SR-135N

SCIENTIFIC CALCULATOR

User's Guide

(1)

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.

A separator symbol is displayed every three digits when the integer part of the mantissa has more than three digits.

Before Starting Calculations. . .

■ Modes

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

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.
- In this manual, the name of the mode you need to enter in order to perform the calculations being described is indicated in the main title of each section.

Example:

Note!

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

Calculation Mode:	COMP
Angle Unit:	Deg
Exponential Display Format:	Norm1
Fraction Display Format:	$a\,{}^{b}/_{c}$
Decimal Point Character:	Dot

- Mode indicators appear in the upper part of the display.
- Be sure to check the current calculation mode (SD, REG, COMP) and angle unit setting (Deg, Rad, Gra) 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 (−) , for example, takes up only one step.
- You can input up to 79 steps for a single calculation. Whenever you input the 73rd step of any calculation. the cursor changes from "_" to "▒" to let you know memory is running low. If you need to input more than 79 steps, you should divide your calculation into two or more parts.
- 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 ◄ and ► to move the cursor to the location you want.
- Press DEL to delete the number or function at the current cursor position.
- Press SHIFT INS to change to an insert cursor [ ]. Inputting something while the insert cursor is on the display inserts the input at the insert cursor position.
- Press ◄, ►, 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 display 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 calculation display the editing screen for tat calculation.
- Pressing AC does not clear replay memory, so you can recall the last calculation even after you press AC.
- Replay memory capacity is 128 bytes for storage of both expressions and results.
- 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 (MODE) =
  When you change from one calculation mode to another
  When you turn off the calculator.

■ Error Locator

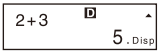
- Pressing ▶ or ◀ after an error occurs displays the calculation with the cursor positioned at the location where the error occurred.

■ Multi-statements

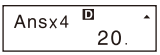
A multi-statements is an expression that is made up of two or more smaller expressions, which are joined using a colon(:).

- **Example**: To add 2+3 and then multiply the result by 4

2 + 3 ALPHA : Ans × 4 =



=



■ Exponential Display Formats

This calculator can display up to 10 digits. Larger values are automatically displayed using exponential notation. In the case of decimal values, you can select between two formats that determine at what point exponential notation is used.

- 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.

Fix	Sci	Norm
1	2	3

- Press 3 . On the format selection screen that appears, press 1 to select Norm 1 or 2 for Norm2.

- NORM 1

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

•NORM2

With NORM 2, exponential notation is automatically used for integer values with more than 10 digits and decimal values with more than nine 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 shown below.

- Display the selection screen.

  [1] [►]

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

  [1] (Dot): Period decimal point, comma separator

  [2] (Comma): 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 COMP

■ 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 → [sin] [(] [(-)] 1.23 [)]

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

  sin 2.34×10^{-5} → [sin] 2.34 [EXP] [(-)] 5

- **Example 1**: $3 \times (5 \times 0^{-9}) = 1.5\times10^{-8}$

  3 [×] 5 [EXP] [(-)] 9 [=]

- **Example 2**: 5x(9+7)=80

  5 [×] [(] 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.
- **Example 1**: $\frac{2}{3} + \frac{1}{5} = \frac{13}{15}$

  2 [a b/c] 3 [+] 1 [a b/c] 5 [=] | 13⌟15.

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

  3 [a b/c] 1 [a b/c] 4 [+]

  1 [a b/c] 2 [a b/c] 3 [=] | 4⌟11⌟12.

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

  2 [a b/c] 4 [=]

• **Example 4**: $\frac{1}{2}+1.6=2.1$ 1 [a b/c] 2 [+] 1.6 [=]

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

• Decimal ↔ Fraction Conversion

• **Example 1**: $2.75 = 2\frac{3}{4}$ (Decimal ↔ Fraction)

2.75 [=]	2.75
[a b/c]	2 ⌟3⌟4.
$=\frac{11}{4}$ [SHIFT] [d/c]	11⌟4.

• **Example 2**: $\frac{1}{2} \leftrightarrow 0.5$ (Fraction ↔ Decimal)

1 [a b/c] 2 [=]	1⌟2.
[a b/c]	0.5
[a b/c]	1⌟2.

