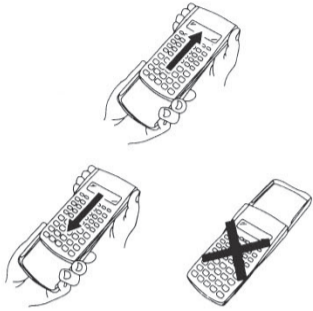


DELUXE SCIENTIFIC CALCULATOR USER'S GUIDE

Removing and Replacing the Calculator's Cover

- To remove the cover
Holding the cover as shown in the illustration, slide the unit out of the cover.
- To replace the cover
Holding the cover as shown in the illustration, slide the unit into the cover, keyboard end first.
Always slide the keyboard end of the unit into the cover first. Never slide the display end of the unit into the cover.



Safety Precautions

Be sure to read the following safety precautions before using this calculator. Keep this manual handy for later reference.

Caution

This symbol is used to indicate information that can result in personal injury or material damage if ignored.

Batteries

- Only batteries of the same or equivalent type as recommended are to be used.
- Batteries are to be inserted in position according to polarity.
- Do not mix old and new batteries.
- Do not mix alkaline, standard (carbon-zinc) or rechargeable batteries.
- Do not attempt to burn batteries.
- Dispose of batteries safely and correctly.
- Remove batteries if the calculator will not be used for a long period of time.
- Exhausted batteries are to be removed from the calculator.
- The supply terminals are not to be short circuited.
- Do not use rechargeable batteries.
- Non-rechargeable batteries are not to be recharged.
- Batteries should be replaced under adult supervision.
- Do not dispose of in fire.
- Different types of batteries are not to be mixed.
- Rechargeable batteries are only to be charged under adult supervision.
- Rechargeable batteries are to be removed from the calculator before being charged.

Disposing of the Calculator

- Never dispose of the calculator by burning it. Doing so can cause certain components to suddenly burst, creating the risk for fire and personal injury.

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.

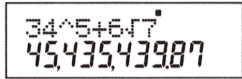
The contents of this manual are subject to change without notice.

Handling Precautions

- Be sure to press the **ON** key before using the calculator for the first time.
- Even if the calculator is operating normally, replace the batteries at least once every year. A dead battery can leak, causing damage to and malfunction of the calculator. Never leave a dead battery in the calculator.
- The batteries that come with this unit discharges slightly during shipment and storage. Because of this, it may require replacement sooner than the normal expected battery life.
- Low battery power can cause memory contents to become corrupted or lost completely. Always keep written records of all important data.
- Avoid use and storage in areas subjected to temperature extremes. Very low temperatures can cause slow display response, total failure of the display, and shortening of battery life. Also avoid leaving the calculator in direct sunlight, near a window, near a heater or anywhere else it might be exposed to very high temperatures. Heat can cause discoloration or deformation of the calculator's case, and damage to internal circuitry.
- Avoid use and storage in areas subjected to large amounts of humidity and dust. Take care never to leave the calculator where it might be splashed by water or exposed to large amounts of humidity or dust. Such conditions can damage internal circuitry.
- Never drop the calculator or otherwise subject it to strong impact.
- Never twist or bend the calculator. Avoid carrying the calculator in the pocket of your trousers or other tight fitting clothing where it might be subjected to twisting or bending.
- Never try to take the calculator apart.
- Never press the keys of the calculator with a ballpoint pen or other pointed object.

- Use a soft, dry cloth to clean the exterior of the calculator. If the calculator becomes very dirty, wipe it off with a cloth moistened in a weak solution of water and a mild neutral household detergent. Wring out all excess moisture before wiping the calculator. Never use thinner, benzene or other volatile agents to clean the calculator. Doing so can remove printed markings and can damage the case.

Two-line Display



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

- The upper line shows the calculation formula.
 - The lower line shows the result.
- When the integer part of the computational solution is displayed, a delimiter will occur every 3 figures, when the integer is greater than 3 figures.

Before getting started...

Modes

To perform this type of calculation:	Perform this key operation:	To enter this mode:
Basic arithmetic calculations	(MODE) (1)	COMP
Standard deviation	(MODE) (2)	SD
Regression calculations	(MODE) (3)	REG

- Pressing the **(MODE)** key more than once displays additional setup screens. Setup screens are described in the sections of this manual where they are actually used to change the calculator setup.

Example:

Statistical Calculations	SD
Calculations	REG

Note!

- To return the calculation mode and setup to the initial defaults shown below, press **(SHIFT) (CLR) (2) (Mode) (MODE)**.

Calculation Mode:	COMP
Angle Unit:	Deg
Exponent Display Format:	Norm1
Fraction Display Format:	a b/c
Decimal Point Character:	Dot

- Be sure to check the current calculation mode (SD, REG, COMP) and angle unit setting (Deg, Rad, Grad) before beginning a calculation.

