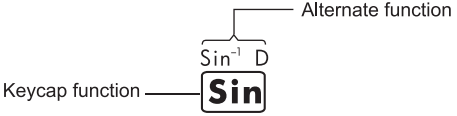
DONAU TECH

Instruction Manual

Model no.: K-DT6002/K-DT6004

Technical basics

- [MATH] and [LINE] indicators mark examples that use Math and Linear format, respectively. See "Input/Output Format" for details about specifying these.
- Marks on the calculator keys indicate their functions and input they provide in your calculations.
- [SHIFT] and [ALPHA] keys let you use the second function of other keys. To do that, simply press one of them before using the intended key. The second function is marked above the keys.



- Keys are also marked by color to group them into groups listed below:

Color the same as "SHIFT" key	Function available after pressing [SHIFT]
Color the same as "ALPHA" key	Function available after pressing [ALPHA]
i and the brackets in consistent color	Enter the CMPLX mode to access
Color same as "DEC"	Enter the BASE-*n* mode to access

Displays, illustrations, and markings used in this guide are shown for illustrative purposes only and may differ from how they are represented on the calculator. This manual can be modified and/or update with time, without notice. This manual can be changed and/or updated without notice.

Cursor keys are marked with four arrows indicating four directions. Operations performed with these will be marked as ▲, ◀, ▶, ▼ in this manual.

To specify degree or radian angle unit, press Deg or Rad respectively.

■ Safety precautions

Study the following safety precautions to avoid injury. Keep the manual for reference and guidance when using the calculator.

Caution

When you see this symbol, proceed with caution, as it indicates risk of injury or damage if you don't use the calculator according to the safety precautions listed below.

Battery

- Keep it out of reach of children. If a battery is swallowed, seek urgent medical care.
- Applying heat, disabling, short-circuiting or charging attempts are not advised.
- During the installation of a new battery, point the positive sign upwards.
- Only the battery type specified in the manual should be used to power the calculator.

■ Disposing of the calculator

Using the calculator in proximity of an open fire might result in injury or fire and the calculator might explode. Keep safe distance to ensure your safety.

■ Other precautions

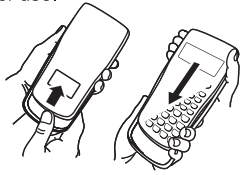
- Loss of charge in the battery between the time the calculator leaves the factory and the time it is purchased might happen. As a result, an original battery might not last as long as a new battery. Keep that in mind.
- When battery power is very low, the calculator's memory may become corrupted or be lost completely. Proceed with caution when doing complex operations. It is advised to store a copy of important information elsewhere.
- Avoid storing or using the calculator under extreme conditions.

- Don't leave the calculator in areas subjected to temperature extremes. High temperatures and direct sunlight exposure might cause deformation or discoloration of the calculator's case, and low temperatures might shorten battery life and display malfunction might occur.
- Avoid using the calculator in areas with high humidity or with high intensity of dust particles. These factors can damage internal circuitry.
- Strong impact (e.g., upon dropping) might result in irreversible damage.
- Never twist or bend the calculator in any way.
- Never try to take the calculator apart.
- Never press the keys of the calculator with a ball-point pen or other pointed object that might damage the keys.
- Exposing the calculator to open flame might cause certain components to suddenly burst, creating the risk of fire and personal injury.
- Use a soft, dry cloth to clean the calculator.
- Opening the casing voids the warranty.
- To properly clean the calculator, use a neutral cleaning agent diluted in water. Start with dipping a microfiber cloth in the solution and wring it out before applying it to the calculator. To avoid damaging the casing or the keys of the calculator, do not use any volatile solvent.

Before Using the Calculator

■ Protective hard case

Before using the calculator, slide the unit out of its hard case and slide it on to the back for safe keeping. Put the protective hard case back on by reversing these steps, to keep it safe after use.



■ Power on/off

Press [ON] key to turn on the calculator. By pressing [SHIFT] [AC] (OFF) key combination, you can turn it off.

■ Display Contrast adjustment

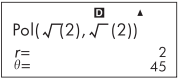
Combination: [SHIFT] [MODE] (SETUP) ▼ [6] (◀ CONT ▶)

Contrast adjustment screen is displayed. Use ◀ and ▶ to adjust the contrast, and press [AC] to confirm.

Remember! If adjustment doesn't help in increasing the readability, that might be the indicator of low battery.

■ Calculator display

Here you will see your entries (input), results and indicators helping you through your calculations and other operations.



Your input takes the upper line, while the output (results of your operations) sit at the bottom line.

If ▶ indicator appears on the right side of the result line, it means that the value was too long to display it. You can press ▶ to show the rest of it and ◀ to go back. This also works for input expression when you are working on a longer, more complex operation, but the indicator is ▷. If both ▷ and ▶ are shown, you need to press [AC] first to scroll through the input line.

■ Display indicators and their meaning

Indicator:	Description:
S	SHIFT key has been pressed. To unshift the keypad, press the key again.
A	ALPHA key has been pressed. Press it again to cancel.

M	There is a value stored in the calculator memory.
STO	The calculator is standing by for input of a variable name to assign a value to the variable. This indicator appears after you press SHIFT RCL(STO).
RCL	Variable recalling mode is active. It appears after RCL is pressed.
STAT	Statistics mode has been activated.
CMPLX	The calculator is in the CMPLX Mode.
MAT	The calculator is in the MATRIX Mode.
VCT	The calculator is in the VECTOR Mode.
D	Default angle unit set to degrees.
R	Default angle unit set to radians.
G	Default angle unit set to grads.
FIX	A fixed number of decimal places is in effect.
SCI	A fixed number of significant notation is in effect.
Math	Natural Display is selected as the display format.
▲ ▼	There are earlier or later results that can be displayed
Disp	The displayed value is an intermediate result when performing multi-statement calculation.

If you are working on a complex calculation, the calculator might not display anything besides these indicators before the calculation is performed internally.

Calculation Modes and Calculator Setup

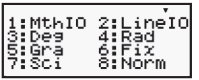
■ Calculation modes

Press [MODE] key to display mode menu and pick the number corresponding to the mode you want to do operations in.

Number	Mode	Description
1	COMP	Basic calculations (including scientific).
2	CMPLX	Complex number calculations.
3	STAT	Statistical and regression calculations.
4	BASE-*n*	Numeric comparison with binary, octal, decimal or hexadecimal values.
5	EQN	Simultaneous linear equations.
6	MATRIX	Matrix calculations.
7	TABLE	Defined functions in a tabular form.
8	VECTOR	Vector calculations.

■ Setup keys

By pressing [SHIFT] [MODE] (SETUP), you enter setup menu. Here, you can control how the calculations are displayed and executed. To configure these settings, use ▲ ▼.

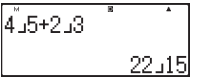


■ Input/Output Format

Enter the setup menu and press " 1 " (MthIO) for natural display or " 2 " (LineIO) for linear display of values.

Natural (math) format causes fractions, irrational numbers and other expressions to display as they are written on paper. On the other hand, linear format displays them in a single line for simplicity.

Math Format



Linear Format

■ Specifying the Default Angle Unit

Angle unit:	To set as default:
Degrees	SHIFT MODE 3(Deg)
Radians	SHIFT MODE 4(Rad)
Grads	SHIFT MODE 5(Gra)

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

■ Number of Display Digits

Angle unit:	To set as default:
Number of decimal places	SHIFT MODE 6(Fix) 0 – 9
Number of significant digits	SHIFT MODE 7(Sci) 0 – 9
Exponential display range	SHIFT MODE 8(Norm) 1(Norm1) or 2(Norm2)

■ Calculation Result Display Examples

Fix: By picking a number from 0 to 9, on the controls, you change the number of decimal places for displayed

calculation results. Calculation results are rounded off to the specified digit before being displayed.

Example: 112 ÷ 12 = 9.3333 (Fix4) or 9.33 (Fix2)

Sci: By picking a number from 0 to 9, on the controls, you change the number of significant digits for displayed calculation results. Results are rounded off the specified digit before being displayed.

Example: $1 \div 6 = 1.6667 \times 10^{-1}$ (Sci5) or 1.667×10^{-1} (Sci4)

Norm: By selecting either Norm1 or Norm2, you determine the range in which results are displayed in non- exponential format. Outside the specified range, results are displayed using exponential format.

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

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

Example: $1 \div 400 = 2.5 \times 10^{-3}$ (Norm1) or 0.0025 (Norm2)

■ **Fraction Format**

Fraction format	**To specify it:**
Mixed	SHIFT MODE ▼ 1 *(a b/c)*
Improper	SHIFT MODE ▼ 2 *(d/c)*

■ **Coordinates Format**

Coordinates format	**To specify it:**
Rectangular	SHIFT MODE ▼ 3 (CMPLX) 1 a+bi
Polar ($r\angle\theta$)	SHIFT MODE ▼ 3 (CMPLX) 2 $r\angle\theta$

■ **Statistical Display Format**

You can hide or show FREQ column of the STAT mode

Action:	Command:
Show FREQ column	SHIFT MODE ▼ 4 (STAT) 1 (ON)
Hide FREQ column	SHIFT MODE ▼ 4 (STAT) 2 (OFF)

■ **Decimal Point Display Format**

Decimal point display format:	Command:
Dot(.)	SHIFT MODE ▼ 5 (Disp) 1 (Dot)
Comma(,)	SHIFT MODE ▼ 5 (Disp) 2 (Comma)

Decimal points are always marked with a dot (.). Settings configured above applies only to the results line.

■ **Initializing the calculator settings**

To initialize the calculation mode and other setup settings, press:

SHIFT 9 (CLR) 1 (Setup) = (Yes)

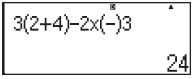
Inputting expressions and values

■ **Inputting a calculation expression**

You can input calculation expressions just as they are written, while the calculator automatically sets the priority sequence for addition, subtraction, multiplication, and division functions, and parentheses.

Example: 3 (2 + 4) - 2 x (-) 3 = LINE

3 (2 + 4) − 2 x (-) 3 =



■ **Inputting a general function**

Inputting any of the general functions (below), the function is automatically input with the open parentheses "("character for convenience. You just need to close with another parentheses.

Example: cos20 =
As you can see, pressing [cos] inputs "cos (". Input procedure changes, though, if you want to use the Math format. See "Inputting with Math format" for more information.

■ Omitting the multiplication sign

You can skip the multiplication sign (×) in any of the following cases.

- Before an open parenthesis "("
  Example: 2×(5+4)
- Before a general function
  Example: 2×sin(30), 2×√
- Before a variable name, constant, or a random number
  Example: 20×A, 2×π

■ Long expressions and input length

- Single expression can hold up to 99 bytes of data for a single expression. Each key operation uses up one byte. Some functions require 3 to 13 bytes.
- When your cursor changes from a straight vertical/horizontal line into a rectangle, it indicates that 10 or fewer bytes of free space remain.

■ Insert and overwrite input modes

In insert mode, displayed characters shift to the left to make room for a replacement character at the current cursor position. When insert mode is active, the cursor changes into a vertical flashing line " ". You can change it to overwrite mode.
The initial default for linear format input is insert mode. To switch to overwrite, press [SHIFT] [DEL] (INS). The cursor will change to "_", a horizontal flashing line.