• Mixed Fraction ↔Improper Fraction Conversion

• **Example**: $1\frac{2}{3} = \frac{5}{3}$

1 [a b/c] 2 [a b/c] 3 [=]	1⌟2⌟3.
[SHIFT] [d/c]	5⌟3.
[SHIFT] [d/c]	1⌟2⌟3.

• You can use the display setup (Disp) screen to specify the display 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.

Disp
1

• Display the selection screen.

[1]

• Press the number key ([1] or [2]) that corresponds to the setting you want to use.

[1] ($a^b/_c$) : Mixed fraction

[2] (d/c) : Improper fraction

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

■ Percentage Calculations

• **Example 1**: To calculate 12% of 1500 (180)

1500 [×] 12 [SHIFT] [%] [=]

• **Example 2**: To calculate what percentage of 880 is 660 (75%)

660 [÷] 880 [SHIFT] [%] [=]

• **Example 3**: To add 15% onto 2500 (2875)

2500 [×] [(] 1 [+] 15 [SHIFT] [%] [)] [=]

• **Example 4**: To discount 3500 by 25% (2625)

3500 [×] [(] 1 [−] 25 [SHIFT] [%] [)] [=]

• **Example 5**: If 300 grams are added to a test sample originally weighing 500 grams, what is the percentage increase in weight? (160%)

[(] 300 [+] 500 [)] [÷] 500 [SHIFT] [%] [=]

• **Example 6**: What is the percentage change when a value is increased from 40 to 46? How about to 48? (15%, 20%)

[(] 46 [−] 40 [)] [÷] 40 [SHIFT] [%] [=]

[(] 48 [−] 40 [)] [÷] 40 [SHIFT] [%] [=]

■ 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 [=]	2.258
[SHIFT] [°’”]	2°15°28.8
[°’”]	2.258

• **Example 2**: To perform the following calculation:
12°34'56"x3.45

12 [°’”] 34 [°’”] 56 [°’”] [×]

3.45 [=]	43°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.

Fix	Sci	Norm
1	2	3

• 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

• **Example 1**: 200 ÷ 7 x 14 =

200 [÷] 7 [×] 14 [=]	400.
(Specifies three decimal places.) [MODE] ····· 1 (Fix) 3	200÷7×14 FIX 400.000
(Internal calculation continues using 12 digits.) 200 [÷] 7 [=]	28.571
[×] 14 [=]	400.000

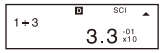
The following performs the same calculation using the specified number of decimal places.

	200 ÷ 7 =	28.571
(Internal rounding)	SHIFT RND	28.571
	× 14 =	399.994

- Press MODE . . . . 3 (Norm) 1 to clear the Fix specification.
- **Example 2**: 1 ÷ 3, displaying result with two significant digits(Sci 2)

MODE ····· 2 (Sci) 2

1 ÷ 3 =



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

Memory Calculations COMP

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 is automatically updates Answer Memory contents by storing the result.
- In addition to = . Answer Memory contents are also updated with result whenever you press SHIFT , %, M+ SHIFT M− , or SHIFT STO followed by a letter(A through F, or 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 changed if the operation performed by any of the above key operations results in an error.

■ Consecutive Calculations

- You can use the calculation result that is currently on the display as the first value of you next calculation.
- The result of a calculation can also be used with a subsequent Type A function (x^2, x^3, x^{-1}, x!), +, −, ^(x^y), $\sqrt[x]{\ }$, ×, ÷, nPr, nCr and °, ′, ″.

■ 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 independent memory (M), input [0] [SHIFT] [STO] [M] (M+).

- **Example**:

23 + 9 = 32	23 [+] 9 [SHIFT] [STO] [M]
53 − 6 = 47	53 [−] 6 [M+]
−) 45 × 2 = 90	45 [×] 2 [SHIFT] [M-]
(Total) −11	[RCL] [M]

■ 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) [=]

• **Example**: 193.2÷23=8.4

193.2÷28=6.9

193.2 [SHIFT] [STO] [A] [÷] 23 [=]

[ALPHA] [A] [÷] 28 [=]

Scientific Function Calculations COMP

Use the [MODE] key to enter the COMP Mode when you want to perform scientific function calculation.

