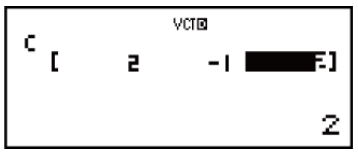
- The following operations are not supported by the Vector Editor: [M+], [SHIFT] [M+] (M-), [SHIFT] [RCL] (STO). Pol, Rec, and multi-statements also cannot be input with the Vector Editor.

To assign new data to a vector variable:

1. Press [SHIFT] [5] (VECTOR) [1] (Dim), and then, on the menu that appears, select the vector variable to which you want to assign data.
2. On the next menu that appears, select dimension (m).
3. Use the Vector Editor that appears to input the elements of the vector.

Example 2: To assign (2, -1, 2) to VctC

[SHIFT] [5] (VECTOR) [1] (Dim) [3] (VctC) [1] (3) 2 [=] [(−)] 1 [=] 2 [=]



To edit the elements of a vector variable:

1. Press [SHIFT] [5] (VECTOR) [2] (Data), and then, on the menu that appears, select the vector variable you want to edit.
2. Use the Vector Editor that appears to edit the elements of the vector.
   - Move the cursor to the cell that contains the element you want to change, input the new value, and then press [=].

To copy vector variable (or VctAns) contents:

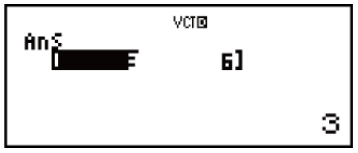
1. Use the Vector Editor to display the vector you want to copy.
   - If you want to copy VctA, for example, perform the following key operation: [SHIFT] [5] (VECTOR) [2] (Data) [1] (VctA).
   - If you want to copy VctAns contents, perform the following to display the VctAns screen: [AC] [SHIFT] [5] (VECTOR) [6] (VctAns) [=].
2. Press [SHIFT] [RCL] (STO), and then perform one of the following key operations to specify the copy destination: [(−)] (VctA), [°‘‘’] (VctB), or [hyp] (VctC).
   - This will display the Vector Editor with the contents of the copy destination.

Vector Calculation Examples

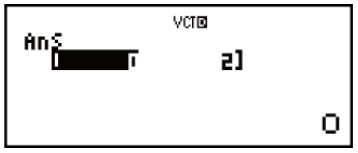
The following examples use VctA = (1, 2) and VctB = (3, 4) from Example 1, and VctC = (2, -1, 2) from Example 2.

Example 3: 3 × VctA (Vector scalar multiplication), 3 × VctA - VctB (Calculation example using VctAns)

AC 3 × SHIFT 5 (VECTOR) 3 (VctA) =



− SHIFT 5 (VECTOR) 4 (VctB) =

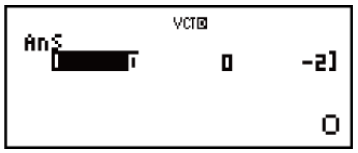


Example 4: VctA • VctB (Vector dot product)

AC SHIFT 5 (VECTOR) 3 (VctA)
SHIFT 5 (VECTOR) 7 (Dot)
SHIFT 5 (VECTOR) 4 (VctB) =

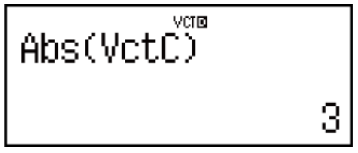
Example 5: VctA × VctB (Vector cross product)

AC SHIFT 5 (VECTOR) 3 (VctA) ×
SHIFT 5 (VECTOR) 4 (VctB) =



Example 6: Obtain the absolute values of VctC.

