E

fx-9860GII SD
fx-9860GII
fx-9860G AU PLUS
Quick Start Guide

CASIO Worldwide Education Website

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CASIO®

Warning!

Never play a CD-ROM disc on any device that is not specifically designed to play back CD-ROM discs. Audio output at a high volume setting creates the risk of damaged hearing and damage to audio speakers.

Important!

A special USB driver must be installed on your computer in order to connect to the calculator. The driver is installed along with the Program-Link software (FA-124) that comes bundled with the calculator. Be sure to install the Program-Link software (FA-124) on your computer before trying to connect the calculator. Attempting to connect the calculator to a computer that does not have the Program-Link software installed can cause malfunction. For information about how to install the Program-Link software, see the User's Guide on the bundled CD-ROM.

Accessing the Contents of the User's Guide

Your computer needs to have Adobe® Reader® installed in order for you to access the contents of the User's Guide. If your computer does not have Adobe® Reader® installed, you can install it from the bundled CD-ROM.

Be sure to keep all user documentation handy for future reference.

EEE Yönetmeliğine Uygundur

Thank you for selecting the CASIO fx-9860GII SD/fx-9860GII/fx-9860G AU PLUS graphing calculator.

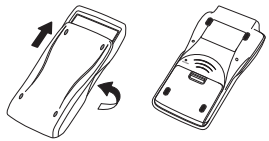
This manual illustrates the basic operations of the fx-9860GII SD/fx-9860GII/ fx-9860G AU PLUS using a number of practical examples, which helps you to understand how to use the calculator more quickly and easily.

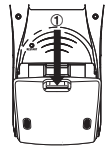
For full details about operational procedures, see the User's Guide (PDF file) on the CD-ROM that comes with the calculator.

BEFORE USING THE CALCULATOR FOR THE FIRST TIME...

Batteries are not loaded in your calculator at the factory.
Be sure to follow the procedure below to load batteries and adjust the display contrast before trying to use the calculator for the first time.

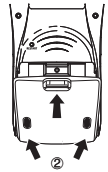
1. Making sure that you do not accidently press the [AC/ON] key, slide the case onto the calculator and then turn the calculator over. Remove the battery cover from the calculator by pulling with your finger at the point marked ①.



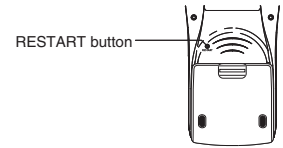


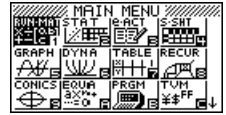
2. Load the four batteries that come with the calculator.
   - Make sure that the positive (+) and negative (–) ends of the batteries are facing correctly.

3. Replace the battery cover, making sure that its tabs enter the holes marked ② and turn the calculator front side up. The calculator will turn on automatically and the MAIN MENU will appear on the display.

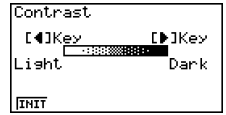


- If the Main Menu shown to the right is not on the display, press the RESTART button on the back of the calculator.





4. Use the cursor keys (▲, ▼, ◀, ▶) to select the **SYSTEM** icon and press [EXE], then press [F1](◀▬) to display the contrast adjustment screen.

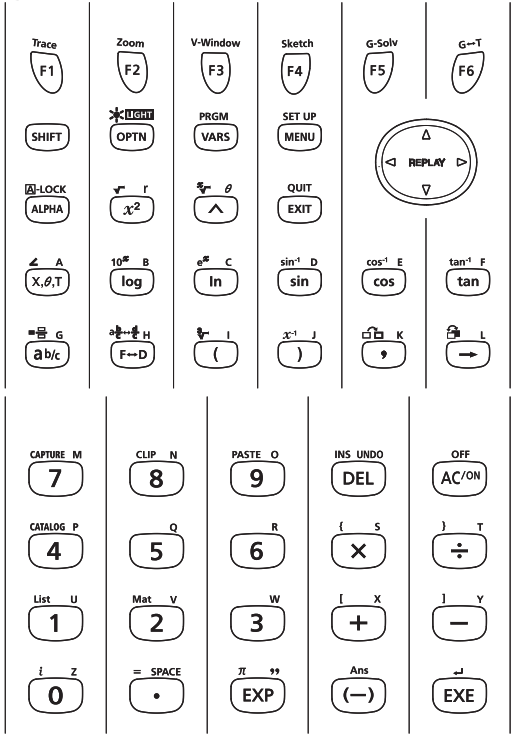


5. Adjust the contrast.
   - The ▶ cursor key makes display contrast darker.
   - The ◀ cursor key makes display contrast lighter.
   - [F1](INIT) returns display contrast to its initial default.

6. To exit display contrast adjustment, press [MENU].

1. Keys and Display

Keys



Key Index

- The reference pages shown in the table below are for the Software Version 2.00 User's Guide.

Key	Primary Function	Combined with SHIFT	Combined with ALPHA
Trace F1	Selects 1st function menu item.	Performs trace operation (page 5-29).	
Zoom F2	Selects 2nd function menu item.	Performs zoom operation (page 5-5).	
V-Window F3	Selects 3rd function menu item.	Displays V-Window parameter input screen (page 5-3).	
Sketch F4	Selects 4th function menu item.	Performs sketch operation (page 5-28).	
G-Solv F5	Selects 5th function menu item.	Performs G-Solve operation (page 5-30).	
G↔T F6	Selects 6th function menu item.	Switches display between graph and text screens (pages 5-1 and 5-24).	
SHIFT	Activates shift functions of other keys and function menus (page 1-2).		
LIGHT OPTN	Displays option menu (page 1-22).	Turns backlight on/off.	
PRGM VARS	Displays the variable data menu (page 1-23).	Displays program command menu (page 1-25).	
SET UP MENU	Returns to the Main Menu (page 1-2).	Shows the Setup screen (page 1-26).	
A-LOCK ALPHA	Allows entry of alphanumeric characters shown in red (page 1-2).	Locks entry of alphanumeric characters (page 2-7).	
$\sqrt{\ }$ r x^2	Press after entering value to calculate square (page 2-14).	Press before entering value to calculate square root (page 2-14).	Enters character r.
$\sqrt[x]{\ }$ θ ^	Press between two values to make second value exponent of first (page 2-14).	Linear input/output mode: Press between entering values for X & Y to show xth root of y (page 2-14). Math input/output mode: Enters $\sqrt[x]{\ }$ ($\sqrt[\square]{\ }$) in natural input format (page 1-18).	Enters character θ.