COMP..... [MODE] [1]

- Certain types of calculations may take a long time to complete.
- What for the result to appear on the display before starting the next calculation.
- π=3.141592654

■ Trigonometric/Inverse Trigonometric Functions

- To change the default angle unit(degrees, radians, grads), press the [MODE] key a number of times until you reach the angle nuit setup screen shown below.

Deg	Rad	Gra
1	2	3

- Press the number key([1], [2], or [3]) that corresponds to the angle unit you want to use.

$(90 = \frac{\pi}{2}\text{radians} = 100\text{ grads})$

- **Example 1**: sin 63° 52'41" =0.897859012

[MODE] ····· [1] (Deg)

[sin] 63 [°,"] 52 [°,"] 41 [°,"] [=]

• **Example 2**: $\cos\left(\frac{\pi}{3}\text{ rad}\right)=0.5$

MODE ····· 2 (Rad)

cos (SHIFT π ÷ 3) =

• **Example 3**: $\cos^{-1}\frac{\sqrt{2}}{2}=0.25\,\pi\,(\text{rad})\left(=\frac{\pi}{4}\,(\text{rad})\right)$

MODE ····· 2 (Rad)

SHIFT cos⁻¹ (√ 2 ÷ 2) =

Ans ÷ SHIFT π =

• **Example 4**: $\tan^{-1}0.741=36.53844577$

MODE ····· 1 (Deg)

SHIFT tan⁻¹ 0.741 =

■ Hyperbolic/Inverse Hyperbolic Functions

• **Example 1**: $\sinh 3.6=18.28545536$

hyp sin 3.6 =

• **Example 2**: $\sinh^{-1}30=4.094622224$

hyp SHIFT sin⁻¹ 30 =

■ Common and Natural Logarithms/ Antilogarithms

• **Example 1**: $\log 1.23=0.089905111$

log 1.23 =

• **Example 2**: $\ln 90\ (=\log_e 90)=4.49980967$

ln 90 =

$\ln e=1$ ln ALPHA e =

• **Example 3**: $e^{10}=22026.46579$ SHIFT eˣ 10 =

• **Example 4**: $10^{1.5}=31.6227766$

SHIFT 10ˣ 1.5 =

• **Example 5**: $2^4=16$ 2 ^ 4 =

■ Square Roots, Cube Roots, Roots, Squares, Cubes, Reciprocals, Factorials, Random Numbers, π and Permutation/Combination

- **Example 1**: $\sqrt{2}+\sqrt{3}\times\sqrt{5}=5.287196909$

  [√] 2 [+] [√] 3 [×] [√] 5 [=]

- **Example 2**: $\sqrt[3]{5}+\sqrt[3]{-27}=-1.290024053$

  [SHIFT] [∛] 5 [+] [SHIFT] [∛] [(] [(-)] 27 [)] [=]

- **Example 3**: $\sqrt[7]{123}\ (=123^{\frac{1}{7}})=1.988647795$

  7 [SHIFT] [$\sqrt[x]{\ }$] 123 [=]

- **Example 4**: $123+30^2=1023$ 123 [+] 30 [x^2] [=]

- **Example 5**: $12^3=1728$ 12 [x^3] [=]

- **Example 6**: $\dfrac{1}{\frac{1}{3}-\frac{1}{4}}=12$

  [(] 3 [x^{-1}] [−] 4 [x^{-1}] [)] [x^{-1}] [=]

- **Example 7**: $8!=40320$ 8 [SHIFT] [x!] [=]

- **Example 8**: To generate a random number between 0.000 and 0.999

  [SHIFT] [Ran#] [=] 0.664

  (The above value is a sample only. Results differ each time.)

- **Example 9**: $3\pi=9.424777961$ 3 [SHIFT] [π] [=]

- **Example 10**: To determine how many different 4-digit values can be produced using the numbers 1 through 7
  - Numbers cannot be duplicated within the same 4-digit value (1234 is allowed, but 1123 is not). (840)

  7 [SHIFT] [nPr] 4 [=]

- **Example 11**: To determine how many different 4-member groups can be organized in a group of 10 individuals (210)

  10 [nCr] 4 [=]

■ Angle Unit Conversion

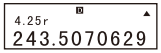
- Press SHIFT DRG▸ to display the following menu.

