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# **Important Information**

- The displays and illustrations (such as key markings) shown in this User's Guide are for illustrative purposes only, and may differ somewhat from the actual items they represent.
- The contents of this manual are subject to change without notice.
- In no event shall CASIO Computer Co., Ltd. be liable to anyone for special, collateral, incidental, or consequential damages in connection with or arising out of the purchase or use of this product and items that come with it. Moreover, CASIO Computer Co., Ltd. shall not be liable for any claim of any kind whatsoever by any other party arising out of the use of this product and the items that come with it.
- Be sure to keep all user documentation handy for future reference.

# **Sample Operations**

Sample operations in this manual are indicated by a  $\mathcal{O}$  icon. Unless specifically stated, all sample operations 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.

For information about the MATH, LINE, Deg, and Rad marks that are shown in the sample operations, see "Configuring the Calculator Setup".

# **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.

# **Safety Precautions**



- Keep batteries out of the reach of small children.
- Use only the type of battery specified for this calculator in this manual.

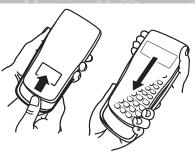
# **Handling Precautions**

- Even if the calculator is operating normally, replace the battery at least once every two 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 discharges slightly during shipment and storage. Because of this, it may require replacement sooner than the normal expected battery life.
- Do not use an oxyride battery\* or any other type of 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.
- \* Company and product names used in this manual may be registered trademarks or trademarks of their respective owners.

# **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 nearby.



# **Turning Power On and Off**

Press (N) to turn on the calculator.

Press SHIFT AC (OFF) to turn off the calculator.

#### **Auto Power Off**

Your calculator will turn off automatically if you do not perform any operation for about 10 minutes. If this happens, press the (N) key to turn the calculator back on.

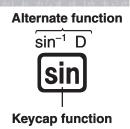
# **Adjusting Display Contrast**

**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 SHFT or APHA 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.

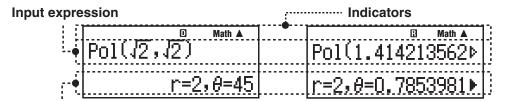
The following shows what the different colors of the alternate function key text mean.



If key marking text is this color:	It means this:
Yellow	Press suff and then the key to access the applicable function.
Red	Press APHA and then the key to input the applicable variable, constant, or symbol.
Purple (or enclosed in purple brackets)	Enter the CMPLX Mode to access the function.
Green (or enclosed in green brackets)	Enter the BASE-N Mode to access the function.

# **Reading the Display**

The display of the calculator shows expressions you input, calculation results, and various indicators.



#### **Calculation result**

- 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 ⑤ and ⑥ 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 ⑥
  first and then use ⑥ and ⑥ to scroll.

#### **Display indicators**

This indicator:	Means this:
The keypad has been shifted by pressing the shift key. keypad will unshift and this indicator will disappear whe you press a key.	
The alpha input mode has been entered by pressing key. The alpha input mode will be exited and thi indicator will disappear when you press a key.	
M	There is a value stored in independent memory.
The calculator is standing by for input of a variable name assign a value to the variable. This indicator appears after you press [SHFT] 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.
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.

# **Specifying the Calculation Mode**

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**

First perform the following key operation to display the setup menu: SHIFT MODE (SETUP). Next, use  $\bigcirc$  and  $\triangle$  and the number keys to configure the settings you want.

Underlined (\_\_\_\_) settings are initial defaults.

1 MthIO 2 LineIO Specifies the display format.

**Natural Display (MthIO)** causes fractions, irrational numbers, and other expressions to be displayed as they are written on paper.

4/5+2/3 0 Math ▲ 22/15

MthIO: Selects MathO or LineO. MathO displays

input and calculation results using the same format as they are written on paper. LineO displays input the same way as MathO, but calculation results are displayed in linear format.

**Linear Display (LineIO)** causes fractions and other expressions to be displayed in a single line.

 **Note:** • The calculator switches to Linear Display automatically whenever you enter the STAT, BASE-N, or VECTOR Mode. • In this manual, the **MATH** symbol next to a sample operation indicates Natural Display (LineO), while the **LINE** symbol indicates Linear Display.

<u>3 Deg</u> <u>4 Rad</u> <u>5 Gra</u> Specifies degrees, radians or grads as the angle unit for value input and calculation result display.

**Note:** In this manual, the **Peg** symbol next to a sample operation indicates degrees, while the **Rad** symbol indicates radians.

**6 Fix 7 Sci 8 Norm** 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: LINE  $100 \div 7 = 14.286$  (Fix 3) 14.29 (Fix 2)

**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: LINE  $1 \div 7 = 1.4286 \times 10^{-1}$  (Sci 5)  $1.429 \times 10^{-1}$  (Sci 4)

**Norm:** Selecting one of the two available settings (Norm 1, <u>Norm 2</u>) determines the range in which results will be displayed in non-exponential format. Outside the specified range, results are displayed using exponential format.

Norm 1:  $10^{-2} > |x|$ ,  $|x| \ge 10^{10}$  Norm 2:  $10^{-9} > |x|$ ,  $|x| \ge 10^{10}$ 

Example: LINE  $1 \div 200 = 5 \times 10^{-3}$  (Norm 1) 0.005 (Norm 2)

▼ 1 ab/c ▼ 2 d/c Specifies either mixed fraction (ab/c) or improper fraction (d/c) for display of fractions in calculation results.

**③ CMPLX** 1 a+bi; 2 r∠ $\theta$  Specifies either rectangular coordinates (a+bi) or polar coordinates  $(r∠\theta)$  for CMPLX Mode calculations.

▼ 4 STAT 1 ON; 2 OFF Specifies whether or not to display a FREQ (frequency) column in the STAT Mode Stat Editor.

**▼ 5 Disp 1 Dot ; 2 Comma** Specifies whether to display a dot or a comma for the calculation result decimal point. A dot is always displayed during input.

**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 (;).

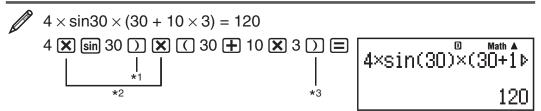
# **Initializing Calculator Settings**

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.

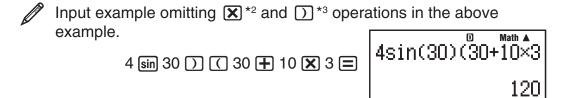
# **Inputting Expressions and Values**

# **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.



- \*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),  $\pi$  or e.
- \*3 The closing parenthesis immediately before the 
  operation can be omitted.



**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.

$$6 \div 2 (1 + 2) \rightarrow 6 \div (2 (1 + 2))$$
  $6 \div A (1 + 2) \rightarrow 6 \div (A (1 + 2))$   $1 \div (2 + 3) \sin(30) \rightarrow 1 \div ((2 + 3) \sin(30))$ 

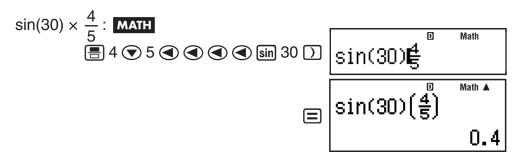
 When a multiplication sign is omitted immediately before a variable, a constant, etc.

$$6 \div 2\pi \rightarrow 6 \div (2\pi)$$
  $2 \div 2\sqrt{2} \rightarrow 2 \div (2\sqrt{2})$   $4\pi \div 2\pi \rightarrow 4\pi \div (2\pi)$ 

 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.

**Important:** 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.





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 ④ and ⑤ to move the cursor. • When Linear Display is selected, pressing ⑥ will cause the cursor to jump to the beginning of the calculation, while ⑦ will jump to the end. • When Natural Display is selected, pressing ⑥ while the cursor is at the end of the input calculation will cause it to jump to the beginning, while pressing ⑥ 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 ■.