AC SHIFT hyp (Abs)
SHIFT 5 (VECTOR) 5 (VctC)) =

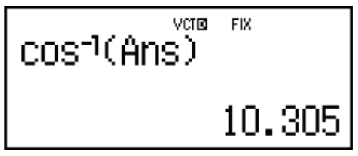


Example 7: Determine the angle formed by VctA and VctB to three decimal places (Fix 3). (Angle unit: Deg)

($\cos\theta = \frac{(A\cdot B)}{|A||B|}$, which becomes $\theta = \cos^{-1}\frac{(A\cdot B)}{|A||B|}$)

SHIFT MODE (SETUP) 6 (Fix) 3
AC (SHIFT 5 (VECTOR) 3 (VctA)
SHIFT 5 (VECTOR) 7 (Dot)
SHIFT 5 (VECTOR) 4 (VctB)) ÷
(Abs SHIFT 5 (VECTOR) 3 (VctA)
) Abs SHIFT 5 (VECTOR) 4 (VctB)
)) =

SHIFT cos ($\cos^{-1}$) Ans) =



Technical Information

Errors

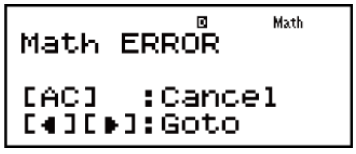
The calculator will display an error message whenever an error occurs for any reason during a calculation.
There are two ways to exit an error message display: Pressing ◀ or ▶ to display the location of the error, or pressing AC to clear the message and calculation.

Displaying the Location of an Error

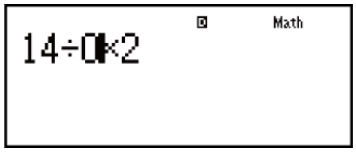
While an error message is displayed, press ◀ or ▶ to return to the calculation screen. The cursor will be positioned at the location where the error occurred, ready for input. Make the necessary corrections to the calculation and execute it again.

Example: When you input 14 ÷ 0 × 2 by mistake instead of 14 ÷ 10 × 2 (MthIO-LineO)

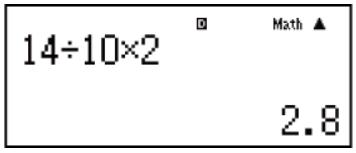
14 ÷ 0 × 2 =



▶ (or ◀)



◀ 1 =



Clearing the Error Message

While an error message is displayed, press AC to return to the calculation screen. Note that this also clears the calculation that contained the error.

Error Messages

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 independent memory or a variable as the argument of a function, make sure that the memory or 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.
- The calculation you are performing has caused the capacity of the vector 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.

Syntax ERROR

Cause:

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

Action:

- Make necessary corrections.

Argument ERROR

Cause:

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

Action:

- Make necessary corrections.

Dimension ERROR (VECTOR Mode only)

Cause:

- The vector you are trying to use in a calculation was input without specifying its dimension.

- You are trying to perform a calculation with vectors whose dimensions do not allow that type of calculation.

Action:

- Specify the dimension of the vector and then perform the calculation again.
- Check the dimensions specified for the vectors to see if they are compatible with the calculation.

Before Assuming Malfunction of the Calculator...

Perform the following steps whenever an error occurs during a calculation or when calculation results are not what you expected. If one step does not correct the problem, move on to the next step.
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 mode for the type of calculation you are trying to perform.
3. If the above steps do not correct your problem, press the [ON] key. This will cause the calculator to perform a routine that checks whether calculation functions are operating correctly. If the calculator discovers any abnormality, it automatically initializes the calculation mode and clears memory contents. For details about initialized settings, see "Configuring the Calculator Setup".
4. Initialize all modes and settings by performing the following operation: [SHIFT] [9] (CLR) [1] (Setup) [=] (Yes).

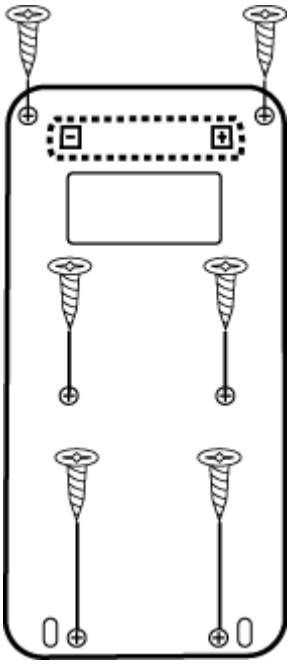
Replacing the Battery

The battery needs to be replaced after a specific number of years. Also, replace the battery immediately after display figures become dim.
A low battery is 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, replace the battery with a new one.

Important!

- Removing the battery will cause all of the calculator's memory contents to be deleted.