Input Capacity

- The memory area used for calculation input can hold 79 "steps". One step is taken up each time you press a number key or arithmetic operator key (**+**, **-**, **×**, **÷**, **=**). A **(SHIFT)** or **(ALPHA)** key operation does not take up a step, so inputting **(SHIFT) (7)** for example, takes up only one step.
- Pressing the **(ANS)** key recalls the last result obtained, which you can use in a subsequent calculation. See "Answer Memory" for more information about using the **(ANS)** key.

Making Corrections During Input

- Use **(←)** or **(→)** to move the cursor to the location you want.
- Press **(DEL)** to delete the number of function at the current cursor position.
- Press **(SHIFT) (INS)** to change to an insert cursor **[]**. Inputting something while the insert cursor is on the current display inserts the input at the insert cursor position.
- Pressing **(SHIFT) (INS)**, or **(=)** returns to the normal cursor from the insert cursor.

Replay Function

- Every time you perform a calculation, the replay function stores the calculation formula and its result in replay memory. Pressing the **(▶)** key displays the formula and result of the calculation you last performed. Pressing **(▶)** again back steps sequentially (new-to-old) through past calculations.
- Pressing the **(←)** or **(▶)** key while a replay memory calculation is on the display changes to the editing screen.
- Pressing the **(←)** or **(▶)** key immediately after you finish a calculation displays the editing screen for that calculation.
- Pressing **(AC)** does not clear replay memory, so you can recall the last calculation even after you press **(AC)**.
- Replay memory is cleared by any of the following actions:
 - When you press the **(ON)** key.
 - When you initialize modes and settings by pressing **(SHIFT) (CLR) (2) (or) (3) (=)**.
 - When you change from one calculation mode to another.
 - When you turn off the calculator.

Error Locator

- Pressing the **(←)** or **(▶)** after an error occurs displays the calculation with the cursor positioned at the location where the error occurred.

Multi-statements

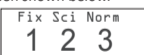
- A multi-statement is an expression that is made up of two or more smaller expressions, which are joined using a colon (:).
- Example: To add 2+3 and then multiply the result by 4.

$$2 + 3 (ALPHA) (:) (ANS) (x) 4 = 20$$

Exponential Display Formats

This calculator can display up to 10 digits. Larger values are automatically displayed using exponential notation.

- To change the exponential display format, press the **(MODE)** key a number of times until you reach the exponential display format setup screen shown below.



- Press **(3)**. On the format selection screen that appears, press **(1)** to select Norm 1 or **(2)** for Norm 2.

Norm 1

With Norm 1, exponential notation is automatically used for integer values with more than 10 digits and decimal values with more than 2 decimal places.

Norm 2

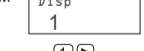
With Norm 2, exponential notation is automatically used for integer values with more than 10 digits and decimal values with more than 9 decimal places.

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

Decimal Point and Separator Symbols

You can use the display setup (Disp) screen to specify the symbols you want for the decimal point and 3-digit separator.

- To change the decimal point and separator symbol setting, press the **(MODE)** key a number of times until you reach the setup screen below.



Display the selection screen.

- Press the number key **(1)** or **(2)** that corresponds to the setting you want to use.

- (1)** (Dot): Period decimal point, comma separator
- (2)** (Dot): Comma decimal point, period separator

Initializing the Calculator

Perform the following key operation when you want to initialize the calculation mode and setup, and clear replay memory and variables.

$$(SHIFT) (CLR) (3) (ALL) (=)$$

Basic Calculations

Arithmetic Calculations

Use the **(MODE)** key to enter the COMP Mode when you want to perform basic calculations.

$$COMP.....(MODE) (1)$$

- Negative values inside of calculations must be enclosed within parentheses.

$$\sin - 1.23 \rightarrow (SIN) ((-)) 1.23 ()$$

- It is not necessary to enclose a negative exponent within parentheses.

$$\sin 2.34 \times 10^5 \rightarrow (SIN) 2.34 (EXP) ((-)) 5$$

$$\text{Example 1: } 3 \times (5 \times 10^9) = 1.5 \times 10^{10}$$

$$\text{Example 2: } 5 \times (9 + 7) = 80$$

$$5 \times (9 + 7) (=)$$

- You can skip all **()** operations before **(=)**.

Fraction Operations

Fraction Calculations

Values are displayed in decimal format automatically whenever the total number of digits of a fractional value (integer + numerator + denominator + separator marks) exceeds 10.

$$\text{Example 1: } 3 \frac{1}{4} + 1 \frac{2}{3} = 4 \frac{11}{12}$$

$$3 (a/b) 1 (a/b) 4 (+) 1 (a/b) 2 (a/b) 3 (=) \rightarrow 4.91\bar{6}$$

$$\text{Example 2: } \frac{2}{4} - \frac{1}{2} = 0$$

$$\text{Example 3: } \frac{2}{2} + 1.6 = 2.1$$

Results of calculations that mix fraction and decimal values are always decimal.