### **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.

1st	Parenthetical expressions
2nd	Functions that require an argument to the right and a closing parenthesis ")" following the argument.
3rd	Functions that come after the input value $(x^2, x^3, x^{-1}, x!, \circ, r, g, \infty)$ , powers $(x^{-1})$ , roots $(\sqrt[4]{-1})$
4th	Fractions
5th	Negative sign (–), base- $n$ symbols (d, h, b, o) <b>Note:</b> 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.
6th	Metric conversion commands (cm $\blacktriangleright$ in, etc.), STAT Mode estimated values $(\hat{x}, \hat{y}, \hat{x}_1, \hat{x}_2)$
7th	Multiplication where the multiplication sign is omitted
8th	Permutation ( $nPr$ ), combination ( $nCr$ ), complex number polar coordinate symbol ( $\angle$ )
9th	Dot product (•)
10th	Multiplication, division (×, ÷)
11th	Addition, subtraction (+, -)
12th	Logical AND (and)
13th	Logical OR, XOR, XNOR (or, xor, xnor)

### **Inputting with Natural Display**

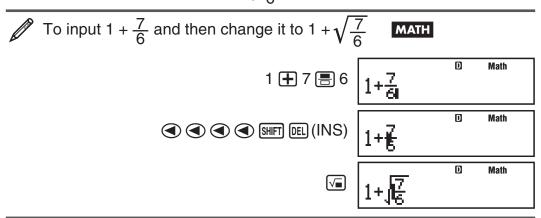
Selecting Natural Display makes it possible to input and display fractions and certain functions ( $x^2$ ,  $x^3$ ,  $x^{\blacksquare}$ ,  $\sqrt{\blacksquare}$ ,  $\sqrt[3]{\blacksquare}$ ,  $\sqrt{\blacksquare}$ ,  $x^{-1}$ ,  $x^{-1}$ ,  $x^{-1}$ , Abs) just as they are written in your textbook.

**Important:** • Certain types of expressions can cause the height of a calculation formula to be greater than one display line. The maximum allowable height of a calculation formula is two display screens (31  $dots \times 2$ ). 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  $\blacksquare$  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  $\blacksquare$  and then use  $\blacksquare$  and  $\blacksquare$  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  $\sqrt{\phantom{0}}$ , resulting in  $\sqrt{\frac{7}{6}}$ .



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:  $\blacksquare$ , SHIFT  $x^{\bullet}(\sqrt[4]{-})$ , SHIFT  $\log(10^{\bullet})$ , SHIFT  $\ln(e^{\bullet})$ ,  $\sqrt{a}$ , SHIFT  $\sqrt{a}(\sqrt[3]{a})$ , 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: [SHFT] [DEL] (INS). The cursor appears as "1" 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 [EL]. In the overwrite mode, move the cursor so it is directly under the character or function you want to delete, and then press [EL].

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.

# **Toggling Calculation Results**

Each press of will toggle the currently displayed calculation result between its decimal form and fraction form.

Important: • With certain calculation results, pressing the (set) 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 **SHFT** instead of after inputting a calculation will display the calculation result in decimal form.

## **Basic Calculations**

### **Fraction Calculations**

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

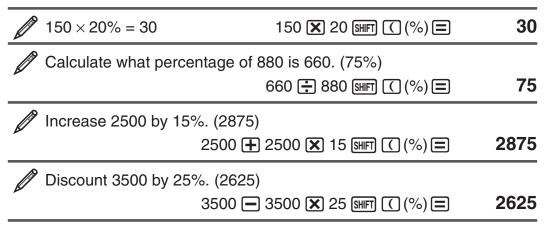
**Note:** • Mixing fractions and decimal values in a calculation while Linear Display is selected will cause the result to be displayed as a decimal value. • Fractions in calculation results are displayed after being reduced to their lowest terms.

To switch a calculation result between improper fraction and mixed fraction form: Perform the following key operation: SHIFT SHIFT

To switch a calculation result between fraction and decimal form: Press (S+D).

#### **Percent Calculations**

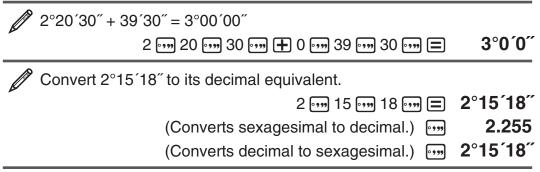
Inputting a value and pressing  $\mathbb{H}\mathbb{F}$  (%) causes the input value to become a percent.



# Degree, Minute, Second (Sexagesimal) Calculations

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.



#### 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  $\blacksquare$ .

3 + 3 : 3 × 3	$3 + 3 \text{ ALPHA } x^3(:)3 \times 3 =$	6
		9

# **Using Engineering Notation**

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



Transform the value 1234 to engineering notation, shifting the decimal point to the right

		decimal point to the right.
1234	1234 🖃	
1.234×10 <sup>3</sup>	ENG	
1234×10°	ENG	



Transform the value 123 to engineering notation, shifting the decimal

point to the left.		
	123 🖃	123
	SHIFT ENG $(\leftarrow)$	$0.123 \times 10^3$
	SHIFT ENG $(\leftarrow)$	0.000123×10 <sup>6</sup>

# Calculation History

In the COMP, CMPLX, or BASE-N Mode, you can scroll through calculation history contents using (A) and (\(\nabla\)).

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 any reset operation.

## Replay

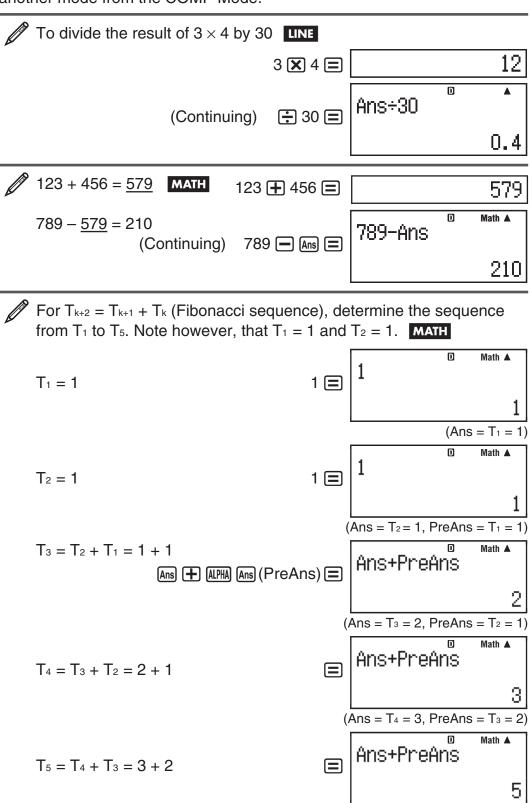
While a calculation result is on the display, you can press **●** or **●** to edit the expression you used for the previous calculation.



**Note:** If you want to edit a calculation when the ▶ indicator is on the right side of a calculation result display (see "Reading the Display"), press AC and then use 
and 
to scroll the calculation.

# 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.



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

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

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

To assign the result of 3 + 5 to varia	ble A	
3	<b>★</b> 5 SHIFT RCL (STO) (→) (A)	8
To multiply the contents of variable	A by 10	
(Continuin	g) ALPHA (-) (A) X 10 =	80
To recall the contents of variable A	(Continuing) RCL (-) (A)	8
To clear the contents of variable A	$0 \text{ SHIFT } \text{RCL} (STO) \bigcirc (A)$	0

## **Independent Memory (M)**

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

0	STO) M+ (M)	O SHIFT RCL (	To clear the contents of M
50	10 🗙 5 M+	(Continuing)	$\nearrow$ To add the result of $10 \times 5$ to M
15	SHIFT M+ (M-)	om M nuing) 10 🛨 5	To subtract the result of 10 + 5 from (Continuous)
35	RCL M+ (M)	(Continuing)	To recall the contents of M

**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.

9 (CLR) 2 (Memory) **(**Yes)

### **Prime Factorization**

In the COMP Mode, you can factor a positive integer up to 10 digits into prime factors up to three digits.



