CASIO

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CASIO

Introduction

Congratulations on your selection of a CASIO Scientific Calculator. This calculator features a 16-column dot matrix display that is capable of displaying alpha characters along with values and indicators. In addition, you also get the following advanced features and functions.

- **Simplified formula input**
  Just input formulas as they are written.
- **Powerful calculation modes**
  Select the mode that matches the type of calculation you want to perform.
- **Replay Function**
  Press a key and the last formula you executed reappears on the display for correction or other editing.
- **Fraction calculations**
  Input and calculate fractions without converting them to decimal values.
- **Formula Memory Function**
  Store often-used calculations for recall with the touch of a key.

To get the most out of your calculator, be sure to read this manual to become familiar with its many powerful capabilities. Keep the manual on hand for later reference when you need it.

Important!

Be sure to keep physical records of all important data!

The memory capacity of the unit makes it possible to store data. You should note, however, that low battery power can cause the data stored in memory to be corrupted or even lost entirely. Stored data can also be affected by strong electrostatic charge or strong impact.

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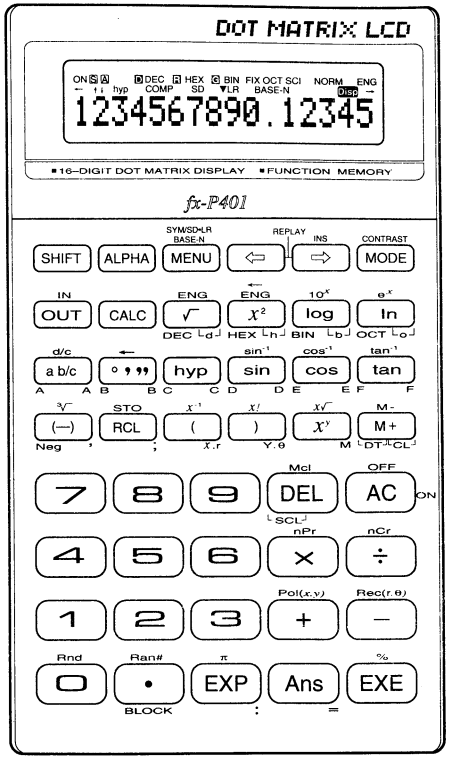

■ KEY INDEX

Refer to the pages noted below to find out information on each key.

GENERAL KEYS

Key	Function	Page
[ON]	Power ON key	8
[OFF]	Power OFF key	8
[EXE]	Execute key	16
[AC]	All clear key	18
[CONTRAST]	Contrast key	13
[◁] - [▷]	Cursor/Replay keys	13, 19, 32

EDIT KEYS

Key	Function	Page
[INS]	Insert key	20
[DEL]	Delete key	19
[SHIFT]	Shift key	8
[MODE]	Mode key	8
[ALPHA]	Alpha key	8
[MENU]	Menu key	43, 45, 53, 57

NUMERIC KEYS

Key	Function	Page
[0] ~ [9], [•]	Number keys	9, 10, 24
[+], [−], [×], [÷]	Arithmetic operator keys	24
[(], [)]	Parentheses keys	25

MEMORY KEYS

Key	Function	Page
Mcl	Memory clear key	23, 30
M	Independent memory key	22, 30
M+	Memory plus key	22, 30
M−	Memory minus key	22, 30
A, B, C, D, E, F, M, X, Y	Variable memory keys	20, 30, 33, 66
RCL	Memory recall key	21, 30
STO	Memory store key	21, 30

FORMULA MEMORY KEYS

Key	Function	Page
OUT, IN, CALC	Formula memory function keys	66

FUNCTION KEYS

Key	Function	Page
=	Equal key	22, 66
Rnd	Rounding key	29
Ran#	Random number key	38
EXP	Exponent key	18, 24
π	Pi key	35
:	Multistatement key	33
Pol(x,y), Rec(r,θ)	Coordinate transformation keys	39
nPr	Permutation key	41

Key	Function	Page
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Ans	Answer key	31, 61, 63, 65
√	Square root key	38
ENG, SHIFT ENG	Engineering keys	28, 29, 44
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10^x	Antilogarithm key	36
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e^x	Exponential key	36
a b/c, d/c	Fraction keys	42
°′″, SHIFT °′″	Sexagesimal notation/decimal notation conversion keys	35, 40
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sin, cos, tan $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$	Trigonometric/Inverse trigonometric function keys	35, 37
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$\sqrt[3]{}$	Cube root key	38
x^{-1}	Inversion key	38
$x!$	Factorial key	38
x,r, Y,θ	Coordinate transformation keys	39
x^y	Power key	36
$\sqrt[x]{}$	Root key	36

BASE-N CALCULATION KEYS

Key	Function	Page
[BLOCK]	Block display key	47
[DEC]	Decimal key	45
[HEX]	Hexadecimal key	45
[BIN]	Binary key	45, 47
[OCT]	Octal key	45
[d]	Decimal value key	45
[h]	Hexadecimal value key	45
[b]	Binary value key	45
[o]	Octal value key	45
[Neg]	Negative key	49
[A], [B], [C], [D], [E], [F]	Hexadecimal values	46

STATISTICS CALCULATION KEYS

Key	Function	Page
[Scl]	Statistical memory clear key	52, 56
[DT]	Statistics data input key	52, 56
[CL]	Statistics data delete key	53
[,]	Comma key	56
[;]	Semicolon key	52, 56

❑ Handling precautions

Warning!
Never expose the calculator or batteries to direct heat or flame.

- Replace the battery at least once every 2 years, no matter how much you use the calculator during that time. A dead battery can cause serious damage to the interior of the calculator, and so you should change the battery immediately after they appear to weaken.
- Avoid using or storing the calculator under very low temperatures, which can cause the display response to slow down or fail entirely. Low temperature can also shorten battery life.
- Avoid using or storing the calculator under very high temperatures, such as direct sunlight, in a closed automobile, or near a heater.
- Avoid using or storing the calculator where there is high humidity or large amounts of dust. Never allow liquids to come into contact with the calculator.
- Avoid dropping the calculator or otherwise subjecting it to strong impact.
- Never bend or twist the calculator. Carrying the calculator in your back pocket can subject it to abnormal bending and twisting.
- Never try to take the calculator apart.
- Do not press the keys of the calculator with a pen, pencil, or other sharp object.
- To clean the calculator, wipe it off with a soft cloth.
  When necessary, you can wipe the exterior with a soft cloth that was dipped in a weak solution of a mild neutral detergent and water.
- Never use volatile liquids such as lacquer thinner or benzine to clean the calculator.
- In no event will CASIO and its suppliers be liable to you or any other person for any damages, including any incidental or consequential expenses, lost profits, lost savings or any other damages arising out of the use of this product.

Operational Flow

Be sure to read this part of the manual. It contains important information that will be useful when you use this calculator.
Unlike other types of calculators, the scientific calculator is capable of performing a wide variety of complex calculations. Because of this the keys of a scientific calculator are assigned more than one function.
The following explains the meanings of the key markings and when each of the functions is available. Reading the section is especially important for those who have never before used a scientific calculator.

● Power ON/OFF

To switch power on, press [AC]ON.
To switch power off, press [SHIFT] [OFF AC].
* Your unit will automically shut itself off after six minutes of inactivity.

● Key Markings

Most keys are assigned more than one function. For example, the key illustrated below is capable of performing four different functions.

Note that key functions are color coded. The following table shows what each color means.

Color	Meaning
Orange	Press [SHIFT] first
Red	Press [ALPHA] first
Green	Available in the BASE-N Mode only

This means that the different functions of the key illustrated above are available as follows.

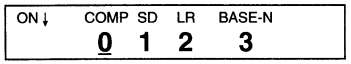
Function	Availability
(–)	When key is normally pressed
$\sqrt[3]{\ }$	Following [SHIFT]
,	Following [ALPHA]
Neg	In the BASE-N Mode only

● Modes

You must tell the calculator what type of calculation you want to perform before you actually start. To do this, you enter the appropriate *mode*. There are three types of modes: *calculation modes*, *angle unit modes*, and *display modes*.
To select a mode, you use the special *mode menus*.

■ To select a calculation mode

1. Press the [MODE] key to display the first mode menu.



* Note that one of the menu numbers is underlined. This underline indicates the currently selected mode.

2. Press the number key that corresponds to the mode you want to select. The following describes each mode.

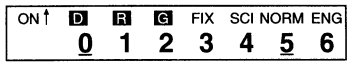
- [0] — **COMP Mode**
  This is the COMPutation Mode. Use it to perform standard calculations, including those that involve scientific functions. When you enter this mode, the currently set angle unit mode (**page 10**) remains in effect. You are in this mode whenever the indicator "COMP" is shown on the display.
- [1] — **SD Mode**
  This is the Standard Deviation Mode. Use it to perform single-variable statistical calculations. You are in this mode whenever the indicator "SD" is shown on the display.
- [2] — **LR Mode**
  This is the Linear Regression Mode. Use it to perform paired-variable statistical calculations. You are in this mode whenever the indicator "LR" is shown on the display.
- [3] — **BASE-N Mode**
  Use this mode to perform calculations, conversions, and logical operations that involve binary, octal, decimal, and hexadecimal values. You are in this mode whenever the indicator "DEC," "HEX," "BIN," or "OCT" is shown on the display.

Important!

- The COMP, SD, LR, and BASE-N modes cannot be used in combination. You must leave a mode to enter a new one.

■ To select an angle unit/display mode

1. Press the [MODE] key twice to display the second mode menu.



* Note that one of the menu numbers is underlined. This underline indicates the currently selected mode.

2. Press the number key that corresponds to the mode you want to select. The following describes each mode.

• [0] — **DEG Mode**
This is the DEGree Mode, which means that the unit of angular measurement is degrees. You are in this mode whenever the indicator "D" is shown on the display.

• [1] — **RAD Mode**
This is the RADian Mode, which means that the unit of angular measurement is radians. You are in this mode whenever the indicator "R" is shown on the display.

• [2] — **GRA Mode**
This is the GRAd Mode, which means that the unit of angular measurement is grads. You are in this mode whenever the indicator "G" is shown on the display.

• [3] — **FIX Mode**
In the FIX Mode, the number of decimal places are FIXed at a specific number. You are in this mode whenever the indicator "FIX" is shown on the display.
When you select this mode from the second mode menu, a prompt appears asking "FIX 0 ~ 9?" Input a number from 0 to 9 to specify the number of decimal places. The following operation, for example, specifies three decimal places:
[MODE] [MODE] [3] [3]

• [4] — **SCI Mode**
This is the SCIentific Mode, in which the number of significant digits are set at a specific number. You are in this mode whenever the indicator "SCI" is shown on the display.
When you select this mode from the second mode menu, a prompt appears asking "SCI 0 ~ 9?" Input a number from 0 to 9 to specify the number of significant digits. The following operation, for example, specifies five significant digits:
[MODE] [MODE] [4] [5]

• [5] — **NORM Mode**
Selecting this mode exits the FIX and SCI modes (clearing any number of decimal place and significant digit specifications), and returns values back to NORMal. You are in this mode whenever the indicator "NORM" is shown on the display.
Note that there are actually two NORM modes: NORM1 and NORM2, which you can select between using the procedure described on **page 12**.
In the NORM1 Mode, values less than 10^{-1} and greater than 10^{9} are displayed in exponential format.
In the NORM2 Mode, values less than 10^{-8} and greater than 10^{9} are displayed in exponential format.

• [6] — **ENG Mode**
This is the ENGineering Mode, which you can use in combination with the COMP, SD, and LR modes to perform calculations with engineering notation. You are in this mode whenever the indicator "ENG" is shown on the display. For full details on using this mode, see **page 43** of this manual.

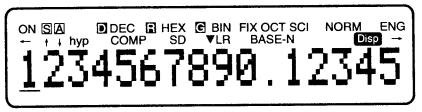
Note

* You can use any of the modes available in the second mode menu in combination with the COMP, SD and LR calculation modes in the first mode menu. Note that you cannot use second mode menu modes in combination with the BASE-N Mode.
* Your mode settings are retained whenever you switch power off and then on again.

● Reading the Display

■ Display Symbols

The symbols on the display show you the current status of the calculator at a glance.



ON	:	Power is on.
S	:	SHIFT key was pressed.
A	:	ALPHA key was pressed.
D	:	Angle unit = degrees
R	:	Angle unit = radians
G	:	Angle unit = grads
DEC	:	Decimal value input (BASE-N Mode)
HEX	:	Hexadecimal value input (BASE-N Mode)
BIN	:	Binary value input (BASE-N Mode)
OCT	:	Octal value input (BASE-N Mode)
FIX	:	Number of decimal places fixed at a specific value.
SCI	:	Number of significant digits fixed at a specific value.
NORM	:	NORM1 or NORM2 Mode
ENG	:	Engineering notation mode
hyp	:	hyp key was pressed.
COMP	:	COMP Mode
SD	:	SD Mode
LR	:	LR Mode
BASE-N	:	BASE-N Mode
Disp	:	Indicates displayed value is an intermediate result.
↑ , ↓	:	Indicates there is more information or another menu above or below.
← , →	:	Indicates that there is more data off the left or right of the display.
▼	:	Separator for binary and octal values.