■ Changing the character or function you just input

Correcting the expression 627 × 11 and changing it to 627 × 13

6 2 7 x 1 1	627x11 0
DEL	627x1 0
3	627x13 0

■ **Deleting a Character or Function**

Correcting the expression 627 ×× 11 so it becomes 627 × 11.

In insert mode:

6 2 7 x 1 1	627xx11 0
◀ ◀	627xx 11 0
DEL	627x 11 0

In overwrite mode:

6 2 7 x 1 1	627xx11 0
◀ ◀ ◀	627xx11 0
DEL	627x11 0

■ **Correcting a Calculation**

Correcting sin(30) so it becomes cos(30)

In insert mode:

sin 3 0)	sin(30) 0
◄ ◄ ◄ DEL	30) 0
cos	cos(30) 0

In overwrite mode:

sin 3 0)	sin(30) 0
◄ ◄ ◄	sin(30) 0
cos	cos(30) 0

■ **Inserting Input into a Calculation**

For this type of operation, always use insert mode. By using ► or ◄, you can move the cursor to the location where the new input should be added.

■ **Inputting with Natural Display**

When providing input in Math format, you can input and display fractions and some functions using the same format as they appear on paper.

Two display screens height (31 dots × 2) is the maximum for the display line. Adding further input will be blocked if you reach the limit of the calculator.

You can nest functions and parentheses, but as to not exceed the input limit, it is advised to divide the calculations into multiple parts and execute each of them separately.

■ Math Format Input Examples (MATH)

Perform operations shown in examples while using Math format. Pay attention to the location and size of your cursor during this process.

Example 1: Input of $4^3 - 3$

[4] [$x^{\blacksquare}$] [3]	4^{3} 0
[▶] [−] [3]	$4^{3}-3$ 0

Example 2: Input of $3 + \sqrt{5} + 7$

[3] [+] [$\sqrt{\blacksquare}$] [5]	$3+\sqrt{5}$ 0
[▶] [+] [7]	$3+\sqrt{5}+7$ 0

Example 3: Input of $\left(2 + \frac{3}{5}\right)^3 \times 5$

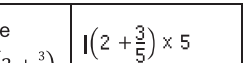
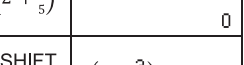
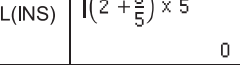
[(] [2] [+] [▤] [3] [▼] [5] [▶] [)] [SHIFT] [x^2] [×] [5] [=]	$\left(2+\frac{3}{5}\right)^3 \times 5$ $\frac{2197}{25}$

As you can see in example 3, in Math format, a part of the expression can be cut off. To view the entire input, press [AC] and then [▶].

■ Incorporating a Value into a Function

When using Math format, you can incorporate a part of an input expression into a function. To do that, follow the example.

Example: Incorporating expression inside a parenthesis of $\left(2+\frac{3}{5}\right) \times 5$ into the $\sqrt{\ }$ function.

Move the cursor before the $\left(2+\frac{3}{5}\right)$	
To change the cursor: SHIFT DEL(INS)	
$\sqrt{\blacksquare}$	

The expression has been incorporated into the $\sqrt{}$ function. The value to the right of the cursor became the argument of the next function after SHIFT DEL (INS) combination has been pressed. The range of the argument contains everything up to the first function encountered on the right or the first open parenthesis.

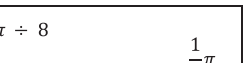
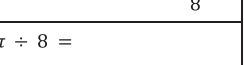
You can also incorporate values into the following functions.

$\blacksquare$, $\log_{\blacksquare}\square$, $\int_{\blacksquare}^{\blacksquare}$, SHIFT $\int_{\blacksquare}^{\blacksquare}$ $\left(\frac{d}{dx}\blacksquare\right)$, SHIFT $\log_{\blacksquare}\square$ $\left(\sum_{\square}^{\square}\right)$, SHIFT $\blacksquare^{\blacksquare}$ $\left(\sqrt[\blacksquare]{\square}\right)$, SHIFT log $(10^{\blacksquare})$, SHIFT ln $(e^{\blacksquare})$, $\sqrt{\blacksquare}$, $\blacksquare^{\blacksquare}$, SHIFT $\sqrt{\blacksquare}$ $\left(\sqrt[3]{\blacksquare}\right)$, SHIFT hyp (Abs).

Toggling Calculation Results

Press S⇔D when Natural display is selected to switch the calculation result between its fraction and decimal forms, its π form and decimal form or its $\sqrt{}$ form and decimal form.

Example 1: Calculation of $\pi \div 8 = \frac{1}{8}\pi = 0.03926990817$

SHIFT ×10^ (π) ÷ 8 =	
S⇔D	

Example 2: Calculation of $(\sqrt{2}+3) \times \sqrt{3}$

(√ 2 ▶ + 3) × √ 3 =	$(\sqrt{2}+3) \times \sqrt{3}$ $\sqrt{6} + 3\sqrt{3}$
S⇔D	$(\sqrt{2}+3) \times \sqrt{3}$ 7.645642165

When linear display is selected, by pressing S⇔D you can toggle the currently displayed calculation result between its decimal and fraction forms.

Example 3: Calculation of $1 \div 4 = 0.25 = \frac{1}{4}$

1 ÷ 4 =	$1 \div 4$ 0.25
S⇔D	$1 \div 4$ 1⌟4

Conversion process might take more time, depending on the result displayed. In addition, sometimes pressing S⇔D won't influence the results displayed. For example, convertion from decimal to mixed fraction form won't be completed if the total number of digits used in the mixed fraction (including integer, numerator, denominator, separator symbols) is greater than 10.

By pressing SHIFT = instead of = after providing input, you can display the result in decimal form in natural display (MathO). Proceeding with S⇔D after that will result in switching to the fraction form or π for of the results. The √ form won't be available.

Basic Calculations COMP

Here you will find explanation how to perform arithmetic fraction, percent and sexagesimal calculations performed in COMP mode (MODE , 1).

■ Arithmetic Calculations

Use the +, −, ×, ÷ keys to perform arithmetic calculations.

Example: 5 × 3 – 4 × 2 = 7

5 × 3 − 4 × 2 =	5x3−4x2 7

Your calculator automatically sets the correct priority of operations. To learn more, see “Calculation priority sequence”.

■ Decimal Places and Number of Significant Digits

You can specify the number of decimal places and significant digits of the result of your calculation.

Example: 1 ÷ 7 =

Default setting (Norm1)	1÷7 0.1428571429
3 decimal places (Fix3)	1÷7 0.143
3 significant digits (Sci3)	1÷7 0.143×10^{-1}

You can find more information on this in the part “Specifying the number of display digits” of this manual.

■ Omitting a Final Closed Parentheses

When using linear format, you can omit any closed parentheses ()) proceeding the operation of the = key at the end of calculation.

Example: (5 + 3) × (4 – 2) = 16

(5 + 3) × (4 − 2 =	(5+3)x(4−2) 16

■ Fraction calculations

Fraction input depends on the “input/output format” that is selected currently. By default, fractions are displayed as improper fractions. Fraction calculation results are always reduced before displayed.

	Improper Fraction	Mixed Fraction
Math Format	$\frac{7}{3}$	$2\frac{1}{3}$
Linear Format	7 ⌟ 3 (Numerator, Denominator)	2 ⌟ 1 ⌟ 3 (Integer Part, Numerator, Denominator)

Example: Calculation of $\frac{2}{3}+\frac{1}{2}=\frac{7}{6}$

MATH [2] [▼] [3] [►] [+] [1] [▼] [2] [=]	$\frac{2}{3}+\frac{1}{2}$ $\frac{7}{6}$
LINE [2] [3] [+] [1] [2] [=]	2⌟3+1⌟2 7⌟6

Example: Calculation of $3\frac{1}{4}+1\frac{2}{3}=4\frac{11}{12}$ (fraction format $a\frac{b}{c}$)

LINE [3] [1] [4] [+] [1] [2] [3] [=]	3⌟1⌟4+1⌟2⌟3 4⌟11⌟12

When mixing fractions and decimal values in a calculation, in LINE display, results will be displayed as decimal values. Fractions in results are reduced to the lowest by default.

■ Switching Between Improper Fraction and Mixed Fraction Format

To switch between improper and mixed formats, press [SHIFT] [S⇔D] $a\left(\frac{b}{c}\Leftrightarrow\frac{d}{c}\right)$ keys.

■ Switching Between Fraction and Decimal formats

3÷2 1.5	→ [S⇔D]	3÷2 3⌟2

■ Calculating Percent values

When you input a value, press [SHIFT] [(] (%) to change it into a percent.

Example 1: 4% = 0.04 ($\frac{4}{100}$)

LINE 4 SHIFT ((%) =	4% 0.04

Example 2: 150 × 20% = 30 (150 × $\frac{20}{100}$)

LINE 1 5 0 × 2 0 SHIFT ((%) =	150x20% 30

Example 3: Calculate what percentage is 450 of 1800

LINE 4 5 0 ÷ 1 8 0 0 SHIFT ((%) =	450÷1800 % 25

Example 4: Increasing 9000 by 20%

LINE 9 0 0 0 + 9 0 0 0 × 2 0 SHIFT ((%) =	9000+9000x20% 10800

Example 5: Discounting 9000 by 20%

LINE 9 0 0 0 − 9 0 0 0 × 2 0 SHIFT ((%) =	9000−9000x20% 7200

■ Degree, Minute, and Sexagesimal Calculations

It is possible to perform calculations using degree, minute or sexagesimal formats and convert them between sexagesimal and decimal values.

■ Inputting Sexagesimal Values

Te syntax for inputtng a sexagesimal value is as follows:

{Degrees} °,,, {Minutes} °,,, {Seconds} °,,,

Example: Input of 14° 2’ 42”

LINE 1 4 °’” 2 °’” 4 2 °’” =	14° 2° 42° ▲ 14° 2’42”

You can’t leave values blank – use a zero instead.

■ Sexagesimal Calculations

Addition, subtraction of sexagesimal values and multiplication or division of sexagesimal values (also with decimal value) give sexagesimal result.

Example: 14° 2’ 42” + 5° 5’ 7”

LINE 1 4 °’” 2 °’” 4 2 °’” + 5 °’” 5 °’” 7 °’” =	14° 2° 42° + 5° 5° 7° ▲ 19° 7’49”

■ Converting Values Between Sexagesimal and Decimal

Pressing °’” while a calculation result is displayed, will result in changing between sexagesimal and decimal values.

Example: Convert 14.045 into sexagesimal format.

LINE 1 4 • 0 4 5 =	14.045 ▲ 14.045
°’”	14.045 ▲ 14° 2 ’ 42”
°’”	14° 2 ’ 42” ▲ 14.045

■ Using Multi-statements in Calculations

To connect multiple expressions and execute them in a sequence from left to right after pressing =, use the colon (:) character.

Example: Creating a multi-statement that performs: 4 + 7 and 10 × 3

LINE 4 + 7 ALPHA (:) 1 0 × 3	4+7:10x3 0
=	4+7 11
=	10x3 30

■ Recalling Calculation History

When you are using COMP, CMPLX or BASE-*n* modes, the calculator saves up to 200 bytes of data for the newest calculation. Scrolling through the calculation history is possible using ▲ and ▼.