Key	Primary Function	Combined with SHIFT	Combined with ALPHA
QUIT EXIT	Back steps to the previous screen without making any changes.	Returns directly to initial screen of the mode.	
▲	Moves cursor upward. Scrolls screen. Switches to previous function in trace mode.	Scrolls one screen up in the **e • ACT** or **RUN • MAT** mode (Math input/output mode).	
▼	Moves cursor downward. Scrolls screen. Switches to next function in trace mode.	Scrolls one screen down in the **e • ACT** or **RUN • MAT** mode (Math input/output mode).	
◀	Moves cursor to left. Scrolls screen. Press after EXE to display calculation from end.	Makes contrast lighter.	
▶	Moves cursor to right. Scrolls screen. Press after EXE to display calculation from beginning.	Makes contrast darker.	
∠ A x,θ,T	Allows input of variable X, θ, and T.	Enters the operator (∠) for complex number polar format input (page 2-30).	Enters letter A.
10^x B log	Press before entering value to calculate common logalithm (page 2-14).	Press before entering exponent value of 10.	Enters letter B.
e^x C ln	Press before entering value to calculate natural logarithm.	Press before entering exponent value of e.	Enters letter C.
$\sin^{-1}$ D sin	Press before entering value to calculate sine (page 2-13).	Press before entering value to calculate inverse sine (page 2-13).	Enters letter D.
$\cos^{-1}$ E cos	Press before entering value to calculate cosine (page 2-13).	Press before entering value to calculate inverse cosine.	Enters letter E.
$\tan^{-1}$ F tan	Press before entering value to calculate tangent.	Press before entering value to calculate inverse tangent.	Enters letter F.
G $a\frac{b}{c}$	Linear input/output mode: Press between entering fraction values (page 2-19). Math input/output mode: Enters an improper fraction ($\frac{}{}$) in natural input format (pages 1-12 and 1-18).	Inputs a mixed fraction (page 1-11). (Enabled only for the Math input/output mode.)	Enters letter G.
H F⇔D	Converts a fraction to a decimal value or a decimal value to a fraction (pages 1-19 and 2-19).	Converts between an improper fraction and mixed fraction (page 2-19).	Enters letter H.

Key	Primary Function	Combined with SHIFT	Combined with ALPHA
$\sqrt[3]{}$ I (	Enters open parenthesis in formula (page 2-1).	Press before entering value to calculate cube root.	Enters letter I.
x^{-1} J)	Enters close parenthesis in formula (page 2-1).	Press after entering value to calculate reciprocal.	Enters letter J.
K ,	Enters comma.	Transitions from an application launched from an eActivity to another application (page 10-11). (Enabled only in an eActivity.)	Enters letter K.
L →	Assigns value to an Alpha memory name (page 2-6).	Toggles between an eActivity and the screen of an application launched from the eActivity (page 10-9). (Enabled only in an eActivity.)	Enters letter L.
CAPTURE M 7	Enters number 7.	Captures the current screen to Capture memory (page 1-30).	Enters letter M.
CLIP N 8	Enters number 8.	Changes the shape of the cursor to indicate that the clipboard function is enabled (page 1-8).	Enters letter N.
PASTE O 9	Enters number 9.	Pastes the character string that is on the clipboard (page 1-9).	Enters letter O.
INS UNDO DEL	Insert mode: Backspace function. Overwrite mode: Deletes the character at the cursor position. (See page 1-6.)	Linear input/output mode: Toggles between the insert mode and overwrite mode (page 1-6). Math input/output mode: With natural input, inserts a function into an existing expression (page 1-15).	Performs UNDO operation (page 1-16).
OFF AC/ON	Turns power on. Clears the display.	Turns power off.	
CATALOG P 4	Enters number 4.	Displays the catalog function list (page 1-9).	Enters letter P.
Q 5	Enters number 5.		Enters letter Q.
R 6	Enters number 6.		Enters letter R.
{ S ×	Multiplication function (page 2-1).	Enters open curly bracket.	Enters letter S.
} T ÷	Division function (page 2-1).	Enters close curly bracket.	Enters letter T.

Key	Primary Function	Combined with SHIFT	Combined with ALPHA
List U 1	Enters number 1.	Inputs List command (page 3-2).	Enters letter U.
Mat V 2	Enters number 2.	Inputs Mat command (page 2-41).	Enters letter V.
W 3	Enters number 3.		Enters letter W.
[X +	Addition function (page 2-1). Specifies positive value.	Enters open bracket.	Enters letter X.
] Y −	Subtraction function. Specifies negative value.	Enters close bracket.	Enters letter Y.
i Z 0	Enters number 0.	Inputs imaginary number unit (page 2-30).	Enters letter Z.
= SPACE •	Enters decimal point.	Enters character =.	Enters a blank space.
π " EXP	Enables entry of exponent (page 2-1).	Inputs value of pi (page 2-13). Enters pi symbol.	Enters double quotation mark (page 2-7).
Ans (−)	Enter before value to specify as negative (page 2-1).	Recalls most recent calculation result (page 2-9).	
↵ EXE	Displays result of calculation.	Inputs a new line.	

Display

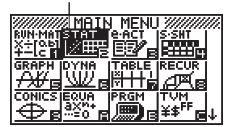
Selecting Icons

This section describes how to select an icon in the Main Menu to enter the mode you want.

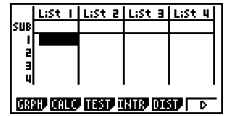
• To select an icon

1. Press MENU to display the Main Menu.
2. Use the cursor keys (◀, ▶, ▲, ▼) to move the highlighting to the icon you want.