■ Exponential Display

Calculation results are displayed up to 10 digits. Values that require more places, however, are automatically displayed in exponential format.

(A) 10^{-2} (0.01) > $|x|$, $|x| \leqq 10^{10}$ NORM1

(B) 10^{-9} (0.0000000001) > $|x|$, $|x| \leqq 10^{10}$ NORM2

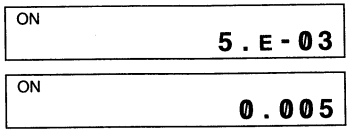
There are two types of exponential display available: NORM1 and NORM2.

To enter the NORM1 Mode, press [MODE] [MODE] [5] [1].

To enter the NORM2 Mode, press [MODE] [MODE] [5] [2].

There is nothing to indicate whether you are in the NORM1 or NORM2 Mode. You can use the following operation to confirm which NORM Mode you are in.

1 [÷] 2 0 0 [EXE]

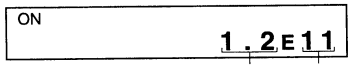


NORM1 Mode :

NORM2 Mode :

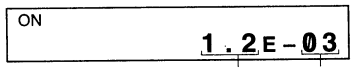
All of the calculation examples shown in this manual are performed using the NORM1 Mode unless specifically noted otherwise.

* Reading the Exponential Display



Integer Exponent

→ 1.2×10^{11} → 120,000,000,000 (120billion)



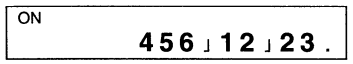
Integer Exponent

→ 1.2×10^{-3} → 0.0012

■ Special Display Formats

Note that special display formats are used for fractional, hexadecimal, and sexagesimal (base 60) values.

• Fraction Display Format

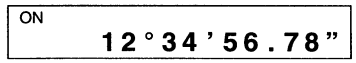


[Example]
To display 456 $\frac{12}{23}$

• Hexadecimal Display Format

[Example]
To display ABCDEF12H
= 1412567278D

• Sexagesimal Display Format



[Example]
To display 12°34'56.78"

* In addition, there are a number of other special symbols that the calculator uses to represent certain operations inside of formulas. These are explained in detail in other sections of this manual.

● Before assuming malfunction. . .

If the calculator starts to produce strange or unexpected results, or if your calculations produce errors, you may be in the wrong mode. Use the following procedure to get the calculator back to the its initial mode settings.

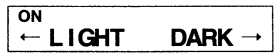
1. Press [ALPHA] [Mcl] to clear all data currently stored in memory.
2. Press [MODE] [○] to enter the COMP Mode.
3. Press [MODE] [MODE] [○] to specify the DEG Mode.
4. Press [MODE] [MODE] [5] [1] to specify NORM 1.

Next, specify the modes you need to perform your calculation and try again.

● Contrast Adjustment

Use the following procedure to adjust the display contrast to the level you want.

① Press [SHIFT] [MODE] to display the contrast adjustment screen.



② Press [◁] to make the display characters lighter, or [▷] to make them darker.

③ Press [AC] to complete the procedure.

* If the display remains dim even after adjust the contrast, it may mean that battery power is low. Use the procedures on **page 14** to replace the battery as soon as possible.

Power Supply

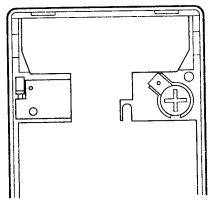
This calculator is powered by a single G13 Type (SR44 or LR44) battery. As battery power weakens, the characters on the display become dim and difficult to read (even after you adjust the contrast as described on **page 13**). When this happens, replace the battery as soon as possible.

Important!

* Be sure to replace the battery at least once every two years, regardless of how much the calculator is used during that time. An old battery may leak, seriously damaging the interior of the calculator.
* The battery that comes installed in the calculator when you purchase it is for factory test purposes, and so it may not provide a full service life.
* All data stored in the memory of the calculator is lost when you replace the battery. Be sure to make a note of any important data before you replace the battery.

■ To replace batteries

1. Press [SHIFT] [OFF] to switch power off.
2. Remove the screws that hold the back cover in place, and then remove the cover.
3. Remove the old battery by turning the battery compartment face down and lightly tapping the calculator.
4. Wipe off the surfaces of a new battery with a soft, dry cloth, and install the battery with its positive (+) side facing up (so you can see it).
5. Replace the back cover and secure it in place with the screw.
6. Press [AC] to switch power on.



Note

The calculator automatically resets its memory whenever batteries are removed for longer than two or three minutes. The following are the initial settings of the calculator whenever its memory is reset.

- COMP Mode
- DEG Mode
- NORM1 Mode
- Dec (for BASE-N Mode)
- Variable memory cleared
- Ans memory cleared
- CALC memory cleared
- Input buffer cleared
- Maximum (darkest) contrast setting

Important!

If you allow battery power to drop too low, memory contents may become corrupted or lost completely. Be sure to replace the battery as soon as you notice the display becoming dim.

- Always be sure to load the battery with its positive (+) side facing up (so you can see it).

- Never try to charge the battery, take it apart, or allow it to become shorted. Keep batteries away from flame and direct heat at all times.

- Keep batteries out of the reach of small children. If swallowed, consult with your physician immediately.

● Auto Power Off Function

To conserve power, the calculator automatically switches itself off automatically if no key operation is performed for about six minutes. Data stored in memory and mode settings are retained even when power is switched off by this function. To restore power, press the [AC]ON key.

Before Beginning Calculations....

● Inputting Calculations

When you are ready to input a calculation, first press [AC] to clear the display. Next, input your calculation formulas exactly as they are written, from left to right, and press [EXE] to obtain a result.

Example $2 \times (5 + 4) \div 3 =$

[AC] [2] [×] [(] [5]
[+] [4] [)] [÷] [3]
[EXE]

```
2×(5+4)÷3_
                6.
```

● Calculation priority sequence

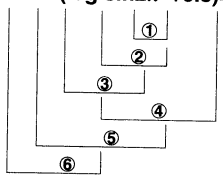
This calculator employs true algebraic logic to calculate the parts of a formula in the following order:

① Coordinate transformation / integration
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^2, x^{-1}, $x!$, °' ", ENG symbols
③ Power / root
x^y, $\sqrt[x]{\ }$
④ Fractions
$a^{b/c}$
⑤ Abbreviated multiplication format in front of π, memory or parenthesis
2π, 5π, πR, 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, $\sinh^{-1}$, $\cosh^{-1}$, $\tanh^{-1}$, (–), parenthesis, (following in BASE-N calculations only) d, h, b, o, Neg, Not
⑦ Abbreviated multiplication format in front of Type B functions
$2\sqrt{3}$, A log2, etc
⑧ Permutation, combination
nPr, nCr
⑨ ×, ÷
⑩ +, –
⑪ and
⑫ or, xor, xnor
] BASE-N calculations only.

* When functions with the same priority are used in series, execution is performed from right to left
[$e^x \ln \sqrt{120}$ ' $e^x\{\ln(\sqrt{120})\}$]

* Otherwise, execution is from left to right.
* Anything contained within parentheses receives highest priority.

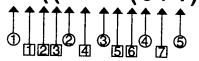
Example **2+3×(log sin2π² +6.8)=22.07101691(in the "Rad" mode)**



● Number of stacks

This calculator uses a memory known as a "stack" for temporary storage of low priority numeric values and commands (functions, etc). The numeric value stack has 10 levels, while the command stack has 24. If a formula exceeds the stack space available, a stack error (Stk ERROR) message appears on the display.

Example **2×((3+4×(5+4)÷3)÷5)+8=14**



Numeric stack value

①	2
②	3
③	4
④	5
⑤	4
⋮	

Command stack

1	×
2	(
3	(
4	+
5	×
6	(
7	+
⋮	

* Calculations are performed in sequence, with the highest priority operation first. Once a calculation is executed, it is cleared from the stack.

● Number of input / output digits and calculation digits

The allowable input / output range (number of digits) is 10 digits for a mantissa, and 2 digits for an exponent. Calculations are performed internally with 12 digits for the mantissa and 2 digits for the exponent.

Example $3 \times 10^5 \div 7 =$

[3] [EXP] [5] [÷] [7] [EXE]

42857.14286

[3] [EXP] [5] [÷] [7]
[−] [4] [2] [8] [5] [7] [EXE]

0.1428571

Once a calculation is complete, the mantissa is rounded off to 10 digits and displayed.

Example $3 \times 10^5 \div 7 =$

[3] [EXP] [5] [÷] [7] [EXE]

42857.14286

[−] [4] [2] [8] [5] [7] [EXE]

0.14286

● Overflow and errors

Exceeding a specified input or calculation range, or attempting an illegal input activates the Error Check function which causes an error message to appear on the display. Further operation of the calculator is impossible while an error message is displayed. You can clear the Error Check by pressing the [AC] key.
The following operations cause the Error Check function to activate.

- When any result, whether intermediate or final, or any value in memory exceeds $\pm 9.999999999 \times 10^{99}$ (Ma ERROR).
- When an attempt is made to perform a function calculation that exceeds the input range (Ma ERROR) (see **page 69 ~ 71**).
- When an illegal operation is attempted during statistical calculations (Ma ERROR). For example, attempting to obtain $\bar{x}$ or $x\sigma n$ without data input.
- When the capacity of the numeric value stack or command stack is exceeded (Stk ERROR). For example, entering 23 successive [(], followed by 2 [+] 3 [×] 4.
- When an illegal input is attempted (Syn ERROR). For example, 5 [×] [×] [EXE].

Most of the calculator's keys are inoperative while an error message is displayed. You can resume operation using one of the two following procedures.

- Press the [AC] key to clear the error and return normal operation.
- Press [◁] or [▷] to display the error (see Error position display function on **page 33**).

● Input capacity

This calculator features a 79-step area for calculation execution. One function comprises one step. Each press of numeric, or [+], [−], [×], and [÷] keys requires one step. Though such operations as [SHIFT] [x!] ([x^{-1}] key) require two key operations, they actually comprise only one function, and, therefore, require only one step. These steps can be confirmed using the cursor. With each press of the [◁] or [▷] key, the cursor moves one step.
Input is limited to 79 steps. Usually, the cursor is represented by a blinking "_", but once the 73rd step is reached, the cursor changes to a blinking "■". If the "■" appears during a calculation, the calculation should be divided at some point and performed in two parts.
"When numeric values or calculation commands are input, they appear on the display from the left. Calculation results, however, are displayed from the right.

● Editing calculations

The following procedures show how to edit calculations on the display. You can use these procedures before you execute the calculation or after you obtain the result of the calculation. Use the [◁] and [▷] keys to move the cursor to the position of the edit, and perform one of the operations described below.

■ To change a step

Use the [◁] and [▷] keys to move the cursor to the step to be changed, and press the applicable key.

Example To change an input of cos60 to sin60:

[cos] [6] [0]

cos 60_

[◁] [◁] [◁]

cos 60

[sin]

sin 60

After you edit a calculation, you can execute it immediately by pressing [EXE] or you can use the [▷] key to move the cursor to the end of the calculation for further input.

■ To delete a step

Use the [◁] and [▷] keys to move the cursor to the step to be deleted and press the [DEL] key. One step is deleted each time you press [DEL].

Example To correct an input of 369 × × 2 to 369 × 2:

[3] [6] [9] [×] [×] [2]

369××2_

[◁] [◁] [DEL]

369×2

■ To insert a step

Use the ◁ and ▷ keys to move the cursor to the position of the insertion and press SHIFT followed by INS . Each time you do this, a 1-step space is created.

Example To correct an input of 2.36^2 to $\sin 2.36^2$:

2 • 3 6 x^2	2.36^2_
◁ ◁ ◁ ◁ ◁	2.36^2
SHIFT INS	$2\ulcorner\urcorner.36^2$
sin	$\sin 2\ulcorner\urcorner.36^2$

•The space created by the SHIFT INS operation is indicated by "⌜⌝" on the display. The function or value that corresponds to the next key you press is inserted at the location of the "⌜⌝". To exit the insertion without inputting anything, either move the cursor, press SHIFT INS again, or press EXE .

Even after the EXE key has been pressed to calculate a result, it is possible to use this procedure for correction. Press the ◁ key to move the cursor to the place where the correction is to be made.

● Memory

This unit contains 9 standard memories. There are two basic types of memories, "Variable" memories, which are accessed by using the SHIFT STO and RCL keys in combination with the 9 letters of the alphabet, and "Independent" memories, which are accessed by using the M+ , SHIFT , M− , RCL and M keys.

Contents of both of the variable and independent memories are protected even when the power is turned OFF.

* The variable memory and independent memory utilize the same memory area "M".

■ Variable memories

Up to 9 values can be retained in memory at the same time, and can be recalled when desired.

Example Inputting 123 into memory "A":

AC 1 2 3	123_

SHIFT STO A	A=
	↓ Result displayed in approximately 0.5 seconds.
	123.
AC	_
RCL A	A=
	↓ Result displayed in approximately 0.5 seconds.
	123.

When formulas are input, the result of the formula's calculation is retained in memory.

