Canon

F-715SG / F-715SA
SCIENTIFIC CALCULAOR
USER INSTRUCTIONS

ENGLISH

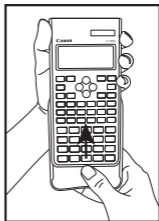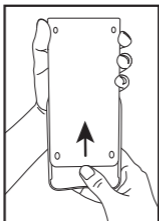## CONTENTS

Thank you for purchasing Canon Scientific Calculator. The F-715SG/ F-715SA features scientific, statistical and other advance functions such as LCM, GCD, Quotient and Remainder Calculations, and many more.

We recommend you to read this user manual and all the important notices before start using F-715SG/F-715SA. And please keep this user manual with you for future use.

HOW TO USE THE SLIDE COVER

Slide to open the cover
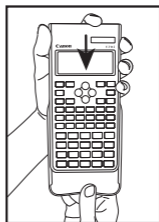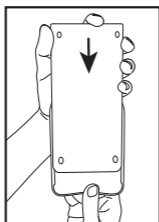
Slide to close the cover

DISPLAY (2-LINE DISPLAY)

Extension mark (Shows the presence of hidden formula)

Status indicators

S A M STORCL hyp SDREG   **D R G** FIXSCI

Next or Previous page

Mantissa minus sign

-8888888888 -88 ×10Disp Qr

Exponent minus sign

Exponent

Formula (12 characters)   Mantissa

<Status Indicators>
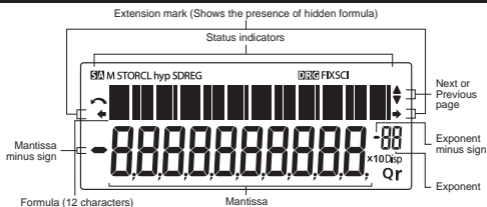
S	: Shift key
A	: Alpha key
hyp	: Hyperbolic key
M	: Independent memory
STO	: Store Memory
RCL	: Recall Memory
SD	: Statistic Mode
REG	: Regression Mode
D	: Degree Mode
R	: Radian Mode
G	: Grade Mode
FIX	: Fixed-decimal Setting
SCI	: Scientific Notation
Disp	: Multi-statements Display
Q	: Quotient value
r	: Remainder value
⌢	: Undo
▲	: Upper Arrow
▼	: Aown Arrow

TO GET START

Power ON, OFF

■ **First time operation:**
1. Pull out the battery insulation sheet, then the battery will be loaded and the calculator can be powered on.
2. Press ON/CA Alpha CLR 3 = ON/CA to reset the calculator.

Power ON: When ON/CA (Power ON/Clear All) is pressed.

Power OFF: When Shift OFF are pressed.

■ **Auto Power Off Function:**
When the calculator is not used for about **7 minutes**, the calculator will automatically power off.

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MODE Selection

Press $\boxed{\text{MODE}}$ to start the calculation mode selection with the following display:

$$\leftarrow \quad \textbf{COMP} \quad \textbf{SD} \quad \textbf{REG} \quad \rightarrow$$
$$\qquad 1 \qquad\quad 2 \qquad\quad 3$$

When pressing $\odot$, $\odot$ or $\boxed{\text{MODE}}$, you can access the next (or previous) mode selection page.

The following table shows the mode selection menu:

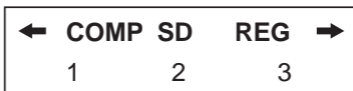| Operation	Mode		LCD Indicator
$\boxed{\text{MODE}}$ $\boxed{1}$	COMP	Normal Calculation	
$\boxed{\text{MODE}}$ $\boxed{2}$	SD	Statistical Calculation	SD
$\boxed{\text{MODE}}$ $\boxed{3}$	REG	Regression Calculation	REG
$\boxed{\text{MODE}}$ $\boxed{\text{MODE}}$ $\boxed{1}$	Deg	Degree	D
$\boxed{\text{MODE}}$ $\boxed{\text{MODE}}$ $\boxed{2}$	Rad	Radian	R
$\boxed{\text{MODE}}$ $\boxed{\text{MODE}}$ $\boxed{3}$	Gra	Grade	G
$\boxed{\text{MODE}}$ $\odot$ $\odot$ $\boxed{1}$	Fix	Fixed-decimal Setting	FIX
$\boxed{\text{MODE}}$ $\odot$ $\odot$ $\boxed{2}$	Sci	Scientific Notation	SCI
$\boxed{\text{MODE}}$ $\odot$ $\odot$ $\boxed{3}$	Norm	Exponential Notation	
$\boxed{\text{MODE}}$ $\odot$ $\boxed{1}$	Disp[*1]	Display Setup Selection	

*1 Display Setup Selection options

First page : Press $\boxed{1}$ [ab/c] or $\boxed{2}$ [d/c] to specify mixed fraction or improper fraction display.

$\odot$: Press $\boxed{1}$ [Dot] or $\boxed{2}$ [Comma] to specify decimal point or 3 digits separator symbols.

Display Formats Setting

F-715SG/F-715SA can display a result up to 10 digits. Results exceed the digit limit will be automatically displayed by exponential notation format. You can enter a value in floating-decimal, fixed-decimal, or scientific notation format and display format setting only affects the calculation results.

Example : Change the display formats for 1.23 $\times 10^{-03}$

Display Setting	Operation	Display (Lower)
Default setting : Norm 1,	[1][2][3][×][·][0] [0][0][0][1][=]	1.23 $\times 10^{-03}$
Scientific Notation : "5" significant digits	$\frac{MODE}{}$ⓒⓒ[2][5]	1.2300 $\times 10^{-03}$
Exponential Notation : Norm 2	$\frac{MODE}{}$ⓒⓒ[3][2]	0.00123
Fixed decimal places : "7"	$\frac{MODE}{}$ⓒⓒ[1][7]	0.0012300

Before Using the Calculator

■ Check the current Calculation Mode
Be sure to check the status indicators that indicate the current calculation mode (SD, REG... etc), display formats setting and angle unit setting (Deg, Rad, Gra) before starting a calculation.

■ Return Calculation Mode to the initial setup
You can return the calculation mode to the initial default by pressing $\frac{Alpha}{}$ $\frac{CLR}{}$ [2] (Mode) [=] $\frac{ON/CA}{}$

Calculation Mode	: COMP
Angle Unit	: Deg
Exponential Display Format	: Norm 1
Fraction Display Format	: a b/c
Decimal Point Character	: Dot

, and this action will not clear the variable memories.

■ Initialize the Calculator
When you are not sure the current calculator setting, you are recommended to initialize the calculator (calculation mode "COMP", angle unit "Degree", and clear replay and variable memories) by performing the following key operations:
$\frac{Alpha}{}$ $\frac{CLR}{}$ [3] (All) [=] $\frac{ON/CA}{}$

Input Capacity

F-715SG/F-715SA allows you to input a single calculation up to 79 steps. One step is used as each time you press one of the numeric keys, arithmetic keys, scientific calculation keys or $\boxed{\text{Ans}}$ key. $\underline{\text{shift}}$, $\underline{\text{Alpha}}$, $\underline{\text{MODE}}$ and the direction keys will not use up any step. Starting from the 73rd step, the cursor changes from [_] to [■] that notifying the memory is running low. In case you need to input a single calculation with more than 79 steps, you should separate your calculation into two or more segments.

Input Editing $\boxed{\text{CE/C}}$ $\bigcirc$ $\bigcirc$ $\boxed{\text{DEL}}$ $\boxed{\text{Insert}}$ $\bigcirc$

New input begins on the left of the upper (entry) line. As the entries are more than 12 digits, the line will scroll to the right consecutively. Press $\bigcirc$, $\bigcirc$ to scroll the cursor within the upper (entry) line and you can perform input editing as needed.