LINE 1 + 1 = 2 + 2 = 3 + 3 =	3+3 6
▲	2+2 4
▲	1+1 2

Important! Memory contents are cleared each time you turn off the calculator, press the ON key, change the calculation mode or the input/output format or after any reset operation. Proceed with caution and save your data on a physical copy.

■ Replay Function

While there's a calculation result on display, press [AC] and then [◄] or [►] to edit the expression you used for the previous calculation. When using linear format, you can skip pressing the [AC] button.

Example: 2 × 3 + 7.5 =13.5

2 × 3 - 6.3 =- 0.3

LINE [2] [×] [3] [+] [7] [•] [5] [=]	2x3+7.5 13.5
[AC]	I 0
[◄]	2x37.5 0
[DEL] [DEL] [DEL] [DEL]	2x3 0
[−] [6] [•] [3] [=]	2x3−6.3 −0.3

■ Calculator Memory

There are 3 types of usable calculator memory.

Answer memory – is used to store the result of your last calculation.

Independent memory – you can add or substract results of your calculation using this memory type. If there's data stored in independent memory, the "M" indicator is visible.

Variables – You can store individual values within eight variables named from A to F, X and Y.

COMP mode was used in examples in this part of the guide ([MODE], [1]).

■ Variables (A, B, C, D, E, F, X, Y)

Example 1: Assigning result of 6+4 to variable A

6 [+] 4 [SHIFT] [RCL] (STO) [(-)] (A)

Example 2: Recalling contents of A. [RCL] [(-)] A

Example 3: Multiplying A by the contents of B.

[ALPHA] [(-)] (A) [×] [ALPHA] A [°'''] (B) [=]

Variables are maintained even if you press the [AC] key, change the calculation mode or turn off the calculator. Store important values in them to use them later.

Example 4: Assigning 10 × 4 + 3 to B, 8 + 3 to C and then calculating B÷C

LINE	
[1] [0] [×] [4] [+] [3] [SHIFT] [RCL] (STO) [°'''] (B)	10x4+3→B 43
[8] [+] [3] [SHIFT] [RCL] (STO) [hyp] (C)	8+3→C 11
[ALPHA] [°'''] (B) [÷] [ALPHA] [hyp] (C) [=]	B÷C 3.909090909

To clear a variable, press [0] [SHIFT] [RCL] (STO) and press the key corresponding variable's name.

■ Answer Memory (Ans)

Answer memory (Ans) updates every time you execute an operation.

Example 1: Subtracting 10 from the result of 3 x 20

LINE	
[3] [x] [2] [0] [=]	3x20 60
[−] [1] [0] [=]	Ans−10 50

In this example, press [÷] automatically puts Ans in the equation. To put the value from answer memory into the equation manually, press [Ans] button.

Example:

LINE [4] [5] [6] [+] [1] [2] [3] [=]	456+123 579
[7] [8] [9] [−] [Ans] [=]	789−Ans 210

■ **Independent Memory (M)**

You can add to or subtract from independent memory value. When there's a value stored in this memory, "M" indicator appears on the display. Independent memory uses variable M.

Key command:	**Description:**
[M+]	Add the displayed value or result of the expression to the memory
[SHIFT] [M+] (M-)	Subtract the displayed value or result of the expression from the memory
[RCL] [M+] (M)	Recall the current value stored in independent memory
[0] [SHIFT] [RCL] (STO) [M+]	Clear the independent memory.

Example: Adding or subtracting consecutive results to and from the memory.

Equation	Command
33 + 9 = 42, added to M	3 3 [+] 9 [M+]
53 – 7 = 46, added to M	5 3 [−] 7 [M+]
30 × 2 = 60, subtracted from M	3 0 [×] 2 [SHIFT] [M+] (M-)
5 × 4 = 20, added to M	5 [×] 4 [M+]
Total: 48	[RCL] [M+] (M)

■ **Clearing the Contents of All Memories**

To clear all of the above mentioned memories (Independent, Answer, Variables), press [SHIFT] [9] (CLR) [2] (Memory) [=] (Yes) To cancel this operation, press [AC] (Cancel) instead of [=].

Function Calculations

Keep in mind that while π=3.141592654 is displayed, π= 3.14159265358980 is used for internal calculations. While e=2.718281828 is displayed, for internal calculations e = 2.71828182845904.

sin, cos, tan, $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$ are trigonometric functions available in the calculator. Before performing these calculations, specify the angle unit first.

Example:

sin(30) = 0.5	[sin] 30 [)] [=]
$\sin^{-1}$0.5 = 30°	[SHIFT] [sin] ($\sin^{-1}$) 0.5 [)] [=]

sinh, cosh, tanh, $\sinh^{-1}$, $\cosh^{-1}$, $\tanh^{-1}$ are hyperbolic functions. Press [hyp] and then input one of the functions. Default angle unit settings don't affect calculations.

Example:

sinh(1) = 1.175201194	[hyp] [1] (sinh) 1 [)] [=]
$\cosh^{-1}$1 = 0	[hyp] [5] ($\cosh^{-1}$) 1 [)] [=]

Degrees (°), Radians (ʳ), and Grads (ᵍ) are angle units. To specify the default, press SHIFT Ans (DRG▶).

Example: Conversion, π/3 radians = 60°, 45 grads = 40.5°

(SHIFT ×10ˣ (π) ÷ 3) SHIFT Ans (DRG▶) 2 (ʳ) =	60°
45 SHIFT Ans (DRG▶) 3 (ᵍ) =	40.5°

Exponential functions $10^{\blacksquare}$ and $e^{\blacksquare}$. Remember that depending on if you are using natural or linear display, input method will be different.

Example: Calculating $e^5 \times 2$ to three significant digits (Sci3)

SHIFT MODE (SETUP) 7 (Sci) 3	Setting (Sci3)
MATH SHIFT ln ($e^{\blacksquare}$) 5 ▶ × 2 =	2.97×10^2
LINE SHIFT ln ($e^{\blacksquare}$) 5) × 2 =	2.97×10^2

To use **log (logarithmic function)**, press log key to input $\log_a b$ as $\log(a, b)$. Base 10 is the default setting if there's no input for a. The $\log_{\square}$ key also can be used for input, but only with natural display.

Examples:

$\log_{10} 1000 = \log 1000 = 3$	log 1000) =
$\log_2 32 = 5$	log 2 SHIFT) (,) 32) =
(MATH)	$\log_{\square}$ 2 ▶ 32 =

■ **Natural logaritm to base e(ln).**

Example: To calculate ln 60 (=$\log_e 60$) to three significant digits (Sci3)

SHIFT MODE (SETUP) 7 (Sci) 3 ln 60) =	4.09×10^0

Powers, power roots, and reciprocals, x^2, x^3, $x^{\blacksquare}$, $\sqrt{\blacksquare}$, $\sqrt[3]{\blacksquare}$, $\sqrt[\blacksquare]{\square}$, x^{-1}. Note that $x^{\blacksquare}$, $\sqrt{\blacksquare}$, $\sqrt[3]{\blacksquare}$, $\sqrt[\blacksquare]{\square}$ are different depending on your display settings (natural or linear).

x^2, x^3, $x^{\blacksquare}$ and x^{-1} cannot be used in consecutive sequence. Putting them one after another will result with the last one being ignored by the calculator. To input 2^{2^2}, input 2 x^2 and then press ◀ key and x^3 (MATH).

x^2, x^3 and x^{-1} can be used in complex number calculations.

Examples:

$1.5 \times 10^4 = 15000$	(MATH) 1.5 × 10 $x^{\blacksquare}$ 4 =
$(2+4)^{2+2} = 1296$	(MATH) (2 + 4) x^2 2 + 2 =
$(4^2)^3 = 4096$	(4 x^2) SHIFT x^2 (x^3) =
$\sqrt[5]{32} = 2$	(MATH) SHIFT $x^{\blacksquare}$ ($\sqrt[\blacksquare]{\square}$) 5 ▶ 32 = (LINE) 5 SHIFT $x^{\blacksquare}$ ($\sqrt[\blacksquare]{\square}$) 32) =

$\int_{\blacksquare}^{\blacksquare}$ You can use this function to perform numerical integration using the Gauss-Kronrod method. Input syntax for natural display is $\int_a^b f(x)$, while for linear display its $\int(f(x), a, b, tol)$. tol. is tolerance, which becomes 1×10^{-5} when there's no input for tol. See "Integration and Differential Calculation Precautions" for more information.

Example: $\int_1^e \ln(x) = 1$

MATH $\int_{\blacksquare}^{\blacksquare}$ ln ALPHA) (X)) ▶ 1 ▶ ALPHA ×10^ (e) =

LINE $\int_{\blacksquare}^{\blacksquare}$ ln ALPHA) (X)) SHIFT) (,)
1 SHIFT) (,) ALPHA ×10^ (e)) =

$\frac{d}{dx}$ **if function for approximation of the derivative based on the central difference method.** For natural display, input syntax is $\frac{d}{dx}(f(x))|_{x=a}$, while for linear display its $\frac{d}{dx}(f(x), a, tol)$. As previously mentioned, tol becomes 1×10^{-5} when there's no input. Also see "Integration and Differential Calculation Precautions" for more information.

Example: Obtaining the derivative at point $x = \pi/2$ for the function of $y = \sin(x)$

Rad

MATH

[SHIFT] [∫dx] ([d/dx]) [sin] [ALPHA] [)] (X) [)]

[▶] [□] [SHIFT] [×10^x] (π) [▶] 2 [=]

LINE

[SHIFT] [∫dx] ([d/dx]) [sin] [ALPHA] [)] (X) [)]

[SHIFT] [)] (,) [SHIFT] [×10^x] (π) [□] 2 [)] [=]

$\sum_{\square}^{\square}$ **is a function that, for a specified range of** $f(x)$**, determines sum** $\sum_{x=a}^{b}(f(x)) = f(a) + f(a+1) + f(a+2) + \ldots + f(b)$.

Linear display input syntax and natural display syntax are $\Sigma(f(x), a, b)$ and $\sum_{x=a}^{b}(f(x))$ respectively. Integers a and b can be specified within the range of $-1\times10^{10} < a \leqq b < 1\times10^{10}$.

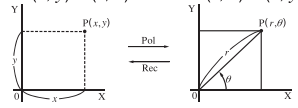
Note: The following cannot be used in $f(x)$, a, or b: d/dx, Σ, Pol, Rec, $\int$.

Example: $\sum_{x=1}^{4}(x+1) = 14$

MATH [SHIFT] [log□] ($\sum_{\square}^{\square}$) [ALPHA] [)] (X) [+] 1 [▶] 1 [▶] 4 [=]	14
LINE [SHIFT] [log□] ($\sum_{\square}^{\square}$) [ALPHA] [)] (X) [+] 1 [SHIFT] [)] (,) 1 [SHIFT] [)] (,) 4 [)] [=]	14

Rec, Pol: Rec converts rectangular coordinates to polar coordinates and Pol works the other way.
Before starting any calculations, specify the default angle unit first.