Example Inputting the result of 123 × 456 into memory "B":

AC 1 2 3 × 4 5 6	123×456_
SHIFT STO B	B=
	↓ Result displayed in approximately 0.5 seconds.
	56088.

If a variable expression is entered, the expression is first calculated according to the values stored in the variable memories used in the expression. The result is then stored in the variable memory specified for the result.

Example Inputting the results of A × B into memory "C":

AC ALPHA A × ALPHA B	A×B_
SHIFT STO C	C=
	↓ Result displayed in approximately 0.5 seconds.
	6898824.

* Syn ERROR is generated when an attempt is made to input a substitution formula (such as C = A × B) or multistatements (such as A × B : C × D), and the existing memory contents are retained.

When input is made in a format such as "X = log2", where the variable is equal to the formula, the results of the calculation are input into the specified memory.

Example Executing "X = log2"

[AC] [ALPHA] [X] [ALPHA] [=] [log] 2

X=log 2_

[EXE]

X=

↓ Result displayed in approximately 0.5 seconds.

0.3010299957

* In the SD mode, variable memories A,B and C are used as statistical memories. In the LR mode, variable memories A, B, C, D, E, and F are used as statistical memories. These variable memories cannot be used simultaneously while making statistical calculations.

■ Independent memories

Addition and subtraction (to and from sum) results can be stored directly in memory. Results can also be totalized in memory, making it easy to calculate sums.

Example Inputting 123 to Independent memory:

[AC] 1 2 3

123_

[M+]

123.

Recall memory data.

[AC]

_

[RCL] [M]

M=

↓ Result displayed in approximately 0.5 seconds.

123.

Add 25, subtract 12.

2 5 [M+] 1 2 [SHIFT] [M−]

12.

(Perssing 25 [−] 12 [M+] provides same result.)

Recall memory data.

[AC]

_

[RCL] [M]

M=

↓ Result displayed in approximately 0.5 seconds.

136.

* To clear memory contents, press [SHIFT] [Mcl] [EXE] or [0] [SHIFT] [STO] [M] .
* Addition / subtraction to or from sum in memory cannot be carried out with [M+] , [SHIFT] and [M−] keys in SD mode and LR mode.

Important!

- Difference between [SHIFT] [STO] [M] and [M+] , [SHIFT] [M−] .
  Both [SHIFT] [STO] [M] and [M+] , [SHIFT] [M−] can be used to input results into memory, however when the [SHIFT] [STO] [M] operation is used, previous memory contents are cleared. When [M+] , [SHIFT] [M−] is used, value is added or subtracted to or from present sum in memory.

● About the multiplication symbol

Since this calculator lets you enter calculations as they are written, you can omit the multiplication symbol in the following cases:

- In front of Type B functions (**page 16**) and coordinate transformation functions.

Example 2sin30, 10log1.2, $2\sqrt{3}$, 2Pol(5, 12), etc.

- In front of constant, variable, or memory names

Example 2π, 2AB, 3Ans, etc.

- In front of an open parenthesis.

Example 3 (5 + 6), (A + 1) (B − 1), etc.

Manual Calculations

● Basic calculations

■ Arithmetic operations

- Arithmetic operations are performed by pressing the keys in the same order as noted in the formula.
- For negative values, press [(-)] before entering the value.

Example	Operation	Display
23+4.5−53=−25.5	23[+]4.5[−]53[EXE]	−25.5
56×(−12)÷(−25)	56[×][(-)]12[÷][(-)]2.5[EXE]	268.8
=268.8		
12369×7532×74103=	12369[×]	
6.903680613×10^{12}	7532[×]74103[EXE]	6.903680613E12
(6903680613000)		
$(4.5\times10^{75})\times(-2.3\times10^{-79})$	4.5[EXP]75[×][(-)]	
$=-1.035\times10^{-3}$	2.3[EXP][(-)]79[EXE]	−1.035E−03
(−0.001035)		(NORM 1 mode)
$(2+3)\times10^{2}=500$	[(]2[+]3[)][×]1[EXP]2[EXE]	500.

* The correct answer cannot be derived by entering [(] 2 [+] 3 [)] [EXP] 2. Be sure to enter [×] 1 between the [(] and [EXP] in the above example.

$(1\times10^{5})\div7=14285.71429$	1[EXP]5[÷]7[EXE]	14285.71429
$(1\times10^{5})\div7-14285$	1[EXP]5[÷]7[−]	
=0.71422857	14285[EXE]	0.7142857

* Internal calculations are calculated in 12 digits for a mantissa, and the result is displayed rounded off to 10 digits. Internally, however, the mantissa is calculated to 12 digits.

- For mixed basic arithmetic operations, multiplication and division are given priority over addition and subtraction.

Example	Operation	Display
3+5×6=33	3[+]5[×]6[EXE]	33.
7×8−4×5=36	7[×]8[−]4[×]5[EXE]	36.
1+2−3×4÷5+6	1[+]2[−]	
=6.6	3[×]4[÷]5[+]6[EXE]	6.6

■ Parenthesis calculations

Example	Operation	Display
100−(2+3)×4=80	100[−][(]2[+]3[)][×]4[EXE]	80.
2+3×(4+5)=29	2[+]3[×][(]4[+]5[EXE]	29.

* Closed parentheses occurring immediately before operation of the [EXE] key may be omitted, no matter how many are required.

(7−2)×(8+5)=65	[(]7[−]2[)][(]8[+]5[EXE]	65.

* A multiplication sign [×] occurring immediately before an open parenthesis can be omitted.

10−{2+7×(3+6)}=−55	10[−][(]2[+]7[(]3[+]6[EXE]	−55.

* Henceforth, abbreviated style will not be used in this manual.

$\frac{2\times3+4}{5}=(2\times3+4)\div5=2$	[(]2[×]3[+]4[)][÷]5[EXE]	2.
$\frac{5\times6+6\times8}{15\times4+12\times3}=0.8125$	[(]5[×]6[+]6[×]8[)][÷] [(]15[×]4[+]12[×]3[)][EXE]	0.8125
$(1.2\times10^{19})-\{(2.5\times10^{20})\times\frac{3}{100}\}=4.5\times10^{18}$	1.2[EXP]19[−][(]2.5[EXP] 20[×]3[÷]100[)][EXE]	4.5E18
$\frac{6}{4\times5}=0.3$	6[÷][(]4[×]5[)][EXE]	0.3

* The above is the same as 6 [÷] 4 [÷] 5 [EXE].

■ Parcentage calculations

Example	Operation	Display
• Percentage 25% of $1500.00	1500 × 25 SHIFT %	375.
• Premium 15% increase from $3500.00	3500 × 15 SHIFT % +	4025.
• Discount 4% discount from $4750.00	4750 × 4 SHIFT % −	4560.
• Ratio 75 is what % of 250?	75 ÷ 250 SHIFT %	30.
• Ratio of change 141 is an increase of what % from 120?	141 − 120 SHIFT %	17.5
240 is a decrease of what % from 300?	240 − 300 SHIFT %	−20.

■ Setting the Number of Decimal Places, the Number of Significant Digits and the Exponential Display Type

All of the following procedures are performed starting from the second mode menu. To display the second mode menu, press the MODE key twice.

To set the number of decimal places

1. Display the second mode menu.
2. Press 3.
3. Input a number in the range of 0 to 9 to specify the number of decimal places you want to use. When you do, the indicator "FIX" appears on the display.

Example To display the result of 123 × 456 to two decimal places.

AC 1 2 3 × 4 5 6 EXE

MODE MODE	ON D 56088.
	ON↑ D R G FIX SCI NORM ENG 0 1 2 3 4 5 6
3	ON FIX 0~9?
2	ON D FIX 56088.00

To set the number of significant digits.

1. Display the second mode menu.
2. Press 4.
3. Input a number in the range of 0 to 9 to specify the number of decimal places you want to use. When you do, the indicator "SCI" appears on the display.

* To specify the number of decimal places to 10 digits, input 0.

Example To display the result of 123 × 456 to three significant digits.

AC 1 2 3 × 4 5 6 EXE

MODE MODE	ON D 56088.
	ON↑ D R G FIX SCI NORM ENG 0 1 2 3 4 5 6
4	ON SCI 0~9?
3	ON D SCI 5.61E04

* Once you set the number of decimal places or the number of significant digits, the settings stay in effect (even when power is switched off) until you clear them by selecting the NORM Mode.

To set the exponential display

1. Display the second mode menu.
2. Press [5].
3. Press [1] to select the NORM1 Mode, or [2] to select NORM2.
   - In the NORM1 Mode, values less than 10^{-1} and greater than 10^{9} are displayed in exponential format.
   - In the NORM2 Mode, values less than 10^{-8} and greater than 10^{9} are displayed in exponential format.

Example To change from the NORM1 Mode to the NORM2 Mode in order to view the result of 1 ÷ 500

[AC] 1 [÷] 5 0 0	ON [D] 2.E-03
[EXE]	
[MODE] [MODE]	ON↑ [D] [R] [G] FIX SCI NORM ENG 0 1 2 3 4 5 6
[5]	ON NORM 1or2?
[2]	ON [D] 0.002

- Even after you set the number of decimal place or the number of significant digits, the calculator still stores values internally with a 12-digit mantissa and a 10-digit exponent. To round the current internal value in accordance with FIX and SCI settings, press [SHIFT] [Rnd].
- You can shift the decimal point of the displayed value three digits left and right using [SHIFT] [ENG] and [SHIFT] [$\overleftarrow{\text{ENG}}$].
- The above settings are not applied in the BASE-N Mode.

Example	Operation	Display
100÷6=16.66666666…	100[÷]6[EXE]	16.66666667
(Four decimal places specified.)	[MODE][MODE]3[4]	FIX 16.6667
(Specification cancelled.)	[MODE][MODE]5[1]	16.66666667
(Five significant digits specified.)	[MODE][MODE]4[5]	1.6667E01
(Specification cancelled.)	[MODE][MODE]5[1]	16.66666667
* Values are displayed rounded off to the place specified.		
1÷1000=0.001 (With NORM1 specified.)	1[÷]1000[EXE]	1.E−03
=1×10^{-3} (NORM2 specified)	[MODE][MODE]5[2]	0.001
* The NORM1/NORM2 specification remains in effect until you change it.		
200÷7×14=400	200[÷]7[×]14[EXE]	400.
(Three decimal places specified.)	[MODE][MODE]3[3]	FIX 400.000
(Calculation continues with 10 digits.)	200[÷]7[EXE]	FIX 28.571
	[×]	28.57142857×_
	14[EXE]	FIX 400.000
If the same calculation is performed with the specified number of digits:	200[÷]7[EXE]	FIX 28.571
(Value stored internally cut off at specified decimal place.)	[SHIFT][Rnd]	FIX 28.571
	[×]	FIX 28.571×_
	14[EXE]	FIX 399.994
(Specification cancelled.)	[MODE][MODE]5[1]	399.994
123m×456=56088m	123[×]456[EXE]	56088.
=56.088km	[SHIFT][ENG]	56.088E03
78g×0.96=74.88g	78[×]0.96[EXE]	74.88
=0.07488kg	[SHIFT][$\overleftarrow{\text{ENG}}$]	0.07488E03

■ Memory Calculations

Variable memories

- The 9 variable memories can be used for storage of data, constants, and any other numeric value.

Example	Operation	Display
193.2÷23=8.4	193.2 STO A ÷ 23 EXE	8.4
193.2÷28=6.9	RCL A ÷ 28 EXE	6.9
193.2÷42=4.6	RCL A ÷ 42 EXE	4.6
$\frac{9\times6+3}{(7-2)\times8}$=1.425	9 × 6 + 3 SHIFT STO B	57.
	□ 7 − 2 □ × 8 SHIFT STO C	40.
	ALPHA B ÷ ALPHA C EXE	1.425
*The same result can be produced by entering □ 9 × 6 + 3 □ ÷ □ □ 7 − 2 □ × 8 □ EXE.		

Independent memory

- Values can be directly added to or subtracted from memory. You can view the result of each individual calculation and accumulate a grand total in the memory.

Example	Operation	Display
	SHIFT Mcl EXE	0.
23+9=32	23 + 9 M+	32.
53−6 =47	53 − 6 M+	47.
−)45×2=90	45 × 2 SHIFT M−	90.
99÷3=33	99 ÷ 3 M+	33.
22	RCL M	22.
Note that M+ and M− are used in place of EXE.		

● Special Functions

■ Answer function

The Answer function stores the result of the most recent calculation. Once a numeric value or numeric expression is entered and EXE is pressed, the result is stored by this function.
To recall the stored value, press the Ans key. When Ans is pressed, "Ans" appears on the display along with the Answer function value. The value can be used in subsequent calculations.

* Since the "Ans" function works just like any other memory, it will be referred to as "Ans memory" throughout this manual.

Example 123 + 456 = 579
789 − 579 = 210

AC 1 2 3 + 4 5 6 EXE → 579.

7 8 9 − Ans → 789-Ans_

EXE → 210.

Numeric values with 12 digits for a mantissa and 2 digits for an exponent can be stored in the Ans memory. The Ans memory is not cleared even if the power of the unit is turned OFF. Each time EXE is pressed, the value in the Ans memory is replaced with the value produced by the new calculation. When execution of a calculation results in an error, however, the Ans memory retains its current value.