Example (under editing): 1234567 $\boxed{+}$ 889900
Replacing an entry (1234567 → 1234560)

Display Setting	Operation	Display (Upper)
Press or keep pressing until "7" blinks	$\bigcirc \cdots \bigcirc$	123456<u>7</u>+8899 ➡
Replace with "0"	$\boxed{0}$	123456<u>0</u>+8899 ➡

Deletion (1234560 → 134560)

| Press or keep pressing until "2" blinks | $\bigcirc \cdots \bigcirc$ | 1<u>2</u>34560+8899 ➡ |
| "2" is deleted | $\boxed{\text{DEL}}$ | ⌒1<u>3</u>4560+88990 ➡ |

Insertion (889900 → 2889900)

Press or keep pressing until "8" blinks	$\bigcirc \cdots \bigcirc$	⌒134560+<u>8</u>8990 ➡
"8" and ⌐⌐ blinks alternately	$\underline{\text{Shift}}$ $\underline{\text{Insert}}$	⌒134560+<u>■</u>8990 ➡
Insert "2", "8" still blinking	$\boxed{2}$	134560+2<u>8</u>899 ➡

Undo (889900)

| Clear "889900", ⌐⌐ still blinking | $\boxed{\text{CE/C}}$ | ⌒134560+2⌐⌐ |
| Resume "889900" | $\underline{\text{Shift}}$ $\bigcirc$ | ⬅ 560+2889900⌐⌐ |

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- After deleted an input by $\boxed{\text{DEL}}$ or cleared the input by $\boxed{\text{CE/C}}$, ⌐ icon will be shown on the display.
- Press $\stackrel{\text{shift}}{}$ ⊙ to resume up to 79 $\boxed{\text{DEL}}$ deleted input or to undo the cleared segment and back to the previous display.
- If pressed $\boxed{\text{DEL}}$ ... $\boxed{\text{CE/C}}$ to delete character(s) then clear the display, the calculator will prioritize the undo from resuming the latest $\boxed{\text{CE/C}}$ cleared characters, and followed with the deleted characters continuously.
- After inserting a new data or executing a calculation command, or pressing $\stackrel{\text{ON/CA}}{}$, the calculator cannot perform the "Undo" function.

Replay, Copy and Multi-statements

Replay
- Replay memory capacity is 256 bytes that can store calculation expressions and results.
- After the calculation is executed, the calculation expression and its result will be stored in the replay memory automatically.
- Pressing ⊙ (or ⊙) can replay the performed calculation expressions and results.
- Replay memory is cleared when you.
  - i) Initialize calculator setting by $\stackrel{\text{Alpha}}{}$ $\stackrel{\text{CLR}}{}$ $\boxed{2}$ $\boxed{=}$ $\stackrel{\text{ON/CA}}{}$ (or $\boxed{3}$ $\boxed{=}$ $\stackrel{\text{ON/CA}}{}$).
  - ii) Change from one calculation mode to another.
  - iii) Press $\stackrel{\text{ON/CA}}{}$ key.
  - iv) Turn off the calculator by $\stackrel{\text{shift}}{}$ $\stackrel{\text{OFF}}{}$.

Copy
- Press $\stackrel{\text{shift}}{}$ ⊕ after replayed the previous calculation expressions (statements).

Multi-statements
- You can put two or more calculation expressions together by using a colon ⌐⌐.
- The first executed statement will have [Disp] indicator; and the [Disp] icon will disappeared after the last statement is being executed.

Operation	Display (Upper line)	Display (Lower Line)
$\boxed{8}$ $\boxed{+}$ $\boxed{9}$ $\boxed{=}$	8 + 9	17.
$\boxed{5}$ $\boxed{\times}$ $\boxed{2}$ $\stackrel{\text{Alpha}}{}$⌐⌐$\boxed{\text{Ans}}$ $\boxed{+}$ $\boxed{6}$ $\boxed{=}$	5 x 2	10.$_{\text{Disp}}$
$\boxed{=}$	Ans + 6	16.
⊙ ⊙ $\stackrel{\text{shift}}{}$ ⊕	9 : 5 x 2 : Ans + 6 ⌐	17.
$\boxed{=}$	8 + 9	17.$_{\text{Disp}}$
$\boxed{=}$	5 x 2	10.$_{\text{Disp}}$
$\boxed{=}$	Ans + 6	16.

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INPUT RANGE AND ERROR MESSAGE

Calculation Accuracy, Input Ranges

Internal digits: Up to 16
Accuracy*: ±1 at the 10th digit for a single calculation.
±1 at the last significant digit for exponential display.
Output ranges: ±1 x 10^{-99} to ±9.999999999 x 10^{99}

Function		Input Range
sin x	Deg	$0 \leqq | x | \leqq 4.499999999 \times 10^{10}$
	Rad	$0 \leqq | x | \leqq 785398163.3$
	Grad	$0 \leqq | x | \leqq 4.999999999 \times 10^{10}$
cos x	Deg	$0 \leqq | x | \leqq 4.500000008 \times 10^{10}$
	Rad	$0 \leqq | x | \leqq 785398164.9$
	Grad	$0 \leqq | x | \leqq 5.000000009 \times 10^{10}$
tan x	Deg	Same as sinx, except when $| x | = 90(2n-1)$
	Rad	Same as sinx, except when $| x | = \pi/2(2n-1)$
	Grad	Same as sinx, except when $| x | = 100(2n-1)$
sin^{-1}x, cos^{-1}x		$0 \leqq | x | \leqq 1$
tan^{-1}x, tanhx		$0 \leqq | x | \leqq 9.999999999 \times 10^{99}$
sinhx, coshx		$0 \leqq | x | \leqq 230.2585092$
sinh^{-1}x		$0 \leqq | x | \leqq 4.999999999 \times 10^{99}$
cosh^{-1}x		$1 \leqq x \leqq 4.999999999 \times 10^{99}$
tanh^{-1}x		$0 \leqq | x | \leqq 9.999999999 \times 10^{-1}$
logx, lnx		$0 < x \leqq 9.999999999 \times 10^{99}$
10^x		$-9.999999999 \times 10^{99} \leqq x \leqq 99.99999999$
e^x		$-9.999999999 \times 10^{99} \leqq x \leqq 230.2585092$
$\sqrt{x}$		$0 \leqq x < 1 \times 10^{100}$
X^2		$| x | < 1 \times 10^{50}$
X^3		$| x | \leqq 2.15443469 \times 10^{33}$
1/x		$| x | < 1 \times 10^{100}; x \neq 0$
$\sqrt[3]{x}$		$| x | < 1 \times 10^{100}$
X!		$0 \leqq x \leqq 69$ (x is an integer)
nPr		$0 \leqq n < 1 \times 10^{10}, 0 \leqq r \leqq n$ (n, r are integers)
		$1 \leqq \{n!/(n-r)!\} < 1 \times 10^{100}$
nCr		$0 \leqq n < 1 \times 10^{10}, 0 \leqq r \leqq n$ (n, r are integers)
		$1 \leqq [n!/\{r!(n-r)!\}] < 1 \times 10^{100}$