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.

To perform prime factorization on 4104676 (= $2^2 \times 1013^2$ )		
4104676 (SHIFT) (FACT)	2 <sup>2</sup> ×(1026169)	
4104676 (SHIFT (FACT)	2 <sup>2</sup> ×(1026169	

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

- Pressing SHIFT [999] (FACT) or =.
- Pressing any of the following keys: [ENG] or [979].
- 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.

### **Function Calculations**

For actual operations using each function, see the "Examples" section following the list below.

 $\pi$ :  $\pi$  is displayed as 3.141592654, but  $\pi$  = 3.14159265358980 is used for internal calculations.

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

sin, cos, tan, sin<sup>-1</sup>, cos<sup>-1</sup>, tan<sup>-1</sup>: Trigonometric functions. Specify the angle unit before performing calculations. See  $\underline{\mathscr{D}_1}$ .

sinh, cosh, tanh, sinh<sup>-1</sup>, cosh<sup>-1</sup>, tanh<sup>-1</sup>: Hyperbolic functions. Input a function from the menu that appears when you press hyp. The angle unit setting does not affect calculations. See  $\mathcal{O}_2$ .

°, 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►). See 23.

10 $^{\blacksquare}$ ,  $e^{\blacksquare}$ : Exponential functions. Note that the input method is different depending upon whether you are using Natural Display or Linear Display. See 24.

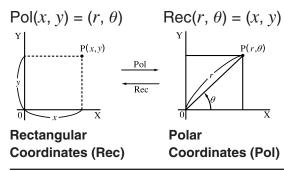
log: Logarithmic function. See \$\int\_5\$.

In: Natural logarithm to base e. See  $\mathcal{Q}_6$ .

 $x^2$ ,  $x^3$ ,  $x^{\blacksquare}$ ,  $\sqrt{\blacksquare}$ ,  $\sqrt[3]{\blacksquare}$ ,  $\sqrt[8]{\Box}$ ,  $x^{-1}$ : Powers, power roots, and reciprocals. Note that the input methods for  $x^{\blacksquare}$ ,  $\sqrt{\blacksquare}$ ,  $\sqrt[3]{\blacksquare}$ , and  $\sqrt[8]{\Box}$  are different depending upon whether you are using Natural Display or Linear Display. See  $\sqrt[8]{7}$ .

**Note:** The following functions cannot be input in consecutive sequence:  $x^2$ ,  $x^3$ ,  $x^{1}$ ,  $x^{-1}$ . If you input  $2x^2x^2$ , for example, the final  $x^2$  will be ignored. To input  $2^{2^2}$ , input  $2x^2$ , press the  $x^2$  key, and then press  $x^2$  (MATH).

**Pol, Rec:** Pol converts rectangular coordinates to polar coordinates, while Rec converts polar coordinates to rectangular coordinates. See  $\mathcal{D}_8$ .



Specify the angle unit before performing calculations.

The calculation result for r and  $\theta$  and for x and y are each assigned respectively to variables X and Y. Calculation result  $\theta$  is displayed in the range of  $-180^{\circ} < \theta \le 180^{\circ}$ .

x!: Factorial function. See  $\mathcal{D}_9$ .

**Abs:** Absolute value function. Note that the input method is different depending upon whether you are using Natural Display or Linear Display. See **10**.

Ran#: Generates a 3-digit pseudo random number that is less than 1. The result is displayed as a fraction when Natural Display is selected. See <a href="#">11</a>1.

**RanInt#:** For input of the function of the form RanInt#(a, b), which generates a random integer within the range of a to b. See 212.

nPr, nCr: Permutation (nPr) and combination (nCr) functions. See nPr.

**GCD**, **LCM**: GCD determines the greatest common divisor of two values, while LCM determines the least common multiple. See 215.

**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**.

### **Examples**

<u>1</u>	$\sin 30^{\circ} = 0.5$ LINE Deg $\sin^{-1}0.5 = 30^{\circ}$ LINE Deg		0.5 30
<u>2</u>	$sinh 1 = 1.175201194$ $cosh^{-1} 1 = 0$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1.175201194 0
<u>/3</u>		$S = 45^{\circ}$ <b>Deg</b> SHIFT Ans (DRG $\blacktriangleright$ ) <b>2</b> ( $^{r}$ ) $\equiv$ SHIFT Ans (DRG $\blacktriangleright$ ) <b>3</b> ( $^{g}$ ) $\equiv$	90 45

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

SHIFT MODE (SETUP) 7 (Sci) 3

MATH

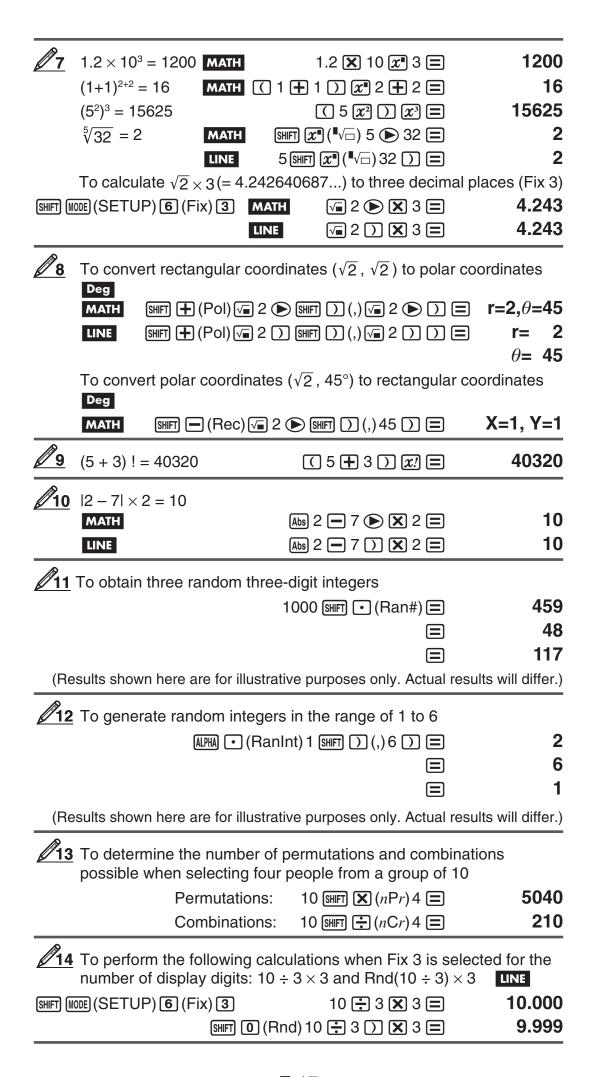
SHIFT In  $(e^{\bullet})$  5  $\blacktriangleright$   $\bigstar$  2  $\equiv$  2.97×10<sup>2</sup>

LINE

SHIFT In  $(e^{\bullet})$  5  $\blacktriangleright$   $\bigstar$  2  $\equiv$  2.97×10<sup>2</sup>

 $\sqrt[6]{5}$   $\log_{10} 1000 = \log 1000 = 3$   $\log 1000$   $\bigcirc$   $\bigcirc$  3

To calculate  $\ln 90 = \log_e 90$  to three significant digits (Sci 3) SHFT MODE (SETUP) 7 (Sci) 3 In 90  $\implies$  4.50×10°



To determine the greatest common divisor of 28 and 35

To determine the least common multiple of 9 and 15

**45** 

7

# **Complex Number Calculations (CMPLX)**

To perform complex number calculations, first press (CMPLX) to enter the CMPLX Mode. You can use either rectangular coordinates (a+bi) 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.