* Contents of Ans memory are not altered when RCL α (α =A~F, M, X, Y) is used to recall the contents of a variable memory.
- The Ans Memory can be used just like any other variable memory. You can include it inside of a calculation, and the multiplication operator is not necessary following Ans.

■ Continuous calculation function

Even calculation are concluded with the EXE key, the result obtained can be used for further calculations. Such calculations are performed with 10-digit mantissa of the displayed value.

Example 1 ÷ 7 = continuing × 3 =

AC 1 ÷ 7 EXE → 0.1428571429

(Continuing) × 3 → 0.1428571429×3

[EXE]

0.4285714287

This function can be used with Type A functions (x^2, x^{-1}, $x!$, see **page 16**), +, −, x^y, $\sqrt[x]{\ }$, and °' ".

■ Replay function

This function stores the latest formula executed. After execution is complete, pressing either the [⇨] or [⇦] key will display the formula.
Pressing [⇨] will display the formula from the beginning, with the cursor located under the first character. Pressing [⇦] will display the formula from the end, with the cursor located at the space following the last character. After this, use [⇨] and [⇦] to move the cursor, to check the formula. You can edit numeric values or commands for subsequent execution.

Example 123 × 456 = 56088

[AC] 1 2 3 [×] 4 5 6 [EXE]

56088.

[⇨]

123×456

Example 4.12 × 3.58 + 6.4 = 21.1496
4.12 × 3.58 − 7.1 = 7.6496

[AC] 4 . 1 2 [×] 3 . 5 8
[+] 6 . 4 [EXE]

21.1496

[⇦]

4.12×3.58+6.4_

[⇦] [⇦] [⇦] [⇦]

4.12×3.58+6.4

[−] 7 . 1

4.12×3.58-7.1_

[EXE]

7.6496

* As with the number of input steps (see **page 18**), the Replay function can accept input of up to 79 steps.
* The contents of the Replay function memory are cleared whenever you change from one mode to another, execute new formula, press [AC] and turn the power off.

■ Error position display function

When an ERROR massage appears, press [⇦] or [⇨] to display the calculation with the cursor located at the step that caused the error. You can also clear an error by pressing [AC] and then reenter the values and formulas from the beginning.

Example 14 ÷ 0 × 2.3 mistakenly input instead of 14 ÷ 10 × 2.3:

[AC] 1 4 [÷] 0 [×] 2 . 3
[EXE]

Ma ERROR

[⇨] (o r [⇦])

14÷0×2.3

Cursor indicates where error is generated

[⇦] [SHIFT] [INS] 1

14÷10×2.3

[EXE]

3.22

■ Multistatement function

- The multistatement function available in formula memory function calculations can also be used in manual calculations.
- With the multistatement function, multiple statements are linked together with a colon ([ALPHA] [:]) separating them.
- Pressing the [EXE] key after a multistatement is entered causes the entire chain of statements to be executed from left to right.

Example 6.9 × 123 = 848.7
123 ÷ 3.2 = 38.4375

1 2 3 [SHIFT] [STO] [A]
6 . 9 [×] [ALPHA] [A]
[ALPHA] [:] [ALPHA] [A]
[÷] 3 . 2

6.9×A:A÷3.2

Appears on display when " : " is used.

[EXE]

Disp
848.7

[EXE]

38.4375

* Consecutive calculations contained in multistatements cannot be performed.
123 × 456 : × 5
Invalid

● Scientific function calculations

■ Trigonometric functions and inverse trigonometric functions

Be sure to set the unit of angular measurement before performing trigonometric function and inverse trigonometric function calculations.

- The unit of angular measurement (degrees, redians, grads) is set by pressing [MODE] followed by a value from [0] to [2].

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

- Once a unit of angular measurement is set, it remains in effect until a new unit is set.
  Settings are not cleared when power is switched OFF.
- This operation is invalid in the BASE–N mode. When in the BASE–N mode, make setting after pressing [MODE] followed by [0].

Example	Operation	Display
$\sin 63°52'41'' =$ 0.897859012	[MODE][MODE][0] → "D"	
	[sin] 63 [°'"] 52 [°'"] 41 [°'"] [EXE]	0.897859012
$\cos\left(\frac{\pi}{3}\text{rad}\right) = 0.5$	[MODE][MODE][1] → "R"	
	[cos] [(] [SHIFT] [π] [÷] 3 [)] [EXE]	0.5
$\tan(-35\text{grad}) =$ -0.6128007881	[MODE][MODE][2] → "G"	
	[tan] [(−)] 35 [EXE]	−0.6128007881
$2 \cdot \sin 45° \times \cos 65° =$ 0.5976724775	[MODE][MODE][0] → "D"	
	2 [×] [sin] 45 [×] [cos] 65 [EXE] (× can be omitted.)	0.5976724775
$\cot 30° = \frac{1}{\tan 30°}$ $= 1.732050808$	1 [÷] [tan] 30 [EXE]	1.732050808
$\cos\left(\frac{\pi}{3}\text{rad}\right) = \frac{1}{\cos(\pi/3\text{rad})} = 2$	[MODE][MODE][1] → "R"	
	1 [÷] [cos] [(] [SHIFT] [π] [÷] 3 [)] [EXE]	2.
$\text{cosec}30° \frac{1}{\sin 30°} = 2$	[MODE][MODE][0] → "D"	
	1 [÷] [sin] 30 [EXE]	2.
$\sin^{-1}0.5 = 30°$ (Determines x for $\sin x = 0.5$)	[SHIFT] [sin⁻¹] 0.5 [EXE] (Can be entered as .5)	30.
$\cos^{-1}\frac{\sqrt{2}}{2} =$ 0.7853981634rad	[MODE][MODE][1] → "R"	
	[SHIFT] [cos⁻¹] [(] [√] 2 [÷] 2 [)] [EXE]	0.7853981634
$= \frac{\pi}{4}$ rad	[÷] [SHIFT] [π] [EXE]	0.25
$\tan^{-1}0.741 =$ $36.53844577°$	[MODE][MODE][0] → "D"	
	[SHIFT] [tan⁻¹] 0.741 [EXE]	36.53844577
$= 36°32'18.4''$	[SHIFT] [°'"]	36°32'18.4"

* If the total number of digits for degrees / minutes / seconds exceeds 11 digits, the high–order values (degrees and minutes) are given display priority, and any lower–order values are not displayed. However, the entire value is stored within the unit as a decimal value.

$2.5 \times (\sin^{-1}0.8 -$ $\cos^{-1}0.9) = 68°13'13.53''$	2.5 [×] [(] [SHIFT] [sin⁻¹] 0.8 [−] [SHIFT] [cos⁻¹] 0.9 [)] [EXE] [SHIFT] [°'"]	68°13'13.53"

■ Logarithmic and exponential functions

• The following operation is invalid in the BASE–N mode. When in the BASE–N mode, carry out calculation after pressing [MODE] followed by [0].

Example	Operation	Display
$\log 1.23(\log_{10} 1.23)=$ 8.990511144×10^{-2}	[log] 1.23 [EXE]	0.08990511144
$\ln 90(\log_e 90)=$ 4.49980967	[ln] 90 [EXE]	4.49980967
$\log 456 \div \ln 456=$ 0.4342944819	[log] 456 [÷] [ln] 456 [EXE]	0.4342944819
(log/ln ratio = constant M)		
$4^x=64$		
$x.\log 4=\log 64$		
$x=\frac{\log 64}{\log 4}=3$	[log] 64 [÷] [log] 4 [EXE]	3.
$10^{1.23}=16.98243652$	[SHIFT] [10^x] 1.23 [EXE]	16.98243652
(To obtain the anti-logarithm of common logarithm 1.23)		
$e^{4.5}=90.0171313$	[SHIFT] [e^x] 4.5 [EXE]	90.0171313
(To obtain the anti-logarithm of natural logarithm 4.5)		
$10^4 \cdot e^{-4}+1.2 \cdot 10^{2.3}=$	[SHIFT] [10^x] 4 [×] [SHIFT] [e^x] [(–)] 4 [+]	
422.5878667	1.2 [×] [SHIFT] [10^x] 2.3 [EXE]	422.5878667
$(-3)^4=(-3)\times(-3)\times$ $(-3)\times(-3)=81$	[(] [(–)] 3 [)] [x^y] 4 [EXE]	81.
$-3^4=-(3\times3\times3\times3)$ $=-81$	[(–)] 3 [x^y] 4 [EXE]	–81.
$5.6^{2.3}=52.58143837$	5.6 [x^y] 2.3 [EXE]	52.58143837
$\sqrt[7]{123}(=123^{\frac{1}{7}})=$ 1.988647795	7 [SHIFT] [$x\sqrt{}$] 123 [EXE]	1.988647795
$(78-23)^{-12}=$ $1.305111829\times10^{-21}$	[(] 78 [–] 23 [)] [x^y] [(–)] 12 [EXE]	1.305111829E–21
$2+3\times\sqrt[3]{64}-4=10$	2 [+] 3 [×] 3 [SHIFT] [$x\sqrt{}$] 64 [–] 4 [EXE]	10.
* x^y and $x\sqrt{}$ given calculation priority over x and ÷.		
$2\times3.4^{(5+6.7)}=3306232.001$	2 [×] 3.4 [x^y] [(] 5 [+] 6.7 [)] [EXE]	3306232.001

■ Performing hyperbolic and inverse hyperbolic functions

• The following operation is invalid in the BASE–N mode. When in the BASE–N mode, carry out calculation after pressing [MODE] followed by [0].

Example	Operation	Display
$\sinh 3.6=18.28545536$	[hyp] [sin] 3.6 [EXE]	18.28545536
$\cosh 1.23=1.856761057$	[hyp] [cos] 1.23 [EXE]	1.856761057
$\tanh 2.5=0.9866142981$	[hyp] [tan] 2.5 [EXE]	0.9866142981
$\cosh 1.5-\sinh 1.5=$ 0.2231301602	[hyp] [cos] 1.5 [–] [hyp] [sin] 1.5 [EXE]	0.2231301602
$=e^{-1.5}$	(continuing) [ln] [Ans] [EXE]	–1.5
(Proof of $\cosh x \pm \sinh x = e^{\pm x}$)		
$\sinh^{-1}30=4.094622224$	[hyp] [SHIFT] [$\sin^{-1}$] 30 [EXE]	4.094622224
$\cosh^{-1}\left(\frac{20}{15}\right)$ $=0.7953654612$	[hyp] [SHIFT] [$\cos^{-1}$] [(] 20 [÷] 15 [)] [EXE]	0.7953654612
Determine the value of x when $\tanh 4x = 0.88$		
$x=\frac{\tanh^{-1}0.88}{4}=$ 0.3439419141	[hyp] [SHIFT] [$\tan^{-1}$] 0.88 [÷] 4 [EXE]	0.3439419141
$\sinh^{-1}2\times\cosh^{-1}1.5=$ 1.389388923	[hyp] [SHIFT] [$\sin^{-1}$] 2 [×] [hyp] [SHIFT] [$\cos^{-1}$] 1.5 [EXE]	1.389388923
$\sinh^{-1}\left(\frac{2}{3}\right)+\tanh^{-1}\left(\frac{4}{5}\right)$ $=1.723757406$	[hyp] [SHIFT] [$\sin^{-1}$] [(] 2 [÷] 3 [)] [+] [hyp] [SHIFT] [$\tan^{-1}$] [(] 4 [÷] 5 [)] [EXE]	1.723757406

■ Other functions ($\sqrt{\ }$, x^2, x^{-1}, $x!$, $\sqrt[3]{\ }$, Ran#)

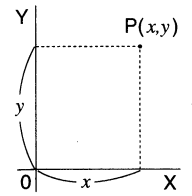
• The following operation is invalid in the BASE–N mode. When in the BASE–N mode, carry out calculation after pressing MODE followed by [0].

Example	Operation	Display
$\sqrt{2}+\sqrt{5}=3.65028154$	$\sqrt{\ }$ 2 + $\sqrt{\ }$ 5 EXE	3.65028154
$(-3)^2=(-3)\times(-3)=9$	(−) 3 x^2 EXE	9.
$-3^2=-(3\times3)=-9$	(−) 3 x^2 EXE	−9.
$2^2+3^2+4^2+5^2=54$	2 x^2 + 3 x^2 + 4 x^2 + 5 x^2 EXE	54.
$\frac{1}{\frac{1}{3}-\frac{1}{4}}=12$	(3 SHIFT x^{-1} − 4 SHIFT x^{-1}) SHIFT x^{-1} EXE	12.
$8!(=1\times2\times3\times\cdots\times8)$ $=40320$	8 SHIFT $x!$ EXE	40320.
$\sqrt[3]{36\times42\times49}=42$	SHIFT $\sqrt[3]{\ }$ (36 × 42 × 49) EXE	42.
Random Number generation (pseudorandom number from 0.000 to 0.999)	SHIFT Ran# EXE	0.792
$\sqrt{13^2-5^2}+\sqrt{3^2+4^2}=17$	$\sqrt{\ }$ (13 x^2 − 5 x^2) + $\sqrt{\ }$ (3 x^2 + 4 x^2) EXE	17.
$\sqrt{1-\sin^2 40°}=$ 0.7660444431 $=\cos40°$ (Proof of $\cos\theta=\sqrt{1-\sin^2\theta}$)	MODE MODE 0 → "D" $\sqrt{\ }$ (1 − (sin 40) x^2) EXE (Continuing) SHIFT cos Ans EXE	0.7660444431 40.
$\frac{1}{2!}+\frac{1}{4!}+\frac{1}{6!}+\frac{1}{8!}=$ 0.5430803571	2 SHIFT $x!$ SHIFT x^{-1} + 4 SHIFT $x!$ SHIFT x^{-1} + 6 SHIFT $x!$ SHIFT x^{-1} + 8 SHIFT $x!$ SHIFT x^{-1} EXE	0.5430803571

■ Coordinate transformation

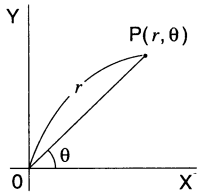
• Your scientific calculator lets you convert between rectangular coordinates and polar coordinates.