Pol$(x, y) = (r, \theta)$ Rec$(r, \theta) = (x, y)$



Rectangular Coordinates (Rec) **Polar Coordinates (Pol)**

Calculations result for r and θ and for x and y are each assigned to variables X and Y.
θ result range: $-180° < \theta \leqq 180°$.

Example: Converting rectangular coordinates ($\sqrt{2}$, $\sqrt{2}$) to polar coordinates.

MATH SHIFT + (Pol) √ 2 ▶ SHIFT) (,) √ 2 ▶) =	r =2, θ=45°
LINE SHIFT + (Pol) √ 2) SHIFT) (,) √ 2)) =	r =2, θ=45°

Example: Converting rectangular coordinates ($\sqrt{2}$, 45°) to polar coordinates.

(Deg) (MATH) SHIFT − (Rec) √ 2 ▶ SHIFT) (,) 45) =	X =1, Y =1

***x!* is a factorial function.**
Example: (4 + 1) ! = 120

(4 + 1) SHIFT x^{-1} ($x!$) =	120

Abs is an absolute value function. Input varies, depending on natural or linear display.
Example: $|2 - 6| \times 4 = 16$

MATH SHIFT hyp (Abs) 2 − 6 ▶ × 4 =	16
LINE SHIFT hyp (Abs) 2 − 6) × 4 =	16

Ran# is a function that generates pseudo random number less than 1, made out of 3 digits. Results are displayed as fraction when natural display is set.

Example: Obtaining a random three-digit integers.

1000 SHIFT • (Ran#) =	436

Value in this example is random.

RanInt# generates a random integer within a range of a and b. Input is RanInt#(a,b).

Example: Obtaining a random integer between 20 and 125

ALPHA • (RanInt) 20 SHIFT) (,) 125) =	94

Value in this example is random.

***n*Pr, *n*Cr are Permutation and combination functions respectively.**

Example: How many four person permutations and combinations are possible for a group of 20 people?

Permutations: 20 SHIFT × ($_nP_r$) 4 =	116280
Combinations: 20 SHIFT ÷ ($_nC_r$) 4 =	4845

Rnd is a rounding function. This function rounds the value or the result of the expression in the function's argument to the number of significant digits specified by the settings.

For Norm1 or Norm2, the mantissa is rounded to 10 digits. For Fix or Sci, the value is rounded to the specified number of digits.

Example 1: While the calculator maintains the value of up to 15 digits for more precise internal calculation, it is displayed differently. For example, result of 20 ÷ 6 is displayed as 3.333. Both displayed, and internal values will match, if Rnd(20÷ 6)= 3.333, when Fix3 is set. Whether Rnd is used or not, calculations will produce different outcomes, for example: (Rnd(20÷6) × 6 = 19.999) or (20÷ 6 × 6 = 20.000) for using and not using Rnd respectively.

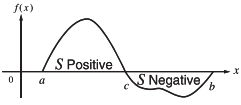
Example 2: Calculating 100 ÷ 30 × 30 and Rnd(100 ÷ 30) x 30 when Fix3 is selected.

LINE SHIFT MODE (SETUP) 6 (Fix) 3 100 ÷ 3 × 3 =	100.000
SHIFT 0 (Rnd) 100 ÷ 3) × 3 =	99.999

Important! Results might be displayed with a delay when you use more complex functions. Avoid performing subsequent operations while waiting for the internal calculation to be completed. Instead, if you want to interrupt it, press [AC].

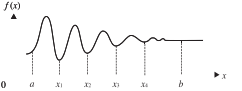
■ Integration and Differential Calculation Precautions

If your periodic function or integration interval results are in both positive and negative $f(x)$ function values, separate integrations for each cycle are needed. After performing them for both parts (negative and positive), combine the results.



$$\int_a^b f(x)dx = \underbrace{\int_a^c f(x)dx}_{\text{Positive Part } (S \text{ Positive})} + \underbrace{(-\int_c^b f(x)dx)}_{\text{Negative Part } (S \text{ Negative})}$$

When integration values fluctuate widely due to a minute shift in the integration interval, divide the interval into multiple parts to break areas of wide fluctuation, then perform integration on each part before finally combining the results.



$$\int_a^b f(x)dx = \int_a^{x_1} f(x)dx + \int_{x_1}^{x_2} f(x)dx + \ldots\ldots + \int_{x_4}^b f(x)dx$$

Complex Number Calculations CMPLX

Complex number calculations are performed in CMPLX mode. To enter the CMPLX mode, press [MODE] [2] (CMPLX). You can use either polar or rectangular coordinates to input complex numbers. Results are displayed in accordance with the number format setting on the setup menu.

Example 1: $(3+12i)\div(6i)=2-\frac{1}{2}i$ (format: $a+bi$)

[(] 3 [+] 12 [ENG] (*i*) [)] [÷] [(] 6 [ENG] (*i*) [)] [=]	$2-\frac{1}{2}i$

Example 2: $4 \angle 30 = 2\sqrt{3} + 2i$ (format: $a + bi$)

4 SHIFT (↪) (∠) 30 =	$2\sqrt{3} + 2i$

Example 3: $\sqrt{2} + 2i = 2 \angle 45$ (format: $r\angle\theta$)

√ 2 ▶ + √ 2 ▶ ENG (i) =	$2 \angle 45$

If you want to perform input and display of the result in polar coordinates, specify the angel unit BEFORE starting the calculation.

The θ value is displayed in the range of $-180^\circ < \theta \leqq 180^\circ$.

To separate a and bi on separate lines, set display mode to LINE.

■ CMPLX – Calculation Examples

Example 1: $(3+12i) \div (6i) = 2 - \frac{1}{2}i$ (format: $a + bi$)

(3 + 12 ENG (i)) ÷ (6 ENG (i)) =	$2 - \frac{1}{2}i$

Example 2: $4 \angle 30 = 2\sqrt{3} + 2i$ (format: $a + bi$)

4 SHIFT (↪) (∠) 30 =	$2\sqrt{3} + 2i$

Example 3: $\sqrt{2} + 2i = 2 \angle 45$ (format: $r\angle\theta$)

√ 2 ▶ + √ 2 ▶ ENG (i) =	$2 \angle 45$

■ Using a Command to Specify the Calculation Result Format

You can put $\blacktriangleright r\angle\theta$ or $\blacktriangleright a+bi$ at the end of a calculator to specify the display format of the results. Both of these commands override the defaults set by format settings.

Example 1: $\sqrt{2} + 2i = 2 \angle 45$

√ 2 ▶ + √ 2 ▶ ENG (i) SHIFT 2 (CMPLX) 3 ($\blacktriangleright r\angle\theta$) =	$2 \angle 45$

Example 2: $2 \angle 45 = \sqrt{2} + 2i$

2 SHIFT (−) (∠) 45 SHIFT 2 (CMPLX) 4 (▶ $a+bi$) =	$\sqrt{2}+\sqrt{2}i$

Using CALC

CALC command stores a mathematical expression so it can be performed several times if needed. You can recall the expression, input variables and calculate with it quickly to save time. You can store these kinds of expressions:

a. Expressions: 4X + 2Y, 3AX + 5BY + C, A + Bi
b. Multi-statements: Y + X : Y (X + Y)
c. Equalities with a single variable on the left and an expression including variables on the right: C = A + B, Y = X^3 + X + 4. Use ALPHA CALC (=) for the sign of the equality.

Example: Storing 4A + B and then calculating the results for A=3, B=7

4 ALPHA (−) (A) + ALPHA , (B)	4A+B D Math
CALC	A? D Math 0
3 = 7 =	3A+B D Math 19

To exit CALC: AC.

Example: Storing A + Bi and then determining $\sqrt{3}+i$, $1+\sqrt{3}i$ using polar coordinates ($r\angle\theta$)

MODE 2 (CMPLX) ALPHA (−) (A) + ALPHA , (B) ENG (i) SHIFT 2 (CMPLX) 3 (▶$r\angle\theta$)	CMPLX D Math A+Bi ▶$r\angle\theta$
CALC √ 3) = 1 =	$2\angle 30$
CALC (or =) 1 = √ 3) =	$2\angle 60$

After pressing [CALC] (and until you exit with [AC]) use linear display input.

SOLVE Function

This function can be used in COMP mode only ([MODE] , 1). It uses Newton's Law to provide you with approximate solution for your calculations. Types of equations for which solutions can be calculated:

- Equations that include variable x and solved for x: $x^2 + 4x - 3$, y = x – 7, x = sin(M), x + 11 = B - C. It means that an expression like 4x - 3 + x is treated as 4x – 3 + x = 0.
- Equations input using: {equation}, {solution}, {variable} syntax are solved for Y.

Always use closing parenthesis for input functions like sin, log, cos etc. when using SOLVE.

These are not allowed in an equation for SOLVE: $\int$, d/dx, Σ Σ, Pol, Rec.

Example: To solve $y = ax^2 + b$ for x when $y = 0$, $a = 1$, $b = -2$

[ALPHA] [S⇔D] (Y) [ALPHA] [CALC] (=) [ALPHA] [(–)] (A) [ALPHA] [)] (X) [x^2] [+] [ALPHA] [,] (B)	Math Y=AX²+ B▌
[SHIFT] [CALC] (SOLVE)	Math Y? 0
0 [=] 1 [=] [(–)] 2 [=]	Math Solve for X 0
Input an initial value for x (here, input 1) 1 [=]	Math Y=AX²+B X= 1.414213562 L–R= 0

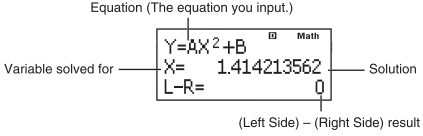
To exit SOLVE: [AC].

After pressing [SHIFT] [CALC] (and until you exit with [AC]) use linear display input.

Depending on your input, SOLVE may not be able to find solutions. If this happens, try changing the initial value so they are closer to the solution. It is also possible that SOLVE may not be able to determine a solution, even if there is one.

Due to the characteristics and limitations of Newton's Law, only one of possible solutions will be displayed and you might encounter problems with obtaining solutions for: $y = \sin(x)$, $y = e^x$, $y = \sqrt{x}$.

■ Calculator's Solution Screen



The calculator displays solutions in their decimal form The indicator "L-R=" is directly connected to the order of performing operations. It indicates that the right side (R)will be substracted from left side (L) of the equation, after inputting the obtained value to the variable that is being solved for. The closer this result is to 0, the higher the accuracy of SOLVE.

■ Continue Screen

SOLVE performs convergence a preset number of times. If there's no solution found, [=] input is needed to confirm continuing the search for solution. Press [=] to continue or [AC] to cancel the SOLVE operation.

Example: Solve $y = x^2 - x + 1$ for x when y = 3, 7, and 13.

[ALPHA] [S⇔D] (Y) [ALPHA] [CALC] (=) [ALPHA] [)] (X) [x^2] [−] [ALPHA] [)] (X) [+] 1	Math ▲ Y=X²−X+1
[SHIFT] [CALC] (SOLVE)	Math ▲ Y? 0
3 [=]	Math ▲ Solve for X 0
Input an initial value for x (here, input 1) 1 [=]	Math ▲ X=2
[=] 7 [=] [=]	X=3
[=] 13 [=] [=]	X=4

Metric Conversion

The calculator's metric conversion commands will help you switch from one unit to another. Conversion is possible for any mode except BASE-*n* and TABLE.