(2 + 6i) ÷ (2i) = 3 – i (Complex number format: a + bi)

 $(2 + 6 ENG(i)) \div (2 ENG(i)) =$ 

3-i

 $\sqrt{2} \angle 45 = 1 + i$  MATH Deg (Complex number format: a + bi)

**2 ►** SHIFT (→) (∠) 45 **=** 

1+i

 $\sqrt{2} + \sqrt{2} i = 2 \angle 45$  MATH Deg (Complex number format:  $r\angle\theta$ )

**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  $\theta$  value of the calculation result is displayed in the range of  $-180^{\circ} < \theta \leq 180^{\circ}$ . • Display of the calculation result while Linear Display is selected will show a and bi (or r and  $\theta$ ) on separate lines.

# **CMPLX Mode Calculation Examples**

(1 - i)<sup>-1</sup> =  $\frac{1}{2} + \frac{1}{2}i$  MATH (Complex number format: a + bi)

(1 - ENG(i)) x =

 $\frac{1}{2}$ + $\frac{1}{2}$ i

 $(1+i)^4 + (1-i)^2 = -4-2i$  MATH

-4-2i

2-3i

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

SHIFT **2** (CMPLX) **2** (Conjg) 2 **+** 3 ENG (*i*) ) **=** 

To obtain the absolute value and argument of 1 + i MATH Deg

Absolute Value: Abs 1 + ENG (i) = 1.414213562

Argument: SHIFT 2 (CMPLX) 1 (arg)1 + ENG (i) ) = 45

# Using a Command to Specify the Calculation Result Format

Either of two special commands ( $\triangleright r \angle \theta$  or  $\triangleright a + bi$ ) 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.

# **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 (_+CX²)
Paired-variable (X, Y), logarithmic regression $(y = A + Blnx)$	4 (In X)
Paired-variable (X, Y), $e$ exponential regression $(y = Ae^{B^X})$	<b>5</b> (e^X)
Paired-variable (X, Y), $ab$ exponential regression $(y = AB^x)$	<b>6</b> (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 Stat 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 Stat Editor to input data. Perform the following key operation to display the Stat Editor: SHIFT 1 (STAT) 2 (Data).

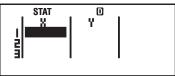
The Stat Editor provides 40 rows for data input when there is an X column only or when there are X and Y columns, 20 rows when there are X and FREQ columns, or 26 rows when there are X, Y, and FREQ columns.

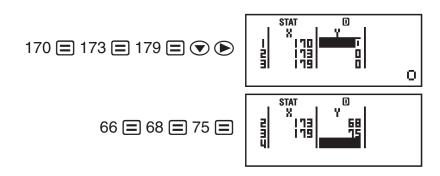
**Note:** Use the FREQ (frequency) column to input the quantity (frequency) of identical data items. Display of the FREQ column can be turned on (displayed) or off (not displayed) using the Stat Format setting on the setup menu.



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

MODE 3 (STAT) 2 (A+BX)





Important: • All data currently input in the Stat 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 Stat Editor: M+, SHFT M+ (M-), SHFT RCL (STO). Pol, Rec, and multi-statements also cannot be input with the Stat Editor.

To change the data in a cell: In the Stat 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 Stat Editor, move the cursor to the line that you want to delete and then press [PL].

To insert a line: In the Stat 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 Stat Editor contents: In the Stat Editor, perform the following key operation: SHFT 1 (STAT) 3 (Edit) 2 (Del-A).

### **Obtaining Statistical Values from Input Data**

To obtain statistical values, press  $\mathbb{AC}$  while in the Stat Editor and then recall the statistical variable ( $\sigma x$ ,  $\Sigma x^2$ , etc.) you want. Supported statistical variables and the keys you should press to recall them are shown below. For single-variable statistical calculations, the variables marked with an asterisk (\*) are available.

**Sum:**  $\Sigma x^{2*}$ ,  $\Sigma x^{*}$ ,  $\Sigma y^{2}$ ,  $\Sigma y$ ,  $\Sigma xy$ ,  $\Sigma x^{3}$ ,  $\Sigma x^{2}y$ ,  $\Sigma x^{4}$  [SHFT 1 (STAT) 3 (Sum) 1 to 8

Number of Items:  $n^*$ , Mean:  $\bar{x}^*$ ,  $\bar{y}$ , Population Standard Deviation:  $\sigma x^*$ ,  $\sigma y$ , Sample Standard Deviation:  $s x^*$ , s y

SHIFT 1 (STAT) 4 (Var) 1 to 7

Regression Coefficients: A, B, Correlation Coefficient: r, Estimated Values:  $\hat{x}$ ,  $\hat{y}$ 

SHIFT 1 (STAT) 5 (Reg) 1 to 5

Regression Coefficients for Quadratic Regression: A, B, C, Estimated Values:  $\hat{x}_1$ ,  $\hat{x}_2$ ,  $\hat{y}$ 

SHIFT 1 (STAT) 5 (Reg) 1 to 6

- See the table at the beginning of this section of the manual for the regression formulas.
- $\hat{x}$ ,  $\hat{x}_1$ ,  $\hat{x}_2$  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.

Minimum Value: minX\*, minY, Maximum Value: maxX\*, maxY

[SHIFT] [1] (STAT) [6] (MinMax) [1] to [2]

(When the single-variable statistical calculation is selected)

SHIFT 1 (STAT) 6 (MinMax) 1 to 4

(When a paired-variable statistical calculation is selected)

SHIFT 1 (STAT) 6 (MinMax) 3 to 5 (When the single-variable statistical calculation is selected.) Note: While single-variable statistical calculation is selected, you can input the functions and commands for performing normal distribution calculation from the menu that appears when you perform the following key operation: [SHFT] [1] (STAT) [5] (Distr). See "Performing Normal Distribution Calculations" for details. 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  $(\{x_n; freg_n\} = \{1;1, 2;2, 3;3, 4;2, 5;1\})$ , and calculate the mean and population standard deviation. SHIFT MODE (SETUP) • 4 (STAT) 1 (ON) STAT X MODE 3 (STAT) 1 (1-VAR) 1 = 2 = 3 = 4 = 5 =  $\bigcirc$ 1 = 2 = 3 = 2 =1 3 AC SHIFT 1 (STAT) 4 (Var) 2  $(\bar{x})$ 1.154700538 AC SHIFT 1 (STAT) 4 (Var) 3 ( $\sigma_x$ ) Results: Mean: 3 Population Standard Deviation: 1.154700538 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) (STAT) (2) (OFF) SHIFT MODE (SETUP) 6 (Fix) 3 FIX STAT MODE 3 (STAT) 2 (A+BX) n 릚 345 8800 20 = 110 = 200 = 290 = 🔻 🕒 3150 = 7310 = 8800 = 9310 = 0.923AC SHIFT 1 (STAT) 5 (Reg) 3 (r) AC SHFT 1 (STAT) 1 (Type) 4 (In X) 0.998 AC (SHIFT) 1 (STAT) 5 (Reg) 3 (r) = -3857.984 AC SHIFT 1 (STAT) 5 (Reg) 1 (A) 2357.532 AC SHIFT 1 (STAT) 5 (Reg) 2 (B) **Results:** Linear Regression Correlation Coefficient: 0.923 Logarithmic Regression Correlation Coefficient: 0.998 Logarithmic Regression Formula:  $y = -3857.984 + 2357.532 \ln x$ 

First Quartile: Q1, Median: med, Third Quartile: Q3

### **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.



To determine the estimate value for y when x = 160 in the regression formula produced by logarithmic regression of the data in  $\underline{\mathbb{Z}_3}$ . Specify Fix 3 for the result. (Perform the following operation after completing the operations in  $\underline{\mathbb{Z}_3}$ .)