D	R	G
1	2	3

- Press 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) =



■ Coordinate 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 , 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 ,$\sqrt{3}$) to polar coordinates(r , θ)(Rad)

r =2 Pol(1 , √ 3) =

θ =60 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

$\longrightarrow 56.088 \times 10^{3}$(km) 56088 = ENG

• **Example 2**: To convert 0. 08125 grams to milligrams
→ 81.25×10^{-3}(mg) 0.08125 [=] [ENG]

Statistical Calculations

SD
REG

Standard Deviation

SD

Use the [MODE] key to enter the SD Mode when you want to perform statistical calculations using standard deviation.

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, Σx^2, $\bar{x}$, σn and $\sigma n-1$, 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]
$\bar{x}$	[SHIFT] [S-VAR] [1]
$x\sigma n$	[SHIFT] [S-VAR] [2]
$x\sigma n-1$	[SHIFT] [S-VAR] [3]

• **Example**: To calculate $\sigma n-1$, σn, $\bar{x}$, n, Σx, and Σx^2 for the following data: 55, 54, 51, 55, 53, 53, 54, 52

In the SD Mode:

SHIFT CLR 1 (Scl) = (Stat clear)

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 DT 54 DT 52 DT

Sample Standard Deviation ($x\sigma n-1$)=1.407885953 SHIFT S-VAR 3 =

Population Standard Deviation ($x\sigma n$)=1.316956719 SHIFT S-VAR 2 =

Arithmetic Mean ($\bar{x}$)=53.375 SHIFT S-VAR 1 =

Number of Data (n)=8 SHIFT S-SUM 3 =

Sum of Values ($\sum x$)=427 SHIFT S-SUM 2 =

Sum of Squares of Values ($\sum x^2$)=22805 SHIFT S-SUM 1 =

Data Input Precautions

- DT DT input the same data twice.
- You can also input multiple entries of the same data using SHIFT : . To input the data 110 ten times, for example, press 110 SHIFT : 10 DT .
- You can perform the above key operations in any order, and not necessarily that shown above.
- While inputting data or after inputting data is complete, you can use the ▲ and ▼ keys to scroll through data you have input. If you input multiple entries of the same data using SHIFT : 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 = key to replace the old value with the new one.
- 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 [DT] key to display the screen shown below.

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.

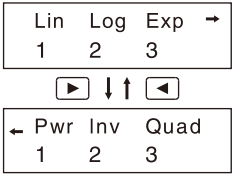
- To delete data you have just input, press [SHIFT] [CL].

Regression Calculations REG

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.



- 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 〈y-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
Σx^3	SHIFT S-SUM ► ► 1
Σx^2y	SHIFT S-SUM ► ► 2
Σx^4	SHIFT S-SUM ► ► 3
$\bar{x}$	SHIFT S-VAR 1
$x\sigma n$	SHIFT S-VAR 2
$x\sigma n{-}1$	SHIFT S-VAR 3
$\bar{y}$	SHIFT S-VAR ► 1
$y\sigma n$	SHIFT S-VAR ► 2
$y\sigma n{-}1$	SHIFT S-VAR ► 3
Regression coefficient A	SHIFT S-VAR ► ► 1
Regression coefficient B	SHIFT S-VAR ► ► 2

Regression calculation other than quadratic regression	
Correlation coefficient r	SHIFT S-VAR ▶ ▶ 3
$\hat{x}$	SHIFT S-VAR ▶ ▶ ▶ 1
$\hat{y}$	SHIFT S-VAR ▶ ▶ ▶ 2

- The following table shows the key operations you should use to recall results in the case of quadratic regression.

To recall this type of value:	Perform this key operation:
Regression coefficient C	SHIFT S-VAR ▶ ▶ 3
$\hat{x}_1$	SHIFT S-VAR ▶ ▶ ▶ 1
$\hat{y}_2$	SHIFT S-VAR ▶ ▶ ▶ 2
$\hat{y}$	SHIFT S-VAR ▶ ▶ ▶ 2

- 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**: Atmospheric Pressure vs. Temperature

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

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 18 ℃ and temperature at 1000 hPa. Finally, calculate the coefficient of determination (r^2) and sample covariance $\left(\frac{\Sigma xy - n \cdot \bar{x} \cdot \bar{y}}{n-1}\right)$

In the REG Mode:

1 (Lin)

SHIFT CLR 1 (Scl) = (Stat clear)

10 [,] 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).