1. Press [SHIFT] [AC](OFF) to turn off the calculator.
2. On the back of the calculator, remove the screws and the cover.



3. Remove the battery, and then load a new battery with its plus (+) and minus (-) ends facing correctly.
4. Replace the cover.
5. Initialize the calculator: [ON] [SHIFT] [9](CLR)[3](All)[=](Yes).
   • Do not skip the above step!

Calculation Priority Sequence

The priority sequence of input calculations is evaluated in accordance with the rules below.
When the priority of two expressions is the same, the calculation is performed from left to right.

1	Parenthetical expressions
2	Functions that require an argument to the right and a closing parenthesis ")" following the argument
3	Functions that come after the input value (x^2, x^3, x^{-1}, $x!$, °’ ”, °, ^{r}, ^{g}, %, ►t), powers ($x^{\blacksquare}$), roots ($\sqrt[\blacksquare]{\square}$)
4	Fractions
5	Negative sign ((-)), base-n symbols (d, h, b, o)

6	Metric conversion commands (cm ▸ in, etc.), STAT Mode 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), complex number polar coordinate symbol (∠)
9	Dot product (•)
10	Multiplication (×), division (÷)
11	Addition (+), subtraction (-)
12	and (logical operator)
13	or, xor, xnor (logical operators)

Note

- When squaring a negative value (such as -2), the value being squared must be enclosed in parentheses ([(] [(−)] 2 [)] [x^2] [=]). Since x^2 has a higher priority than the negative sign, inputting [(−)] 2 [x^2] [=] would result in the squaring of 2 and then appending a negative sign to the result.
- Always keep the priority sequence in mind, and enclose negative values in parentheses when required.

Calculation Ranges, Number of Digits, and Precision

The calculation range, number of digits used for internal calculation, and calculation precision depends 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	15 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**	
$\sin x$ $\cos x$	Deg	$0 \leqq \lvert x \rvert < 9 \times 10^{9}$
	Rad	$0 \leqq \lvert x \rvert < 157079632.7$
	Gra	$0 \leqq \lvert x \rvert < 1 \times 10^{10}$
$\tan x$	Deg	Same as $\sin x$, except when $\lvert x \rvert = (2n\text{-}1) \times 90$.
	Rad	Same as $\sin x$, except when $\lvert x \rvert = (2n\text{-}1) \times \pi/2$.
	Gra	Same as $\sin x$, except when $\lvert x \rvert = (2n\text{-}1) \times 100$.
$\sin^{-1}x$, $\cos^{-1}x$	$0 \leqq \lvert x \rvert \leqq 1$	
$\tan^{-1}x$	$0 \leqq \lvert x \rvert \leqq 9.999999999 \times 10^{99}$	
$\sinh x$, $\cosh x$	$0 \leqq \lvert x \rvert \leqq 230.2585092$	
$\sinh^{-1}x$	$0 \leqq \lvert x \rvert \leqq 4.999999999 \times 10^{99}$	
$\cosh^{-1}x$	$1 \leqq x \leqq 4.999999999 \times 10^{99}$	
$\tanh x$	$0 \leqq \lvert x \rvert \leqq 9.999999999 \times 10^{99}$	
$\tanh^{-1}x$	$0 \leqq \lvert x \rvert \leqq 9.999999999 \times 10^{-1}$	
$\log x$, $\ln x$	$0 < x \leqq 9.999999999 \times 10^{99}$	
10^{x}	$-9.999999999 \times 10^{99} \leqq x \leqq 99.99999999$	
e^{x}	$-9.999999999 \times 10^{99} \leqq x \leqq 230.2585092$	