Decimal - Fraction Conversion

Use the operation shown below to convert calculation results between decimal values and fraction values. Note that conversion can take as long as two seconds to perform.

$$\text{Example 1: } 2.75 = 2 \frac{3}{4} \text{ (Decimal } \rightarrow \text{ Fraction)}$$

$$2.75 (=) \rightarrow 2.75$$

$$2.75 (a/b) \rightarrow 2.75$$

$$2.75 (a/b) (d/c) \rightarrow 11/4$$

$$\text{Example 2: } \frac{1}{2} = 0.5 \text{ (Fraction } \rightarrow \text{ Decimal)}$$

$$1 (a/b) 2 (=) \rightarrow 1.2$$

$$1 (a/b) 2 (a/b) (=) \rightarrow 0.5$$

$$1 (a/b) 2 (a/b) (=) \rightarrow 1/2$$

Mixed Fraction - Improper Fraction Conversion

$$\text{Example 1: } 1 \frac{2}{3} \leftrightarrow \frac{5}{3}$$

$$1 (a/b) 2 (a/b) 3 (=) \rightarrow 1.2\bar{3}$$

$$(SHIFT) (d/c) \rightarrow 5/3$$

$$(SHIFT) (d/c) \rightarrow 1.2\bar{3}$$

- You can use the display setup (Disp) screen to specify the display format when a fraction calculation result is greater than one.

- To change the fraction display format, press the **(MODE)** key a number of times until you reach the setup screen shown below.

$$\text{Disp } 1$$

- Display the selection screen. **(1)**

- Press the number key **(1)** or **(2)** that corresponds to the setting you want to use.

- (1)** (a/b): Mixed fraction
- (2)** (d/c): Improper fraction

- An error occurs if you try to input a mixed fraction while the d/c display format is selected.

Percentage Calculations

$$\text{Example 1: To calculate 12% of 1500} \rightarrow 1500 (x) 12 (SHIFT) (%) (180)$$

$$\text{Example 2: To calculate what percentage of 880 is 660} \rightarrow 660 (x) 880 (SHIFT) (%) (75%)$$

$$\text{Example 3: To add 15% onto 2500} \rightarrow 2500 (x) 15 (SHIFT) (%) (+) (2875)$$

$$\text{Example 4: To discount 3500 by 25%} \rightarrow 3500 (x) 25 (SHIFT) (%) (-) (2625)$$

$$\text{Example 5: To discount the sum of 168,98,734 by 20%} \rightarrow 168 (x) 98 (+) 734 (=) (ANS) (SHIFT) (STO) (A) (800)$$

$$168 (x) 98 (+) 734 (=) (ANS) (SHIFT) (STO) (A) (ALPHA) (x) 20 (SHIFT) (%) (-)$$

As shown here, if you want to use the current Answer Memory value in a mark up or discount calculation, you need to assign the Answer Memory value into a variable and then use the variable in the mark up or discount calculation. This is because the calculation performed when **(%)** is pressed stores a result to Answer Memory before the **(=)** key is pressed.

$$\text{Example 6: If 300 grams are added to a test sample originally weighing 500 grams, what is the percentage increase in weight?} \rightarrow 300 (x) 500 (SHIFT) (%) (160%)$$

$$\text{Example 7: What is the percentage change when a value is increased from 40 to 46? How about to 48?} \rightarrow 15\%, 20\% \rightarrow 46 (x) 40 (SHIFT) (%) (4) (4) (4) (4) (8) (=)$$

Degrees, Minutes, Seconds Calculations

- You can perform sexagesimal calculations using degrees (hours), minutes, and seconds, and convert between sexagesimal and decimal values.

Example 1: To convert the decimal value 2.258 to a sexagesimal value and then back to a decimal value.

$$2.258 (=) \rightarrow 2.258$$

$$(SHIFT) (DMS) \rightarrow 2^{\circ}15'28.8''$$

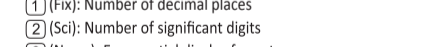
$$(DMS) \rightarrow 2.258$$

Example 2: To perform the following calculation:

$$12^{\circ}34'56'' \times 3.45 \rightarrow 12 (DMS) 34 (DMS) 56 (DMS) (x) 3.45 (=) \rightarrow 43^{\circ}24'31.2''$$

FIX, SCI, RND

- To change the settings for the number of decimal places, the number of significant digits, or the exponential display format, press the **(MODE)** key a number of times until you reach the setup screen shown below.



- Press the number key **(1)**, **(2)** or **(3)** that corresponds to the setup item you want to change.