15 [,] 1005 [DT]

20 [,] 1010 [DT] 25 [,] 1011 [DT]

30 [,] 1014 [DT]

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℃ = 1007.48

18 [SHIFT] [S-VAR] [▶] [▶] [▶] [2] [=]

Temperature at 1000 hPa = 4.642857143

1000 [SHIFT] [S-VAR] [▶] [▶] [▶] [1] [=]

Coefficient of Determination = 0.965517241

[SHIFT] [S-VAR] [▶] [▶] [3] [x^2] [=]

Sample Covariance = 35 [(] [SHIFT] [S-SUM] [▶] [3] [−]

[SHIFT] [S-SUM] [3] [×] [SHIFT] [S-VAR] [1] [×]

[SHIFT] [S-VAR] [▶] [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

Perform quadratic regression to determine the regression formula terms for the data nearby. Next, use the regression formula to estimate the values for $\hat{y}$ (estimated value of y) for xi=16 and $\hat{x}$ (estimated value of x) for yi=20.

In the REG Mode:

[►] [3] (Quad)

[SHIFT] [CLR] [1] (Scl) [=] (Stat clear)

29 [,] 1.6 [DT] 50 [,] 23.5 [DT]

74 [,] 38.0 [DT] 103 [,] 46.4 [DT]

118 [,] 48.0 [DT]

Regression Coefficient A=-35.59856934

[SHIFT] [S-VAR] [►] [►] [1] [=]

Regression Coefficient B=1.495939413

[SHIFT] [S-VAR] [►] [►] [2] [=]

Correlation Coefficient C=6.71629667x10^{-3}

[SHIFT] [S-VAR] [►] [►] [3] [=]

$\hat{y}$ when xi is 16=-13.38291067

16 [SHIFT] [S-VAR] [►] [►] [►] [3] [=]

$\hat{x}_1$ when yi is 20=47.14556728

20 [SHIFT] [S-VAR] [►] [►] [►] [1] [=]

$\hat{x}_2$ when yi is 20=175.5872105

20 [SHIFT] [S-VAR] [►] [►] [►] [2] [=]

Data Input Precautions

- [DT] [DT] input the same data twice.
- You can also input multiple entries of the same data using [SHIFT] [;] . To input the data"20 and 30"five times, for example, press20 [;]30 [SHIFT] [;] 5 [DT] .
- The above results can be obtained in any order, and not necessarily that 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.

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

■ 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.

Ma ERROR

- **Cause**
  - Calculation result is outside the allowable calculation range.
  - Attempt to perform a function calculation using a value that exceeds the allowable input range.
  - Attempt to perform an illogical 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.

Stk ERROR

- **Cause**
  - 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.

Syn ERROR

- **Cause**
  - Attempt to perform an illegal mathematical operation.
- **Action**
  - Press [◄] or [►] to display the calculation with the cursor located at the location of the error. Make necessary corrections.

Arg ERROR

- **Cause**
  - Improper use of argument
- **Action**
  - Press [◄] or [►] to display the location of the cause of the error and make required corrections.

■ Order of Operations

Calculations are performed in the following order of precedence.

① Coordinate transformation: Pol (x, y) , Rec (r, θ)

② Type A functions:
With these functions, the value is entered and then the function key is pressed.
x^3 , x^2 , x^{-1} , $x!$, ° ' "
$\hat{x}$, $\hat{x}1$, $\hat{x}2$, $\hat{y}$
Angle unit conversions (DRG►)

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

④ $a\,b/c$

⑤ Abbreviated multiplication format in front of π, memory name, or variable name: 2π, 5A, πA etc.

⑥ Type B functions:
With these functions, the function key is pressed and then the value is entered.
$\sqrt{\ }$, $\sqrt[3]{\ }$, log, ln, e^x, 10^x, sin, cos, tan, $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$, sinh, cosh, tanh, $\sinh^{-1}$, $\cosh^{-1}$ $\tanh^{-1}$, (-)

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

⑧ Permutation and combination: nPr、nCr

⑨ × , ÷

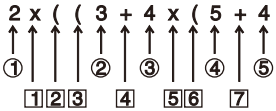
⑩ + , −

- Operations of the same precedence are performed from right to left. $e^{\wedge}\ln\sqrt{\ }120 \rightarrow e^{\wedge}\{\ln(\sqrt{\ }120)\}$
  Other operations are performed from left to right.
- Operations enclosed in parentheses are performed first.