Function	Input Range
Pol(x,y)	$\lvert x \rvert, \lvert y \rvert \leqq 9.999999999 \times 10^{49}$
	$(x^2+y^2) \leqq 9.999999999 \times 10^{99}$
Rec(r, θ)	$0 \leqq r \leqq 9.999999999 \times 10^{99}$
	θ : Same as sinx
°,',"	$\lvert a \rvert, b, c < 1 \times 10^{100}, 0 \leqq b, c$
< °,',"	$\lvert x \rvert < 1 \times 10^{100}$, Decimal ↔ Sexagesimal Conversions
	$0°0'0'' \leqq \lvert x \rvert \leqq 999999°59'$
∧(x^y)	$x>0$: $-1 \times 10^{100} < y \log x < 100$
	$x=0$: $y > 0$
	$x<0$: $y=n, 1/(2n+1)$, (n is an integer),
	However: $-1 \times 10^{100} < y \log \lvert x \rvert < 100$
$^x\sqrt{y}$	$y>0$: $x \neq 0$, $-1 \times 10^{100} < (1/x) \log y < 100$
	$y=0$: $x > 0$,
	$y<0$: $x=2n+1, 1/n$ ($n \neq 0$, n is an integer)
	However: $-1 \times 10^{100} < (1/x) \log \lvert y \rvert < 100$
$a\,b/c$	Total of integer, numerator, and denominator must be 10 digits or less (including division marks).
SD	$\lvert x \rvert < 1 \times 10^{50}$, $x\sigma_n, y\sigma_n, \bar{x}, \bar{y} : n \neq 0$
(REG)	$\lvert y \rvert < 1 \times 10^{50}$, $x\sigma_{n-1}, y\sigma_{n-1}, A, B, r : n \neq 0, 1$
	$\lvert n \rvert < 1 \times 10^{100}$, med : $0 < n < 1 \times 10^{10}$, n is an integer
LCM & GCD	$0 < x \leqq 9.999999999 \times 10^{12}$
	$0 < y \leqq 9.999999999 \times 10^{12}$
	$0 < z \leqq 9.999999999 \times 10^{12}$
Abs	$\lvert x \rvert < 1 \times 10^{50}$
θ ↔ r θ...r	$0 < x \leqq 9.999999999 \times 10^{12}$
(Quotient &	$0 < y \leqq 9.999999999 \times 10^{12}$
Remainder)	Quotient: $0 \leqq Q \leqq 9999999999$
	Remainder: $0 \leqq r \leqq 9999999999$

*Errors are cumulative in the case of consecutive calculations, this is also true as internal consecutive calculations are performed in the case of ∧(x^y), $^x\sqrt{y}$, x!, nPr, nCr, etc. and may become large.

Order of Operations

The calculator will automatically determine the operation priority that algebraic expressions can be entered just as they are written:

1) Coordinate transformation : Pol(x, y), Rec(r, θ)
   Statistic Points : max, min, med
   Logarithm with a, b variables : $\log_a b(a, b)$
   Random Integer Number Generation : i~Rand(A, B)
   LCM & GCD : LCM(, GCD(
   Quotient and remainder : Q...r(
   Other Function with parentheses : Abs(

2) Type A* functions
   Cube, Square, Reciprocal, Factorial : x^3, x^2, x^{-1}, x!, ° ' "
   Percentage : %
   Regression value : $\hat{x}$, $\hat{x}_1$, $\hat{x}_2$, $\hat{y}$
   Angle unit conversions : DRG▶
   To perform type A function, input calculation value then press the above function key(s)

3) Powers and roots : $\wedge(x^y)$, $\sqrt[x]{}$

4) Fraction : a b/c, d/c

5) Abbreviated multiplication format in front of π, e(natural logarithm base), memory name, or variable name : 2π, $3e$, 5A, Aπ, etc.

6) Type B** function :
   $\sqrt{}$, $\sqrt[3]{}$, log, ln, e^x, 10^x, sin, cos, tan, $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$, sinh, cosh, tanh, $\sinh^{-1}$, $\cosh^{-1}$, $\tanh^{-1}$, (−).
   **To perform type B function, press the above function key(s) then input calculation value*

7) Abbreviated multiplication format in front of Type B functions : $2\sqrt{3}$, Alog2, etc.

8) Permutations (nPr) and combinations (nCr).

9) x, ÷

10) +, −

■ Operations of the same precedence are performed from right to left. For example: $e^x \ln\sqrt{120} \rightarrow e^x\{\ln(\sqrt{120})\}$. Other operations are performed from left to right

■ Operations enclosed with parentheses are performed first. When a calculation contains an argument that is a negative number, the negative number must be enclosed within parentheses.

Example: $(-2)^4 = 16$; and $-2^4 = -16$

Calculation Stacks

■ This calculator uses memory areas, called "stacks", to temporarily store numeric value (numbers) and commands (+ − x ...) 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 exceeds the capacity of stacks.

■ Calculations are performed in sequence according to "Order of Operations". After the calculation is performed, the stored stack values will be released.

Error Messages and Error Locator

The calculator is locked up while an error message is shown on the display to indicate the cause of the error.

■ Press $\frac{ON/CA}{}$ will clear the error, remove all replay memory and return to initial display of the latest mode.

■ Press $\boxed{CE/C}$ will clear the error message and return to the display of the latest mode.

■ Press $\textcircled{<}$ or $\textcircled{>}$ to display the calculation with the cursor positioned under the error and you can correct it accordingly.

Error Message	Cause	Action
Math ERROR	• Calculation result is outside the allowable calculation range • An attempt to perform a calculation using a value that exceeds the allowable input range. • An attempt to perform an illogical operation (division by zero, etc.)	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	The capacity of the numeric stack or operator stack is exceeded.	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.

Error Message	Cause	Action
Syntax ERROR	An attempt to perform an illegal mathematical operation.	Press $\odot$ or $\odot$ to display the calculation with the cursor located at the location of the error and make required corrections.

BASIC CALCULATIONS

■ Press $\overset{\text{MODE}}{\square}$ $\boxed{1}$ to enter COMP mode as you want to perform basic calculations.

■ During the busy calculation, the calculator will display the message [PROCESSING].

Arithmetic Calculations $\boxed{+}$ $\boxed{-}$ $\boxed{\times}$ $\boxed{\div}$

• To calculate the negative values (excludes the negative exponent), you have to enclose them with parentheses.

Calculation Expression	Operation	Display (Result)
$(-2.5)^2$	$\boxed{(}$ $\boxed{(-)}$ $\boxed{2}$ $\boxed{.}$ $\boxed{5}$ $\boxed{)}$ $\boxed{x^2}$ $\boxed{=}$	6.25
$(4 \times 10^{75})(-2 \times 10^{-79})$	$\boxed{4}$ $\boxed{\text{EXP}}$ $\boxed{7}$ $\boxed{5}$ $\boxed{\times}$ $\boxed{(-)}$ $\boxed{2}$ $\boxed{\text{EXP}}$ $\boxed{(-)}$ $\boxed{7}$ $\boxed{9}$ $\boxed{=}$	-8×10^{-04}

• This Calculator supports 24-level of parenthetical expression.

• You can omit the close parentheses $\boxed{)}$ as the calculation ends with $\boxed{=}$ or $\boxed{\text{M+}}$.

Calculation Expression	Operation	Display (Result)
$(\tan - 45) \div (-2)$	$\boxed{\tan}$ $\boxed{(-)}$ $\boxed{4}$ $\boxed{5}$ $\boxed{\div}$ $\boxed{(-)}$ $\boxed{2}$ $\boxed{=}$	0.5
$\tan (- 45 \div -2)$	$\boxed{\tan}$ $\boxed{(}$ $\boxed{(-)}$ $\boxed{4}$ $\boxed{5}$ $\boxed{\div}$ $\boxed{(-)}$ $\boxed{2}$ $\boxed{=}$	0.414213562

! When the number of $\boxed{)}$ is more than $\boxed{(}$, [Syntax ERROR] will be shown.

Memory Calculations

[Ans] [M-] [M+] [M] [STO] [RCL]

Memory Variables
- There are 17 memory variables (0 through 9, A through D, M, X, and Y) which store data, results, or dedicated values.
- To store values into memory by pressing [STO] + Memory variable.
- To recall memory values, press [RCL] + Memory variable.
- Memory content can be cleared by simply pressing [0] [STO] + Memory variable.

Example: 23 + 7 (Store to A), calculate sin (memory A), and clear memory A

Operation	Display (Upper Line)	Display (Lower Line)
[2][3][+][7] [Shift][STO] [A]	23+7 → A	30.
[sin] [RCL] [A] [=]	sin A	0.5
[0] [Shift][STO] [A]	0 → A	0.