- (1)** (Fix): Number of decimal places
- (2)** (Sci): Number of significant digits
- (3)** (Norm): Exponential display format

$$\text{Example 1: } 200 \div 7 \times 14 = 400$$

$$200 (x) 14 (=) \rightarrow 400$$

$$\text{Specifies three decimal places.} \rightarrow (MODE) (1) (Fix) (3) \rightarrow 400.000$$

$$\text{Internal calculation continues using 12 digits.} \rightarrow 200 (x) 14 (=) \rightarrow 28.571$$

$$(x) 14 (=) \rightarrow 400$$

The following performs the same calculation using the specified number of decimal places.

$$200 (x) 14 (=) \rightarrow 28.571$$

$$\text{(Internal Rounding) } (SHIFT) (RND) \rightarrow 28.571$$

$$(x) 14 (=) \rightarrow 399.994$$

Press **(MODE) (3)** (Norm) **(1)** to clear the Fix specification.

$$\text{Example 2: } 1 \div 3, \text{ displaying result with two significant digits} \rightarrow (MODE) (2) (Sci) (2) 1 (x) 3 (=) \rightarrow 3.3 \times 10^{-1}$$

Press **(MODE) (3)** (Norm) **(1)** to clear the Sci specification.

Memory Calculations

Use the **(MODE)** key to enter the COMP Mode when you want to perform a calculation using memory.

$$COMP.....(MODE) (1)$$

Answer Memory

- Whenever you press **(=)** after inputting values or an expression, the calculated result automatically updates Answer Memory contents by storing the result.

- In addition to **(=)**, Answer Memory contents are also updated with results whenever you press **(SHIFT) (M+)**, **(SHIFT) (M-)**, or **(SHIFT) (STO)** followed by letter (A through F, M, X, or Y).

- You can recall Answer Memory contents by pressing **(ANS)**.

- Answer Memory can store up to 12 digits for the mantissa and two digits for the exponent.

- Answer Memory contents are not updated if the operation performed by any of the above key operations results in error.

Continuously Count

- The first numerical value of the next available calculation, of the computational solution (at the same time the answer in storage is preserved) is displayed on the panel at present. When working a computational solution, to show the numerical value of the solution use the Ans key to display the value, on the panel. When the numerical value is displayed it is preserved, at present, in the answer storage.

- The computational solution still can be calculated by following A's Mould function (X^2 , X^3 , X^{-1} , $x1$, DRG) and $+$, $-$, \times , \div , \sqrt{x} , $\sqrt[n]{x}$, π , e .

Independent Memory

- Values can be input directly into memory, added to memory, or subtracted from memory. Independent memory is convenient for calculating cumulative totals.

- Independent memory uses the same memory area as variable M.

- To clear the independent memory (M), input **(0) (SHIFT) (STO) (M) (M+)**.

$$\text{Example: } 23 + 9 = 32 \rightarrow 23 (+) 9 (SHIFT) (STO) (M) (M+) \rightarrow 53$$

$$53 - 6 = 47 \rightarrow 53 (-) 6 (M+) \rightarrow 45$$

$$45 \times 2 = 90 \rightarrow 45 (x) 2 (SHIFT) (M-) \rightarrow (Total) -11$$

$$(RCL) (M) (M+) \rightarrow 193.2 + 23 = 8.4$$

$$193.2 + 23 = 8.4$$

$$193.2 + 23 = 6.9$$

$$193.2 (SHIFT) (STO) (A) (23) (=) \rightarrow 23$$

$$(ALPHA) (A) (28) (=) \rightarrow 28$$

Variables

- There are nine variables (A through F, M, X and Y), which can be used to store data, constants, results, and other values.

- Use the following operation to delete data assigned to a particular variable: **(0) (SHIFT) (STO) (A)**. This operation deletes the data assigned to variable A.

- Perform the following key operation when you want to clear the values assigned to all of the variables.

$$(SHIFT) (CLR) (1) (Mcl) (=)$$

$$\text{Example: } 193.2 + 23 = 8.4$$

$$1$$

- Pressing (1), (2) or (3) converts the displayed value to the corresponding angle unit.
Example: To convert 4.25 radians to degrees
(MODE).....(1) (Deg)
4.25 (SHIFT) (DRG) (2) (R) (=) 243.5070629
- Coordinating Conversion (Pol (x, y), Rec (r, θ))
- Calculation results are automatically assigned to variables E and F.
Example 1: To convert polar coordinates (r = 2, θ = 60°) to rectangular coordinates (x, y) (Deg)
x = 1 (SHIFT) (Rec) (2) (2) (60) (=)
y = 1.732050808 (RCL) (F)
- Press (RCL) (E) to display the value of x, or (RCL) (F) to display the value of y.
Example 2: To convert rectangular coordinates (1, √3) to polar coordinates (r, θ) (Rad)
r = 2 (Pol) (1) (√) (3) (=)
θ = 1.047197551 (RCL) (F)
- Press (RCL) (E) to display the value of r, or (RCL) (F) to display the value of θ.
- Engineering Notation Calculations**
Example 1: To convert 56.088 meters to kilometers →
56.088 x 10³ (km) 56.088 (=) (ENG)
- Example 2:** To convert 0.08125 grams to milligrams →
81.25 x 10³ (mg) 0.08125 (=) (ENG)