To start converting, simply input a metric conversion command and press [SHIFT] [8] (CONV) followed by the two-digit number corresponding the command you want to use.

Example 1: Conversion of 12 cm into inches

[1] [2] [SHIFT] [8](CONV) [0] [2] [=]	12cm ▶ in 4.724409449

Example 2: Conversion of 150g into ounces

[AC]150 [SHIFT] [8] (CONV) [2] [2] (g▶oz) [=]	150g ▶ oz 5.291084876

Example 3: Conversion of – 40°C into Fahrenheit

[AC] [(–)] 40 [SHIFT] [8] (CONV) [3] [8] (°C▶°F) [=]	–40° C ▶° F –40

Full table of commands for metric conversion:

01: in▶cm	02: cm▶in	03: ft▶m	04: m▶ft
05: yd▶m	06: m▶yd	07: mile▶km	08: km▶mile
09: n mile▶m	10: m▶n mile	11: acre▶m^2	12: m^2▶acre
13: gal(US)▶ℓ	14: ℓ▶gal(US)	15: gal(UK)▶ℓ	16: ℓ▶gal(UK)
17: pc▶km	18: km▶pc	19: km/h▶m/s	20: m/s▶km/h
21: oz▶g	22: g▶oz	23: lb▶kg	24: kg▶lb
25: atm▶Pa	26: Pa▶atm	27: mmHg▶Pa	28: Pa▶mmHg
29: hp▶kW	30: kW▶hp	31: kgf/cm^2▶Pa	32: Pa▶kgf/cm^2
33: kgf_m▶J	34: J▶kgf_m	35: lbf/in^2▶kPa	36: kPa▶lbf/in^2
37: °F▶°C	38: °C▶°F	39: J▶cal	40: cal▶J

Conversion formula data is based on the "NIST Special Publication 811(1995)."

Transforming Displayed Values

Use these procedures to transform between standard and decimal form of a value or to transform a displayed value to engineering notation (ENG).

■ Using Engineering Notation

Transform values by using [ENG] key.

Example 1: Transforming 2345 number

[2] [3] [4] [5] [=]	2345 2345
[ENG]	2345 2.345×10^{3}
[ENG]	2345 2345×10^{0}

Example 2: Shift the decimal point to the left for 234.

[2] [3] [4] [=]	234 234
[SHIFT] [ENG] (←)	234 0.234×10^{3}
[SHIFT] [ENG] (←)	234 0.000234×10^{6}

■ Using S↔D Transformation

Use S↔D transformation to change a value between decimal (D) and its standard (S) form (fraction, π)

■ Formats Supported for S↔D Transformation

Use S↔D transformation to transform the displayed decimal calculation result to one of the listed forms and back. Standard form is automatically chosen by the calculator, you don't need to specify it.

Fraction – current fraction format setting determines whether the result is an improper or mixed fraction.
π – works only for the Math format. Supported forms are: $n\pi$, where n is an integer, $\frac{a}{b}\pi$ or $a\frac{b}{c}\pi$. Transformations to a fractional π form are limited to inverse trigonometric function result and values that are normally expressed in radians.

After obtaining a result in √ form, you are free to convert it to decimal form by pressing the [S↔D] key.
Results in decimal form can't be converted to √ form.

Example 1: Fraction into Decimal

(MATH) [7] [▼] [1] [1] [=]	$\frac{7}{11}$ $\frac{7}{11}$
[S↔D]	$\frac{7}{11}$ 0.6363636364
[S↔D]	$\frac{7}{11}$

Example 2: π Fraction into Decimal

(MATH) [SHIFT] [x10ˣ] (π) [×] [3] [▼] [5] [=]	$\pi \times \frac{3}{5}$ $\frac{3}{5}\pi$
[S↔D]	$\pi \times \frac{3}{5}$ 1.884955592

Example 3: √ Fraction into Decimal

(MATH) [√] [2] [►] [×] [√] [3] [=]	$\sqrt{2} \times \sqrt{3}$ $\sqrt{6}$
[S↔D]	$\sqrt{2} \times \sqrt{3}$ 2.4494897433

Statistical Calculation STAT

To perform statistical calculations, you need to enter STAT mode (MODE 3).

■ Statistical Calculation Types

Pressing any of the following keys will open the STAT editor:

Key	Menu Item	Calculation
1	1-VAR	Single-variable
2	A+B*X*	Linear regression ($y = A + B^x$)
3	_+C*X* ^{2}	Quadratic regression ($y = A + B^x + Cx_2$)
4	ln *X*	Logarithmic regression ($y = A + B\ln x$)
5	*e*^ *X*	*e* exponential regression ($y = Ae^{Bx}$)
6	A • B^*X*	*ab* exponential regression ($y = AB^x$)
7	A • *X*^B	Power regression ($y = Ax^B$)
8	1/*X*	Inverse regression ($y = A + B/x$)

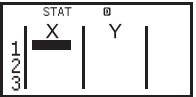
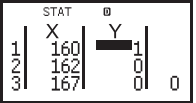
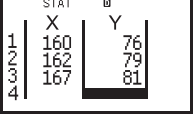
Changing the calculation type after entering the STAT Mode is possible through SHIFT 1 (STAT) 1 (TYPE) combination. It will display the calculation type selection screen.

■ Inputting Sample Data

You can input data by using the Stat editor. To open the editor, press SHIFT 1 (STAT) 2 (DATA). When using only X column, the editor can hold up to 80 rows of data. If you are using X and FREQ columns, the data capacity splits between them (40 max). if you are using X, Y and FREQ, 26 rows of data is the maximum.

FREQ is the frequency column, useful when there are many identical data items. In FREQ column put quantity (frequency) of the data. Its display can be turned on and off using the stat format settings on the setup menu.

Example: Select linear regression and input the following data: (160,76), (162, 79), (167, 81)

MODE 3 (STAT) 2 (A+BX)	
160 = 162 = 167 = ▼ ▶	
76 = 79 = 81 =	

To insert a line, on the STAT editor screen move the cursor to the line that will be UNDER the line you will insert, and then press SHIFT 1 (STAT) 3 (EDIT), followed by 1 (Ins).

To replace the data in a cell, move the cursor on the STAT editor screen to the cell you want to edit, input new data value or expression and press =.

To delete a line, move the cursor to the lane you want to delete on the STAT editor and press DEL.

The following operations are not supported by the Stat Editor: M+, SHIFT M+ (M–), SHIFT RCL (STO), Pol, Rec, multi-statements.

Remember! All data will be purged from the stat editor when you leave the STAT mode, switch between the single- and paired-variable statistical calculation type or change the Stat Format setting on the setup menu. Proceed with caution.

To delete ALL STAT Editor contents, press SHIFT 1 (STAT) and 3 (Edit), followed by 2 (Del-A). It clears all the sample data on the STAT editor screen.

■ Obtaining Statistical Values from Input Data

To obtain statistical values, press AC while in the Stat Editor. Here you can recall the statistical variable you want.

Available variables:

Sum: Σx^{2*}, Σx^*, Σy^2, Σy, Σxy, Σx^3, $\Sigma x^2 y$, Σx^4	SHIFT 1 (STAT) 3 (Sum) 1 to 8
Number of Items: n^*, Mean: $\bar{x}^*$, $\bar{y}$ Population Standard Deviation: σx^*, σy, Sample Standard Deviation: sx^*, sy	SHIFT 1 (STAT) 4 (Var) 1 to 7
Regression Coefficients: A, B Correlation Coefficient: r Estimated Values: $\hat{x}$, $\hat{y}$	SHIFT 1 (STAT) 5 (Reg) 1 to 5
Regression Coefficients for Quadratic Regression: A, B, C Estimated Values: $\hat{x}_1$, $\hat{x}_2$, $\hat{y}$	SHIFT 1 (STAT) 5 (Reg) 1 to 6
Minimum Value: minX*, minY Maximum Value: maxX*, maxY	SHIFT 1 (STAT) 6 (MinMax) 1 to 4

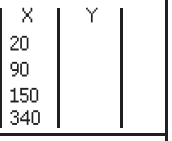
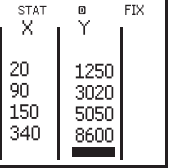
$\hat{x}$, $\hat{x}_1$, $\hat{x}_2$, $\hat{y}$ are commands of the type that take an argument immediately before them, NOT variables. See "Calculating Estimated Values" for more information.

While single-variable statistical calculation is selected, you can perform normal distribution calculation from the menu: SHIFT 1 (STAT) 5 (Distr). See "Normal Distribution Calculations" for more.

Example: Single-variable data input for x = {1, 1, 1, 2, 3, 4, 4, 5 } with the addition of FREQ column and calculate the mean and population standard deviation.

SHIFT MODE (SETUP) ▼ 4 (STAT) 1 (ON) MODE 3 (STAT) 1 (1-VAR) 1 = 2 = 3 = 4 = 5 = ▼ ▶ 3 = 1 = 1 = 2 =	
AC SHIFT 1 (STAT) 4 (Var) 2 ($\bar{x}$) =	2. 625
AC SHIFT 1 (STAT) 4 (Var) 3 (σx) =	1. 494782593

Example: Calculate the linear and logarithmic regression correlation coefficients for the provided data and determine the regression formula for the strongest correlation: (x,y) = (20, 1250), (90, 3020), (150, 5050), (340, 8600). Specify Fix 3 for results. SHIFT MODE (SETUP) 6 (Fix) 3

SHIFT MODE (SETUP) ▼ 4 (STAT) 2 (OFF) MODE 3 (STAT) 2 (A+BX) 20 = 90 = 150 = 340 = ▼ ▶	
1250 = 3020 = 5050 = 8600 =	
AC SHIFT 1 (STAT) 5 (Reg) 3 (r) =	0. 992
AC SHIFT 1 (STAT) 1 (Type) 4 (ln X) AC SHIFT 1 (STAT) 5 (Reg) 3 (r) =	0. 942
AC SHIFT 1 (STAT) 5 (Reg) 1 (A) =	−6948. 697
AC SHIFT 1 (STAT) 5 (Reg) 2 (B) =	2493. 291

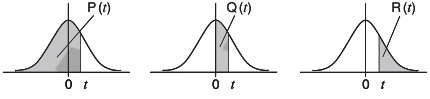
■ Calculating Estimated Values

Estimated value of y can be calculated for a given *x*-value, basing on the regression formula obtained by paired-variable statistical calculation. And the corresponding x-value (two values in fact, x_1 and x_2 in case of quadratic regression) also can be calculated for a value of y in the formula. Try it out by following the example.

Example: Determining the estimate value for y when x=120 in the regression formula produced by logarithmic regression of the data. Use Fix3 for the result.

AC 120 SHIFT 1 (STAT) 5 (Reg) 5 ($\hat{y}$) =	4987.911

Remember! Regression and correlation coefficient or estimated value calculations can take longer than basic calculations. Take your time and avoid providing additional input when internal calculation is running (before the result is shown).