AC 160 SHFT 1 (STAT) 5 (Reg) 5 (ŷ)

8106.898

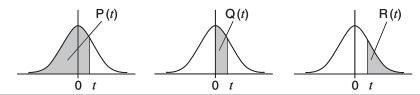
**Result:** 8106.898

**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: [SIIFT] 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  $X \triangleright t = \frac{X - \bar{x}}{Cx}$ .



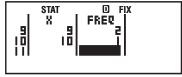
For the single variable data  $\{x_n : \text{freq}_n\} = \{0;1, 1;2, 2;1, 3;2, 4;2, 5;2, 6;3, 7;4, 9;2, 10;1\}$ , to determine the normalized variate ( $\triangleright t$ ) when x = 3, and P(t) at that point up to three decimal places (Fix 3).

SHIFT MODE (SETUP) 4 (STAT) 1 (ON)

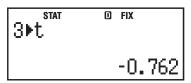
SHIFT MODE (SETUP) 6 (Fix) 3 MODE 3 (STAT) 1 (1-VAR)

0 = 1 = 2 = 3 = 4 = 5 = 6 = 7 = 9 = 10 = **① ①** 1 = 2 = 1 = 2 = 2 = 3 =

4 🗏 2 🗏 1 🗐



AC 3 SHIFT 1 (STAT) 5 (Distr) 4 ( $\triangleright t$ )



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

P(Ans) 0.223

**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,  $x^2$  (HEX) for hexadecimal,  $x^3$  (BIN) for binary, or  $x^3$  (OCT) for octal.

To enter the BASE-N Mode, switch to the bit 112+12	nary mode, and calculate
MODE 4 (BASE-N)	Dec 0
log (BIN)	Bin 000000000000000000000000000000000000
11 🕂 1 🖃	00000000000000000000000000000000000000

Continuing from above, switch to the hexadecimal mode and calculate 1F<sub>16</sub> + 1<sub>16</sub>

AC (T) (HEX) 1 tan (F) + 1 = 00000020

Continuing from above, switch to the octal mode and calculate 78 + 18

Base- <i>n</i> Mode	Input/Output Ranges	
Binary	Positive: $000000000000000000000000000000000000$	
Octal	Positive: $000000000000000000000000000000000000$	
Decimal	$-2147483648 \le x \le 2147483647$	

Hexadecimal

Positive:  $00000000 \le x \le 7FFFFFF$ Negative:  $80000000 \le x \le FFFFFFFF$ 

### 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).



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

AC  $(x^2)$  (DEC)  $(x^2)$   $(x^2)$ 

SHFT 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), (HEX) (hexadecimal), [10] (BIN) (binary), [11] (OCT)(octal).



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

 $AC (x^2) (DEC) 15 \times 37 \equiv$ 

555

 $x^{\bullet}$  (HEX)

0000022B [log (BIN) 0000001000101011

In (OCT)

0000001053

### **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 [SHFT] [3] (BASE) to input these logical operators and functions.

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

To determine the logical AND of 10102 and 11002 (10102 and 11002)

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



To determine the logical OR of 10112 and 110102 (10112 or 110102)

AC 1011 SHFT 3 (BASE) 2 (or) 11010 = 000000000011011



To determine the logical XOR of 10102 and 11002 (10102 xor 11002)

AC 1010 SHIFT 3 (BASE) 3 (xor) 1100 = 000000000000110

To determine the logical XNOR of 11112 and 1012 (11112 xnor 1012)

AC 1111 SHIFT 3 (BASE) 4 (xnor) 101 = 11111111111110101

P

To determine the bitwise complement of 1010<sub>2</sub> (Not(1010<sub>2</sub>))

AC SHFT 3 (BASE) 5 (Not) 1010 ) = 11111111111110101



To negate (take the two's complement) of 1011012 (Neg(1011012))

AC SHIFT 3 (BASE) 6 (Neg) 101101 ) = 11111111111010011

**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.



To verify whether  $4\sqrt{9} = 12$  is true

MATH

1. Press [IIII] 5 (VERIF) to enter the VERIFY Mode.

TRUE/FALSE

- 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 (VERIFY).
- 1:= 2:≠ 3:> 4:< 5:≥ 6:≤

3. To verify, press  $\blacksquare$ .

4√9=12	D	Math ▲
		TRUE

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

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

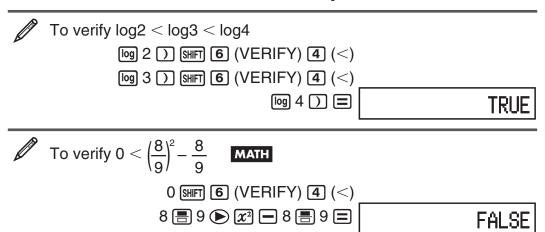
In the VERIFY Mode, the calculator performs a mathematical operation on the input expression and then displays TRUE or FALSE based on the result. Because of this, calculation error can occur or a mathematically correct result may not be able to be displayed when the input calculation expression includes calculation that approaches the singular point or inflection point of a function, or when the input expression contains multiple calculation operations.

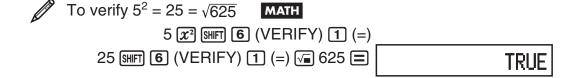
### **Expression Input Precautions**

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  $\leq$  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:  $5 \le 6 \ge 4$ )
- An expression that contains two of the following operators in any combination (Example:  $4 < 6 \neq 8$ )
- An expression that contains consecutive relational operators (Example:  $5 \ge 9$ )

# **VERIFY Mode Calculation Examples**





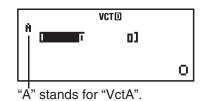
# **Vector Calculations (VECTOR)**

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.



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

- 1. Press [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.



3. Input the elements of VctA: 1 = 2 = .

- 4. Perform the following key operation: SHFT 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.



**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.

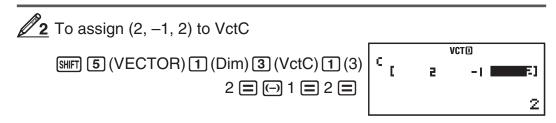
- To insert the VctAns variable into a calculation, perform the following key operation: [SHFT] [5] (VECTOR) [6] (VctAns).
- Pressing any one of the following keys while the VctAns screen is displayed will switch automatically to the calculation screen: 🛨, 🖃, 🕱. The calculation screen will show the VctAns variable followed by the operator for the key you pressed.

## **Assigning and Editing Vector Variable Data**

**Important:** The following operations are not supported by the Vector Editor: M+, M-, M-,

#### To assign new data to a vector variable:

- 1. Press (SHFT) 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.