Statistical Calculations

Standard Deviation (SD Mode)

Use the (MODE) key to enter the SD Mode, when you want to perform statistical calculations using standard deviation memory. SD.....(MODE) (2)

- Always start data input with (SHIFT) (CLR) (1) (Scl) (=) to clear statistical memory.
- Input data using the key sequence shown below.
<x-data> (DT)
- Input data is used to calculate values for n, Σx, Σx², Σ(x - \bar{x}), Σ(x - \bar{x})², and Σ(x - \bar{x})³, which you can recall using the key operations noted nearby.

To recall this type of value:	Perform this key operation:
Σx ²	(SHIFT) (S-SUM) (1)
Σx	(SHIFT) (S-SUM) (2)
n	(SHIFT) (S-SUM) (3)
Σ(x - \bar{x})	(SHIFT) (S-VAR) (1)
Σ(x - \bar{x}) ²	(SHIFT) (S-VAR) (2)
Σ(x - \bar{x}) ³	(SHIFT) (S-VAR) (3)

Example 1: To calculate Σ(x - \bar{x}), Σ(x - \bar{x})², n, Σx and Σx² for the following data: 55, 54, 51, 55, 53, 53, 54, 52
In the SD Mode
(SHIFT) (CLR) (1) (Scl) (=) (Stat clear) n = 50 1.
55 (DT)

Each time you press (DT) to register your input, the number of data input up to that point is indicated on the display (n value).

54 (DT) 51 (DT) 55 (DT)	53 (DT) 54 (DT) 52 (DT)
Sample Standard Deviation (Σ(x - \bar{x}) ²) = 1.407885953	(SHIFT) (S-VAR) (3)
Population Standard Deviation (Σ(x - \bar{x}) ²) = 1.316956719	(SHIFT) (S-VAR) (2)
Arithmetic Mean (Σ) = 53.375	(SHIFT) (S-VAR) (1)
Number of Data (n) = 8	(SHIFT) (S-SUM) (3)
Sum of Values (Σx) = 427	(SHIFT) (S-SUM) (2)
Sum of Squares of Values (Σx ²) = 22805	(SHIFT) (S-SUM) (1)

Data Input Precautions

- (DT) (DT) inputs the same data twice.
- You can also input multiple entries of the same data using (SHIFT) (1) to input the data 110 ten times, for example, press 110 (SHIFT) (1) 10 (DT).
- You can perform the above key operations in any order, and not necessarily as shown above.
- While inputting data or after inputting data is complete, you can use the (▲) or (▼) keys to scroll through data you have entered. If you input multiple entries of the same data using (SHIFT) (1) to specify the data frequency (number of data items) as described above, scrolling through data shows both the data item and a separate screen for the data frequency (Freq).
- You can then edit the displayed data, if you want. Input the new value and then press the (ESC) key to replace the old value with the new one. This also means that if you want to perform some other operation (calculation, recall of statistical calculation results, etc.), you should always press the (AC) key first to exit data display.
- Pressing the (DT) key instead of (=) after changing a value on the display registers the value you input as a new data item, and leaves the old value as it is.
- You can delete a data value displayed using (▲) and (▼) by pressing (SHIFT) (CL). Deleting a data value causes all values following it to be shifted up.
- Data values you register are normally stored in calculator memory. The message "Data Full" appears and you will not be able to input any more data if there is no memory left for data storage. If this happens, press the (ESC) key to display the screen shown below.

1 2

Press (2) to exit data input without registering the value you just input.

Press (1) if you want to register the value you just input, without saving it in memory. If you do this, however, you will not be able to display or edit any of the data you have input.

To delete data you have just input, press (SHIFT) (CL).

After inputting statistical data in the SD Mode or REG Mode, you will be unable to display or edit individual data items any longer, perform either of the following operations.

- Change to another mode
- Change the regression type (Lin, Log, Exp, Pwr, Inv, Quad)

Regression Calculations (REG Mode)

Use the (MODE) key to enter the REG Mode, when you want to perform statistical calculations using regression. REG.....(MODE) (3)

Entering the REG Mode displays screens like the ones shown below.

Lin Log Exp
1 2 3

Per Inv Quad
1 2 3

- Press the number key (1), (2) or (3) that corresponds to the type of regression you want to use.