■ Normal Distribution Calculations

With single-variable statistical calculation selected, you can perform distribution calculation using listed functions. You can pick one of these in the menu: SHIFT 1 (STAT) 5 (Distr).

Functions P, Q, R take the argument t and determine a probability of a standard normal distribution. And t function is preceded by the X argument and used to determine $X \blacktriangleright t = \frac{X-x}{\sigma x}$, the normalized variate.

Example: For the single variable data {x*n* ; freq*n*} = (0;1, 1;2, 2;1, 3;3, 4;3, 6;5, 8;4, 9;5, 10;2, 11;1) determine the normalized variate ($\blacktriangleright t$) when x = 2, and P(t), with Fix3 settings for decimals.

SHIFT MODE (SETUP) ▼ 4 (STAT) 1 (ON)
SHIFT MODE (SETUP) 6 (Fix) 3 MODE 3 (STAT) 1 (1-VAR)

0=1=2=3=4=6=8=9=10= 11=▼▶1=2=1=3=3=5=4= 5=2=1=	STAT 0 FIX X FREQ 0 1 1 2 2 1 3 3 4 3 6 5 8 4 9 5 10 2 11 1
AC 2 SHIFT 1 (STAT) 5 (Distr) 4 (▶*t*)=	STAT 0 FIX 2▶t −1.304
SHIFT 1 (STAT) 5 (Distr) 1 (P() Ans) =	STAT 0 FIX P(Ans) 0.096

Base-*n* Calculations (BASE-N)

Base-*n* is the mode you use for calculations using other number modes. You can perform operations using decimal (default), hexadecimal, binary, and octal numbers.

To start, press MODE 4 (BASE-N) to enter the Base-*n* mode and then press:
x^2 for decimal (DEC), x^n for hexadecimal (HEX), log for binary (BIN) and ln for octal (OCT). BASE-N mode doesn't support fractional values and exponents in decimal system. If your result has a fractional part, it is cut off.

Inputs and outputs range is 16 bits for binary and 32 for other systems.

BASE-N mode	Input/Output ranges
BIN	Positive: 0000000000000000 ≦ x ≦ 0111111111111111 Negative: 1000000000000000 ≦ x ≦ 1111111111111111

OCT	Positive: 00000000000 ≦ x ≦ 17777777777 Negative: 20000000000 ≦ x ≦ 37777777777
DEC	–2147483648 ≦ x ≦ 2147483647
HEX	Positive: 00000000 ≦ x ≦ 7FFFFFFF Negative: 80000000 ≦ x ≦ FFFFFFFF

Example 1: Switching to binary mode after entering BASE-N and calculating $10_2 + 11_2$.

MODE 4(BASE-N)	Dec 0
log(BIN)	Bin 0000000000000000
10 ⊞ 11 ⊟	Bin 0000000000000101

Example 2: Switching to octal mode and calculating $6_8 + 3_8$.

AC In (OCT) 6 ⊞ 3 ⊟	Oct 00000000011

Example 3: Switching to hexadecimal mode and calculating $A3_{16} + 2F_{16}$. For hexadecimal letters from A to F, use the following buttons:
A (–), B (°’”), C (hyp), D (sin), E (cos), F(tan)

AC x^y (HEX) ⇔ (A)3 ⊞ 2 tan (F) ⊟	Hex 000000D2

■ **Number mode of a specific input value**

If you want to convert a value in your operation immediately to one of the other number modes, simply put in a special command right after input of that value.

Example: Calculating $10_8+10_2+10_{10}+10_{16}$ and displaying the result in decimal value.

AC x^2 (DEC) SHIFT 3 (BASE) ▼ 4 (o) 10 + SHIFT 3 (BASE) ▼ 3 (b) 10 + SHIFT 3 (BASE) ▼ 1 (d) 10 + SHIFT 3 (BASE) ▼ 2 (h) 10 =	Dec 36

■ **Results conversion to another number system**

To convert the currently displayed calculation result to any system, use x^2 for decimal (DEC), $x^{\blacksquare}$ for hexadecimal (HEX), log for binary (BIN) and ln for octal (OCT).

Example: Converting the result from the last example from decimal into octal, hexadecimal and binary.

AC x^2 (DEC) SHIFT 3 (BASE) ▼ 4 (o) 10 + SHIFT 3 (BASE) ▼ 3 (b) 10 + SHIFT 3 (BASE) ▼ 1 (d) 10 + SHIFT 3 (BASE) ▼ 2 (h) 10 =	Dec 36
ln (OCT)	Oct 00000000044
$x^{\blacksquare}$ (HEX)	Hex 00000024
log (BIN)	Bin 0000000000100100

■ **Negation and Logical Operations**

You can use both logical operators (and, or, xor, xnor) and functions (not, neg) for operations on binary values, both logical and negation. To use them, press SHIFT 3 (BASE) to open the menu where you can provide them as input.

Example 1: 1100_2 AND 1011_2

AC 1100 SHIFT 3 (BASE) 1 (and) 1011 =	Bin 0000000000001000

Example 2: 1110_2 OR 11011_2

AC 1110 SHIFT 3 (BASE) 2 (or) 11011 =	Bin 0000000000011111

Example 3: 1010_2 XOR 1000_2

AC 1010 SHIFT 3 (BASE) 3 (xor) 1000 =	Bin 0000000000000010

Example 4: 1011_2 XNOR 110_2

AC 1011 SHIFT 3 (BASE) 4 (xnor) 110 =	Bin 1111111111110010

Example 5: Not 101011_2

AC SHIFT 3 (BASE) 5 (Not) 101011) =	Bin 1111111111010100

Example 6: Neg 10001_2

AC SHIFT 3 (BASE) 6 (Neg) 10001) =	Bin 1111111111101111

While for decimal values the calculator just adds a minus sign (base-10), for binary, octal or hexadecimal negative values, the value is converted to binary (if isn't binary to start with), two's complement is taken and then its converted back to the original number system.

Calculations of Equations EQN

To solve simultaneous linear equations with two or three unknowns and cubic and quadratic equations, use EQN Mode. To enter this mode, press MODE, 5 (EQN).

Before you start calculations, you need to pick an equation type.

Calculation type:	Key combination:
Simultaneous linear equation, two unknowns	1 ($a_nX + b_nY = c_n$)
Simultaneous linear equation, three unknowns	2 ($a_nX + b_nY + c_nZ = d_n$)
Quadratic equation	3 ($aX^2 + bX + c = 0$)
Cubic equation	4 ($aX^3 + bX^2 + cX + d = 0$)

To input coefficient values, use Coefficient Editor.
For example, to solve $3x^2 + x - 4$, press [3] to pick quadratic equation and input your coefficients ($a = 3$, $b = 1$, $c = -4$).
Like this: 3 [=] 1 [=] [(-)] 4 [=]

To change a coefficient value you already put in, move your cursor to that cell, input a new value and press [=] to confirm. If you want to delete them, pressing [AC] will clear all the coefficients to zero (0). Changing equation type will also cause the values of all coefficients to go back to zero (0).

Coefficient Editor doesn't support [M+], [SHIFT] [M+] (M–), [SHIFT] [RCL] (STO), Pol, Rec and multi-statements.

After all the values are in place, press [=] and the solution will be displayed. Values cannot be converted to engineering notation on the solution screen and solutions for simultaneous linear equation won't be displayed using any form using $\sqrt{\ }$. Each consecutive [=] will display another solution for the equation. Pressing it at the last solution will return to the Coefficient Editor.

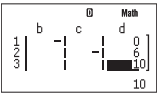
You can scroll through solutions with [▼] and [▲] keys and return to the editor at any time with [AC].

■ EQN Mode Calculation Examples

Example 1: x + 3y = 6, 2x + 2y = 8

[MODE] [5] (EQN) [1] ($a_nX + b_nY = c_n$) 1 [=] 3 [=] 6 [=] 2 [=] 2 [=] 8 [=] [=] [▼]	Math a b c 1 [1 3 6] 2 [2 2 8] X=3 Y=1

Example 2: x – y + z = 0, x + y - z = 0, –x + y + z = 10

MODE 5 (EQN) 2 ($a_nX + b_nY + c_nZ = d_n$) 1 = (−) 1 = 1 = 0 = 1 = 1 = (−) 1 = 6 = (−) 1 = 1 = 1 = 10 = = ▼ ▼	 X=3 Y=8 Z=5

Example 3: $x^2+x+\frac{4}{5}=0$

MODE 5 (EQN) 3 ($aX^2 + bX + c = 0$) 1 = 1 = 4 ▤ 5 = = ▼	$x_1=-\frac{1}{2}+\frac{\sqrt{55}}{10}i$ $x_2=-\frac{1}{2}-\frac{\sqrt{55}}{10}i$

Example 4: $x^2 - 4\sqrt{2}x + 6 = 0$

MODE 5 (EQN) 3 ($aX^2 + bX + c = 0$) 1 = (−) 4 √▪ 2) = 6 = = ▼	$x_1=3\sqrt{2}$ $x_2=\sqrt{2}$

Example 5: $2x^3 - 4x^2 - 2x + 4 = 0$

MODE 5 (EQN) 4 ($aX^3 + bX^2 + cX + d = 0$) 2 = (−) 4 = (−) 2 = 4 = = ▼ ▼	$x_1=-1$ $x_2=2$ $x_3=1$

Matrix Calculations MATRIX

In MATRIX mode, you can perform calculations that involve matrices of up to 3 rows by 3 columns in size. To do this, you need to first assign data to special variables (MatA, MatB, MatC) to later use them in your calculations. To enter MATRIX mode press MODE 6 (MATRIX).

MATRIX Editor doesn't support [M+], [SHIFT] [M+] (M–), [SHIFT] [RCL] (STO), Pol, Rec and multi-statements.

Example: Assigning $\begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$ to MatA and $\begin{bmatrix} -2 & 1 \\ 1 & -2 \end{bmatrix}$ to MatB and then performing operations (MatA × MatB) and (MatA+MatB). $\begin{bmatrix} 0 & 2 \\ 2 & 0 \end{bmatrix}$

Create MatA (2x2)	[1] (MatA) [5] (2×2)
Input for MatA	2 [=] 1 [=] 1 [=] 2 [=]
Create MatA (2x2)	[SHIFT] [4] (MATRIX) [2] (Data) [2] (MatB) [5] (2×2).
Input for MatB	[(-)] 2 [=] 1 [=] 1 [=] [(-)] 2 [=]
Advance to calculation screen	[AC]
MatA × MatB = MatAns is displayed	[SHIFT] [4] (MATRIX) [3] (MatA) [×] [SHIFT] [4] (MATRIX) [4] (MatB) [=] $\begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix}$
MatA+MatB = MatAns is displayed	[AC] [SHIFT] [4] (MATRIX) [3] (MatA) [+] [SHIFT] [4] (MATRIX) [4] (MatB) [=] $\begin{bmatrix} 0 & 2 \\ 2 & 0 \end{bmatrix}$

■ Matrix Answer Memory

When a calculation yields a matrix result, it is simultaneously saved to MatAns, the Matrix Answer memory, and displayed.