#### To edit the elements of a vector variable:

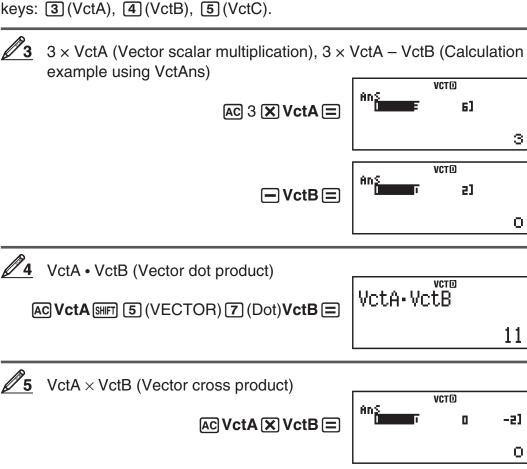
- 1. Press (SHFT) 5 (VECTOR) 2 (Data), and then, on the menu that appears, select the vector variable you want to edit.
- 2. Use the Vector Editor that appears to edit the elements of the vector.
  - Move the cursor to the cell that contains the element you want to change, input the new value, and then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

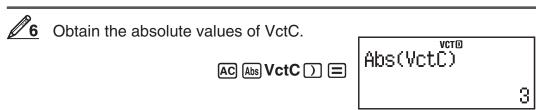
#### To copy vector variable (or VctAns) contents:

- 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: SHFT 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 (SHFT (RCL) (STO), and then perform one of the following key operations to specify the copy destination: (-) (VctA), ()-19 (VctB), or (Np) (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  $2 \\ 1$ , and VctC = (2, -1, 2) from  $2 \\ 2$ . You can input a vector variable into a key operation by pressing SHFT 5 (VECTOR) and then pressing one of the following number keys: 3 (VctA), 4 (VctB), 5 (VctC).



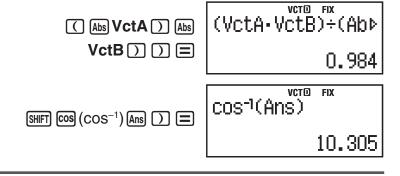


Determine the angle formed by VctA and VctB to three decimal places (Fix 3). Deg

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

SHIFT MODE (SETUP) 6 (Fix) 3

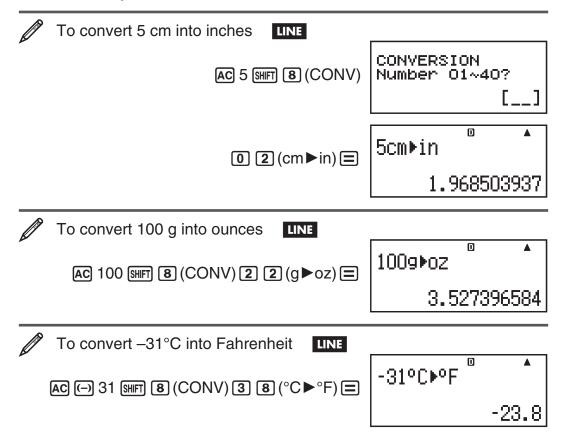
AC ( VctA SHIFT 5 (VECTOR) 7 (Dot)VctB ) ÷



### **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 (CONV) and then input the two-digit number that corresponds to the command you want.



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

01: in ▶ cm	02: cm <b>►</b> in	03: ft ► m	04: m ► ft
05: yd ► m	06: m <b>►</b> yd	07: mile ► km	08: km ► mile
09: n mile ► m	10: m ►n mile	11: acre ► m²	12: m² ► 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 <b>►</b> 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/cm² ▶ Pa	32: Pa ► kgf/cm²
33: kgf • m ▶ J	34: J ▶ kgf • m	35: lbf/in² ▶ kPa	36: kPa ► lbf/in²
37: °F ▶ °C	38: °C <b>▶</b> °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.

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

# **Function Calculation Input Ranges and Precision**

Functions	Input Range		
	DEG	$0 \le  x  < 9 \times 10^9$	
sinx	RAD	$0 \le  x  < 157079632.7$	
	GRA	$0 \le  x  < 1 \times 10^{10}$	
	DEG	$0 \le  x  < 9 \times 10^9$	
cosx	RAD	$0 \le  x  < 157079632.7$	
	GRA	$0 \le  x  < 1 \times 10^{10}$	
	DEG	Same as $\sin x$ , except when $ x  = (2n-1) \times 90$ .	
tanx	RAD	Same as $\sin x$ , except when $ x  = (2n-1) \times \pi/2$ .	
	GRA	Same as $\sin x$ , except when $ x  = (2n-1) \times 100$ .	
sin <sup>-1</sup> x	0 - 1		
cos <sup>-1</sup> x	$0 \le  x $		
tan⁻¹x	$0 \le  x $	$  \le 9.999999999 \times 10^{99}$	
sinhx	0 - 1	0 - 1.1 - 000 0505000	
coshx	$0 \le  x  \le 230.2585092$		
sinh <sup>-1</sup> x	$0 \le  x  \le 4.999999999 \times 10^{99}$		
cosh <sup>-1</sup> x	$1 \le x \le 4.999999999 \times 10^{99}$		
tanhx	$0 \le  x  \le 9.999999999 \times 10^{99}$		
tanh-1x	$0 \le  x  \le 9.99999999 \times 10^{-1}$		
$\log x / \ln x \qquad 0 < x \le 9.9999999999 \times 10^{99}$		$\leq 9.999999999 \times 10^{99}$	