$\sqrt{x}$	$0 \leqq x < 1 \times 10^{100}$
x^2	$\lvert x \rvert < 1 \times 10^{50}$
x^{-1}	$\lvert x \rvert < 1 \times 10^{100}$; $x \neq 0$
$\sqrt[3]{x}$	$\lvert x \rvert < 1 \times 10^{100}$
$x!$	$0 \leqq x \leqq 69$ (x is an integer)
$n\mathrm{P}r$	$0 \leqq n < 1 \times 10^{10}$, $0 \leqq r \leqq n$ (n, r are integers) $1 \leqq \{n!/(n-r)!\} < 1 \times 10^{100}$
$n\mathrm{C}r$	$0 \leqq n < 1 \times 10^{10}$, $0 \leqq r \leqq n$ (n, r are integers) $1 \leqq n!/r! < 1 \times 10^{100}$ or $1 \leqq n!/(n-r)! < 1 \times 10^{100}$
$\mathrm{Pol}(x, y)$	$\lvert x \rvert, \lvert y \rvert \leqq 9.999999999 \times 10^{99}$ $\sqrt{x^2 + y^2} \leqq 9.999999999 \times 10^{99}$
$\mathrm{Rec}(r, \theta)$	$0 \leqq r \leqq 9.999999999 \times 10^{99}$ θ: Same as $\sin x$
°’ ”	$a°b’c”$: $\lvert a \rvert$, b, $c < 1 \times 10^{100}$; $0 \leqq b, c$ The display seconds value is subject to an error of ±1 at the second decimal place.
$\overleftarrow{\text{°’ ”}}$	$\lvert x \rvert < 1 \times 10^{100}$ Decimal ↔ Sexagesimal Conversions $0°0’0” \leqq \lvert x \rvert \leqq 9999999°59’59”$
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)	$a < b$; $\|a\|$, $\|b\| < 1 \times 10^{10}$; $b - a < 1 \times 10^{10}$
GCD(a, b)	$\|a\|$, $\|b\| < 1 \times 10^{10}$ (a, b are integers)
LCM(a, b)	$0 \leqq a, b < 1 \times 10^{10}$ (a, b are integers)

- Precision is basically the same as that described under "Calculation Range and Precision", above.
- x^y, $\sqrt[x]{\ }$, $\sqrt[3]{\ }$, $x!$, $n\mathrm{P}r$, $n\mathrm{C}r$ 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 (UM-4) × 1

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

Power Consumption:
0.0002 W

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

Dimensions:
13.8 (H) × 77 (W) × 161.5 (D) mm
$1/2$" (H) × 3" (W) × $6\,3/8$" (D)

Approximate Weight:
105 g (3.7 oz) including the battery

Verifying the Authenticity of Your Calculator

Use the steps below to verify that your calculator is a genuine CASIO calculator.

1. Press [MODE].

2. Press [0].
   • This displays the information below.
     - Calculator ID number (24-character string)
     - QR Code for accessing the Worldwide Education Service (https://wes.casio.com/calc/)
3. Access the above site.
4. Follow the instructions on the display to verify the authenticity of your calculator.

Press [AC] to return to the mode menu.

Frequently Asked Questions

Frequently Asked Questions

■ How can I perform input and display results the same way I did on a model that does not have Natural Textbook Format?

→ Perform the following key operation: SHIFT MODE (SETUP) 2 (LineIO). See "Configuring the Calculator Setup" for more information.

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

→ See "Toggling Calculation Results" for the procedure.

■ What is the difference between Ans memory, PreAns memory, independent 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.

PreAns Memory:
Stores the result of calculation before the last one. PreAns memory can be used only in the COMP Mode.

Independent Memory:
Use this memory to totalize the results of multiple calculations.

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

■ What is the key operation to take me from the STAT Mode to a mode where I can perform arithmetic calculations?

→ Press MODE 1 (COMP).

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

→ Perform the following key operation: SHIFT 9 (CLR) 1 (Setup) = (Yes).

■ When I execute a function calculation, why do I get a calculation result that is completely different from older CASIO calculator models?

→ With a Natural Textbook Display model, the argument of a function that uses parentheses must be followed by a closing parenthesis. Failing to

press [)] after the argument to close the parentheses may cause unwanted values or expressions to be included as part of the argument.

Example: (sin 30) + 15 (Angle Unit: Deg)

Older (S-V.P.A.M.) Model: [sin] 30 [+] 15 [=] 15.5

Natural Textbook Display Model:

(LineIO) [sin] 30 [)] [+] 15 [=] 15.5

Failure to press [)] here as shown below will result in calculation of sin 45.

[sin] 30 [+] 15 [=] 0.7071067812

CASIO®