- (1) (Lin): Linear regression
- (2) (Log): Logarithmic regression
- (3) (Exp): Exponential regression
- (1) (Pwr): Power regression
- (2) (Inv): Inverse regression
- (3) (Quad): Quadratic regression

- Always start data input with (SHIFT) (CLR) (1) (Scl) (=) to clear statistical memory.
- Input data using the key sequence shown below.
<x-data> (DT)

- The values produced by a regression calculation depend on the values input and results can be recalled using the key operations shown in the table below.

To recall this type of value:	Perform this key operation:
Σx ²	(SHIFT) (S-SUM) (1)
Σx	(SHIFT) (S-SUM) (2)
n	(SHIFT) (S-SUM) (3)
Σy ²	(SHIFT) (S-SUM) (1)
Σy	(SHIFT) (S-SUM) (2)
Σxy	(SHIFT) (S-SUM) (3)
Σ(x - \bar{x})	(SHIFT) (S-VAR) (1)
Σ(x - \bar{x}) ²	(SHIFT) (S-VAR) (2)
Σ(x - \bar{x}) ³	(SHIFT) (S-VAR) (3)
Regression coefficient A	(SHIFT) (S-VAR) (1)
Regression coefficient B	(SHIFT) (S-VAR) (2)

Regression calculation other than quadratic regression

To recall this type of value:	Perform this key operation:
Σx ³	(SHIFT) (S-SUM) (1)
Σx ² y	(SHIFT) (S-SUM) (2)
Σx ⁴	(SHIFT) (S-SUM) (3)
Regression coefficient A	(SHIFT) (S-VAR) (1)
Σx _i	(SHIFT) (S-VAR) (2)
Σy _i	(SHIFT) (S-VAR) (3)
Σy _i ²	(SHIFT) (S-VAR) (4)

- The values in the above tables can be used inside of expressions the same way you use variables.

Linear Regression

The regression formula for linear regression is:

$$y = A + Bx$$

Example 4: Atmospheric Pressure vs. Temperature

Temperature	Atmospheric Pressure
10°C	1003 hPa
15°C	1005 hPa
20°C	1010 hPa
25°C	1011 hPa
30°C	1014 hPa

Perform linear regression to determine the regression formula terms and correlation coefficient for the data nearby. Next, use the regression formula to estimate atmospheric pressure at 1000hPa and temperature at 18°C. Finally calculate the coefficient of determination (r²) and sample covariance.

$$\left(\frac{\sum xy - n \cdot \bar{x} \cdot \bar{y}}{n - 1} \right)$$

In the REG Mode:
(1) (Lin)
(SHIFT) (CLR) (1) (Scl) (=) (Stat clear) n = REG 1.
10 (1) 1003 (DT)

Each time you press (DT) to register your input, the number of data input up to that point is indicated on the display (n value).

(Regression Coefficient A) = 997.4 (SHIFT) (S-VAR) (1) (=)
(Regression Coefficient B) = 0.56 (SHIFT) (S-VAR) (2) (=)
(Correlation Coefficient r) = 0.982607368 (SHIFT) (S-VAR) (3) (=)

(Atmospheric Pressure at 18°C) = 1007.48 (18) (SHIFT) (S-VAR) (2) (=)
(Temperature at 1000hPa) = 4.642857143 (1000) (SHIFT) (S-VAR) (1) (=)
(Coefficient of Determination) = 0.965517241 (SHIFT) (S-VAR) (3) (x²) (=)

(Sample Covariance) = 35 (1) (SHIFT) (S-SUM) (3) (=)
(SHIFT) (S-SUM) (3) (x) (SHIFT) (S-VAR) (1) (x)
(SHIFT) (S-VAR) (1) (1) (=)
(1) (SHIFT) (S-SUM) (3) (1) (=)

Logarithmic, Exponential, Power, and Inverse Regression

- Use the same key operations as linear regression to recall results for these types of regression.
- The following shows the regression formulas for each type of regression.

Logarithmic Regression	$y = A + B \cdot \ln x$
Exponential Regression	$y = A \cdot e^{B \cdot x} (\ln y = \ln A + Bx)$
Power Regression	$y = A \cdot x^B (\ln y = \ln A + B \ln x)$
Inverse Regression	$y = A + B \cdot 1/x$

Quadratic Regression
The regression formula for quadratic regression is:
 $y = A + Bx + Cx^2$

Example:

xi	yi
29	1.6
50	23.5
74	38.0
103	46.4
118	48.0

In the REG Mode:
(1) (Quad)
(SHIFT) (CLR) (1) (Scl) (=) (Stat clear)

29 (1) 1.6 (DT) 50 (1) 23.5 (DT)
74 (1) 38.0 (DT) 103 (1) 46.4 (DT)
118 (1) 48.0 (DT)

(Regression Coefficient A) = -35.59856934997.4 (SHIFT) (S-VAR) (1) (=)
(Regression Coefficient B) = 1.495939413 (SHIFT) (S-VAR) (2) (=)
(Correlation Coefficient C) = -6.71629667 x 10⁻³ (SHIFT) (S-VAR) (3) (=)

yi when xi is 16 = -13.38291067 (16) (SHIFT) (S-VAR) (3) (=)
xi when yi is 20 = 47.14556728 (20) (SHIFT) (S-VAR) (1) (=)

xi when yi is 20 = 175.5872105 (20) (SHIFT) (S-VAR) (2) (=)

Data Input Precautions....