•Rectangular coordinates



Pol →
← Rec

•Polar coordinates



• Calculation results are stored in variable memory X and variable memory Y. Contents of variable memory X are displayed initially. To display contents of memory Y, press RCL Y:θ .

	X	Y
Pol	r	θ
Rec	x	y

• With polar coordinates, θ can be calculated within a range of $-180° < \theta \leqq 180°$. (Calculation range is the same with radians or grads.)

• The following operation is invalid in the BASE–N mode. When in the BASE–N mode, carry out calculation after pressing MODE following by [0].

Example	Operation	Display
If x = 14 and y =20.7, what are r and θ °?	MODE MODE 0 → "D"	
	SHIFT Pol(x,y) 14 ALPHA , 20.7)	
	EXE	24.98979792(r)
	(Continuing) RCL Y.θ	
	SHIFT ° ' "	55°55'42.2"(θ)
If x =7.5 and y = −10, what are r and θ rad?	MODE MODE 1 → "R"	
	SHIFT Pol(x,y) 7.5 ALPHA , (−) 10)	
	EXE	12.5(r)
	(Continuing) RCL Y.θ	−0.927295218(θ)
If r = 25 and θ =56°, what are x and y?	MODE MODE 0 → "D"	
	SHIFT Rec(r,θ) 25 ALPHA , 56)	
	EXE	13.97982259(x)
	(Continuing) RCL Y.θ	20.72593931(y)
If r = 4.5 and $\theta = \frac{2}{3}\pi$rad, what are x and y?	MODE MODE 1 → "R"	
	SHIFT Rec(r,θ) 4.5 ALPHA , (2 ÷	
	3 × SHIFT π)) EXE	−2.25(x)
	(Continuing) RCL Y.θ	3.897114317(y)

Permutation and combination

- Total number of permutations
- Total number of combinations

$$ {}_nPr = \frac{n!}{(n-r)!} \qquad {}_nCr = \frac{n!}{r!(n-r)!} $$

- The following operation is invalid in the BASE–N mode. When in the BASE–N mode, carry out calculation after pressing MODE followed by 0 .

Example	Operation	Display
Taking any four out of ten items and arranging them in a row, how many different arrangements are possible? ${}_{10}P_4=5040$	10 SHIFT nPr 4 EXE	5040.
Using any four numbers from 1 to 7, how many four–digit even numbers can be formed if none of the four digits consists of the same number? ($\frac{3}{7}$ of the total number of permutations will be even.) ${}_7P_4 \times \frac{3}{7} = 360$	7 SHIFT nPr 4 × 3 ÷ 7 EXE	360.
If any four items are removed from a total of 10 items, how many different combinations of four items are possible? ${}_{10}C_4=210$	10 SHIFT nCr 4 EXE	210.
If 5 class officers are being selected for a class of 15 boys and 10 girls, how many combinations are possible? At least one girl must be included in each group. ${}_{25}C_5-{}_{15}C_5=50127$	25 SHIFT nCr 5 − 15 SHIFT nCr 5 EXE	50127.

■ Fractions

• Fractions are input and displayed in the order: integer, numerator, denominator.

Example	Operation	Display
$\frac{2}{5}+3\frac{1}{4}=3\frac{13}{20}$	2 a b/c 5 + 3 a b/c 1 a b/c 4 EXE	3⌟13⌟20.
$=3.65$	(Conversion to decimal) a b/c	3.65
* Fractions can be converted to decimals, and then converted back to fractions.		
$3\frac{456}{78}=8\frac{11}{13}$ (Reduced)	3 a b/c 456 a b/c 78 EXE	8⌟11⌟13.
	(Continuing) SHIFT d/c	115⌟13.
* Fractions and improper fractions which can be reduced become reduced fractions when the calculation command key is pressed. Press SHIFT d/c to convert to improper fraction.		
$\frac{1}{2578}+\frac{1}{4572}$		
$=6.066202547\times10^{-4}$	1 a b/c 2578 + 1 a b/c 4572 EXE	6.066202547E−04
		(NORM mode)
* When the total number of characters, including integer, numerator, denominator and delimiter mark exceeds 10, the input fraction is automatically displayed in decimal format.		
$\frac{1}{2}\times0.5=0.25$	1 a b/c 2 × • 5 EXE	0.25
* Calculations containing both fractions and decimals are calculated in decimal format.		
$\frac{1}{3}\times\left(-\frac{4}{5}\right)-\frac{5}{6}=-1\frac{1}{10}$	1 a b/c 3 × (−) 4 a b/c 5 − 5 a b/c 6 EXE	−1⌟1⌟10.
$\frac{1}{2}\times\frac{1}{3}+\frac{1}{4}\times\frac{1}{5}=\frac{13}{60}$	1 a b/c 2 × 1 a b/c 3 + 1 a b/c 4 × 1 a b/c 5 EXE	13⌟60.
$\frac{\frac{1}{2}}{3}=\frac{1}{6}$	( ) 1 a b/c 2) a b/c 3 EXE	1⌟6.
$\frac{1}{\frac{1}{3}+\frac{1}{4}}=1\frac{5}{7}$	1 a b/c ( ) 1 a b/c 3 + 1 a b/c 4) EXE	1⌟5⌟7.
* When parentheses are used in numerators or denominators, it is possible to carry out fractional calculations.		

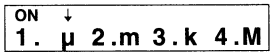
● Engineering Calculations and Engineering Display Symbols

This calculator provides engineering symbols that let you perform engineering calculations. The results of engineering calculations are also displayed using engineering symbols.

■ To input engineering symbols

To input an engineering symbol, press MENU to display the first engineering symbol menu.

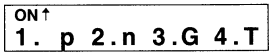
MENU



Input the value that corresponds to the symbol you want to input. The symbols on this menu have the following meanings.

[1] μ This is the symbol for "micro", which is equivalent to 10^{-6}.
[2] m This is the symbol for "milli", which is equivalent to 10^{-3}.
[3] k This is the symbol for "kilo", which is equivalent to 10^{3}.
[4] M This is the symbol for "mega", which is equivalent to 10^{6}.

Press MENU again to display the second engineering symbol menu.



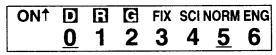
[1] p This is the symbol for "pico", which is equivalent to 10^{-12}.
[2] n This is the symbol for "nano", which is equivalent to 10^{-9}.
[3] G This is the symbol for "giga", which is equivalent to 10^{9}.
[4] T This is the symbol for "tera" , which is equivalent to 10^{12}.

• In the SD and LR Modes, the above engineering symbol menus appear after the statistical calculation menus.
• The above menus are not available in the BASE-N Mode.

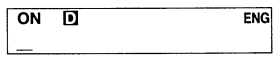
■ To enter the ENG Mode

When you want to display the results of your calculation using engineering symbols, you must enter the ENG Mode as shown below.

1. Press MODE MODE to display the second mode menu.



2. Press 6 to enter the ENG Mode. When you do, the indicator "ENG" appears on the display.



* To exit the ENG Mode, repeat the above procedure.

* In the ENG Mode, the calculator automatically selects the engineering symbol that allows use of a value within the range of 1 to 1,000.

• You can shift the decimal point of the displayed value three digits left and right using [SHIFT] [ENG] and [SHIFT] [ENG].

Example	Operation	Display
999 K(kilo) + 25 K(kilo) = 1.024 M(mega)	[MODE] [MODE] [6] → "ENG"	
	999 [MENU] [3] [+]	
	25 [MENU] [3] [EXE]	1.024M
	[MODE] [MODE] [6]	1024000.
	[MODE] [MODE] [6] → "ENG"	
100 m(milli) × 5 μ(micro) = 500n(nano)	100 [MENU] [2] [×]	
	5 [MENU] [1] [EXE]	500.n
	[MODE] [MODE] [6]	5.E−07.
	[MODE] [MODE] [6] → "ENG"	
9 ÷ 10 = 0.9 = 900(milli)	9 [÷] 10 [EXE]	900.m
	[SHIFT] [ENG]	0.9
	[SHIFT] [ENG]	0.0009k
	[SHIFT] [ENG]	0.9
	[SHIFT] [ENG]	900.m
	[SHIFT] [ENG]	900000.μ
	[SHIFT] [ENG]	900.m

Binary, Octal, Decimal, and Hexadecimal Calculations

You can perform any of the following binary, octal, decimal, and hexadecimal calculations in the BASE-N Mode.

- Base conversions
- Calculations involving negative values
- Addition, subtraction, multiplication, division
- Logical operations

Note that you cannot use scientific functions in the BASE-N Mode, and that all values are treated as integers. This means that you cannot use values that have fractions or exponents. Fractional parts of calculation results are cut off.

To input the default number base

Use the following keys to specify a default number base. This default base is applied whenever you input a number in the BASE-N Mode without specifying its base.

- [BIN] - binary (base 2)
- [OCT] - octal (base 8)
- [DEC] - decimal (base 10)
- [HEX] - hexadecimal (base 16)

To specify the number base for a specific input

Use the following key operations to specify the number base for a specific input. This base overrides the default number base.

- [SHIFT] [b] <value> - binary (base 2)
- [SHIFT] [o] <value> - octal (base 8)
- [SHIFT] [d] <value> - decimal (base 10)
- [SHIFT] [h] <value> - hexadecimal (base 16)

Negative Values and Logical Operations

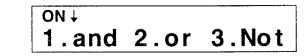
To input a negative value

First press [Neg] and then input the value. Note that the calculator uses the corresponding twos complement for negative binary, octal, and hexadecimal values.

To input logical operators

To input an logical operator, press [MENU] to display the first logical operator menu.

[MENU]



Input the value that corresponds to the operator you want to input. The operators on this menu have the following meanings.

[1] and This is the AND operator.
[2] or This is the OR operator.
[3] Not This is the NOT operator.

If the operator you want is not on this display, press [MENU] again to display the second logical operator menu.

```
ON ↑
1.xor 2.xnor
```

Input the value that corresponds to the operator you want to input. The operators on this menu have the following meanings.

[1] xor This is the XOR (exclusive or) operator.
[2] xnor This is the XNOR (exclusive nor) operator.

- You can switch back to the first menu from the second menu by pressing [SHIFT] [MENU].

About number systems

The following table shows the values that comprise the different number systems.

Base	Valid Values
Binary	0, 1
Octal	0, 1, 2, 3, 4, 5, 6, 7
Decimal	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Hexadecimal	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

- To input a value that is not include in the currently set default number base, you must specify a different base using [SHIFT] plus [b], [o], [d], or [h]. Otherwise, an error (Syn ERROR) occurs.

- Binary, octal, decimal and hexadecimal values are treated as 32-bit values. The table to the right shows the number of display places used for the result of BASE-N calculations for each number base.

Base	Display Places
Binary	16
Octal	11
Decimal	10
Hexadecimal	8

- The table to the right shows the keys you should use to input the alpha characters required by hexadecimal values.

Character Key	Display
[A] ([a b/c])	A
[B] ([' " ( )])	B
[C] ([hyp])	C
[D] ([sin])	D
[E] ([cos])	E
[F] ([tan])	F

Calculation Ranges in the BASE-N Mode

The following are the calculation ranges for each of the number bases in the BASE-N Mode.

Binary	Positive	: $0 \geqq x \geqq 01111111111111111111111111111111$
	Negative	: $11111111111111111111111111111111 \geqq x \geqq 10000000000000000000000000000000$
Octal	Positive	: $0 \leqq x \leqq 17777777777$
	Negative	: $20000000000 \leqq x \leqq 37777777777$
Decimal	Positive	: $0 \leqq x \leqq 2147483647$
	Negative	: $-1 \geqq x \geqq -2147483648$
Hexadecimal	Positive	: $0 \leqq x \leqq 7FFFFFFF$
	Negative	: $80000000 \leqq x \leqq FFFFFFFF$

● Binary Block Display

32-digit calculation results in the Binary Mode are displayed as two blocks of 16-digits each.

Block 2	Block 1
1000011101100101	0100001100100001
← 16-digits →	← 16-digits →
← 32-digits →	

Use the [BLOCK] key to switch between blocks 1 and 2. The ← and → indicators in the upper corners of the display show you which block is currently being displayed.