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	10 <sup>x</sup>	$-9.999999999 \times 10^{99} \le x \le 99.99999999$
$x^{2} \qquad  x  < 1 \times 10^{50}$ $x^{-1} \qquad  x  < 1 \times 10^{100}; x \neq 0$ $\sqrt[3]{x} \qquad  x  < 1 \times 10^{100}; x \neq 0$ $x! \qquad 0 \leq x \leq 69 \ (x \text{ is an integer})$ $n \text{Pr} \qquad 0 \leq n < 1 \times 10^{10}, 0 \leq r \leq n \ (n, r \text{ are integers})$ $1 \leq \{n!/(n-r)!\} < 1 \times 10^{100} \text{ or } 1 \leq n!/(n-r)! < 1 \times 10^{100}$ $n \text{Cr} \qquad 0 \leq n < 1 \times 10^{10}, 0 \leq r \leq n \ (n, r \text{ are integers})$ $1 \leq n!/r! < 1 \times 10^{100} \text{ or } 1 \leq n!/(n-r)! < 1 \times 10^{100}$ $ x ,  y  \leq 9.999999999 \times 10^{99}$ $\sqrt{x^{2} + y^{2}} \leq 9.9999999999 \times 10^{99}$ $\theta : \text{Same as sin}x$ $ a , b, c < 1 \times 10^{100}$ $0 \leq b, c$ $\text{The display seconds value is subject to an error of \pm 1 at the second decimal place.  x  < 1 \times 10^{100} 0 \leq b, c \text{The display seconds value is subject to an error of \pm 1 at the second decimal place.  x  < 1 \times 10^{100} 0 \leq b, c \text{The display seconds value is number: }  x  < 1 \times 10^{100} 1 \leq a \leq b \leq b$	$e^x$	$-9.999999999 \times 10^{99} \le x \le 230.2585092$
$x^{-1} \qquad  x  < 1 \times 10^{100} ; x \neq 0$ $\sqrt[3]{x} \qquad  x  < 1 \times 10^{100} ; x \neq 0$ $x! \qquad 0 \leq x \leq 69 \ (x \text{ is an integer})$ $n \text{Pr} \qquad 0 \leq n < 1 \times 10^{10}, 0 \leq r \leq n \ (n, r \text{ are integers})$ $1 \leq \{n!/(n-r)!\} < 1 \times 10^{100}$ $n \text{Cr} \qquad 0 \leq n < 1 \times 10^{10}, 0 \leq r \leq n \ (n, r \text{ are integers})$ $1 \leq n!/r! < 1 \times 10^{100} \text{ or } 1 \leq n!/(n-r)! < 1 \times 10^{100}$ $ x ,  y  \leq 9.999999999 \times 10^{99}$ $\sqrt{x^2 + y^2} \leq 9.9999999999 \times 10^{99}$ $\theta: \text{ Same as sin} x$ $ a , b, c < 1 \times 10^{100}$ $0 \leq b, c$ $\text{The display seconds value is subject to an error of } \pm 1 \text{ at the second decimal place.}$ $ x  < 1 \times 10^{100}$ $\text{Decimal} \leftrightarrow \text{Sexagesimal Conversions}$ $0^{\circ}0^{\circ}0^{\circ} \leq  x  \leq 9999999^{\circ}59^{\circ}59^{\circ}$ $x > 0: -1 \times 10^{100} < y \log x < 100$ $x = 0: y > 0$ $x < 0: y = n, \frac{m}{2n+1} \ (m, n \text{ are integers})$ $\text{When } x \text{ is a complex number: }  y  < 1 \times 10^{10} \ (y \text{ is an integer})$ $\text{However: } -1 \times 10^{100} < y \log  x  < 100$ $y > 0: x \neq 0, -1 \times 10^{100} < y \log  x  < 100$ $y > 0: x \geq 0, -1 \times 10^{100} < y \log  x  < 100$ $y > 0: x \geq 0, -1 \times 10^{100} < 1/x \log y < 100$ $y > 0: x \geq 2n+1, \frac{2n+1}{m} \ (m \neq 0; m, n \text{ are integers})$ $\text{However: } -1 \times 10^{100} < 1/x \log  y  < 100$ $\text{Total of integer, numerator, and denominator must be } 10$ $\text{digits or less (including division marks}).}$	$\sqrt{x}$	$0 \le x < 1 \times 10^{100}$
$ x  < 1 \times 10^{100}$ $x!$ $0 \le x \le 69$ ( $x$ is an integer) $nPr$ $0 \le n < 1 \times 10^{10}$ , $0 \le r \le n$ ( $n$ , $r$ are integers) $1 \le \{n!/(n-r)!\} < 1 \times 10^{100}$ $nCr$ $0 \le n < 1 \times 10^{10}$ , $0 \le r \le n$ ( $n$ , $r$ are integers) $1 \le n!/r! < 1 \times 10^{100} \text{ or } 1 \le n!/(n-r)! < 1 \times 10^{100}$ $ x ,  y  \le 9.9999999999 \times 10^{99}$ $\sqrt{x^2 + y^2} \le 9.9999999999 \times 10^{99}$ $\sqrt{x^2 + y^2} \le 9.99999999999 \times 10^{99}$ $\theta: \text{ Same as sin} x$ $ a , b, c < 1 \times 10^{100}$ $0 \le b, c$ $\text{The display seconds value is subject to an error of \pm 1 at the second decimal place.  x  < 1 \times 10^{100} \text{Decimal} \leftrightarrow \text{Sexage simal Conversions} 0^\circ 0^\circ 0^\circ \le  x  \le 9999999^\circ 59^\circ 59^\circ x > 0 \cdot -1 \times 10^{100} < y \log x < 100 x = 0: y > 0 x < 0: y = n, \frac{m}{2n+1} (m, n \text{ are integers}) \text{When } x \text{ is a complex number: }  y  < 1 \times 10^{10} \text{ (}y \text{ is an integer}) \text{However: } -1 \times 10^{100} < y \log  x  < 100 y > 0: x \ne 0, -1 \times 10^{100} < 1/x \log y < 100 y > 0: x \ge 0 y < 0: x = 2n+1, \frac{2n+1}{m} (m \ne 0; m, n \text{ are integers}) \text{However: } -1 \times 10^{100} < 1/x \log  y  < 100 \text{Total of integer, numerator, and denominator must be 10 digits or less (including division marks).}$	$\chi^2$	$ x  < 1 \times 10^{50}$
x! $0 \le x \le 69$ (x is an integer) $nPr$ $0 \le n < 1 \times 10^{10}$ , $0 \le r \le n$ (n, r are integers) $1 \le \{n!/(n-r)!\} < 1 \times 10^{100}$ $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \le n!/(n-r)! < 1 \times 10^{100}$ $1 \le n!/r! < 1 \times 10^{100}$ or $1 \ge n!/(n-r)! < 1 \times 10^{100}$ <t< td=""><td>X<sup>-1</sup></td><td><math> x  &lt; 1 \times 10^{100}</math>; <math>x \neq 0</math></td></t<>	X <sup>-1</sup>	$ x  < 1 \times 10^{100}$ ; $x \neq 0$
$n \Pr \qquad 0 \le n < 1 \times 10^{10}, 0 \le r \le n \ (n, r \ \text{are integers}) \\ 1 \le \{n!/(n-r)!\} < 1 \times 10^{100} \\ 0 \le n < 1 \times 10^{10}, 0 \le r \le n \ (n, r \ \text{are integers}) \\ 1 \le n!/r! < 1 \times 10^{100} \ \text{or} \ 1 \le n!/(n-r)! < 1 \times 10^{100} \\ 0 \le n < 1 \times 10^{10}, 0 \le r \le n \ (n, r \ \text{are integers}) \\ 1 \le n!/r! < 1 \times 10^{100} \ \text{or} \ 1 \le n!/(n-r)! < 1 \times 10^{100} \\ 0 \le n!/r! < 1 \times 10^{100} \ \text{or} \ 1 \le n!/(n-r)! < 1 \times 10^{100} \\ 0 \le r \le 9.9999999999 \times 10^{99} \\ \theta : \text{Same as sin} x \\  a , b, c < 1 \times 10^{100} \\ 0 \le b, c \\ \text{The display seconds value is subject to an error of } \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c \\ \text{The display seconds value is subject to an error of } \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c \\ \text{The display seconds value is subject to an error of } \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c \\ \text{The display seconds value is subject to an error of } \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c \\ \text{The display seconds value is subject to an error of } \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c \\ \text{The display seconds value is subject to an error of } \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c \\ \text{The display seconds value is subject to an error of } \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c \\ \text{The display seconds value is subject to an error of } \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c \\ \text{The display seconds value is subject to an error of } \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c \\ \text{The display seconds value is subject to an error of } \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c \\ \text{The display seconds value is subject to an error of } \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c \\ \text{The display seconds value is subject to an error of \pm 1 \ \text{at the second decimal place.} \\  x  < 1 \times 10^{100} \\ 0 = b, c $	3√χ	$ x  < 1 \times 10^{100}$
$n Pr \qquad 1 \leq \{n!/(n-r)!\} < 1 \times 10^{100}$ $n Cr \qquad 0 \leq n < 1 \times 10^{10}, \ 0 \leq r \leq n \ (n, r \ \text{are integers})$ $1 \leq n!/r! < 1 \times 10^{100} \ \text{or} \ 1 \leq n!/(n-r)! < 1 \times 10^{100}$ $ x , \  y  \leq 9.9999999999 \times 10^{99}$ $ x , \  y  \leq 9.9999999999 \times 10^{99}$ $ x , \  y  \leq 9.9999999999 \times 10^{99}$ $ x  \leq 9.9999999999 \times 10^{99}$ $ x  \leq 9.999999999 \times 10^{99}$ $ x  \leq 1 \times 10^{100}$ $ x  \leq 9.9999999999999999999999999999999999$	<i>x</i> !	$0 \le x \le 69$ (x is an integer)
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Pol( $x, y$ ) $\sqrt{x^2 + y^2} \le 9.9999999999999999999999999999999999$	nCr	
Rec $(r,\theta)$ $\theta$ : Same as $\sin x$ $ a , b, c < 1 \times 10^{100}$ $0 \le b, c$ The display seconds value is subject to an error of $\pm 1$ at the second decimal place. $ x  < 1 \times 10^{100}$ Decimal $\leftrightarrow$ Sexagesimal Conversions $0^{\circ}0'0'' \le  x  \le 9999999^{\circ}59'59''$ $x > 0: -1 \times 10^{100} < y\log x < 100$ $x = 0: y > 0$ $x < 0: y = n, \frac{m}{2n+1} (m, n \text{ are integers})$ When $x$ is a complex number: $ y  < 1 \times 10^{10} (y \text{ is an integer})$ However: $-1 \times 10^{100} < y\log  x  < 100$ $y > 0: x \ne 0, -1 \times 10^{100} < 1/x \log y < 100$ $y = 0: x > 0$ $y < 0: x = 2n+1, \frac{2n+1}{m} (m \ne 0; m, n \text{ are integers})$ However: $-1 \times 10^{100} < 1/x \log  y  < 100$ $a^b/c$ Total of integer, numerator, and denominator must be 10 digits or less (including division marks).	Pol(x, y)	' ' ' '
The display seconds value is subject to an error of $\pm 1$ at the second decimal place. $ x  < 1 \times 10^{100}$ Decimal $\leftrightarrow$ Sexagesimal Conversions $0^{\circ}0'0'' \leq  x  \leq 9999999^{\circ}59'59''$ $x > 0: -1 \times 10^{100} < y\log x < 100$ $x = 0: y > 0$ $x < 0: y = n, \frac{m}{2n+1} (m, n \text{ are integers})$ When $x$ is a complex number: $ y  < 1 \times 10^{10} (y \text{ is an integer})$ However: $-1 \times 10^{100} < y\log  x  < 100$ $y > 0: x \neq 0, -1 \times 10^{100} < 1/x \log y < 100$ $y > 0: x \geq 0$ $y < 0: x = 2n+1, \frac{2n+1}{m} (m \neq 0; m, n \text{ are integers})$ However: $-1 \times 10^{100} < 1/x \log  y  < 100$ $a^{b}/c$ Total of integer, numerator, and denominator must be 10 digits or less (including division marks).	$\operatorname{Rec}(r, heta)$	
Decimal $\leftrightarrow$ Sexagesimal Conversions $0^{\circ}0'0'' \leq  x  \leq 9999999^{\circ}59'59''$ $x > 0: -1 \times 10^{100} < y \log x < 100$ $x = 0: y > 0$ $x < 0: y = n, \frac{m}{2n+1} (m, n \text{ are integers})$ When $x$ is a complex number: $ y  < 1 \times 10^{10} (y \text{ is an integer})$ However: $-1 \times 10^{100} < y \log  x  < 100$ $y > 0: x \neq 0, -1 \times 10^{100} < 1/x \log y < 100$ $y = 0: x > 0$ $y < 0: x = 2n+1, \frac{2n+1}{m} (m \neq 0; m, n \text{ are integers})$ However: $-1 \times 10^{100} < 1/x \log  y  < 100$ $a^b/c$ Total of integer, numerator, and denominator must be 10 digits or less (including division marks).	01 11	$0 \le b, c$ The display seconds value is subject to an error of ±1 at
$x^{y}$ $x = 0: y > 0$ $x < 0: y = n, \frac{m}{2n+1} (m, n \text{ are integers})$ When $x$ is a complex number: $ y  < 1 \times 10^{10} (y \text{ is an integer})$ However: $-1 \times 10^{100} < y \log  x  < 100$ $y > 0: x \neq 0, -1 \times 10^{100} < 1/x \log y < 100$ $y = 0: x > 0$ $y < 0: x = 2n+1, \frac{2n+1}{m} (m \neq 0; m, n \text{ are integers})$ However: $-1 \times 10^{100} < 1/x \log  y  < 100$ $a^{b}/c$ Total of integer, numerator, and denominator must be 10 digits or less (including division marks).	01 11	Decimal ↔ Sexagesimal Conversions
$y = 0: x > 0$ $y < 0: x = 2n+1, \frac{2n+1}{m} (m \neq 0; m, n \text{ are integers})$ However: $-1 \times 10^{100} < 1/x \log  y  < 100$ $a^{b}/_{c}$ Total of integer, numerator, and denominator must be 10 digits or less (including division marks).	$\mathcal{X}^{\mathcal{Y}}$	x = 0: $y > 0x < 0: y = n, \frac{m}{2n+1} (m, n are integers)When x is a complex number:  y  < 1 \times 10^{10} (y is an integer)$
$a^{o}/_{c}$ digits or less (including division marks).	$\sqrt[x]{y}$	y = 0: x > 0 $y < 0: x = 2n+1, \frac{2n+1}{m}$ ( $m \neq 0; m, n$ are integers)
RanInt# $(a, b)$ $a < b;  a ,  b  < 1 \times 10^{10}; b - a < 1 \times 10^{10}$	$a^b/_c$	
	RanInt# $(a, b)$	$a < b;  a ,  b  < 1 \times 10^{10}; b - a < 1 \times 10^{10}$