- (DT) (DT) inputs the same data twice.
- You can also input multiple entries of the same data using (SHIFT) (1) to input the data "20 and 30" five times, for example, press 20 (1) 30 (SHIFT) (1) 5 (DT).
- The above results can be obtained in any order, and not necessarily as shown above.
- Precautions when editing data input for standard deviation also apply for regression calculations.

Technical Information

When you have a problem.... if calculation results are not what you expect or if an error occurs, perform the following steps.

- Press (SHIFT) (CLR) (2) (Mode) (=) to initialize all modes and settings.
- Check the formula you are working with to confirm it is correct.
- Enter the correct mode and try performing the calculation again.

If the above steps do not correct the problem, press the (ON) key. The calculator performs a self-check operation and deletes all data stored in memory if any abnormality is detected. Make sure you always keep written copies of all important data.

Error Messages

The calculator is locked up while an error message is on the display. Press (AC) to clear the error, or press (◀) or (▶) to display the calculation and correct the problem. See "Error Locator" for details.

Math ERROR

- Cause**
Calculation result is outside the allowable calculation range.
An attempt to perform a function calculation using a value that exceeds the allowable input range.
An attempt to perform anillogical operation (division by zero, etc.).
- Action**
Check your input values and make sure they are all within the allowable ranges. Pay special attention to values in any memory areas you are using.

Stack ERROR

- Cause**
The capacity of the numeric stack or operator stack is exceeded.
- Action**
Simplify the calculation. The numeric stack has 10 levels and the operator stack has 24 levels.
Divide your calculation into two or more separate parts.

Syntax ERROR

- Cause**
An attempt to perform an illegal mathematical operation.
- Action**
Press (◀) or (▶) to display the calculation with the cursor located at the location of the error and make required corrections.

Arg ERROR

- Cause**
Improper use of an argument.
- Action**
Press (◀) or (▶) to display the location of the cause of the error and make required corrections.

Order of Operation

Calculations are performed in the following order of precedence.

- Coordinate transformation: Pol (x, y), Rec (r, θ)
- Type A functions:
With these functions, the value is entered and then the function key is pressed.
x², x³, x¹, x¹, ...
x, x, x, x, x
- Angle unit conversions (DRG)
- Powers and roots: ^ (x^), √
- a^{b/c}
- Abbreviated multiplication format in front of π, e (natural logarithm base), memory name, or variable name: 2π, 3e, 5A, πA, etc.
- Type B functions:
With these functions, the function key is pressed and then the value is entered.
-r, 3r, log, ln, e^x, 10^x, sin, cos, tan, sin⁻¹, cos⁻¹, tan⁻¹, sinh⁻¹, cosh⁻¹, tanh⁻¹, sinh¹, cosh¹, tanh¹, (-)
- Abbreviated multiplication format in front of Type B functions: 2 3, Alog2, etc.
- Permutation and combination: nPr, nCr
- x, +
- , *

- Operations of the same precedence are performed from right to left. e^{ln} 120 √ e^{ln} (ln(√120))
- Other operations are performed from left to right.
- Operations enclosed in parentheses are performed first.
- When a calculation contains an argument that is a negative number, the negative number must be enclosed within parentheses. The negative sign (-) is treated as a Type B function, so particular care is required when the calculation includes a high-priority Type A function, or power or root operation.

Example: (-2)² = 16
-2² = -16

Stacks

This calculator uses memory areas, called "stacks" to temporarily store values (numeric stacks) and commands (command stacks) according to their precedence during calculations. The numeric stack has 10 levels and the command stack has 24 levels. A stack error (Stack ERROR) occurs whenever you try to perform a calculation that is so complex that the capacity of a stack is exceeded.

Example:

2 x ((3 + 4 x (5 + 4) + 3) + 5) + 8
↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑
(1) (2) (3) (4) (5) (6) (7) (8)

Numeric Stack

①	2
②	3
③	4
④	5
⑤	4
...	

Command Stack

①	x
②	(
③)
④	+
⑤	x
⑥	(
⑦	+
...	

Calculations are performed in sequence according to "Order of Operations". Commands and values are deleted from the stack as the calculation is performed.