Currently selected icon



3. Press EXE to display the initial screen of the mode whose icon you selected. Here we will enter the **STAT** mode.



- You can also enter a mode without highlighting an icon in the Main Menu by inputting the number or letter marked in the lower right corner of the icon.
- Use only the procedures described above to enter a mode. If you use any other procedure, you may end up in a mode that is different than the one you thought you selected.

The following explains the meaning of each icon.

Icon	Mode Name	Description
RUN·MAT	RUN • MAT (Run • Matrix)	Use this mode for arithmetic calculations and function calculations, and for calculations involving binary, octal, decimal, and hexadecimal values and matrices.
STAT	STAT (Statistics)	Use this mode to perform single-variable (standard deviation) and paired-variable (regression) statistical calculations, to perform tests, to analyze data and to draw statistical graphs.
e·ACT	e • ACT (eActivity)	eActivity lets you input text, math expressions, and other data in a notebook-like interface. Use this mode when you want to store text or formulas, or built-in application data in a file.
S·SHT	S • SHT (Spreadsheet)	Use this mode to perform spreadsheet calculations. Each file contains a 26-column × 999-line spreadsheet. In addition to the calculator's built-in commands and **S • SHT** mode commands, you can also perform statistical calculations and graph statistical data using the same procedures that you use in the **STAT** mode.

Icon	Mode Name	Description
	GRAPH	Use this mode to store graph functions and to draw graphs using the functions.
	DYNA (Dynamic Graph)	Use this mode to store graph functions and to draw multiple versions of a graph by changing the values assigned to the variables in a function.
	TABLE	Use this mode to store functions, to generate a numeric table of different solutions as the values assigned to variables in a function change, and to draw graphs.
	RECUR (Recursion)	Use this mode to store recursion formulas, to generate a numeric table of different solutions as the values assigned to variables in a function change, and to draw graphs.
	CONICS	Use this mode to draw graphs of conic sections.
	EQUA (Equation)	Use this mode to solve linear equations with two through six unknowns, and high-order equations from 2nd to 6th degree.
	PRGM (Program)	Use this mode to store programs in the program area and to run programs.
	TVM (Financial)	Use this mode to perform financial calculations and to draw cash flow and other types of graphs.
	E-CON2	Use this mode to control the optionally available EA-200 Data Analyzer. For more information about the **E-CON2** mode, download the E-CON2 manual (English version only) from: http://edu.casio.com.
	LINK	Use this mode to transfer memory contents or back-up data to another unit or PC.
	MEMORY	Use this mode to manage data stored in memory.
	SYSTEM	Use this mode to initialize memory, adjust contrast, and to make other system settings.

2. Power ON/OFF, Auto Power Off, Error Messages

Power ON/OFF

To turn on power, press [AC/ON].
To turn off power, press [SHIFT] [AC/ON] (OFF).

Auto Power Off

Auto Power Off turns off automatically if you do not perform any operation for 10 minutes.
You can select an Auto Power Off trigger time of 10 to 60 minutes.
The Auto Power Off trigger time can be set in the **SYSTEM** mode.

Error Messages

An error message will appear on the screen if you perform a calculation that causes a calculator's limit to be exceeded, or if you try to perform some operation that is not allowed. Press [EXIT], correct the problem, and then re-execute.

3. Examples

Basic Calculation

Example 1: Solve the quadratic equation $3x^2 + 5x - 15 = 0$.

Solve the equation by performing the following calculation: $(-5 + \sqrt{5^2 + 4 \times 3 \times 15}) \div (2 \times 3)$.

[MENU] [1] (RUN • MAT)

[SHIFT] [MENU] (SET UP) [F2] (Line) [EXIT]

[(] [(-)] [5] [+] [SHIFT] [x^2] [(√)] [(] [5] [x^2] [+] [4]

[×] [3] [×] [1] [5] [)] [)] [÷] [(] [2] [×] [3] [)]

[EXE]

Actual solution: 1.552970177

Example 2: To use the Pythagorean Theorem to determine the hypotenuse of a right triangle

For a right triangle of side a = 5 cm and side b = 7 cm, determine the hypotenuse by performing the following calculation: $\sqrt{5^2 + 7^2}$.

[MENU] [1] (RUN • MAT)

[SHIFT] [MENU] (SET UP) [F2] (Line) [EXIT]

[SHIFT] [x^2] [(√)] [(] [5] [x^2] [+] [7] [x^2] [)]

[EXE]

Actual solution: 8.602325267 ≒ 8.6 cm

Example 3: To determine the remaining two sides of right triangle with a hypotenuse of c = 10 cm and an angle of 36° at one end

Determine the length of the two sides by performing the following calculations: 10sin(36), 10cos(36).

• Use the degree angle unit.

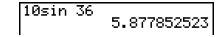
[MENU] [1] (RUN • MAT)

[SHIFT] [MENU] (SET UP) [F2] (Line)

[▼] [▼] [▼] [▼] [▼] [▼] [F1] (Deg) [EXIT]

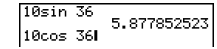
[1] [0] [sin] [3] [6]

[EXE]

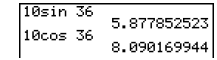


Actual solution: 5.877852523 ≒ 5.9 cm

[1] [0] [cos] [3] [6]



[EXE]



Actual solution: 8.090169944 ≒ 8.1 cm

Replay Function

The Replay Function lets you edit the contents of a previously performed calculation and execute it again.

Pressing [◀] or [▶] will display the last calculation you performed so you can edit it.

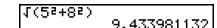
• In the Math input/output mode, use the [▲] key to display the calculation you want to edit, and then [◀] or [▶].

Example: To execute the calculation $\sqrt{5^2 + 8^2}$, change the 8 to 10, and re-calculate

[MENU] [1] (RUN • MAT)

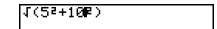
[SHIFT] [MENU] (SET UP) [F2] (Line) [EXIT]

[SHIFT] [x^2] [(√)] [(] [5] [x^2] [+] [8] [x^2] [)] [EXE]

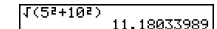


[◀]

[◀] [◀] [DEL] [1] [0]



[EXE]



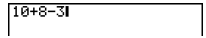
Subtraction Sign and Negative Sign/Negative Number Powers

Use the [−] key to enter a subtraction sign, and the [(−)] key to enter a negative sign.