Example To display the binary value: $1000011101100101010000110010000 1_{(2)}$

[MODE] [3]

```
ON   DEC
_
```

[BIN]

```
ON        BIN
_
```

1000011101100101
0100001100100001

```
ON←       BIN
1000011100100001_
```

[EXE]

```
ON←       BIN
0100001100100001
```

[BLOCK]

```
ON        BIN      →
1000011101100101
```

[BLOCK]

```
ON←       BIN
0100001100100001
```

● Binary, octal, decimal, hexadecimal conversions

There are two ways to perform reciprocal binary, octal, decimal and hexadecimal conversions.

■ Conversion using number system specification key

Value from a different number system input when a specific number system mode is being used.

Example	Operation	Display
What are the decimal values for $2A_{16}$ and 274_8?	MODE 3	
	DEC →"DEC"	DEC
	SHIFT h 2A EXE	42
	SHIFT O 274 EXE	DEC 188
What are the hexadecimal values for 123_{10} and 1010_2?	HEX →"HEX"	
	SHIFT d 123 EXE	HEX 0000007B
	SHIFT b 1010 EXE	HEX 0000000A
What are the octal values for 15_{16} and 1100_2?	OCT →"OCT"	
	SHIFT h 15 EXE	OCT 00000000025
	SHIFT b 1100 EXE	OCT 00000000014
What are the binary values for 36_{10} and $2C_{16}$?	BIN →"BIN"	
	SHIFT d 36 EXE	←BIN 0000000000100100
	SHIFT h 2C EXE	←BIN 0000000000101100

■ Conversion using number system mode key

Calculation results can be converted to any specified number system by using the corresponding number system mode key.

Example	Operation	Display
How is 22_{10} expressed in binary, octal, and hexadecimal number systems?	MODE 3	
	DEC →"DEC"	DEC
	22 EXE	22
	BIN	←BIN 0000000000010110
	OCT	OCT 00000000026
	HEX	HEX 00000016

● Negative expressions

Example	Operation	Display
How is 110010_2 expressed as a negative?	MODE 3	
	BIN →"BIN"	←BIN 1111111111001110
How is 72_8 expressed as a negative?	Neg 110010 EXE	
	OCT →"OCT"	OCT 37777777706
How is $3A_{16}$ expressed as a negative?	Neg 72 EXE	
	HEX →"HEX"	HEX FFFFFFC6
	Neg 3A EXE	

● Basic arithmetic operations using binary, octal, decimal and hexadecimal values

Example	Operation	Display
	[MODE] [3]	
10111(2)+11010(2)	[BIN] → "BIN"	
=110001(2)		←BIN 0000000000110001
	10111 [+] 11010 [EXE]	
B47(16)−DF(16)=A68(16)	[HEX] → "HEX"	HEX 00000A68
123(8)×ABC(16)=37AF4(16)	B47 [−] DF [EXE]	
	[SHIFT] [O] 123 [×]	HEX 00037AF4
	ABC [EXE]	DEC 228084
=228084(10)	[DEC]	
1F2D(16)−100(10)=7881(10)	[SHIFT] [h] 1F2D [−]	DEC 7881
	100 [EXE]	HEX 00001EC9
=1EC9(16)	[HEX]	
7654(8)÷12(10)=334.3333333(10)	[DEC] → "DEC"	
=516(8)	[SHIFT] [O] 7654 [÷]	DEC 334
	12 [EXE]	OCT 00000000516
	[OCT]	

* Calculation results are displayed with the decimal portion cut off.

1234(10)+1EF(16)÷24(8)	[SHIFT] [d] 1234 [+]	
	[SHIFT] [h] 1EF	OCT 00000002352
=2352(8)	[÷] 24 [EXE]	DEC 1258
=1258(10)	[DEC]	

* For mixed basic arithmetic operations, multiplication and division are given priority over addition and subtraction.

● Logical operation

Logical operation are performed through logical products (and), logical sums (or), negation (Not), exclusive logic sum (xor), and negation of exclusive logical sums(xnor).

Example	Operation	Display
	[MODE] [3]	
19(16) AND 1A(16)=18(16)	[HEX] → "HEX"	HEX 00000018
	19 [MENU] [1] 1A [EXE]	
1110(2) AND 36(8)=1110(2)	[BIN] → "BIN"	
	1110 [MENU] [1]	←BIN 0000000000001110
	[SHIFT] [O] 36 [EXE]	
23(8) OR 61(8)=63(8)	[OCT] → "OCT"	OCT 00000000063
	23 [MENU] [2] 61 [EXE]	
120(16) OR 1101(2)=12D(16)	[HEX] → "HEX"	
	120 [MENU] [2]	HEX 0000012D
	[SHIFT] [b] 1101 [EXE]	
1010(2) AND (A(16) OR 7(16))	[BIN] → "BIN"	
=1010(2)	1010 [MENU] [1] [(] [SHIFT] [h] A	←BIN 0000000000001010
	[MENU] [2] [SHIFT] [h] 7 [)] [EXE]	
5(16) XOR 3(16)=6(16)	[HEX] → "HEX"	HEX 00000006
	5 [MENU] [MENU] [1] 3 [EXE]	
2A(16) XNOR 5D(16)=	[HEX] → "HEX"	HEX FFFFFF88
FFFFFF88(16)	2A [MENU] [2] 5D [EXE]	
Negation of $1234_{(8)}$	[OCT] → "OCT"	OCT 37777776543
	[MENU] [SHIFT] [MENU] [3] 1234 [EXE]	
Negation of $2FFFED_{(16)}$	[HEX] → "HEX"	HEX FFD00012
	[MENU] [3] 2FFFED [EXE]	

Statistical Calculations

This calculator provides you with the capability to perform both *single-variable* and *paired-variable* statistical calculations. Single-variable calculations are performed in the SD Mode (using standard deviation), while paired-variable calculations are performed in the LR Mode (using regression).
Note that you can also perform linear, logarithmic, exponential, and power regression calculations in the LR Mode.

Single-Variable Statistics

Once you enter the SD Mode and input data, you can calculate the population standard deviation, sample standard deviation, the mean of the data, number of data, the sum of the data, and sum of the squares of the data.

To input data

1. Press [MODE] [1] to enter the SD Mode.
2. Press [SHIFT] [Scl] [EXE] to clear the statistical memory.
   • Always be sure to clear the statistical memory before performing statistical calculations.
3. Input each data item, pressing [DT] ([M+]) after each item.
   • To input negative data, press [(−)], input the value, and then press [DT].

Example Data: 10, 20, 30
Operation: 10 [DT] 20 [DT] 30 [DT]

* You can input two data items that are identical using the operations noted below.

Example Data: 10, 20, 20, 30
Operation: 10 [DT] 20 [DT] [DT] 30 [DT]

Note that whenever you press [DT] without inputting anything, the calculator automatically re-inputs the last value you input.

Example Data: 10, 20, 20, 20, 30
Operation: 10 [DT] 20 [ALPHA] [;] 3 [DT] 30 [DT]

In the above operation, you input the number of identical data items (3 in the above example) after inputting a semicolon.

Deleting Data

The procedure you use to delete data depends on when you input the data you want to delete. Note that you can only delete numeric data.
If the data to be deleted is a formula (including scientific functions), you should first perform the calculation and store the results in the Ans Memory or variable memory, and then use the memory to delete the data.

Example 10 [DT] 20 [DT] 30
To delete 30, press [AC].

Example 10 [DT] 20 [DT] 30 [DT]
To delete 30, input [SHIFT] [CL].

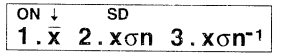
Example 10 [DT] 20 [DT] 3 [DT]
To delete 10, press 10 [SHIFT] [CL].

Example [√‾] 10 [DT] [√‾] 20 [DT] [√‾] 30 [DT]
To delete [√‾] 10 [DT], press [√‾] 10 [EXE] [Ans] [SHIFT] [CL]
You can also perform the above deletion using: [√‾] 10 [ALPHA] [;] −1 [DT].

Performing Single-Variable Statistical Calculations

To perform single-variable statistical calculations, press [MENU] to display the first single-variable statistical calculation menu.

[MENU]

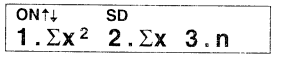


Input the value that corresponds to the operation you want to perform. The symbols on this menu have the following meanings.

[1] $\bar{x}$ Press [1] to calculate the mean of the data.
[2] $x\sigma n$ Press [2] to calculate the population standard deviation of the data.
[3] $x\sigma n{-}1$ Press [3] to calculate the sample standard deviation of the data.

Press [MENU] again to display the second single-variable statistical calculation menu.

[MENU]



[1] Σx^2 Press [1] to calculate the sum of the squares of the data.
[2] Σx Press [2] to calculate the sum of the data.
[3] n Press [3] to count the number of data items.

* Pressing [MENU] again while the second single-variable statistical calculation menu is displayed advances to the ENG symbol menu.
* You can switch back to the first menu from the second menu by pressing [SHIFT] [MENU].
• Standard deviation and the mean are calculated using the following formulas.

● **Mean**

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{\Sigma x}{n}$$

● Standard Deviation

$$x\sigma n = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n}} = \sqrt{\frac{\Sigma x^2-(\Sigma x)^2/n}{n}}$$

Uses all of the data in a finite population to calculate the standard deviation for that population.

$$x\sigma n-1 = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}} = \sqrt{\frac{\Sigma x^2-(\Sigma x)^2/n}{n-1}}$$

Uses sample data from a finite population to estimate the standard deviation for that population.

* The following table shows data that is automatically stored in variable memories A through C whenever you perform single-variable statistical calculations. You can recall these values individually using the single-variable statistical calculation menus, or you can directly recall the contents of the variable memories. It is important to remember that you cannot use variable memories A, B, and C while performing statistical calculations.

Variable Memory	A	B	C
Statistical Data	Σx^2	Σx	n

Example	Operation	Display
Data 55, 54, 51, 55, 53, 53, 54, 52	MODE 1 → "SD"	
	(Memory cleared) SHIFT Scl EXE	0.
	55 DT 54 DT 51 DT 55 DT	
	53 DT DT 54 DT 52 DT	52.
*You can press the function keys to obtain results in any sequence.		
	(Standard deviation σn) MENU 2 ($x\sigma n$) EXE	1.316956719
	(Standard deviation $\sigma n-1$) MENU 3 ($x\sigma n-1$) EXE	1.407885953
	(Mean x) MENU 1 ($\bar{x}$) EXE	53.375
	(Number of data n) MENU MENU 3 (n) EXE	8.
	(Sum total Σx) MENU 2 (Σx) EXE	427.
	(Sum of squares Σx^2) MENU 1 (Σx^2) EXE	22805.
To calculate the deviation of the unbiased variance, the difference between each datum, and mean of the above data.	(Continuing) MENU SHIFT MENU 3 ($x\sigma n-1$) x^2 EXE	1.982142857
	55 − MENU 1 ($\bar{x}$) EXE	1.625
	54 − MENU 1 ($\bar{x}$) EXE	0.625
	51 − MENU 1 ($\bar{x}$) EXE	−2.375
	⋮	⋮
To calculate x and $\sigma n-1$ for the following data.	SHIFT Scl EXE	0.
	110 ALPHA ; 10 DT	110.
	130 ALPHA ; 31 DT	130.
	150 ALPHA ; 24 DT	150.
	170 DT DT	170.
	190 DT DT DT	190.
	(Number of data n) MENU MENU 3 (n) EXE	70.
	(Mean x) MENU SHIFT MENU 1 ($\bar{x}$) EXE	137.7142857
	(Standard deviation $\sigma n-1$) MENU 3 ($x\sigma n-1$) EXE	18.42898069

Class no.	Value	Frequency
1	110	10
2	130	31
3	150	24
4	170	2
5	190	3

● Paired-Variable Statistics

Once you enter the LR Mode and input data, you can perform linear, logarithmic, exponential, and power regression calculations.

■ Linear Regression

The linear regression formula is defined as: $y = A + Bx$.

To input data

1. Press MODE 2 to enter the LR Mode.
2. Press SHIFT Scl EXE to clear the statistical memory.
   * Always be sure to clear the statistical memory before performing statistical calculations.
3. Input data using the following format.
   <x-data> ALPHA , <y-data> DT

Example Data: 10/20, 20/30
Operation: 10 ALPHA , 20 DT
20 ALPHA , 30 DT

• You can input two data pairs that are identical using the operations noted below.

Example Data: 10/20, 20/30, 20/30
Operation: 10 ALPHA , 20 DT
20 ALPHA , 30 DT DT

Note that whenever you press DT without inputting anything, the calculator automatically re-inputs the last pair of values you input.

Example Data: 10/20, 20/30, 20/30, 20/30,
Operation: 10 ALPHA , 20 DT
20 ALPHA , 30 DT ALPHA ; 3 DT

In the above operation, you input the number of identical data pairs (3 in the above example) after inputting a semicolon.

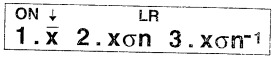
Deleting Data

The procedure you use to delete data depends on when and how you input the data you want to delete. To delete linear regression data, use the same procedures as those described for standard deviation on **page 52**. Note that you can only delete numeric data.