The MatAns variable can be then used in calculations:

- To insert MatAns into a calculation: [SHIFT] [4] (MATRIX) [6] (MatAns)

- It will be automatically sent to calculation screen when displayed and one of the following buttons is pressed: [+], [−], [×], [÷], [x^{-1}], [x^2], [SHIFT] [x^2] (x^3)

■ **Matrix Variable Data**

There are four variables, including MatAns. You can save your matrices to MatA, MatB, MatC. To assign new data to a matrix variable follow these steps:

1. Press [SHIFT] [4] (MATRIX) [1] (Dim) and select the desired variable matrix to assign data to.
2. Select its dimensions ($m \times n$).
3. Use the Matrix Editor that appears to input the elements of the matrix, just how it was done in the first example with MatA and MatB.

■ **To edit the elements of a matrix:**

1. Press [SHIFT] [4] (MATRIX) [2] (Data) and select the variable.
2. Use the Matrix Editor to edit the elements of the matrix. You can accomplish that by moving the cursor for the cell that contains the element to be edited. You can then input a new value and press "=" to confirm.

■ **Copying matrix variable contents:**

1. Display the matrix you want to copy using Matrix Editor. If you want to copy MatAns values: [AC] [SHIFT] [4] (MATRIX) [6] (MatAns) [=].
2. Press [SHIFT] [RCL] (STO) and then pick one of the matrices to specify the copy destination [(−)] (MatC). MatA, [,] MatB or [hyp] The previously picked matrix (or MatAns) will be copied, and the copy will be displayed.

■ **Matrix Calculation Examples**

Operations in these examples are done with the use of MatA and MatB from the previous example. You can use [SHIFT] [4] (MATRIX) and select the desired variable matrix: [3] (MatA), [4] (MatB), [5] (MatC).

5 x MatA (Matrix scalar multiplication)	AC 5 × **MatA** =
Determinant of MatA (det(MatA))	AC SHIFT 4 (MATRIX) 7 (det) **MatA**) =
Transposition of MatB (Trn(MatB))	AC SHIFT 4 (MATRIX) 8 (Trn) MatB) =
Inverse matrix of MatB ($MatB^{-1}$)	AC **MatB** x^{-1} =
Absolute value of MatB (Abs(MatB))	AC SHIFT hyp (Abs) **MatB**) =
Square and cube of MatA ($MatA^2$, $MatA^3$)	AC **MatA** x^2 = AC **MatA** SHIFT x^2 (x^3) =

Number Tables from a Function TABLE

To generate a number table for x and $f(x)$, using input $f(x)$ function, use TABLE mode. To enter this mode, press MODE 7 (TABLE).

Input a function in the format $f(x)$, using the X variable, making sure that you input the X variable (ALPHA) (X)) when generating a number table. Other variables are treated as constants!

You also can't use Pol, Rec, $\int$, d/dx, Σ.

There are three types of TABLE prompts that you need to know:

Prompt:	Your input:
Start?	Lower limit of X (1 by default)
End?	Upper limit of X (5 by default) Should be greater than lower limit.
Step?	Increment step (1 by default). It specifies by how much the Start value should be sequentially incremented as the number table is generated. For instance, if Start = 1 and Step = 1, the values assigned will be 1, 2, 3, 4, 5 etc.

After all the input is provided, you can press [=] to generate and display your number table. If you want to make a new table, press [AC] to start again on the function input.
Example: Creating a number table for the function $f(x) = x^2 + 2$ for the range $-2 \leqq x \leqq 2$, incremented in steps of 0.5

[MODE] [7] (TABLE)	math f(X)=
[ALPHA] [)] (X) [x^2] [+] 2	math $f(X)=X^2+2$
[=] [(-)] 2 [=] 2 [=] 0.5 [=]	math X: -2, -1.5, -1, 0.5, 0, 0.5, 1, 1.5, 2 f(x): 6, 4.25, 3, 2.25, 2, 2.25, 3, 4.25, 6

You can't edit the number table and recreating the table generation process override the current X value. Function is also deleted when setup menu in MENU is opened or you switch between natural and linear display.

Vector Calculations VECTOR

While in the VECTOR mode, you can perform 2- and 3-dimensional vector calculations. Start by entering the VECTOR mode (MODE , 8) and then assigning your variables (VctA, VctB, VctC).

The following operations are not supported by the Vector Editor: M+, SHIFT M+ (M–), SHIFT RCL (STO), Pol, Rec, multi-statements.

To assign, for example, (1, 2) to VctA and (6, 9) to VctB and then calculate VctA+VctB:

Display Vector Editor, 2 dimensional vectors	1 (VctA) 2 (2)
Input for VctA	1 = 2 =
Display Vector Editor switches to VctB	SHIFT 5 (VECTOR) 2 (Data) 2 (VctB) 2 (2)
Input for VctB	6 = 9 =
Calculation screen	AC
VctA+VctB	SHIFT 5 (VECTOR) 3 (VctA) + SHIFT 5 (VECTOR) 4 (VctB) =
VctAns is displayed	(7,11)

■ Vector Answer Memory (VctAns)

As you could see in the previous part of the manual, the result of your calculation was saved in VctAns which stands for Vector Answer Memory. It is a variable that holds the last calculation result in VECTOR mode.

To insert it into your calculation, simply press SHIFT 5 (VECTOR) 6 (VctAns). When VctAns is displayed, pressing it will be automatically sent to calculation screen when displayed and one of the following buttons is pressed: +, −, ×, or ÷ will take you to calculation screen.

Vector Variable Data

To assign new data to a vector variable, press SHIFT 5 (VECTOR) 1 (Dim) and select the vector from the menu to which you want to assign the data. In the next step, provide input for dimensions (*m*). After that, use the Vector Editor to input elements of your newly created vector.

Example: Assigning (4, 6, 9) to VctC.

SHIFT 5 (VECTOR) 1 (Dim) 3 (VctC) 1 (3) 4 = 6 = 9 =	VCTD C [4 6 9] 9

To go back to editing your vector, press SHIFT 5 (VECTOR) 2 (Data) and select which vector you want to edit. Move through the Vector Editor with your cursor, to the cell that you want to edit and input the new value. Confirm with =.

To copy vector contents, display the vector you want to copy:

- Press SHIFT 5 (VECTOR) 2 (Data) and number corresponding with the vector you want to copy. Alternatively use AC SHIFT 5 (VECTOR) 6 (VctAns) = for copying the answer memory.
- Press SHIFT RCL (STO) and press the key corresponding with the new copy: (−) VctA, ,,, VctB or hyp (VctC).
- Your new copy will be displayed.

■ Vector Calculation Examples

Following examples use VctA = (1, 2), VctB = (6, 9) and VctC = (3, 4).

You can use SHIFT 5 (VECTOR) and choose one of the desired vector variable: 3 (Vct), 4 (VctB), 5 (VctC).

5 × VctA (Vector scalar multiplication) and VctB subtracted from VctAns	AC 5 × **VctA** = − **VctB** =
VctA • VctB (Vector dot product)	AC **VctA** SHIFT 5 (VECTOR) 7 (Dot) **VctB** =
Absolute values of VctC	AC SHIFT hyp (Abs) **VctC**) =
Angle formed by VctA and VctC, up to three decimal places (Fix3) $cos\theta = \frac{(A \cdot B)}{\lvert A \rvert \lvert B \rvert}$, which becomes $\theta = cos^{-1}\frac{(A \cdot B)}{\lvert A \rvert \lvert B \rvert}$	SHIFT MODE (SETUP) 6 (Fix) 3 AC (**VctA** SHIFT 5 (VECTOR) 7 (Dot) **VctB**) ÷ (SHIFT hyp (Abs) **VctA**) SHIFT hyp (Abs) **VctB**)) = SHIFT cos (cos^{-1}) Ans)) =

Scientific Constants

This calculator comes with 40 built-in scientific constant at your disposal. They can be used in any mode besides BASE-N. Each of them is displayed as a unique symbol (such as π), which can be used inside your calculations.

To use a constant, press SHIFT 7 (CONST) and then input the two-digit number from the table below:

Constant:	Constant number:
proton mass (mp)	01
neutron mass (mn)	02
electron mass (me)	03
muon mass (m_μ)	04
Bohr radius (a_0)	05
Planck constant (h)	06
nuclear magneton (μN)	07
Bohr magneton (μB)	08
Planck constant, rationalized ($\hbar$)	09
fine-structure constant (α)	10
classical electron radius (re)	11
Compton wavelength (λc)	12
proton gyromagnetic ratio (γp)	13
proton Compton wavelength (λcp)	14
neutron Compton wavelength (λcn)	15
Rydberg constant (R_∞)	16
atomic mass unit (u)	17
proton magnetic moment (μp)	18
electron magnetic moment (μe)	19

neutron magnetic moment (μn)	20
muon magnetic moment ($\mu\mu$)	21
Faraday constant (F)	22
elementary charge (e)	23
Avogadro constant (NA)	24
Boltzmann constant (k)	25
molar volume of ideal gas (Vm)	26
molar gas constant (R)	27
speed of light in vacuum (C_0)	28
first radiation constant (C_1)	29
second radiation constant (C_2)	30
Stefan-Boltzmann constant (σ)	31
electric constant (ε_0)	32
magnetic constant (μ_0)	33
magnetic flux quantum (ϕ_0)	34
standard acceleration of gravity (g)	35
conductance quantum (G_0)	36
characteristic impedance of vacuum (Z_0)	37
Celsius temperature (t)	38
Newtonian constant of gravitation (G)	39
standard atmosphere (atm)	40

The values are based on CODATA recommended value (March 2007).

Example: To input the scientific constant C_0 (conductance quantum), and display its value.

AC SHIFT 7 (CONST)	CONVERSION Number 01~40? [__]
2 8 (Co) =	Co 299792458

Technical Information

■ Order of operations

Each calculation is performed in the following order of precedence:

1. Expression within the parentheses.
2. Functions requiring an argument to the right and a closing parenthesis to follow it.
3. Functions preceded by values, powers, power roots, e.g. x^2, x^3, x^{-1}, x!, ° ' ", °, r, g, %, ►*t*, $x^{\blacksquare}$, $\sqrt[\blacksquare]{\square}$
4. Fractions: a b/c
5. Prefix symbol: (–, negative sign) base-*n* symbols (d, h, b, o). Remember, put your squared negative values in parentheses. As x^2 has a higher priority than the negative sign, it would affect your result.
6. Statistical estimated value calculation: x^, y^, $\hat{x}1$, $\hat{x}2$ and metric conversion commands.
7. Multiplication where sign is omitted.
8. nPr, nCr, (∠)
9. Dot product
10. ×, ÷
11. +, –
12. Logical AND
13. OR, XOR, XNOR

Calculation ranges, number of digits and precision

■ Calculation range and calculator precision

Calculation Range	$\pm 1 \times 10^{-99}$ to $\pm 9.999999999 \times 10^{99}$ or 0
Internal calculation digits number	15 digits
Precision	In general, ± 1 at the 10th digit for a single calculation. Precision for exponential display is ± 1 at the least significant digit. Errors are cumulative in the case of consecutive calculations.