Example 1: To perform the calculation 10 + 8 – 3

[MENU] [1] (RUN • MAT)

[1] [0] [+] [8] [−] [3]



[EXE]

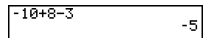
Actual solution: 15

Example 2: To perform the calculation –10 + 8 – 3

[MENU] [1] (RUN • MAT)

[(−)] [1] [0] [+] [8] [−] [3]

[EXE]



Actual solution: –5

Example 3: To perform the calculation 10 + 8 + (–3)

[MENU] [1] (RUN • MAT)

[1] [0] [+] [8] [+] [(−)] [3]

[EXE]

Actual solution: 15

The above calculation also can be entered as shown below.

[1] [0] [+] [8] [+] [(] [(−)] [3] [)]

Perform calculations that include raising a negative value to a power as shown below.

Example 1: To perform the calculation: $(-6)^2 = 36$

[MENU] [1] (RUN • MAT)

[SHIFT] [MENU] (SET UP) [F2] (Line) [EXIT]

[(] [(−)] [6] [)] [x^2]

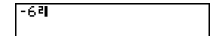
[EXE]

Example 2: To perform the calculation: $-6^2 = -36$

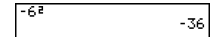
[MENU] [1] (RUN • MAT)

[SHIFT] [MENU] (SET UP) [F2] (Line) [EXIT]

[(−)] [6] [x^2]



[EXE]



Differential and Integration Calculations

Example 1: If a ball is dropped from a height of 100 meters, how far will it have fallen after three seconds?

- Use a 9.8 meters per second per second for gravitational acceleration, and disregard air friction.

Perform the following calculation: $\int_0^3 9.8x\,dx$.

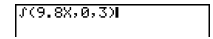
Select the integration function from the menu that appears when you select {CALC} on the option (OPTN) menu.

[MENU] [1] (RUN • MAT)

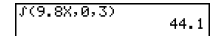
[SHIFT] [MENU] (SET UP) [F2] (Line) [EXIT]

[OPTN] [F4] (CALC) [F4] ($\int dx$) [9] [•] [8]

[X,θ,T] [▼] [0] [▼] [3] [)]



[EXE] [F↔D]



Actual solution: 44.1 meters

This calculation can be verified using the formula $y = \frac{1}{2}gt^2$, which yields $\frac{1}{2} \times 9.8 \times 3^2$.

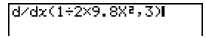
Example 2: If a ball is dropped from a height of 100 meters, at what speed will it be traveling after three seconds?

- Use a 9.8 meters per second per second for gravitational acceleration, and disregard air friction.

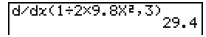
Use the expression $f(x) = \frac{d}{dx}(\frac{1}{2} \cdot 9.8x^2)$ to calculate $f(3)$.

Select the differential function from the menu that appears when you select {CALC} on the option (OPTN) menu.

MENU 1 (RUN • MAT)
SHIFT MENU (SET UP) F2 (Line) EXIT
OPTN F4 (CALC) F2 (*d*/*dx*) 1 ÷ 2 ×
9 • 8 X,θ,T x^3 • 3)



EXE F↔D

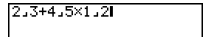


Actual solution: 29.4 meters per second

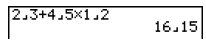
Fraction Calculations

Example 1: To perform the following calculation $\frac{2}{3} + \frac{4}{5} \times \frac{1}{2}$

MENU 1 (RUN • MAT)
SHIFT MENU (SET UP) F2 (Line) EXIT
2 $a\frac{b}{c}$ 3 + 4 $a\frac{b}{c}$ 5 × 1 $a\frac{b}{c}$ 2

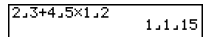


EXE

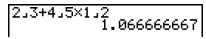


Actual solution: $\frac{16}{15}$

Conversion to a mixed fraction
SHIFT F↔D ($a\frac{b}{c} \leftrightarrow \frac{d}{c}$)

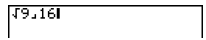


Conversion to a decimal value
F↔D



Example 2: To perform the following calculation $\sqrt{\frac{9}{16}}$

MENU 1 (RUN • MAT)
SHIFT MENU (SET UP) F2 (Line) EXIT
SHIFT x^3 ($\sqrt{\ }$) 9 $a\frac{b}{c}$ 1 6



EXE

Actual solution: $\frac{3}{4}$

Calculations Using Math Input/Output

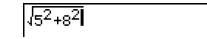
Math input/output lets you enter calculations the same way they appear in your math text book.

Fraction, square root, and pi calculations results only are displayed using the corresponding natural math formats and symbols.

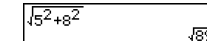
Example 1: Calculation containing √

To perform the following calculation $\sqrt{5^2 + 8^2}$

MENU 1 (RUN • MAT)
SHIFT MENU (SET UP) F1 (Math) EXIT
SHIFT x^3 ($\sqrt{\ }$) 5 x^3 + 8 x^3



EXE



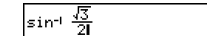
Actual solution: $\sqrt{89}$

Example 2: Calculation containing the π symbol

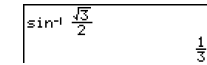
To perform the following calculation $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

• Use the radian angle unit.

MENU 1 (RUN • MAT)
SHIFT MENU (SET UP) F1 (Math)
▼ ▼ ▼ ▼ ▼ ▼ F2 (Rad) EXIT
SHIFT sin ($\sin^{-1}$) $a\frac{b}{c}$ SHIFT x^3 ($\sqrt{\ }$) 3 ▼ 2



EXE

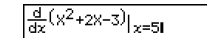


Actual solution: $\frac{1}{3}\pi$

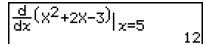
Example 3: To calculate a derivative

Determine the derivative of $\frac{d}{dx}(x^2 + 2x - 3) \mid_{x=5}$.