Performing Paired-Variable Statistical Calculations

To perform paired-variable statistical calculations, press MENU to display the first single-variable statistical calculation menu.

MENU

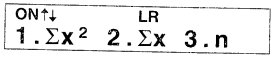


Input the value that corresponds to the operation you want to perform. The symbols on this menu have the following meanings.

1 $\bar{x}$ Press 1 to calculate the mean of the x-data.
2 $x\sigma n$ Press 2 to calculate the population standard deviation of the x-data.
3 $x\sigma n{-}1$ Press 3 to calculate the sample standard deviation of the x-data.

Press MENU again to display the second paired-variable statistical calculation menu.

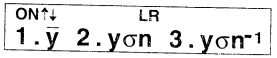
(Continuing) MENU



1 Σx^2 Press 1 to calculate the sum of the squares of the x-data.
2 Σx Press 2 to calculate the sum of the x-data.
3 n Press 3 to count the number of data items.

Press MENU again to display the third paired-variable statistical calculation menu.

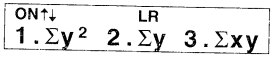
(Continuing) MENU



1 $\bar{y}$ Press 1 to calculate the mean of the y-data.
2 $y\sigma n$ Press 2 to calculate the population standard deviation of the y-data.
3 $y\sigma n{-}1$ Press 3 to calculate the sample standard deviation of the y-data.

Press MENU again to display the fourth paired-variable statistical calculation menu.

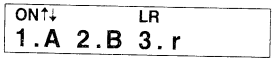
(Continuing) MENU



1 Σy^2 Press 1 to calculate the sum of the squares of the y-data.
2 Σy Press 2 to calculate the sum of the y-data.
3 Σxy Press 3 to calculate the sum of the products of the x-data and y-data.

Press MENU again to display the fifth paired-variable statistical calculation menu.

(Continuing) MENU



1 A Press 1 to calculate the value of constant term A in the regression formula $y = A + Bx$.
2 B Press 2 to calculate the value of constant coefficient B in the regression formula $y = A + Bx$.
3 r Press 3 to calculate the value of correlation coefficient r.

Press [MENU] again to display the sixth paired-variable statistical calculation menu.

(Continuing) [MENU]

ON ↑↓	LR
1.$\hat{x}$	2.$\hat{y}$

[1] $\hat{x}$ Press [1] to display the estimated value of x.

[2] $\hat{y}$ Press [2] to display the estimated value of y.

- Pressing [MENU] again while the sixth paired-variable statistical calculation menu is displayed advances to the ENG symbol menu.
- You can move back through the menus by pressing [SHIFT] [MENU].
- The following table shows data that is automatically stored in variable memories A through F whenever you perform paired-variable statistical calculations. You can recall these values individually using the paired-variable statistical calculation menus, or you can directly recall the contents of the variable memories. It is important to remember that you cannot use variable memories A through F while performing statistical calculations.

Variable Memory	A	B	C	D	E	F
Statistical Data	Σx^2	Σx	n	Σy^2	Σy	Σxy

- Constant term A, regression coefficient B, and correlation coefficient r of the regression formula ($y = A + Bx$), as well as estimated values for x and y are calculated using the following formulas.

$$A = \frac{\Sigma y - B \cdot \Sigma x}{n} \qquad B = \frac{n \cdot \Sigma xy - \Sigma x \cdot \Sigma y}{n \cdot \Sigma x^2 - (\Sigma x)^2}$$

$$r = \frac{n \cdot \Sigma xy - \Sigma x \cdot \Sigma y}{\sqrt{\{n \cdot \Sigma x^2 - (\Sigma x)^2\}\{n \cdot \Sigma y^2 - (\Sigma y)^2\}}}$$

$$\hat{y} = A + B\,x \qquad \hat{x} = \frac{y - A}{B}$$

Example	Operation	Display
• Relationship between temperature and the length of a steel bar	[MODE] [2] → "LR"	
	(Memory cleared) [SHIFT] [Scl] [EXE]	0.
	10 [ALPHA] [,] 1003 [DT]	10.
	15 [ALPHA] [,] 1005 [DT]	15.
	20 [ALPHA] [,] 1010 [DT]	20.
	25 [ALPHA] [,] 1011 [DT]	25.
	30 [ALPHA] [,] 1014 [DT]	30.
	(Constant term A)	
	[MENU] [MENU] [MENU] [MENU] [MENU] [1] (A) [EXE]	997.4
	(Regression coefficient B)	
	[MENU] [2] (B) [EXE]	0.56
	(Correlation coefficient r)	
	[MENU] [3] (r) [EXE]	0.9826073689
	(Length at 18°C)	
	18 [MENU] [MENU] [2] ($\hat{y}$) [EXE]	1007.48
	(Temperature at 1000mm)	
	1000 [MENU] [1] ($\hat{x}$) [EXE]	4.642857143
	(Critical coefficient)	
	[MENU] [SHIFT] [MENU] [3] (r) [x^2] [EXE]	0.9655172414
	(Covariance)	
	[(] [MENU] [SHIFT] [MENU] [3] (Σxy) [−]	
	[MENU] [SHIFT] [MENU] [SHIFT] [MENU] [3] (n) [×] [MENU] [SHIFT] [MENU] [1] ($\bar{x}$) [×]	
	[MENU] [MENU] [MENU] [1] ($\bar{y}$) [)] [÷]	
	[(] [MENU] [SHIFT] [MENU] [3] (n) [−] 1 [)] [EXE]	35.

The data in the above table can be used to obtain the terms of the regression formula and the correlation coefficient. Based on the regression formula, the estimated length of the steel bar at 18°C and the temperature when the bar is 1000 mm long can be calculated.

The critical coefficient ($r2$) and covariance ($\frac{\Sigma xy - n \cdot \bar{x} \cdot \bar{y}}{n-1}$) can also be calculated.

Applications for Paired-Variable Statistics

In addition to paired-variable linear regression ($y = A + Bx$), you can also perform logarithmic, exponential, and power regression.

Logarithmic Regression

The logarithmic regression formula is defined as $y = A + B \cdot \ln x$.

To input data

1. Press [MODE] [2] to enter the LR Mode.
2. Press [SHIFT] [Scl] [EXE] to clear the statistical memory.
   * Always be sure to clear the statistical memory before performing statistical calculations.
3. Input data using the following format.
   [ln] <x-data> [ALPHA] [,] <y-data> [DT]
   * You can input two data pairs that are identical using the same operations described for linear regression. Note, however, that for logarithmic regression you must press [ln] before inputting the x-data.

Deleting Data

Use the same procedures as those described for linear regression to delete data. Note, however, that you must always press [ln] before inputting x-data.

Example [ln] 10 [EXE] [Ans] [ALPHA] [,] 20 [CL]

Example [ln] 10 [ALPHA] [,] 20 [ALPHA] [;] −1 [DT]

Logarithmic Regression Calculations

Logarithmic regression produces the values shown in the following table.

Formula Term	Meaning
A	Constant Term A
B	Regression Coefficient B
r	Correlation Coefficient r
$e \wedge (yx)$	Estimated Value of x
$\ln x\hat{y}$	Estimated Value of y

If x is substituted for $\ln x$ in the regression formula $y = A + B \cdot \ln x$, you get the linear regression formula $y = a + bx$. Because of this, constant term A, regression coefficient B, and correlation coefficient r, as well as the estimated values of x and y can be calculated using the formula as that used for linear regression. Note, however, that calculation results differ from linear regression as noted in the following table.

Linear	Logarithmic
Σx	$\Sigma \ln x$
Σx^2	$\Sigma (\ln x)^2$
Σxy	$\Sigma \ln x \cdot y$

Example	Operation	Display
	[MODE] [2] → "LR"	
	(Memory cleared) [SHIFT] [Scl] [EXE]	0.
x_i 29, y_i 1.6	[ln] 29 [ALPHA] [,] 1.6 [DT]	3.36729583
x_i 50, y_i 23.5	[ln] 50 [ALPHA] [,] 23.5 [DT]	3.912023005
x_i 74, y_i 38.0	[ln] 74 [ALPHA] [,] 38.0 [DT]	4.304065093
x_i 103, y_i 46.4	[ln] 103 [ALPHA] [,] 46.4 [DT]	4.634728988
x_i 118, y_i 48.9	[ln] 118 [ALPHA] [,] 48.9 [DT]	4.770684624
The data in above table can be used to obtain the terms of the regression formula and the correlation coefficient. Based on the regression formula, estimated value $\hat{y}$ can be obtained for xi = 80, and estimated value $\hat{x}$ can be obtained for yi = 73.	(Constant term A) [MENU] [MENU] [MENU] [MENU] [1] (A) [EXE]	−111.1283976
	(Regression coefficient B) [MENU] [2] (B) [EXE]	34.02014749
	(Correlation coefficient r) [MENU] [3] (r) [EXE]	0.9940139464
	($\hat{y}$ when xi = 80) [ln] 80 [MENU] [MENU] [2] ($\hat{y}$) [EXE]	37.94879482
	($\hat{x}$ when yi = 73) 73 [MENU] [1] ($\hat{x}$) [EXE] [SHIFT] [e^x] [Ans] [EXE]	224.1541314

■ Exponential Regression

The exponential regression formula is defined as $y = A \cdot e^{Bx}$ ($\ln y = \ln A + Bx$)

To input data

1. Press [MODE] [2] to enter the LR Mode.
2. Press [SHIFT] [Scl] [EXE] to clear the statistical memory.
   * Always be sure to clear the statistical memory before performing statistical calculations.
3. Input data using the following format.
   <x-data> [ALPHA] [,] [ln] <y-data> [DT]
   * You can input two data pairs that are identical using the same operations described for linear regression. Note, however, that for logarithmic regression you must press [ln] before inputting the y-data.

Deleting Data

Use the same procedures as those described for linear regression to delete data. Note, however, that you must always press [ln] before inputting y-data.

Example [ln] 20 [EXE] 10 [ALPHA] [,] [Ans] [CL]

Example 10 [ALPHA] [,] [ln] 20 [ALPHA] [;] −1 [DT]

Exponential Regression Calculations

Exponential regression produces the values shown in the following table.

Formula Term	Meaning
e ^ A	Constant Term A
B	Regression Coefficient B
r	Correlation Coefficient r
$\ln y\hat{x}$	Estimated Value of x
e ^ $(x\hat{y})$	Estimated Value of y

If y is substituted for $\ln y$ and a is substituted for $\ln A$ in the regression formula $y = A \cdot e^{Bx}$ ($\ln y = \ln A + Bx$), you get the linear regression formula $y = a + bx$. Because of this, constant term A, regression coefficient B, and correlation coefficient r, as well as the estimated values of x and y can be calculated using the formula as that used for linear regression. Note, however, that calculation results differ from linear regression as noted in the following table.

Linear	Exponential
Σy	$\Sigma \ln y$
Σy^2	$\Sigma (\ln y)^2$
Σxy	$\Sigma x \cdot \ln y$

Example	Operation	Display
	[MODE] [2] → "LR"	
x_i / y_i	(Memory cleared) [SHIFT] [Scl] [EXE]	0.
6.9 / 21.4	6.9 [ALPHA] [,] [ln] 21.4 [DT]	6.9
12.9 / 15.7	12.9 [ALPHA] [,] [ln] 15.7 [DT]	12.9
19.8 / 12.1	19.8 [ALPHA] [,] [ln] 12.1 [DT]	19.8
26.7 / 8.5	26.7 [ALPHA] [,] [ln] 8.5 [DT]	26.7
35.1 / 5.2	35.1 [ALPHA] [,] [ln] 5.2 [DT]	35.1
The data in the above table can be used to obtain the terms of the regression formula and the correlation coefficient. Based on the regression formula, estimated value $\hat{y}$ can be obtained for xi =16, and estimated value $\hat{x}$ can be obtained for yi =20.	(Constant term A) [SHIFT] [e^x] [MENU] [MENU] [MENU] [MENU] [MENU] [1] (A) [EXE]	30.49758742
	(Regression coefficient B) [MENU] [2] (B) [EXE]	−0.04920370831
	(Correlation coefficient r) [MENU] [3] (r) [EXE]	−0.9972473519
	($\hat{y}$ when xi =16) 16 [MENU] [MENU] [2] ($\hat{y}$) [EXE] [SHIFT] [e^x] [Ans] [EXE]	13.87915739
	($\hat{x}$ when yi =20) [ln] 20 [MENU] [1] ($\hat{x}$) [EXE]	8.574868046

■ Power Regression

The power regression formula is defined as $y = A \cdot B^x$ ($\ln y = \ln A + B \cdot \ln x$)

To input data

1. Press [MODE] [2] to enter the LR Mode.
2. Press [SHIFT] [Scl] [EXE] to clear the statistical memory.
   * Always be sure to clear the statistical memory before performing statistical calculations.
3. Input data using the following format.
   [ln] <x-data> [ALPHA] [,] [ln] <y-data> [DT]
   * You can input two data pairs that are identical using the same operations described for linear regression. Note, however, that for logarithmic regression you must press [ln] before inputting the x-data and before the y-data, too.

Deleting Data

Use the same procedures as those described for linear regression to delete data. Note, however, that you must always press [ln] before inputting x-data and before the y-data, too.