Input Ranges

Internal digits: 12

Accuracy*: As a rule, accuracy is ±1 at the 10th digit.

sinx	DEG	0 ≤ x ≤ 4.999999999 x 10 ¹⁰
	RAD	0 ≤ x ≤ 785398163.3
	GRA	0 ≤ x ≤ 4.999999999 x 10 ¹⁰
cosx	DEG	0 ≤ x ≤ 4.500000008 x 10 ¹⁰
	RAD	0 ≤ x ≤ 785398164.9
	GRA	0 ≤ x ≤ 5.000000009 x 10 ¹⁰
tanx	DEG	Same as sinx, except when x = (2n-1)π/90
	RAD	Same as sinx, except when x = (2n-1)π/2
	GRA	Same as sinx, except when x = (2n-1)π/100
sin ⁻¹ x		0 ≤ x ≤ 1
cos ⁻¹ x		0 ≤ x ≤ 1
tan ⁻¹ x		0 ≤ x ≤ 9.999999999 x 10 ¹⁰
sinh ⁻¹ x		0 ≤ x ≤ 230.2585092
cosh ⁻¹ x		0 ≤ x ≤ 230.2585092

sinh ⁻¹ x	0 ≤ x ≤ 4.999999999 x 10 ¹⁰
cosh ⁻¹ x	1 ≤ x ≤ 4.999999999 x 10 ¹⁰
tanhx	0 ≤ x ≤ 9.999999999 x 10 ¹⁰
tanh ⁻¹ x	0 ≤ x ≤ 9.999999999 x 10 ⁻¹
log _v lnx	0 ≤ x ≤ 9.999999999 x 10 ¹⁰
10 ^x	-9.999999999 x 10 ¹⁰ ≤ x ≤ 99.999999999
e ^x	-9.999999999 x 10 ¹⁰ ≤ x ≤ 230.2585092
√x	0 ≤ x < 1 x 10 ¹⁰⁰
x ²	x < 1 x 10 ¹⁰⁰
1/x	x < 1 x 10 ¹⁰⁰ , x ≠ 0
√[x]	x < 1 x 10 ¹⁰⁰
x!	0 ≤ x ≤ 69 (x is an integer)
nPr	0 ≤ n < 1 x 10 ¹⁰ , 0 ≤ r ≤ n (n, r are integers) 1 ≤ n!/(n-r)! < 1 x 10 ¹⁰⁰
nCr	0 ≤ n < 1 x 10 ¹⁰ , 0 ≤ r ≤ n (n, r are integers) 1 ≤ n!/(n-r)!r! < 1 x 10 ¹⁰⁰
Pol(x, y)	x , y ≤ 9.999999999 x 10 ¹⁰ x ² +y ² ≤ 9.999999999 x 10 ¹⁰
Rec (r, θ)	0 ≤ r ≤ 9.999999999 x 10 ¹⁰ θ: Same as sinx
u v	a , b, c < 1 x 10 ¹⁰⁰ 0 ≤ b, c
u v	x < 1 x 10 ¹⁰⁰ Decimal ↔ Sexagesimal Conversions 0° 0' 0" ≤ x ≤ 999999959"
^(x ^y)	x > 0: -1 x 10 ¹⁰⁰ < y log _x < 100 x = 0: y > 0 x < 0: y = n, n = 1/2n+1 (n is an integer) However: -1 x 10 ¹⁰⁰ < y log _x x < 100
x√y	y > 0: x ≠ 0 -1 x 10 ¹⁰⁰ < 1/x log _y < 100 y = 0: x > 0 y < 0: x = 2n + 1, 1/n (n ≠ 0, n is an integer) However: -1 x 10 ¹⁰⁰ < 1/x log _y y < 100
a ^{b/c}	Total of integer, numerator, and denominator must be 10 digits or less (including division marks).
SD(REG)	x < 1 x 10 ¹⁰⁰ y < 1 x 10 ¹⁰⁰ n < 1 x 10 ¹⁰⁰ x ₁ , x ₂ , ..., x _n , y ₁ , y ₂ , ..., y _n , n ≠ 0 x ₁ ...x _{n-1} , y ₁ ...y _{n-1} , A, B, r: n ≠ 0, 1

For a single calculation, calculation error is ±1 at the 10th digit. (In the case of exponential display, calculation error is ±1 at the 10th significant digit.) Errors are cumulative in the case of consecutive calculations, which can also cause them to become large. (This is also true of internal consecutive calculations that are performed in the case of (x^y), y, x!, nPr, nCr, etc.) In the vicinity of a function's singular point and point of inflection, errors are cumulative and may become large.

Power Supply

This calculator is powered by two AAA (DC:1.5V) batteries

Replacing the Battery

Dim figures on the display of the calculator indicate that battery power is low. Continued use of the calculator when the battery is low can result in improper operation. Replace the battery as soon as possible when display figures become dim.

To replace the battery

- Press (SHIFT) (OFF) to turn power off.
- Open the battery cover.
- Remove the old battery.
- Load two new AAA batteries into the unit with its positive (+) and negative (-) ends facing correctly.</