MENU 1 (RUN • MAT)
SHIFT MENU (SET UP) F1 (Math) EXIT
OPTN F4 (CALC) F2 (*d*/*dx*) X,θ,T x^3 + 2
X,θ,T − 3 ▶ 5



[EXE]



Actual solution: 12

Example 4: Calculating a definite integral

To perform the following calculation $\int_0^{\frac{\pi}{2}} \sin(x)dx$

- Use the radian angle unit.

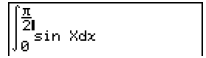
[MENU] [1] (RUN • MAT)

[SHIFT] [MENU] (SET UP) [F1] (Math)

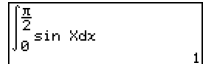
[▼][▼][▼][▼][▼][▼] [F2] (Rad) [EXIT]

[OPTN] [F4] (CALC) [F4] (∫dx) [sin] [X,θ,T] [▶] [0] [▲]

[SHIFT] [EXP] (π) [a b/c] [2]



[EXE]



Actual solution: 1

Matrix Calculations

Example 1: To perform the following calculation $\begin{bmatrix} 2 & 5 & 3 \\ -1 & 2 & 0 \end{bmatrix} \times \begin{bmatrix} 4 & 2 \\ 5 & 1 \\ 0 & 3 \end{bmatrix} =$

Assign $\begin{bmatrix} 2 & 5 & 3 \\ -1 & 2 & 0 \end{bmatrix}$ to Mat A, and $\begin{bmatrix} 4 & 2 \\ 5 & 1 \\ 0 & 3 \end{bmatrix}$ to Mat B.

On the {▶MAT} menu, select [Mat A], specify the matrix dimensions (2 rows × 3 columns), and then enter the elements.

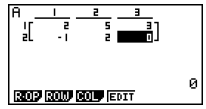
[MENU] [1] (RUN • MAT)

[SHIFT] [MENU] (SET UP) [F2] (Line) [EXIT]

[F1] (▶MAT) [EXE]

[2] [EXE] [3] [EXE] [EXE]

[2] [EXE] [5] [EXE] [3] [EXE] [←] [1] [EXE] [2] [EXE] [0] [EXE]

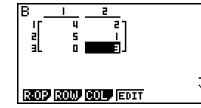


In the same way, select [Mat B], specify the matrix dimensions (3 rows × 2 columns), and then enter the elements.

[EXIT] [▼] [EXE]

[3] [EXE] [2] [EXE] [EXE]

[4] [EXE] [2] [EXE] [5] [EXE] [1] [EXE] [0] [EXE] [3] [EXE]



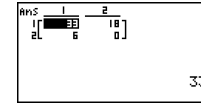
Perform the following calculation: Mat A × Mat B.

[EXIT] [EXIT]

[OPTN] [F2] (MAT) [F1] (Mat) [ALPHA] [X,θ,T] (A) [×]

[F1] (Mat) [ALPHA] [log] (B)

[EXE]



Actual result: $\begin{bmatrix} 33 & 18 \\ 6 & 0 \end{bmatrix}$

Example 2: To determine whether a solution exists for the following simultaneous equations

$$\begin{cases} 2x - y = 3 \\ -4x + 2y = 5 \end{cases}$$

On the {▶MAT} menu, select [Mat A], specify the matrix dimensions (2 rows × 3 columns), and then enter the elements.

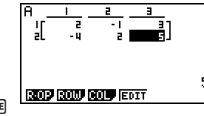
[MENU] [1] (RUN • MAT)

[SHIFT] [MENU] (SET UP) [F2] (Line) [EXIT]

[F1] (▶MAT) [EXE]

[2] [EXE] [3] [EXE] [EXE]

[2] [EXE] [←] [1] [EXE] [3] [EXE] [←] [4] [EXE] [2] [EXE] [5] [EXE]



Use the Rref function to determine whether a solution exists for the equations.

- To enter the Rref function, press [OPTN] - [MAT] - [Rref].

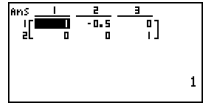
Perform the following calculation: Rref Mat A

[EXIT] [EXIT]

[OPTN] [F2](MAT) [F6](▷) [F5](Rref)

[F6](▷) [F1](Mat) [ALPHA] [X,θ,T](A)

[EXE]



Actual result: $\begin{bmatrix} 1 & -1/2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

From this result, it can be determined that there is no solution for the simultaneous equation.

Statistical Calculations

Example: To analyze average monthly temperatures in New York

Month	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec
Average Temperature (°C)	0.1	0.8	5.1	11.2	16.8	22	24.8	23.8	20.2	14.8	8.6	1.9

Enter numbers for the months into List 1, and the corresponding average temperature values into List 2.

[MENU] [2](STAT)

[1] [EXE] [2] [EXE] [3] [EXE] [4] [EXE] [5] [EXE]

[6] [EXE] [7] [EXE] [8] [EXE] [9] [EXE] [1] [0] [EXE]

[1] [1] [EXE] [1] [2] [EXE] [▶]

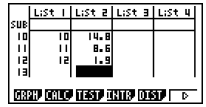
[0] [•] [1] [EXE] [0] [•] [8] [EXE] [5] [•] [1] [EXE]

[1] [1] [•] [2] [EXE] [1] [6] [•] [8] [EXE] [2] [2] [EXE]

[2] [4] [•] [8] [EXE] [2] [3] [•] [8] [EXE]

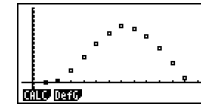
[2] [0] [•] [2] [EXE] [1] [4] [•] [8] [EXE]

[8] [•] [6] [EXE] [1] [•] [9] [EXE]



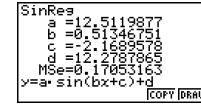
Plot the data on a graph.

[F1](GRPH) [F1](GPH1)



Use sin regression to obtain sinusoidal regression analysis results.

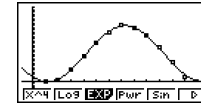
[F1](CALC) [F6](▷) [F5](Sin)



Actual result: Coefficients of $y = a \cdot \sin(bx + c) + d$ are $\begin{cases} a = 12.5119877 \\ b = 0.51346751 \\ c = -2.1689578 \\ d = 12.2787865 \end{cases}$

Use the analysis results to draw the sinusoidal regression graph.