■ Function Calculation Input Ranges and Precision

Function	Range of the input	
$\sin x$	DEG	$0 \leqq \lvert x \rvert < 9 \times 10^{9}$
	RAD	$0 \leqq \lvert x \rvert < 157079632.7$
	GRA	$0 \leqq \lvert x \rvert < 1 \times 10^{10}$
$\cos x$	DEG	$0 \leqq \lvert x \rvert < 9 \times 10^{9}$
	RAD	$0 \leqq \lvert x \rvert < 157079632.7$
	GRA	$0 \leqq \lvert x \rvert < 1 \times 10^{10}$
$\tan x$	DEG	Same as $\sin x$, except when $\lvert x \rvert = (2n-1) \times 90$.
	RAD	Same as $\sin x$, except when $\lvert x \rvert = (2n-1) \times \pi/2$.
	GRA	Same as $\sin x$, except when $\lvert x \rvert = (2n-1) \times 100$.
$\sin^{-1} x$	$0 \leqq \lvert x \rvert \leqq 1$	
$\cos^{-1} x$		
$\tan^{-1} x$	$0 \leqq \lvert x \rvert \leqq 9.999999999 \times 10^{99}$	
$\sinh x$	$0 \leqq \lvert x \rvert \leqq 230.2585092$	
$\cosh x$		
$\sinh^{-1} x$	$0 \leqq \lvert x \rvert \leqq 4.999999999 \times 10^{99}$	
$\cosh^{-1} x$	$1 \leqq x \leqq 4.999999999 \times 10^{99}$	
$\tanh x$	$0 \leqq \lvert x \rvert \leqq 9.999999999 \times 10^{99}$	
$\tanh^{-1} x$	$0 \leqq \lvert x \rvert \leqq 9.999999999 \times 10^{-1}$	
$\log x / \ln x$	$0 < x \leqq 9.999999999 \times 10^{99}$	
10^{x}	$-9.999999999 \times 10^{99} \leqq x \leqq 99.99999999$	

e^x	$-9.999999999 \times 10^{99} \leqq x \leqq 230.2585092$
$\sqrt{x}$	$0 \leqq x < 1 \times 10^{100}$
x^2	$\lvert x\rvert < 1 \times 10^{50}$
x^{-1}	$\lvert x\rvert < 1 \times 10^{100}$; $x \neq 0$
$\sqrt[3]{x}$	$\lvert x\rvert < 1 \times 10^{100}$
$x!$	$0 \leqq x \leqq 69$ (x is an integer)
$n\mathrm{P}r$	$0 \leqq n < 1 \times 10^{10}$, $0 \leqq r \leqq n$ (n, r are integers) $1 \leqq \{n!/(n-r)!\} < 1 \times 10^{100}$
$n\mathrm{C}r$	$0 \leqq n < 1 \times 10^{10}$, $0 \leqq r \leqq n$ (n, r are integers) $1 \leqq n!/r! < 1 \times 10^{100}$ or $1 \leqq n!/(n-r)! < 1 \times 10^{100}$
Pol(x, y)	$\lvert x\rvert, \lvert y\rvert \leqq 9.999999999 \times 10^{99}$ $\sqrt{x^2+y^2} \leqq 9.999999999 \times 10^{99}$
Rec(r, θ)	$0 \leqq r \leqq 9.999999999 \times 10^{99}$ θ: Same as sin$x$
°’ ”	$\lvert a\rvert, b, c < 1 \times 10^{100}$ $0 \leqq b, c$ The display seconds value is subject to an error of ±1 at the second decimal place.
$\overleftarrow{\text{°’ ”}}$	$\lvert x\rvert < 1 \times 10^{100}$ Decimal ↔ Sexagesimal Conversions $0°0’0” \leqq \lvert x\rvert \leqq 9999999°59’59”$
x^y	$x > 0$: $-1 \times 10^{100} < y\log x < 100$ $x = 0$: $y > 0$ $x < 0$: $y = n$, $\frac{m}{2n+1}$ (m, n are integers) However: $-1 \times 10^{100} < y\log \lvert x\rvert < 100$
$\sqrt[x]{y}$	$y > 0$: $x \neq 0$, $-1 \times 10^{100} < 1/x \log y < 100$ $y = 0$: $x > 0$ $y < 0$: $x = 2n+1$, $\frac{2n+1}{m}$ ($m \neq 0$; m, n are integers) However: $-1 \times 10^{100} < 1/x \log \lvert y\rvert < 100$
$a\,^b/_c$	Total of integer, numerator, and denominator must be 10 digits or less (including division marks).
RanInt#(a, b)	$a < b$; $\lvert a\rvert, \lvert b\rvert < 1 \times 10^{10}$; $b - a < 1 \times 10^{10}$

- Look into “Calculation Range and Precision” if you are looking for precision description.
- x^y, $\sqrt[x]{y}$, $\sqrt[3]{}$, $x!$, $n\mathrm{P}r$, $n\mathrm{C}r$ type functions might require consecutive internal calculations which in turn can cause error accumulation with each additional calculation.

- Errors, by their characteristic, might be larger when in the proximity of a function's singular and inflection points.
- $|x| < 10^6$ is the range for calculations results that can be displayed in π form when using natural display. Keep in mind that error that occur as a result of internal calculation can make it impossible to display some results in their π form, as well as causing some results to be presented in π form instead of their normal, decimal form.

Error Messages

Errors are displayed when a result exceeds the calculation range, when you attempt an illegal input and during similar events.

Steps of precaution

If an error occurs during your calculation execution, or when the results are not what was expected, follow this checklist first, before moving on.

1. Make sure you are using the correct mode.
2. Make sure there are no calculation errors visible.
3. If the above steps don't fix the problem, press the [ON] key. Your calculator will perform a self-checkup routine to make sure everything is in order.
4. Initialize all modes and settings: [SHIFT] [9] (CLR) [1] (Setup) [=] (Yes).

A location error

Shows up in form of "Math ERROR" or "Syntax ERROR". Appears when you press [=], [◀] or [▶] and points at the error in your calculation.

Example: 11÷0×3.2 mistakenly input instead of 11 ÷ 10 × 3.2

11 [÷] 0 [×] 3.2 [=]	MATH ERROR
[◀]	11 ÷ 0 × 3.2
[◀] 1 [=]	11 ÷ 10 × 3.2

When an error message appears

Pressing ◀ or ▶ will return you to the calculation editing screen, with the cursor located at the part that is triggering the error message. Pressing AC clears the expression and lets you calculate again with a chance to double-check your input before execution. Remember that in this case, your input won't be saved in the calculation history memory.

Math Error

The calculation you are trying to execute reached the available calculation range, contains an illegal mathematical operation, or your input exceeds the allowable input range. When using independent memory or a variable as the argument of a function, make sure that the memory has enough capacity for you to proceed.

Stack Error

The calculation you are preforming has reached the allowed capacity of the matrix or vector stack and would cause it to be exceeded. Simplify your calculation, try splitting it into smaller, manageable portions.

Syntax Error

There is a problem with the format of the calculation you are performing. Make necessary corrections to proceed.

Insufficient MEM Error

There is not enough memory to perform your calculation. Narrow down the table range by changing its settings (Start, End, Step values).

Argument Error

There is a problem with the argument of the calculation you are performing. Make necessary corrections to proceed.

Dimension Error

Error occurring when working with matrices and vectors only. You are trying to perform a calculation with matrices or vectors whose dimensions do not allow that type of calculation or their dimensions weren't specified yet. Check the dimensions and verify if the calculation is possible.

Can't Solve Error

Calculator could not obtain the solution. Check for errors in your equation and input a value for the solution variable that is close to the expected solution.

■ **Variable Error**

Solution variable wasn't correctly specified, there is no X in the equation you've put in, or the solution variable that you specified is not included in the equation currently calculated. Specify X variable for the equation to be solved or specify a variable that is included in the equation as the solution variable.

■ **Time Out Error**

Ending condition is not fulfilled, but the current integration or differential calculation ends unexpectedly. To prevent this, try increasing the *tol* value. Keep in mind, that it might also decrease solution precision.

Frequently Asked Questions FAQ

1. **How can I return the calculator to its initial default settings?**

   By pressing [SHIFT] [9] (CLR) [1] (Setup) [=] (Yes).

2. **How to configure the calculator the same way the calculator without Natural Textbook Display works?**

   Press [SHIFT] [MODE] (Setup) [2] (LineIO) and see "Calculation Modes and Calculator Setup" for more information.

3. **How to change a fraction to decimal form?**

   See "Toggling Calculator Results".

4. **What's the difference between Ans, independent and variable memory types?**

   Each of these types stores a single value temporarily.

   Ans Memory: Stores the result of your last calculation.

   Independent memory: you can use this memory to totalize the results of multiple calculations.

   Variables: You can store values in here for future reference.

5. **What is the key operation to take me from the STAT mode to TABLE mode, to a mode allowing to perform arithmetic calculations?**

   Press [MODE], [1] (COMP).

6. My result is different from an older model of a calculator.

Natural Textbook Display requires the use of closing parenthesis. Failing to do so, might interfere with the priority of operations.

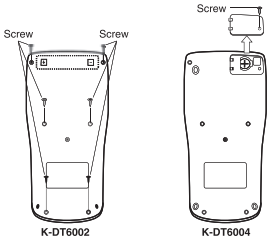
Replacing the battery

This calculator is powered by solar with a button cell battery (LR44) for backup. If your display is dim, it might indicate that the battery is low. Continued use of the calculator might result in corrupted memory and errors during calculations. Replace the battery as soon as possible and remember to do this at least once every two years.

Remember! Battery removal will lead to clearing ALL memory and variables stored in the calculator.

■ To remove the battery:

1. Press [SHIFT] [AC] (OFF)
2. Remove the back cover or the battery cover.
3. Remove the old battery.
4. Load a new battery into the calculator with its positive (+) and negative (-) ends facing correctly.
5. Replace the battery cover or the back cover.
6. Press [ON] [SHIFT] [9] (CLR) [3] (All) [=] (Yes)



■ Auto Power Off

The calculator turns off automatically after approximately 8~12 minutes of inactivity to save power and battery life. It can be reactivated by pressing [ON] key.

Specifications

Battery: LR44 x 1pc
Operating Temperature: 0°C to 40°C
Bundled items: Hard Case

Disposal of Waste Equipment by Users in Private Household in the European Union

The symbol in this information sheet means that used batteries should not be mixed with general household waste. For proper treatment, recovery, and recycling of used batteries, please take them to applicable collection points.

For more information about collection and recycling of batteries, please contact your local municipality, your waste disposal service or the point of sale where you purchased the items.

Information on Disposal in other Countries outside the European Union.

This symbol is only valid in the European Union. If you wish to discard used batteries, please contact your local authorities or dealer and ask for the correct method of disposal.

- If you intend to dispose of this product, do not throw it away with normal household waste. According to the EEC Directive (Directive 2002/96/EC) in force in the European Union, separate disposal methods should be applied for used electrical and electronic equipment.
- The solar cell is in the top right part of the calculator, above or below the buttons.
- Importer: Kaso Trade Czarna Rola 28 61-625 Poznań

Manufacturer: Dongguan K.L.T. & Casine Electronic Technology Co., Ltd.

Add : No.37, Hehe Rd, Xiangxi Industrial District, Liaobu Town, Dongguan City, Guangdong Province, China.
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