Example [ln] 10 [STO] [A] [EXE] [ln] 20 [EXE] [ALPHA] [A] [ALPHA] [,] [Ans] [CL]

Example [ln] 10 [ALPHA] [,] [ln] 20 [ALPHA] [A] [ALPHA] [;] −1 [DT]

Power Regression Calculations

Power regression produces the values shown in the following table.

Formula Term	Meaning
e ^ A	Constant Term A
B	Regression Coefficient B
r	Correlation Coefficient r
e ^ ($y\hat{x}$)	Estimated Value of x
e ^ ($x\hat{y}$)	Estimated Value of y

If y is substituted for $\ln y$, a for $\ln A$, and x for $\ln x$ in the regression formula $y = A \cdot B^x$ ($\ln y = \ln A + B \cdot \ln x$), you get the linear regression formula $y = a + bx$. Because of this, constant term A, regression coefficient B, and correlation coefficient r, as well as the estimated values of x and y can be calculated using the formula as that used for linear regression. Note, however, that calculation results differ from linear regression as noted in the following table.

Linear	Power
Σx	$\Sigma \ln x$
Σx^2	$\Sigma (\ln x)^2$
Σy	$\Sigma \ln y$
Σy^2	$\Sigma (\ln y)^2$
Σxy	$\Sigma \ln x \cdot \ln y$

Example	Operation	Display
	[MODE] [2] → "LR"	
x_i | y_i 28 | 2410 30 | 3033 33 | 3895 35 | 4491 38 | 5717	(Memory cleared) [SHIFT] [Scl] [EXE]	0.
	[ln] 28 [ALPHA] [,] [ln] 2410 [DT]	3.33220451
	[ln] 30 [ALPHA] [,] [ln] 3033 [DT]	3.401197382
	[ln] 33 [ALPHA] [,] [ln] 3895 [DT]	3.496507561
	[ln] 35 [ALPHA] [,] [ln] 4491 [DT]	3.555348061
	[ln] 38 [ALPHA] [,] [ln] 5717 [DT]	3.63758616
The data in the above table can be used to obtain the terms of the regression formula and the correlation coefficient. Based on the regression formula, estimated value $\hat{y}$ can be obtained for xi =40, and estimated value $\hat{x}$ can be otained for yi = 1000.	(Constant term A) [SHIFT] [e^x] [MENU] [MENU] [MENU] [MENU] [1] (A) [EXE]	0.2388010829
	(Regression coefficient B) [MENU] [2] (B) [EXE]	2.771866148
	(Correlation coefficient r) [MENU] [3] (r) [EXE]	0.9989062562
	($\hat{y}$ when xi = 40) [ln] 40 [MENU] [MENU] [2] ($\hat{y}$) [EXE] [SHIFT] [e^x] [Ans] [EXE]	6587.674743
	($\hat{x}$ when yi =1000) [ln] 1000 [MENU] [1] ($\hat{x}$) [EXE] [SHIFT] [e^x] [Ans] [EXE]	20.26225659

Formula Memory Function

The formula memory function lets you store often-used formula in memory for instant recall when you need them.
The following describes the key operations you should use with the formula memory function.

- [SHIFT] [IN] Stores the displayed formula into the formula memory.
- [OUT] Recalls the contents of the formula memory.
- [CALC] Executes the formula recalled from the formula memory.

Example To store the formula $Y = X^2+3X-12$ into formula memory, and then recall and execute it.

Input the formula.

[ALPHA] [Y] [ALPHA] [=]
[ALPHA] [X] [x^2] [+]
[3] [ALPHA] [X] [−] **1 2**

```
Y=X²+3X-12_
```

Store the formula.

[SHIFT] [IN]

```
_
```

Recall the formula.

[OUT]

```
Y=X²+3X-12_
```

Execute the formula.

[CALC]

```
X?
```

Input values for the variables.

7 [EXE]

```
Y=
```

↓ Answer displayed in approximately 0.5 seconds.

```
58.
```

To edit a formula after recalling it from memory

Example To recall the formula $Y = X^2+3X-12$ and change it to $Y = X^2+5X-12$.

Recall the formula.

[OUT]

```
Y=X²+3X-12_
```


Move the cursor to location of the change.

[◁] [◁] [◁] [◁] [◁]

```
Y=X²+3X-12
```

Make the change.

[5]

```
Y=X²+5X-12
```

Store the formula.

[SHIFT] [IN]

```
_
```

To clear the formula memory

To clear the current contents of the formula memory, press [AC] [SHIFT] [IN].

Important!

- You can store only one formula in memory. Formulas connected as multi-statements are regarded as a single formula and can be stored.
- The stored formula can contain up to 79 steps.
- When you store a formula, the calculation mode setting (COMP, SD, LR, BASE-N) where the formula was created is also stored. When you execute the formula, the calculator automatically enters the calculation mode that matches the setting stored with the formula.
- Whenever you store a formula into memory, the previous contents of the memory are overwritten (deleted).
- The formula memory retains its contents even when power is switched off.

Appendix

● Error Message Table

Message	Meaning	Countermeasure
Ma ERROR	• Calculation result exceeds calculation range. • Calculation is performed outside the input range of a function. • Illogical operation (division by zero, etc.)	• Check the input numeric value and correct it. When using memories, check that the numeric values stored in memories are correct.
Stk ERROR	• Execution of calculations that exceed the capacity of the stack for numeric values or stack for calculations.	• Simplify the formulas to keep stacks within 10 levels for the numeric values and 24 levels for the calculations. • Divide the formula into two or more parts.
Syn ERROR	Calculation formula contains an error.	• Use ◁ or ▷ to display the point where the error was generated and correct it.

● Input ranges of functions

Function	Input range	Internal digits	Accuracy	Notes
$\sin x$ $\cos x$ $\tan x$	(DEG) $\|x\| < 9 \times 10^{9}$° (RAD) $\|x\| < 5 \times 10^{7}\pi$rad (GRA) $\|x\| < 1 \times 10^{10}$grad	12 digits	As a rule, accuracy is ±1 at the 10th digit.	However, for $\tan x$: $\|x\| \neq 90(2n+1)$: DEG $\|x\| \neq \pi/2(2n+1)$: RAD $\|x\| \neq 100(2n+1)$: GRA
$\sin^{-1}x$ $\cos^{-1}x$	$\|x\| \leqq 1$	"	"	
$\tan^{-1}x$	$\|x\| < 1 \times 10^{100}$			
$\sinh x$ $\cosh x$	$\|x\| \leqq 230.2585092$	"	"	Note: For sinh and tanh, when $x = 0$, errors are cumulative and accuracy is affected at a certain point.
$\tanh x$	$\|x\| < 1 \times 10^{100}$			
$\sinh^{-1}x$	$\|x\| < 5 \times 10^{99}$	"	"	
$\cosh^{-1}x$	$1 \leqq x < 5 \times 10^{99}$			
$\tanh^{-1}x$	$\|x\| < 1$			
$\log x$ $\ln x$	$1 \times 10^{99} \leqq x < 1 \times 10^{100}$	"	"	
10^{x}	$-1 \times 10^{100} < x < 100$	"	"	
e^{x}	$-1 \times 10^{100} < x \leqq 230.2585092$			
$\sqrt{\ }$	$0 \leqq x < 1 \times 10^{100}$	"	"	
x^{2}	$\|x\| < 1 \times 10^{50}$			
$1/x$	$\|x\| < 1 \times 10^{100}$, $x \neq 0$	"	"	
$\sqrt[3]{\ }$	$\|x\| < 1 \times 10^{100}$			

Function	Input range	Internal digits	Accuracy	Notes
$x!$	$0 \leqq x \leqq 69$ (x is an integer)	12 digits	As a rule, accuracy is ±1 at the 10th digit.	
nPr nCr	Result < 1×10^{100} n, r (n and r are integers) $0 \leqq r \leqq n$, $n < 1\times10^{10}$	"	"	
Pol (x, y)	$\sqrt{x^2+y^2} < 1\times10^{100}$	"	"	
Rec(r, θ)	$0 \leqq r < 1\times10^{100}$ (DEG) $\lvert\theta\rvert < 9\times10^{9}$° (RAD) $\lvert\theta\rvert < 5\times10^{7}\pi$rad (GRA) $\lvert\theta\rvert < 1\times10^{10}$grad	"	"	However, for tan θ: $\lvert\theta\rvert\neq90(2n+1)$: DEG $\lvert\theta\rvert\neq\pi/2(2n+1)$: RAD $\lvert\theta\rvert\neq100(2n+1)$: GRA
°' "	|a|, b, c < 1×10^{100} $0 \leqq$ b, c	"	"	
← °' "	$\lvert x\rvert < 2.777777777\times10^{96}$ Hexadecimal display : $\lvert x\rvert \leqq$ 2777777.777			
x^y	$x > 0$: $-1\times10^{100} < y \log x < 100$ $x = 0$: $y > 0$ $x < 0$: $y = n, \frac{1}{2n+1}$ (n is an integer) However ; $-1\times10^{100} < \frac{1}{y} \log \lvert x\rvert < 100$	"	"	
$x^{1/y}$	$x > 0$: $y \neq 0$ $-1\times10^{100} < \frac{1}{y}\log x < 100$ $x = 0$: $y > 0$ $x < 0$: $y = 2n+1, \frac{1}{n}$ ($n \neq 0$, n is an integer) However ; $-1\times10^{100} < \frac{1}{y}\log \lvert x\rvert < 100$	"	"	

Function	Input range	Internal digits	Accuracy	Notes
$a^{b/c}$	•Results Total of integer, numerator and denominator must be within 10 digits (includes division marks). •Input Result displayed as a fraction for integer when integer, numerator and denominator are less than 1×10^{10}.	12 digits	As a rule, accuracy is ±1 at the 10th digit.	
SD (LR)	$\lvert x\rvert < 1\times10^{50}$ $\lvert y\rvert < 1\times10^{50}$ $\lvert n\rvert < 1\times10^{100}$ $x\sigma n$, $y\sigma n$, $\bar{x}$, $\bar{y}$, A, B, r : $n \neq 0$ $x\sigma n-1$, $y\sigma n-1$: $n \neq 0, 1$	"	"	

Function	Input range
BASE-N	Values after variable within following range : DEC : $-2147483648 \leqq x \leqq 2147483647$ BIN : $1000000000000000000000000000000 \leqq x \leqq 1111111111111111111111111111111$ (negative) $0 \leqq x \leqq 0111111111111111111111111111111$ (0, positive) OCT : $20000000000 \leqq x \leqq 37777777777$ (negative) $0 \leqq x \leqq 17777777777$ (0, positive) HEX : $80000000 \leqq x \leqq$ FFFFFFFF (negative) $0 \leqq x \leqq$ 7FFFFFFF (0, positive)

* Errors may be cumulative with internal continuous calculations such as x^y, $\sqrt[x]{y}$, $x!$, $\sqrt[3]{x}$ sometimes affecting accuracy.

● Specifications

Model: *fx–P401*

■ Calculations

Basic calculation functions:
Negative number, exponents, parenthetical addition/subtraction/multiplication/division (with priority sequence judgement function - true algebraic logic)

Built-in scientific functions:

Trigonometric/inverse trigonometric functions (units of angular measurement: degrees, radians, grads), hyperbolic/inverse hyperbolic functions, logarithmic/exponential functions, powers, roots, squares, square roots, reciprocal, cube roots, factorials, negative value, exponent, π, random numbers, internal rounding, fraction functions, decimal-sexagesimal conversions, coordinate transformations, engineering, permutations/combinations, FIX, SCI, engineering symbol calculations (8 types), Norm, delete, insert, replay, equal symbol, multistatements.

BASE-N calculations:

BASE-N conversions/calculations, logical operations, negative values (complementary numbers). (n = 2, 8, 10, 16)

Statistics:

Single-variable statistics - number of data, sum, sum of squares, mean, standard deviation (two types).
Paired-variable statistics - number of data, sum of x, sum of y, sum of squares of x, sum of squares of y, mean of x, mean of y, standard deviation of x (two types), standard deviation of y (two types), constant term, regression coefficient, correlation coefficient, estimated value of x, estimated value of y.

Formula Memory:

Formula storage (maximum 79 steps), formula recall, formula execution.

Memory:

Independent memory, 9 value memories (including one independent memory), Ans memory.

Calculation range:

$\pm 1 \times 10^{99} \sim \pm 9.999999999 \times 10^{99}$ and 0. Internal operation uses 12-digit mantissa.

Rounding:

Performed according to the specified number of significant digits or the number of specified decimal places.

Exponential display:

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

■ General

Display: 16 digits dot matrix display, 10-digit mantissa plus 2-digit exponent

Power source: One button-type battery (type; LR44, SR44, UCCS76E, A76)

Power consumption: 0.0001 W

Battery life:
Approximately 4,000 hours (continuous use) on type SR44 battery.
Approximately 2,000 hours (continuous use) on type LR44 battery.

Ambient temperature range: 0° C ~ 40°C (32°F ~ 104°F)

Dimensions: 9.7mmH × 74mmW × 141mmD (3/8"H × $2^{7}/_{8}$"W × $5^{1}/_{2}$"D)

Weight: 65g, (2.3oz.) including battery