[F6](DRAW)



Actual result: Graph is drawn along plotted points.

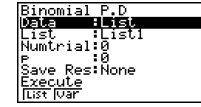
Distribution Function

Example: Five trials of some even are performed, and one trial is successful. If the probability of success of the event is 0.2, determine the probability of the result obtained.

Use the binomial distribution Binomial P.D to perform the calculation.

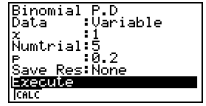
[MENU] [2](STAT)

[F5](DIST) [F5](BINM) [F1](Bpd)

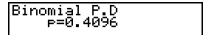


[F2](Var)[▼][1][EXE][5][EXE][0][•][2][EXE][▼]

$x = 1$, $n = 5$, $p = 0.2$



[F1](CALC)



Actual result: $p = 0.4096$

Box Plot

Example: To graph the weight measurement results for 20 component samples on a MedBox graph

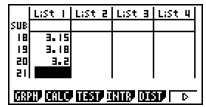
Number	1	2	3	4	5	6	7	8	9	10
Weight (g)	3.15	3.18	3.19	3.15	3.16	3.22	3.21	3.17	3.18	3.22

Number	11	12	13	14	15	16	17	18	19	20
Weight (g)	3.16	3.20	3.18	3.14	3.19	3.18	3.21	3.15	3.18	3.20

Enter the sample weight data into the List 1.

[MENU][2](STAT)

[3][•][1][5][EXE][3][•][1][8][EXE]
[3][•][1][9][EXE][3][•][1][5][EXE]
[3][•][1][6][EXE][3][•][2][2][EXE]
[3][•][2][1][EXE][3][•][1][7][EXE]
[3][•][1][8][EXE][3][•][2][2][EXE]
[3][•][1][6][EXE][3][•][2][0][EXE]
[3][•][1][8][EXE][3][•][1][4][EXE]
[3][•][1][9][EXE][3][•][1][8][EXE]
[3][•][2][1][EXE][3][•][1][5][EXE]
[3][•][1][8][EXE][3][•][2][0][EXE]

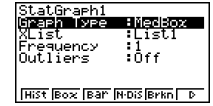


Specify MedBox as the graph type.

- Select {GRPH} - {SET} and then select MedBox for the "Graph Type" setting on the graph settings screen.

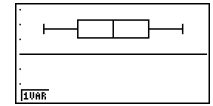
[F1](GRPH)[F6](SET)[▼]

[F6](▷)[F2](Box)



Draw the MedBox graph.

[EXE][F1](GPH1)



Spreadsheet

Example: To create a table that calculates sales amounts using the sale data for products A, B, C, and D.

	PRICE	QUANTITY
A	$599	3490
B	$549	3612
C	$399	5922
D	$349	6187

Enter the information into the table.

[MENU][4](S • SHT)

[5][9][9][EXE][5][4][9][EXE][3][9][9][EXE]
[3][4][9][EXE][▶][▲][▲][▲][▲]
[3][4][9][0][EXE][3][6][1][2][EXE]
[5][9][2][2][EXE][6][1][8][7][EXE]

Add a table (column) to the above table that calculates sales amounts.

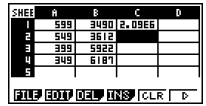
- Inputting an equals sign (=) first make the input following a calculation formula.
- You can use the {GRAB} menu to specify a particular cell.
- To copy the contents of a particular cell, select {COPY} on the {EDIT} menu.

• You can use the sum function to calculate the total of a range of cells. Select the sum function from the {CEL} menu that appears when you input a leading equals sign (=) into a cell.

Calculate the sales amount for Product A.

▶▲▲▲▲

SHIFT • (=) ALPHA X,θ,T (A) 1 × ALPHA log (B) 1 EXE

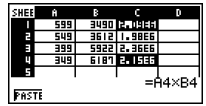


• Enter the following calculation formula: PRICE × QTY.

Next, calculate the sales amounts for Product B, C, and D.

▲ F2 (EDIT) F2 (COPY)

▼ F1 (PASTE) ▼ F1 (PASTE) ▼ F1 (PASTE)

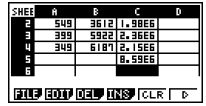


• You can use the {COPY} menu item to copy the calculation formula you input for Product A.

Finally, calculate the grand total for Products A through D.

EXIT ▼ SHIFT • (=) F5 (CEL) F5 (Sum) EXIT

ALPHA ln (C) 1 F3 (:) ALPHA ln (C) 4) EXE



• Use the sum function to calculate the grand total.

Graphing

Example: To graph a cubic function, and determine its roots, maximum value, and minimum value

Graph the following function: $y = x^3 + 2x^2 - x - 2$.

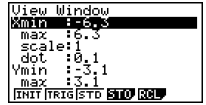
Use View Window to configure the graph screen coordinate values.

MENU 5 (GRAPH)

SHIFT MENU (SET UP) F2 (Line) EXIT

SHIFT F3 (V-WIN)

F1 (INIT)



• Initialize the coordinate settings.

Input the function into area Y1.

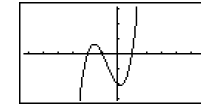
EXIT

X,θ,T ^ 3 + 2 X,θ,T x^3 − X,θ,T

− 2 EXE

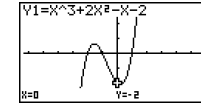
Graph the function.

F6 (DRAW)



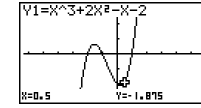
Use the TRACE function to read the coordinates on the graph.

SHIFT F1 (TRCE)



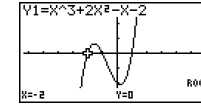
Read the coordinate values as they are traced by the cursor.

▶▶▶▶▶



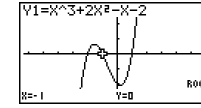
Use the G-SOLVE function to calculate the roots of the graphed cubic function.

SHIFT F5 (G-SLV) F1 (ROOT)

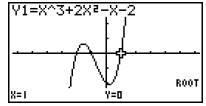


Calculate other roots.