Independent Memory
- Independent memory [M] uses the same memory area as variable M. It is convenient for calculating cumulative total by just pressing [M+] (add to memory) or [M-] (subtract from memory); and the memory contents are retained even when the calculator is turned off.
- To clear independent memory (M), input [0] [STO] [M]
- When you want to clear all memory values, press [Alpha] [CLR] [1] (Mcl) [=] [ON/CA]

Answer Memory
- The input values or the most recent calculation result will be automatically stored into Answer Memory whenever you press [=], [M+], [Shift][M-], [STO] followed by a memory variables, or just reall a memory variable by [RCL].

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Operation	Display (Upper)	Display (Lower)
`1` `2` `3` `+` `4`		
`5` `6` `M+`	123+456M+	579.
`x²` `=`	Ans²	335,241.

• `Ans` can recall and use the latest stored Answer Memory by pressing `Ans`.

Operation	Display (Upper)	Display (Lower)
`7` `8` `9` `9` `0`		
`0` `−` `Ans` `=`	789900 - Ans	454,659.

! Answer Memory is not updated as an error operation had been performed.

Fraction Operations

`a b/c` `d/c`

The Calculator support Fraction Calculation and the conversions between Fraction, Decimal point, Mixed fraction and Improper fraction.

Fraction Calculation, Fraction ⟷ Decimal point conversion

Example	Operation	Display (Lower)
$1\dfrac{2}{3} + \dfrac{5}{6} = 2\dfrac{1}{2}$	`1` `a b/c` `2` `a b/c` `3` `+` `5` `a b/c` `6` `=`	2 ⌐1⌐2.
$2\dfrac{1}{2} \leftrightarrow 2.5$ (Fraction ⟷ Decimal)	`a b/c`	2.5
	`a b/c`	2 ⌐1⌐2.

● Result will be displayed in decimal format automatically whenever the total digits of a fractional value (integer + numerator + denominator + separator marks) exceeds 10.

● As a fraction calculation is mixed with decimal value, the result will be displayed by decimal format.

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Decimal ↔ Mixed fraction ↔ Improper fraction conversion

Example	Operation	Display (Lower)
$5.25 \leftrightarrow 5\frac{1}{4}$	5 . 2 5 =	5.25
(Decimal ↔ Mixed Fraction)	$a\;b/c$	5⌐1⌐4.
(Mixed Fraction ↔		
Improper Fraction)	Shift d/c	21⌐4.

• Fraction conversion may take as long as two seconds.

! You can specify the fraction calculation result (when the result greater than one) display format by either mixed fraction or improper fraction.
Simply press MODE ⊙ [Disp] 1 , then press the corresponding setting you need:

        1 a b/c   : Mixed fraction
        2 d/c   : Improper fraction

Percentage Calculations   %

You can perform the following percentage calculations:

Basic   : To calculate a certain percentage of a value
                    (A × B Shift % =).
      : Percentage of a value against another value
                    (A ÷ B Shift % =).

Example	Operation	Display (Upper)	Display (Lower)
To calculate 25 % of 820	8 2 0 × 2 5 Shift % =	820 x 25 %	205.
The percentage of 750 against 1250	7 5 0 ÷ 1 2 5 0 Shift % =	750 ÷ 1250 %	60.

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Mark up : "A" value mark up by "B%" (A $+$ A $\times$ B $\underset{\text{Shift}}{\%}$ $=$)
Discount : "A" value have "B%" discount (A $-$ A $\times$ B $\underset{\text{Shift}}{\%}$ $=$)

Example	Operation	Display (Upper)	Display (Lower)
820 mark up 25%	8 2 0 $+$ 8 2 0 $\times$ 2 5 Shift % $=$	820+820x25%	1,025.
820 have 25% discount	8 2 0 $-$ 8 2 0 $\times$ 2 5 Shift % $=$	820−820x25%	615.

Percentage Increase :

If "A" is added to "B", the percentage increase from "B" is:

$\left[\dfrac{A+B}{B}\right]$ x 100%

((A $+$ B) $\div$ B $\underset{\text{Shift}}{\%}$ $=$)

Percentage Change :

If "A" is changed into "B", the percentage change from "A" to "B" is:

$\left[\dfrac{B-A}{A}\right]$ x 100%

((B $-$ A) $\div$ A $\underset{\text{Shift}}{\%}$ $=$)

Example	Operation	Display (Upper)	Display (Lower)
300 is added to 750, the percentage increase of 750 is	(3 0 0 $+$ 7 5 0) $\div$ 7 5 0 Shift % $=$	(300+750)÷75	140.
25 increased into 30, the percentage change of 25 is	(3 0 $-$ 2 5) $\div$ 2 5 Shift % $=$	(30−25)÷25%	20.

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Percentage Proportion :

the ratio/ percentage of each individual portion in
a calculation expression.

If $A + B + C = D$

"A" is a% of "D" where $a = \frac{A}{D} \times 100\%$

Examples: To calculate the ratio of each portion as 25+85+90=200
(100%), the ratio of 25 is 12.5%, 85 is 42.5%, 90 is 45%

Operation	Display(Upper)	Display(Lower)
[2] [5] [+] [8] [5] [+] [9] [0] Shift STO ⎣__A	25+85+90 ➡ A	200.
[2] [5] [÷] [RCL] * ⎣__A Shift % [=]	25÷A %	12.5
[8] [5] [÷] [RCL] * ⎣__A Shift % [=]	85÷A %	42.5
[9] [0] [÷] Alpha * ⎣__A Shift % [=]	90÷A %	45.

* You can store the sum of value into memory variables, then recall
and use the value by pressing [RCL] or Alpha + Memory variable.

Degree-Minutes-Seconds Calculations

You can use degrees (hours), minutes and seconds key to perform a
sexagesimal (base-60 notational system) calculation or convert the
sexagesimal value into decimal value.

Degree-Minutes-Seconds ↔ Decimal points

Examples	Operation	Display (Lower)
86°37' 34.2" ÷ 0.7 = 123°45'6"	[8] [6] [°'"] [3] [7] [°'"] [3] [4] [·] [2] [°'"] [÷] [0] [·] [7] [=]	123°45°6.
123°45'6" →123.7516667	[°'"]	123.7516667
2.3456 → 2°20'44"	[2] [·] [3] [4] [5] [6] [=] Shift °'"	2°20'44.16

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Fix, Sci, Norm, ROUND

You can change the number of decimal point, the number of significant digits, or the exponential notation criteria by pressing ⬚ⁿᵒᵈᵉ ⊘ ⊘ to the following selection screen:

$$\boxed{\begin{array}{ccc} \leftarrow \textbf{ Fix} & \textbf{Sci} & \textbf{Norm} \rightarrow \\ 1 & 2 & 3 \end{array}}$$

Press 1 (Fixed Decimal Setting) : [Fix 0 ~ 9?] appears, specify the number of decimal places by pressing ⓪ ~ ⑨ .

Press 2 (Scientific Notation) : [Sci 0 ~ 9?] appears, specify the number of significant digits by pressing ⓪ ~ ⑨ .

Press 3 (Exponential Notation) : [Norm 1 ~ 2?] appears. Specify the exponential notation format by pressing ① or ② .

- Norm 1 : Exponential notation is automatically used for integer values with more than 10 digits and decimal values with more than two decimal point.
- Norm 2 : Exponential notation is automatically used for integer values with more than 10 digits and decimal values with more than nine decimal point.