- Precision is basically the same as that described under "Calculation Range and Precision", above.
- $x^y$ ,  $\sqrt[x]{y}$ ,  $\sqrt[3]{}$ , x!, n Pr, n Cr 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.
- The range for calculation results that can be displayed in  $\pi$  form when using Natural Display is  $|x| < 10^6$ . Note, however, that internal calculation error

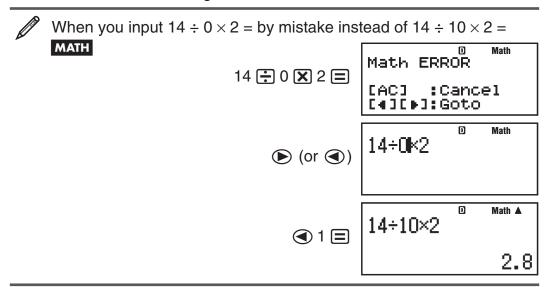
can make it impossible to display some calculation results in  $\pi$  form. It also can cause calculation results that should be in decimal form to appear in  $\pi$  form.

#### **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  $\bigcirc$  or  $\bigcirc$  to display the location of the error, or pressing  $\bigcirc$  to clear the message and calculation.

### Displaying the Location of an Error

While an error message is displayed, press  $\bigcirc$  or  $\bigcirc$  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.



# **Clearing the Error Message**

While an error message is displayed, press 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: A non-integer argument was input for the random number function

(RanInt#).

Action: Input only integers for the argument.

#### **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.

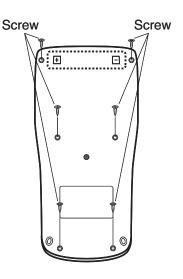
- 1. Check the calculation expression to make sure that it does not contain any errors.
- 2. Make sure that you are using the correct mode for the type of calculation you are trying to perform.
- 3. If the above steps do not correct your problem, press the (in) key. This will cause the calculator to 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**

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.
- Remove the cover as shown in the illustration and replace the battery, taking care that its plus
   (+) and minus (-) ends are facing correctly.
- 3. Replace the cover.
- 4. Initialize the calculator:
  - ON SHIFT 9 (CLR) 3 (AII) (Yes)
  - Do not skip the above step!



# **Specifications**

Power Requirements: AAA-size battery R03 (UM-4) × 1

Approximate Battery Life: 17,000 hours (continuous display of flashing

cursor)

Power Consumption: 0.0002 W

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

**Dimensions:** 13.8 (H)  $\times$  80 (W)  $\times$  162 (D) mm

 $^{1}/_{2}''$  (H)  $\times 3^{1}/_{8}''$  (W)  $\times 6^{3}/_{8}''$  (D)

**Approximate Weight:** 100 g (3.5 oz)

# **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 Display?

Perform the following key operation: SHIFT MODE (SETUP) 2 (LineIO). See "Configuring the Calculator Setup" on page E-5 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" on page E-10 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 operation: SHFT 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 Peg

Older (S-VPAM) Model: sin 30 + 15 = 15.5

Natural Textbook Display Model: LINE sin 30 + 15 = 15.5

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

Sin 30 + 15 = 0.7071067812



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