▶

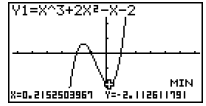


▶



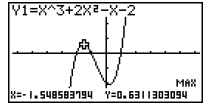
Calculate the local minimum value of the graphed function.

SHIFT F5 (G-SLV) F3 (MIN)



Calculate the local maximum value of the graphed function.

SHIFT F5 (G-SLV) F2 (MAX)



Drawing an Integration Graph

Example: To determine the integration result for the quadratic function $y = -x^2 + 4x$ within the range of $x = 0$ to 4.

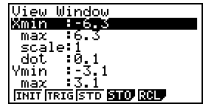
At the same time, draw the function graph for the definite integral derived from the quadratic function and verify the results.

Use View Window to configure the graph screen coordinate values.

MENU 5 (GRAPH)

SHIFT MENU (SET UP) F2 (Line) EXIT

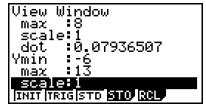
SHIFT F3 (V-WIN)



Configure the following settings: Xmin = –2, Xmax = 8, Ymin = –6, Ymax = 13.

(−) 2 EXE 8 EXE ▼ ▼ (−) 6 EXE

1 3 EXE



Input the function $y = -x^2 + 4x$ into area Y1, and $\int$(Y1, 0, X) into area Y2.

EXIT

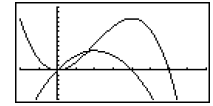
(−) X,θ,T x^2 + 4 X,θ,T EXE

OPTN F2 (CALC) F3 $(\int dx)$ F1 (Y)

1 ▼ 0 ▼ X,θ,T) EXE

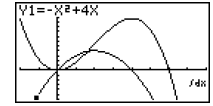
Graph the function.

F6 (DRAW)



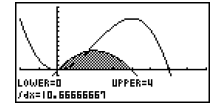
Use the G-SOLVE function to calculate the definite integral result of the graphed quadratic equation for $x = 0$ to 4.

SHIFT F5 (G-SLV) F6 (▷) F3 $(\int dx)$



Use the ▲ and ▼ keys to select one of the graphs and then specify the definite integral range.

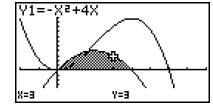
EXE 0 EXE 4 EXE



Definite integral result: 10.66666667

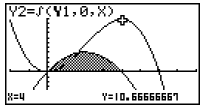
Next, trace the function graph of the definite integral result of the graphed quadratic equation, and compare it with the previous result.

SHIFT F1 (TRCE)



Use the ▲ and ▼ keys to select one of the graphs and specify the coordinate position you want to trace.

▲ 4 EXE



Trace result: 10.66666667

Confirm that the same result is obtained in both cases.

Dynamic Graph

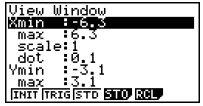
Example: To view how a graph is affected as the value of A in $y = x^3 + Ax^2 + x + 1$ changes

Use View Window to configure the graph screen coordinate values.

MENU 6 (DYNA)

SHIFT MENU (SET UP) F2 (Line) EXIT

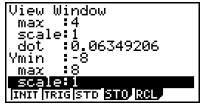
SHIFT F3 (V-WIN)



Configure the following settings: Xmin = –4, Xmax = 4, Ymin = –8, Ymax = 8.

(–) 4 EXE 4 EXE ▼ ▼ (–) 8 EXE

8 EXE



Input $y = x^3 + Ax^2 + x + 1$ into area Y1.

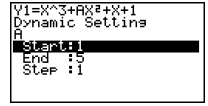
EXIT

X,θ,T ^ 3 + ALPHA X,θ,T (A)

X,θ,T x^2 + X,θ,T + 1 EXE

Configure movement range for variable A.

F4 (VAR) F2 (SET)



Configure the following settings: Start = –4, End = 4, Step = 0.5.

(–) 4 EXE 4 EXE 0 . 5 EXE

Execute the Dynamic Graph operation.

EXIT F6 (DYNA)

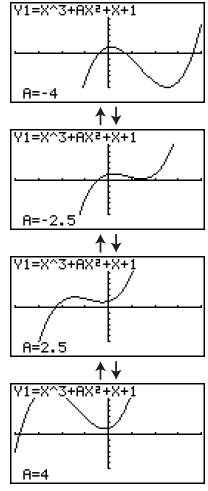


Table Calculations

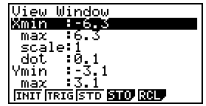
Example: To create a numeric table for the function $y = x^2 + 2x - 3$ and plot the values on a graph

Use View Window to configure the graph screen coordinate values.

[MENU] [7] (TABLE)

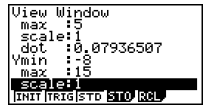
[SHIFT] [MENU] (SET UP) [F2] (Line) [EXIT]

[SHIFT] [F3] (V-WIN)



Configure the following settings: Xmin = –5, Xmax = 5, Ymin = –8, Ymax = 15.

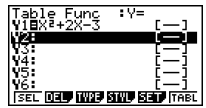
[(–)] [5] [EXE] [5] [EXE] [▼] [▼] [(–)] [8] [EXE] [1] [5] [EXE]



Input $y = x^2 + 2x - 3$ into area Y1.

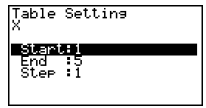
[EXIT]

[X,θ,T] [x^2] [+] [2] [X,θ,T] [–] [3] [EXE]



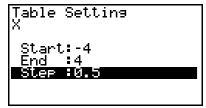
Specify the range for number table creation.

[F5] (SET)



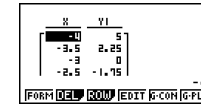
Configure the following settings: Start = –4, End = 4, Step = 0.5.

[(–)] [4] [EXE] [4] [EXE] [0] [.] [5] [EXE]



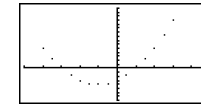
Create the table.

[EXIT] [F6] (TABL)



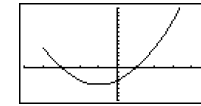
Plot the table data on a graph.