■ Stacks

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

- **Example:**



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.

Functions	Input Range	
$\sin x$	DEG	$0 \leqq \lvert x \rvert \leqq 4.499999999 \times 10^{10}$
	RAD	$0 \leqq \lvert x \rvert \leqq 785398163.3$
	GRA	$0 \leqq \lvert x \rvert \leqq 4.499999999 \times 10^{10}$
$\cos x$	DEG	$0 \leqq \lvert x \rvert \leqq 4.500000008 \times 10^{10}$
	RAD	$0 \leqq \lvert x \rvert \leqq 785398164.9$
	GRA	$0 \leqq \lvert x \rvert \leqq 5.000000009 \times 10^{10}$
$\tan x$	DEG	Same as $\sin x$, except when $\lvert x \rvert = (2n-1) \times 90$.
	RAD	Same as $\sin x$, except when $\lvert x \rvert = (2n-1) \times \pi/2$.
	GRA	Same as $\sin x$, except when $\lvert x \rvert = (2n-1) \times 100$.
$\sin^{-1} x$	$0 \leqq \lvert x \rvert \leqq 1$	
$\cos^{-1} x$		
$\tan^{-1} x$	$0 \leqq \lvert x \rvert \leqq 9.999999999 \times 10^{99}$	
$\sinh x$	$0 \leqq \lvert x \rvert \leqq 230.2585092$	
$\cosh x$		
$\sinh^{-1} x$	$0 \leqq \lvert x \rvert \leqq 4.999999999 \times 10^{99}$	
$\cosh^{-1} x$		
$\tanh x$	$0 \leqq \lvert x \rvert \leqq 9.999999999 \times 10^{-1}$	
$\tanh^{-1} x$		
$\log x / \ln x$	$0 < x$	
10^x	$-9.999999999 \times 10^{99} \leqq x \leqq 99.99999999$	
e^x	$-9.999999999 \times 10^{99} \leqq x \leqq 230.2585092$	
$\sqrt{x}$	$0 \leqq x < 1 \times 10^{100}$	
x^2	$\lvert x \rvert < 1 \times 10^{50}$	
$1/x$	$\lvert x \rvert < 1 \times 10^{100}$; $x \neq 0$	
$\sqrt[3]{x}$	$\lvert x \rvert < 1 \times 10^{100}$	
$x!$	$0 \leqq x \leqq 69$ (x is an integer)	

Functions	Input Range
nPr	$0 \leqq n \leqq 99,\ r \leqq n$ (n, r are integers) $1 \leqq \{n!/(n-r)!\} \leqq 9.999999999 \times 10^{99}$
nCr	$0 \leqq n \leqq 99,\ r \leqq n$ (n, r are integers)
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 ⟷ Sexagesima Conversions $0^\circ 0' 0'' \leqq \lvert X\rvert \leqq 999999^\circ 59' 59''$
$\wedge\sqrt{x^y}$	$X > 0$: $-1 \times 10^{100} < y \log x < 100$ $x=0$: $y>0$ $x<0$: $y=n, \frac{1}{2n+1}$ (n is an integer) However: $-1 \times 10^{100} < y \log \lvert x\rvert < 100$
$\sqrt[x]{y}$	$y>0$: $x \neq 0$ $-1 \times 10^{100} < 1/x \log y < 100$ $Y=0$: $x>0$ $y<0$: $x=2n+1, \frac{1}{n}$ ($n \neq 0$, 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 (REG)	$\lvert X\rvert < 1 \times 10^{50}$ $x\sigma n$, $y\sigma n$, x, y $\lvert y\rvert < 1 \times 10^{50}$ A,B, r : $n \neq 0$ $\lvert n\rvert < 1 \times 10^{100}$ $x\sigma n-1$, $y\sigma n-1$: $n \neq 0,1$

★For a single calculation, calculation error is ±1 at the 10th digit. (In the case of exponential display, calculation error is ±1 at the last 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 $\wedge$ $\sqrt[x]{y}$, $\sqrt[x]{y}$, $x!$, $\sqrt[3]{\ }$, nPr, nCr)

In the vicinity of a function's singular point and point of inflection, errors are cumulative and may become large.