Example : $57 \div 7 \times 20 = ??$	Operation	Display(Lower)

At default setting.
To fix 4 digits decimal point.
(Internal calculation continues
16 digits)
	`5` `7` `÷` `7`
	`×` `2` `0` `=`
	`MODE` `<` `<` `1` `4`
	`5` `7` `÷`
	`7` `=`
	`×` `2` `0` `=`
		162.8571429
		
		162.8571
		8.1429
		162.8571

Perform internal rounding
under the special decimal
setting.
	`5` `7` `÷` `7` `=`
	`Shift` `ROUND` `×` `2` `0`
	`=`
		8.1429
		
		162.8580

To display by 6 digits scientific notation.	`MODE` `<` `<` `2` `6`	1.62858×10^{02}
Notation format by pressing `1` to clear the FIX and Sci specifications.	`MODE` `<` `<` `3` `1`	162.858

FUNCTIONAL SCIENTIFIC CALCULATIONS

- Press $\boxed{\text{MODE}}$ $\boxed{1}$ to enter COMP mode for performing functional scientific calculations.
- During the busy calculation, the calculator will display the message [PROCESSING].
- π = 3.14159265359
- e = 2.71828182846

Square, Root, Cube, Cube Root, Power, Power Root, Reciprocal and Pi

Example: $(\sqrt[3]{-2^2 + 5^3})^{-1} \times \pi = 0.621755977$

Operation	Display (Upper)	Display (Lower)
$\boxed{(}$ $\boxed{\text{Shift}}$ $\sqrt[x]{}$ $\boxed{(}$ $\boxed{(}$ $\boxed{(-)}$ $\boxed{2}$ $\boxed{)}$ $\boxed{x^2}$ $\boxed{+}$ $\boxed{5}$ $\boxed{x^3}$ $\boxed{)}$ $\boxed{)}$ $\boxed{x^{-1}}$ $\boxed{\text{Shift}}$ $\frac{\pi}{\Box}$ $\boxed{=}$	$(^3\sqrt{((-2)^2 + 5^3}$	0.621755977

Example: $(\sqrt[3]{2^6} + \sqrt[5]{243})^{-1} = 0.142857142$

Operation	Display (Upper)	Display (Lower)
$\boxed{(}$ $\boxed{\text{Shift}}$ $\sqrt[x]{}$ $\boxed{2}$ $\boxed{\wedge}$ $\boxed{6}$ $\boxed{+}$ $\boxed{5}$ $\boxed{\text{Shift}}$ $\sqrt[x]{}$ $\boxed{2}$ $\boxed{4}$ $\boxed{3}$ $\boxed{)}$ $\boxed{x^{-1}}$ $\boxed{=}$	$(^3\sqrt{2}^6 + 5^{\,x}\sqrt{}\ 24$	0.142857142

Logarithm, Natural Logarithm, Antilogarithm and Log$_a$b $\boxed{\log}$ $\boxed{\ln}$ $\overset{10^x}{\boxed{}}$ $\overset{e^x}{\boxed{}}$ $\overset{\log_a b}{\boxed{}}$

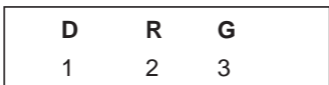| Examples	Operation	Display (Lower)
$e^{-3} + 10^{1.2} + \ln 3$ = 16.99733128	$\boxed{\text{Shift}}$ e^x $\boxed{(-)}$ $\boxed{3}$ $\boxed{+}$ $\boxed{\text{Shift}}$ 10^x $\boxed{1}$ $\boxed{.}$ $\boxed{2}$ $\boxed{+}$ $\boxed{\ln}$ $\boxed{3}$ $\boxed{=}$	16.99733128
$\log_3 81 - \log 1 = 4$	$\boxed{\text{Alpha}}$ $\log_a b$ $\boxed{3}$ $\boxed{,}$ $\boxed{8}$ $\boxed{1}$ $\boxed{)}$ $\boxed{-}$ $\boxed{\log}$ $\boxed{1}$ $\boxed{=}$	4.

Angle Unit Conversion

The calculator default angle unit setting is "Degree". If you need to change into "Radian" or "Grade", you can press [MODE] a number of times until you reach the setup screen:

```
← Deg    Rad    Gra    →
    1      2      3
```
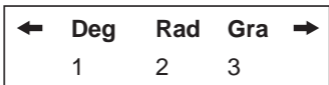
Then press the corresponding number key [1], [2], or [3] for the angle unit you need. Then the display will show the $\mathbf{D}$, $\mathbf{R}$, or $\mathbf{G}$ indicator accordingly.

To convert an angle unit between "Degree", "Radian" and "Grade", you can press [shift] [DRG▶] and the following display menu will be shown:

```
D      R      G
1      2      3
```

Then, press [1], [2], or [3] will convert the displayed value into the selected angle unit.

Example: Convert 180 degree into radian and grade
$$(180° = \pi^{Rad} = 200^{Gra})$$

Operation	Display (Upper)	Display (Lower)
[MODE] ⊙ [2] (Radian mode) [1][8][0] [shift][DRG▶][1][=]	$\mathbf{R}$ 180$^{\square}$	3.141592654
[MODE] ⊙ ⊙ ⊙ [3] (Grade mode) [=]	$\mathbf{G}$ 180$^{\square}$	200.

Trigonometry Calculations $\boxed{\text{sin}}$ $\boxed{\text{cos}}$ $\boxed{\text{tan}}$ $\boxed{\text{sin}^{-1}}$ $\boxed{\text{cos}^{-1}}$ $\boxed{\text{tan}^{-1}}$ $\boxed{\text{hyp}}$

■ Before using the trigonometric functions (except hyperbolic calculations), select the appropriate angle unit (Deg/ Rad/ Gra) by $\boxed{\text{MODE}}$.

■ $90° = \frac{\pi}{2}$ Radians = 100 Grade.

Trigonometric (sin/ cos/ tan), Inverse Trigonometric (sin⁻¹/ cos⁻¹/ tan⁻¹) Functions

Examples	Operation	Display (Lower)
Degree Mode	$\boxed{\text{MODE}}$ $\boxed{\text{<}}$ $\boxed{\text{<}}$ $\boxed{\text{<}}$ $\boxed{1}$	0.
sin 53° 22' 12" = 0.802505182	$\boxed{\text{sin}}$ $\boxed{5}$ $\boxed{3}$ $\boxed{°'''}$ $\boxed{2}$ $\boxed{2}$ $\boxed{°'''}$	
	$\boxed{1}$ $\boxed{2}$ $\boxed{°'''}$ $\boxed{=}$	0.802505182
cosec x = 1/sinx	$\boxed{(}$ $\boxed{\text{sin}}$ $\boxed{4}$ $\boxed{5}$ $\boxed{)}$ $\boxed{x^{-1}}$ $\boxed{=}$	1.414213562
cosec 45° = 1.414213562		
tan⁻¹ (5/6) = 39.80557109°	$\boxed{\text{Shift}}$ $\boxed{\text{tan}^{-1}}$ $\boxed{(}$ $\boxed{5}$ $\boxed{÷}$ $\boxed{6}$ $\boxed{=}$	39.80557109
Radian Mode	$\boxed{\text{MODE}}$ $\boxed{\text{<}}$ $\boxed{\text{<}}$ $\boxed{\text{<}}$ $\boxed{2}$ $\boxed{\text{ON/CA}}$	0.
cos(π/6)$^{\text{Rad}}$ = 0.866025403	$\boxed{\text{cos}}$ $\boxed{6}$ $\boxed{x^{-1}}$ $\boxed{\text{Shift}}$ $\boxed{\pi}$ $\boxed{=}$	0.866025403
$\cos^{-1} \frac{1}{\sqrt{2}} = $ 0.785398163 0.25 π (Rad)	$\boxed{\text{Shift}}$ $\boxed{\text{cos}^{-1}}$ $\boxed{(}$ $\boxed{1}$ $\boxed{÷}$ $\boxed{\sqrt{}}$ $\boxed{2}$	
	$\boxed{=}$	0.785398163
	$\boxed{\text{Ans}}$ $\boxed{÷}$ $\boxed{\text{Shift}}$ $\boxed{\pi}$ $\boxed{=}$	0.25

Hyperbolic (sinh/ cosh/ tanh), Inverse Hyperbolic (sinh⁻¹/ cosh⁻¹/ tanh⁻¹) Functions