[F6] (G·PLT)



Connect the plots to draw a graph.

[EXIT] [F5] (G·CON)



Financial Calculations

Example 1: Compound Interest

If you purchase an item for $20,000 with a loan that has an annual interest rate of 5.5%, compounded monthly, how many payments of $500 per month would it take to pay off the loan?

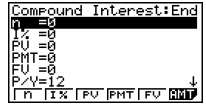
Set: Payment = End (end of period)

$I\%$	Interest rate (Annual)	5.5%
PV	Purchase amount (Present Value)	$20,000
PMT	Payment amount	–$500
FV	Final amount (Future Value)	$0
P/Y	Number of payments per year	12
C/Y	Number of times per year interest is compounded	12

Select Compound Interest.

[MENU] [1n] (TVM)

[F2] (CMPD)



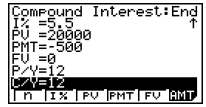
Configure settings for the various conditions.

$I\%$ = 5.5, PV = 20,000, PMT = –500, FV = 0, P/Y = 12, C/Y = 12

[▼] [5] [•] [5] [EXE] [2] [0] [0] [0] [0] [EXE]

[(–)] [5] [0] [0] [EXE] [0] [EXE] [1] [2] [EXE]

[1] [2] [EXE]



Determine the number of payments n.

[F1] (n)

Result: n = 44.28829713 ≒ 45

Example 2: Net Present Value (NPV) Method

By investing $10 million in a piece of machinery, a company expects to earn annual profits as shown in the table below (all profit values calculated at the end of each fiscal year).

If the machine has a useful life of six years, a trade-in value of $1 million, and expected capital costs of 10%, how much is the net present value (the total profit or loss of this investment)?

Cash Data

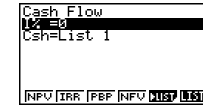
x1	– $10,000,000	Initial investment (One machine, $10 million)
x2	– $1,000,000	
x3	$5,000,000	
x4	$4,500,000	
x5	$3,000,000	
x6	$2,500,000	
x7	$1,500,000 + $1,000,000	To add trade-in value of machine.

$I\%$	Investment cost (annual interest)	10%

Select Cash Flow.

[MENU] [1n] (TVM)

[F3] (CASH)

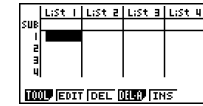


Configure settings for the various conditions.

[1] [0] [EXE]

Input the condition values into List 1.

[F5] (▶LIST)



[(–)] [1] [0] [0] [0] [0] [0] [0] [0] [EXE]

[(–)] [1] [0] [0] [0] [0] [0] [0] [0] [EXE]

[5] [0] [0] [0] [0] [0] [0] [EXE]

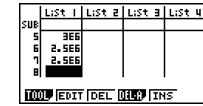
[4] [5] [0] [0] [0] [0] [0] [EXE]

[3] [0] [0] [0] [0] [0] [0] [EXE]

[2] [5] [0] [0] [0] [0] [0] [EXE]

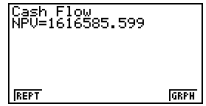
[1] [5] [0] [0] [0] [0] [0] [+]

[1] [0] [0] [0] [0] [0] [0] [EXE]



Determine the net present value (NPV).

EXIT F1 (NPV)



Result: NPV = 1,616,585.599 ≒ $1,616,586

This is the total profit for this investment.

Handling Precautions

- Your calculator is made up of precision components. Never try to take it apart.
- Avoid dropping your calculator and subjecting it to strong impact.
- Do not store the calculator or leave it in areas exposed to high temperatures or humidity, or large amounts of dust. When exposed to low temperatures, the calculator may require more time to display results and may even fail to operate. Correct operation will resume once the calculator is brought back to normal temperature.
- The display will go blank and keys will not operate during calculations. When you are operating the keyboard, be sure to watch the display to make sure that all your key operations are being performed correctly.
- Replace the batteries once every one year regardless of how much the calculator is used during that period. Never leave dead batteries in the battery compartment. They can leak and damage the unit.
- Do not use an oxyride battery* or any other type of nickel-based primary battery with this product. Incompatibility between such batteries and product specifications can result in shorter battery life and product malfunction.
- Keep batteries out of the reach of small children. If swallowed, consult a physician immediately.
- Avoid using volatile liquids such as thinner or benzine to clean the unit. Wipe it with a soft, dry cloth, or with a cloth that has been moistened with a solution of water and a neutral detergent and wrung out.
- Always be gentle when wiping dust off the display to avoid scratching it.
- In no event will the manufacturer and its suppliers be liable to you or any other person for any damages, expenses, lost profits, lost savings or any other damages arising out of loss of data and/or formulas arising out of malfunction, repairs, or battery replacement. It is up to you to prepare physical records of data to protect against such data loss.
- Never dispose of batteries, the liquid crystal panel, or other components by burning them.
- Be sure that the power switch is set to OFF when replacing batteries.
- If the calculator is exposed to a strong electrostatic charge, its memory contents may be damaged or the keys may stop working. In such a case, perform the Reset operation to clear the memory and restore normal key operation.
- If the calculator stops operating correctly for some reason, use a thin, pointed object to press the RESTART button on the back of the calculator. Note, however, that this clears all the data in calculator memory.
- Note that strong vibration or impact during program execution can cause execution to stop or can damage the calculator's memory contents.
- Using the calculator near a television or radio can cause interference with TV or radio reception.
- Before assuming malfunction of the unit, be sure to carefully reread the User's Guide and ensure that the problem is not due to insufficient battery power, programming or operational errors.

* Company and product names used in this manual may be registered trademarks or trademarks of their respective owners.

Be sure to keep physical records of all important data!

The large memory capacity of the unit makes it possible to store large amounts of data.

You should note, however, that low battery power or incorrect replacement of the batteries that power the unit 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. It is up to you to keep back up copies of data to protect against its loss.

Since this calculator employs unused memory as a work area when performing its internal calculations, an error may occur when there is not enough memory available to perform calculations. To avoid such problems, it is a good idea to leave 1 or 2 kbytes of memory free (unused) at all times.

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SA0912-D Printed in China