Examples	Operation	Display (Lower)
sinh 2.5 − cosh 2.5 = -0.082084998	$\boxed{\text{hyp}}$ $\boxed{\text{sin}}$ $\boxed{2}$ $\boxed{.}$ $\boxed{5}$ $\boxed{-}$ $\boxed{\text{hyp}}$ $\boxed{\text{cos}}$ $\boxed{2}$ $\boxed{.}$ $\boxed{5}$ $\boxed{=}$	-0.082084998
cosh⁻¹ 45 = 4.499686191	$\boxed{\text{hyp}}$ $\boxed{\text{Shift}}$ $\boxed{\text{cos}^{-1}}$ $\boxed{4}$ $\boxed{5}$ $\boxed{=}$	4.499686191

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Permutation, Combination, Factorials and Random Number Generation

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

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

- Factorial : $x! = x(x-1)(x-2).....(2)(1)$

Examples	Operation	Display (Lower)
$_{10}P_3$	$\boxed{1}\boxed{0}\,\overset{Shift}{\boxed{}}\,\overset{nPr}{\boxed{}}\,\boxed{3}\,\boxed{=}$	720.
$_5C_2$	$\boxed{5}\,\overset{Shift}{\boxed{}}\,\overset{nCr}{\boxed{}}\,\boxed{2}\,\boxed{=}$	10.
5!	$\boxed{5}\,\overset{Shift}{\boxed{}}\,\overset{x!}{\boxed{}}\,\boxed{=}$	120

Random Number Generation

$\overset{Shift}{\boxed{}}\,\overset{Rand}{\boxed{}}$: To generate a random number between 0.000 and 0.999

$\overset{Alpha}{\boxed{}}\,\overset{i\text{-}Rand}{\boxed{}}$: To generate a random number between two specified positive integers. The entry is divided with " , ".

Example: To generate a random number between 0.000 and 0.999; and generate an integer from range of 1 to 100

Operation	Display (Upper)	Display (Lower)
$\overset{Shift}{\boxed{}}\,\overset{Rand}{\boxed{}}\,\boxed{=}$	Rand	0.833*
$\overset{Alpha}{\boxed{}}\,\overset{i\text{-}Rand}{\boxed{}}\,\boxed{1}\,\boxed{,}\,\boxed{1}\,\boxed{0}\,\boxed{0}\,\boxed{=}$	i~Rand(1,100	83.*

* The value is only a sample, results will differ each time.

Least Common Multiple and Greatest Common Divisor   `LCM` `GCD`

- LCM: Calculate the least common multiple among (maximum) three positive integers.
- GCD: Calculate the greatest common divisor among (maximum) three positive integers.

Examples	Operation	Display (Lower)
LCM(15, 27, 39) = 1755	`LCM` `1` `5` `,` `2` `7` `,` `3` `9` `=`	1,755.
GCD(12, 24, 60) = 12	`Shift` `GCD` `1` `2` `,` `2` `4` `,` `6` `0` `=`	12.

! Inputting a zero [0] value in a LCM/ GCD calculation, the calculator will skip the [0] value and continue the calculation with the non-zero integers.

! [Math ERROR] will be shown when decimal numbers or negative integers had been input.

Quotient & Remainder   `Q...r` `Q...r`

- "Quotient" (Q) is the result of a division problem, "Remainder"(r) is the value left in an integer division problem.
- The calculated quotient value (Q) and remainder value (r) will be stored into memory variables "C" and "D" automatically assigned.
- **Example:** $35 \div 10 = 3 \times 10 + 5$ (3 is Quotient, 5 is Remainder)

Operation	Display (Upper)	Display (Lower)
`Q...r` `3` `5` `,` `1` `0` `=`	Q...r(35,10	3. Q
`Shift` `Q...r`	Q...r(35,10	5. r
`+` `3` `=`	Ans + 3	6.
`RCL` `C` (recall quotient value)	C =	3.
`RCL` `D` (recall remainder value)	D =	5.

! Only integers are allowed. [Math ERROR] will be shown when decimal numbers, non-integers (e.g. sin 60), or dividend value "zero [0]" had been input.

! Only Quotient Value (Q) can continue to be used for the next calculation or being stored into memory variables.

Coordinate Conversion

- With polar coordinates, you can calculate and display θ within -180° < θ ≤ 180° range. (Same as Radian and Gradient)
- After conversion, results will automatically assigned to memory variables X and Y.

Shift Pol : To convert rectangular coordinates (x, y) to polar coordinates (r , θ); Press RCL ⟶X to display the value of r, or RCL ⟶Y to display the value of θ.

Examples	Operation	Display (Lower)
With rectangular coordinate	Shift Pol 1 , √ 3	
(x =1,y = √3). Find Polar	=	2.
coordinate (r, θ) at degree	RCL ⟶Y	60.
mode	RCL ⟶X	2.

Shift Rec : To converts polar coordinates (r , θ) to rectangular coordinates(x, y); Press RCL ⟶X to display the value of x, or RCL ⟶Y to display the value of y.

Examples	Operation	Display (Lower)
With Polar coordinate	Shift Rec 2 , 6 0 =	1.
(r=2, θ =60°). Find rectangular	RCL ⟶Y	1.732050808
coordinate (x,y) at degree mode	RCL ⟶X	1.

! [Syntax ERROR] will be shown if , is missed in the coordinate conversion calculation.

Absolute Value Calculation

Examples	Operation	Display (Lower)
| sin(60−5) x (-π) | =	Abs sin (6 0 − 5	
2.573442045	) x (−) Shift π =	
		2.573442045

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STATISTICAL CALCULATIONS　　　**[SD] [REG]**

■ To enter the standard deviation mode by pressing $\boxed{\overset{MODE}{}}$ $\boxed{2}$, [SD] indicator lights up. If press $\boxed{\overset{MODE}{}}$ $\boxed{3}$, you can enter the regression mode selection menu. [REG] indicator will be turned on.

■ Before starting, be sure to clear the statistic memory by pressing $\boxed{\overset{Alpha}{}}$ $\boxed{\overset{CLR}{}}$ $\boxed{1}$ $\boxed{=}$ $\boxed{\overset{ON/CA}{}}$.

■ Perform the data input .
  • In SD mode, store the displayed data by pressing $\boxed{\text{Data}}$, pressing $\boxed{\text{Data}}$ $\boxed{\text{Data}}$ will input the same data twice.

  • In REG mode, store the x-data and y-data in the form of: x-data $\boxed{,}$ y-data $\boxed{\text{Data}}$, pressing $\boxed{\text{Data}}$ $\boxed{\text{Data}}$ will input the same data twice.

  • Use $\boxed{\overset{shift}{}}$ $\boxed{;}$ for same data multiple entries. For example in SD mode, the data 20 has 8 times will press 20 $\boxed{\overset{shift}{}}$ $\boxed{;}$ 8 $\boxed{\text{Data}}$.

  • Each time you press $\boxed{\text{Data}}$ to register the input, the number of data input up to that point is indicated on the display once (n = the number of input data).

  • Press $\odot$ or $\odot$ key during or after data input can display the data value (x) and data frequency (Freq). Follow with the above example, press $\odot$ will display [x1 = 20], and press $\odot$ will display [Freq1= 8].

- To edit the stored data, input the new value during the display of that data value (x) after pressing ⊙ or ⊙ key, and then press ☰ to confirm the edit. But, if you press ᴰᵃᵗᵃ instead of ☰, a new data value will be stored.

- Press ᴬˡᵖʰᵃ ⎯ᶜᴰ can delete the data during the display of that data value (x) after ⊙ or ⊙ key is pressed; and the sequence of the data which following the deleted data will be shifted up automatically.

- Press ᶜᴱ/ᶜ or ᴼᴺ/ᶜᴬ key to exit the data value and frequency display, then you can perform other calculation operations.

- Input data are stored in calculation memory. As the memory full, [Data Full] will be displayed and you cannot input or perform any calculation. Press ᶜᴱ/ᶜ, ᴰᵃᵗᵃ or ☰ key will display the options [EditOFF] or [ESC].

| Edit OFF (Press ①) : | Keep on inputting data without storing into the memory, and you are not able to display or edit any of the data you had input. |
| ESC (Press ②) : | Just exit data input without registering the data into the memory. |

- After changing into another mode or regression type (Lin, Log, Exp, Pwr, Inv, Quad), input data will be cleared.

■ After finishing data entries, you can recall or calculate the statistical values.

Standard Deviation

- Press $\overset{MODE}{\boxed{}}$ $\boxed{2}$ to ender SD mode.
- Before starting, be sure to clear the statistical memory by pressing $\overset{Alpha}{\boxed{}}$ $\overset{CLR}{\boxed{1}}$ $\boxed{=}$ $\overset{ON/CA}{\boxed{}}$.
- You can recall the following statistical value after input all data.

Value (Symbol)	
Summation of x (Σx)	Mean of x ($\bar{x}$)
Sum of Square (Σx^2)	Maximum value of x (maxX)
Number of data sample (n)	Minimum value of x (minX)
Population Standard Deviation of x ($x\sigma n$)	Median value (med)
Sample Standard Deviation of x ($x\sigma n\text{-}1$)	

Example: To calculate $\Sigma x^2, \Sigma x, \bar{x}, x\sigma n$, $x\sigma n\text{-}1$, minX, maxX, and med of data: 75, 85, 90, 77, 77 in SD mode.

Operation	Display (Upper)	Display (Lower)
$\overset{Alpha}{\boxed{}}$ $\overset{CLR}{\boxed{1}}$ $\boxed{=}$	Stat clear	--------------
$\boxed{7}$ $\boxed{5}$ $\boxed{Data}$ $\boxed{8}$ $\boxed{5}$ $\boxed{Data}$ $\boxed{9}$ $\boxed{0}$ $\boxed{Data}$		
$\boxed{7}$ $\overset{Shift}{\boxed{}}$ $\boxed{2}$ $\boxed{Data}$	n =	5.
$\overset{Shift}{\boxed{}}$ $\overset{S\text{-}SUM}{\boxed{1}}$ $\boxed{=}$	Σx^2	32,808.
$\overset{Shift}{\boxed{}}$ $\overset{S\text{-}SUM}{\boxed{2}}$ $\boxed{=}$	Σx	404.
$\overset{Shift}{\boxed{}}$ $\overset{S\text{-}VAR}{\boxed{1}}$ $\boxed{=}$	$\bar{x}$	80.8
$\overset{Shift}{\boxed{}}$ $\overset{S\text{-}VAR}{\boxed{2}}$ $\boxed{=}$	$x\sigma n$	5.741080038
$\overset{Shift}{\boxed{}}$ $\overset{S\text{-}VAR}{\boxed{3}}$ $\boxed{=}$	$x\sigma n\text{-}1$	6.418722614
$\overset{Shift}{\boxed{}}$ $\overset{S\text{-}PTS}{\boxed{1}}$ $\boxed{=}$	minX	75.
$\overset{Shift}{\boxed{}}$ $\overset{S\text{-}PTS}{\boxed{2}}$ $\boxed{=}$	maxX	90.
$\overset{Shift}{\boxed{}}$ $\overset{S\text{-}PTS}{\boxed{}}$ $\boxed{\oslash}$ $\boxed{1}$ $\boxed{=}$	med	77.

Regression Calculations

- Press $\overset{MODE}{\boxed{}}$ $\boxed{3}$ to ender REG mode, then the follow screen options will be shown:

$$\boxed{\leftarrow \quad \textbf{Lin} \quad \textbf{Log} \quad \textbf{Exp} \quad \rightarrow \\ 1 \qquad 2 \qquad 3}$$

- Press $\boxed{1}$, $\boxed{2}$ or $\boxed{3}$ for [Lin] = Linear regression, [Log] = Logarithmic regression, [Exp] = Exponential regression.

If follow with $\overset{\text{MODE}}{\boxed{}}$ or $\odot$ another regression options will be displayed as follow:

← **Pwr**	**Inv**	**Quad** →
1	2	3
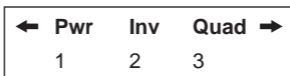
You can press $\boxed{1}$, $\boxed{2}$ or $\boxed{3}$ for [Pwr] = Power regression,
[Inv] = Inverse regression, [Quad] = Quadratic regression.

■ Before starting, be sure to clear the statistical memory by pressing $\overset{\text{Alpha}}{\boxed{}}\overset{\text{CLR}}{\boxed{}}\boxed{1}\boxed{=}\overset{\text{ON/CA}}{\boxed{}}$.
■ Input data in the form of x-data $\boxed{,}$ y-data $\boxed{\text{Data}}$. Use $\overset{\text{Shift}}{\boxed{}}$ for same data multiple entries.
■ Press $\overset{\text{Alpha}}{\boxed{}}\overset{\text{CD}}{\boxed{}}$ can delete the data during the display of data value after $\odot$ or $\odot$ key is pressed.
■ You can recall and use the following regression results:

Value	Symbol	Operation
Summation of all x^2 value	Σx^2	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-SUM}}{\boxed{}}\boxed{1}$
Summation of all x value	Σx	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-SUM}}{\boxed{}}\boxed{2}$
Number of data sample	n	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-SUM}}{\boxed{}}\boxed{3}$
Summation of all y^2 values	Σy^2	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-SUM}}{\boxed{}}\odot\boxed{1}$
Summation of all y values	Σy	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-SUM}}{\boxed{}}\odot\boxed{2}$
Summation of all xy pairs	Σxy	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-SUM}}{\boxed{}}\odot\boxed{3}$
Mean of the x values	$\overline{x}$	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-VAR}}{\boxed{}}\boxed{1}$
Population Standard Deviation of x	$x\sigma_n$	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-VAR}}{\boxed{}}\boxed{2}$
Sample Standard Deviation of x	$x\sigma_{n-1}$	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-VAR}}{\boxed{}}\boxed{3}$
Mean of the y values	$\overline{y}$	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-VAR}}{\boxed{}}\odot\boxed{1}$
Population Standard Deviation of y	$y\sigma_n$	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-VAR}}{\boxed{}}\odot\boxed{2}$
Sample Standard Deviation of y	$y\sigma_{n-1}$	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-VAR}}{\boxed{}}\odot\boxed{3}$
Regression coefficient A	A	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-VAR}}{\boxed{}}\odot\odot\boxed{1}$
Regression coefficient B	B	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-VAR}}{\boxed{}}\odot\odot\boxed{2}$
Minimum value of X	minX	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-PTS}}{\boxed{}}\boxed{1}$
Maximum value of X	maxX	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-PTS}}{\boxed{}}\boxed{2}$
Minimum value of Y	minY	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-PTS}}{\boxed{}}\odot\boxed{1}$
Maximum value of Y	maxY	$\overset{\text{Shift}}{\boxed{}}\overset{\text{S-PTS}}{\boxed{}}\odot\boxed{2}$

For non-quadratic regression		
Correlation coefficient r	r	**Shift** **S-VAR** $\bigcirc$ $\bigcirc$ $\boxed{3}$
Regression estimated value x	$\hat{x}$	**Shift** **S-VAR** $\bigcirc$ $\bigcirc$ $\bigcirc$ $\boxed{1}$
Regression estimated value y	$\hat{y}$	**Shift** **S-VAR** $\bigcirc$ $\bigcirc$ $\bigcirc$ $\boxed{2}$
For Quadratic regression only		
Summation of all x^3 values	Σx^3	**Shift** **S-SUM** $\bigcirc$ $\bigcirc$ $\boxed{1}$
Summation of all x^2y pairs	$\Sigma x^2 y$	**Shift** **S-SUM** $\bigcirc$ $\bigcirc$ $\boxed{2}$
Summation of all x^4 values	Σx^4	**Shift** **S-SUM** $\bigcirc$ $\bigcirc$ $\boxed{3}$
Regression coefficient C	C	**Shift** **S-VAR** $\bigcirc$ $\bigcirc$ $\boxed{3}$
Regression estimated value x_1	$\hat{x}_1$	**Shift** **S-VAR** $\bigcirc$ $\bigcirc$ $\bigcirc$ $\boxed{1}$
Regression estimated value x_2	$\hat{x}_2$	**Shift** **S-VAR** $\bigcirc$ $\bigcirc$ $\bigcirc$ $\boxed{2}$
Regression estimated value y	$\hat{y}$	**Shift** **S-VAR** $\bigcirc$ $\bigcirc$ $\bigcirc$ $\boxed{3}$

Linear regression
- The Linear regression formula is in relation to two variables:
  $y = A + Bx$
- **Example:** By the following investment and yield table, calculate the linear regression (regression coefficient A, regression coefficient B) of capital investment verse yield, the correlation coefficient, the minimum value of investment, the maximum value of yield (%), and the yield percentage at 45 thousand unit of investment, and the investment unit at 180% yield.

Investment (thousand unit)	20	30	40	50	60
Yield (%)	120	126	130	136	141

Operation	Display (Upper)	Display (Lower)
MODE $\boxed{3}$ $\boxed{1}$ (Lin Regression)		0.
Alpha **CLR** $\boxed{1}$ $\boxed{=}$ (Clear Stat. memory)	Stat Clear	- - - - - - - - - - - - -
$\boxed{2}\boxed{0}$ $\boxed{,}$ $\boxed{1}\boxed{2}\boxed{0}$ **Data** $\boxed{3}\boxed{0}$ $\boxed{,}$ $\boxed{1}\boxed{2}\boxed{6}$ **Data** $\boxed{4}\boxed{0}$ $\boxed{,}$ $\boxed{1}\boxed{3}\boxed{0}$ **Data** $\boxed{5}\boxed{0}$ $\boxed{,}$ $\boxed{1}\boxed{3}\boxed{6}$ **Data** $\boxed{6}\boxed{0}$ $\boxed{,}$ $\boxed{1}\boxed{4}\boxed{1}$ **Data**	n =	5.
Shift **S-VAR** $\bigcirc$ $\bigcirc$ $\boxed{1}$ $\boxed{=}$ (Coefficient A)	A	109.8
Shift **S-VAR** $\bigcirc$ $\bigcirc$ $\boxed{2}$ $\boxed{=}$ (Coefficient B)	B	0.52
Shift **S-VAR** $\bigcirc$ $\bigcirc$ $\boxed{3}$ $\boxed{=}$ (Correlation Coefficient)	r	0.998523984

Operation	Display (Upper)	Display (Lower)
Shift S-PTS 1 = (Minimum Investment)	minX	20.
Shift S-PTS ⊙ 2 = (Maximum Yield)	maxY	141.
4 5 Shift S-VAR ⊙ 2 = (Yield%)	45 $\hat{y}$	133.2
1 8 0 Shift S-VAR ⊙ 1 = (Investment unit)	180 $\hat{x}$	135.

Logarithmic, Exponential, Power, and Inverse Regression Formulas
- Logarithmic Regression : $y = A + B\ln x$
- Exponential Regression : $y = Ae^{Bx}$ $(\ln y = \ln A + Bx)$
- Power Regression : $y = Ax^B$ $(\ln y = \ln A + B\ln x)$
- Inverse Regression : $y = A + Bx^{-1}$

Quadratic Regression
- The quadratic regression is in relation to the formula:
  $y = A + Bx + Cx^2$
- **Example:** ABC company investigated the effectiveness of the advertisement expenses in coded units, the following data were obtained:

Advertisement expenses: x	18	35	40	21	19
Effectiveness: y (%)	38	54	59	40	38

Please calculate the correlation coefficient; use the regression to estimate the effectiveness (estimate the value of y) if the advertisement expenses x = 30, and estimate the advertisement expenses level (estimate the value of x_1, x_2) for the effectiveness y=50

Operation	Display (Upper)	Display (Lower)
MODE 3 ⊙ 3 (Quad Regression)		0.
Alpha CLR 1 =	Stat clear	- - - - - - - - - - - -
1 8 , 3 8 Data 3 5 , 5 5 4 Data 4 0 , 5 9 Data 2 1 , 4 0 Data 1 9 , 3 8 Data	n =	5.
3 0 Shift S-VAR ⊙ ⊙ 3 = ($\hat{y}$ when x = 30)	30 $\hat{y}$	48.69615715
5 0 Shift S-VAR ⊙ ⊙ 1 = ($\hat{x}_1$ when y = 50)	50 $\hat{x}_1$	31.30538226
5 0 Shift S-VAR ⊙ ⊙ 2 = ($\hat{x}_2$ when y = 50)	50 $\hat{x}_2$	-167.1096731

BATTERY REPLACEMENT

When the display characters are dim even a darker LCD contrast had been adjusted **OR** the following Low battery message appears on the display, replace the battery immediately.

```
L O W    B A T T E R Y
```

lease replace the lithium battery by the following procedures:
. Press $\stackrel{Shift}{\square}$ $\stackrel{OFF}{\square}$ to power off the calculator.
. Remove the screw which securely fix the battery cover in place.
. Slide the battery cover slightly and lift it.
. Remove the old battery with a ball pen or similar sharp object.
. Load the new battery with the positive "+" side facing up.
. Replace the battery cover, screw, and press the $\stackrel{ON/CA}{\square}$, $\stackrel{Alpha}{\square}$ $\stackrel{CLR}{\square}$ $\boxed{3}$ $\boxed{=}$ $\stackrel{ON/CA}{\square}$ to initialize the calculator.

⚠ **Caution:** Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instruction.

Electromagnetic interference or electrostatic discharge may cause the display to malfunction or the contents of the memory to be lost or altered. Should this occur, press the $\stackrel{ON/CA}{\square}$ and $\stackrel{Alpha}{\square}$ $\stackrel{CLR}{\square}$ $\boxed{3}$ $\boxed{=}$ $\stackrel{ON/CA}{\square}$ to restart the calculator

ADVICE AND PRECAUTIONS

■ This calculator contains precision components such as LSI chips and should not be used in place subject to rapid variations in temperature, excessive humidity dirt or dust, or exposed to direct sunlight.

■ The liquid crystal display panel is made of glass and should not be subjected to excessive pressure.

■ When cleaning the device do not use a damp cloth or a volatile liquid such as paint thinner. Instead, use only a soft, dry cloth.

■ Do not under any circumstances dismantle this device. If you believe that the calculator is not functioning properly, either bring or mail the device together with the guarantee to the service representative of a Canon business office.

■ Never dispose the calculator improperly such as burning; it can create risks of personal injury or harm. You are suggested to dispose this product according to your national law.

■ Do replace the battery once every two years even it is not used frequently.

⚠ **Battery Cautions!**

■ Keep the battery out of reach of children. If the battery is swallowed, contact a doctor immediately.

■ Misuse of battery may cause leakage, explosion, damages or personal injury.

■ Don't recharge or disassemble the battery, it could cause a short circuit.

■ Never expose the battery to high temperatures, direct heat, or dispose by incineration.

■ Never leave a dead battery in the calculator as the dead battery may leak and cause damage to the calculator.

■ Continue using the calculator as the battery is low can cause improper operation and the stored memory may be corrupted or lost completely. Keep the written records of important data all the time; and replace the battery as soon as possible.

SPECIFICATIONS

Power Supply   : Solar cell and a single Alkaline battery (LR44 x 1)
Power Consumption : D.C. 1.5V / 0.1mW
Battery Life   : Approximately 3 years
                     (Base on 1 hour of operation per day)
Auto Power Off   : Approx. 7 minutes
Usable Temperature : 0 ~ 40 ℃ (32℉~ 104℉)
Size : 165 (L) x 80 (W) x 14 (H) mm (body)
       168 (L) x 86.3 (W) x 17.8 (H) mm (with case)
       6-1/2" (L) x 3-5/32" (W) x 35-64" (H) (body)
       6-39/64" (L) x 3-25/64" (W) x 45/64" (H) (with case)
Weight : 89 g (3 oz) (body)
          124 g (4.2 oz) (with case)

* Specifications are subject to change without notice.