The Holt School

Maths Department

Graphical Calculator Workbook.

Here are some basic instructions for the Casio fx-9860G calculator. Note that instructions given may need to be modified slightly for other models. However all Casio Graphical calculators have a very similar operating procedure.

The best way to learn to use your calculator is to just use it! Use it all the time in class and for home learning. Try not to use your scientific, and you will soon get used to your new one!

There are lots more tasks here for you to try when you finish this booklet:

http://mei.org.uk/casio-tasks

Getting started

Casio fx-9860g

Press [MENU] to access the Main Menu, and select **RUN·MAT**.

This is where most of the basic calculations are performed.

When you are on this screen you can type in an expression and evaluate it using the [EXE] key.

Shift and Alpha

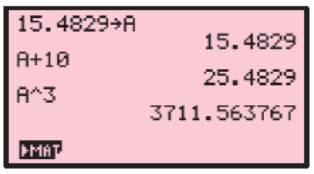
The **shift function** of each key is displayed in yellow above the key. It is accessed by pressing the [SHIFT] key followed by the key corresponding to the desired shift function.

For example, to calculate $\sqrt{36}$, press [SHIFT] [x^2] 36 [EXE].

The **alpha function** of each key is displayed in red above the key. It is accessed by pressing the [ALPHA] key followed by the key corresponding to the desired letter. The main purpose of the alpha keys is to store values which can be recalled later.

Memory

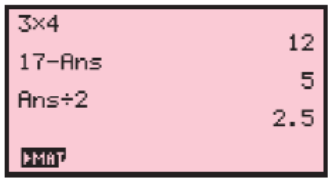
Suppose we wish to store the number 15.4829 for use in a number of calculations. Type in the number then press [→] [ALPHA] [X,θ,T] **(A)** [EXE].



We can now add 10 to this value by pressing [ALPHA] [X,θ,T] [+] 10 [EXE], or cube this value by pressing [ALPHA] [X,θ,T] [^] 3 [EXE].

The variable **Ans** holds the most recent evaluated expression, and can be used in calculations by pressing SHIFT (−). For example, suppose you evaluate 3×4, and then wish to subtract this from 17. This can be done by pressing 17 − SHIFT (−) EXE.

If you start an expression with an operator such as +, −, etc, the previous answer Ans is automatically inserted ahead of the operator. For example, the previous answer can be halved simply by pressing ÷ 2 EXE.



If you wish to view the answer in fractional form, press F↔D.

Pressing the left cursor key allows you to edit the most recently evaluated expression, and is useful if you wish to repeat a calculation with a minor change, or if you have made an error in typing.

Suppose you have evaluated $100 + \sqrt{132}$.

If you now want to evaluate $100 + \sqrt{142}$, instead of retyping the command, it can be recalled by pressing the left cursor key.

Move the cursor between the 3 and the 2, then press DEL 4 to remove the 3 and change it to a 4. Press EXE to re-evaluate the expression.

Number Functions

Most modern calculators have the rules for **Order of Operations** built into them. This order is sometimes referred to as BEDMAS.

This section explains how to enter different types of numbers such as negative numbers and fractions, and how to perform calculations using grouping symbols (brackets), powers, and square roots. It also explains how to round off using your calculator.

Negative Numbers

To enter negative numbers we use the **sign change** key. On both the **TI-83** and **Casio** this looks like [(−)].

Simply press the sign change key and then type in the number.

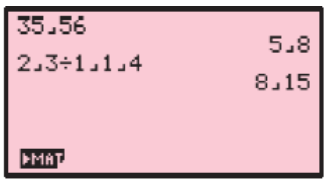
For example, to enter -7, press [(−)] 7.

Fractions

To enter fractions we use the **fraction** key [a b/c].

For example, we enter $\frac{3}{4}$ by typing 3 [a b/c] 4 and $2\frac{3}{4}$ by typing 2 [a b/c] 3 [a b/c] 4. Press [SHIFT] [a b/c] $\left(a\frac{b}{c} \leftrightarrow \frac{d}{c}\right)$ to convert between mixed numbers and improper fractions.

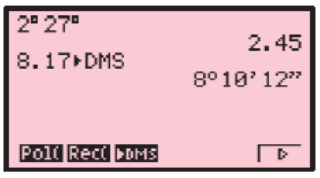
To express the fraction $\frac{35}{56}$ in simplest form, press 35 [a b/c] 56 [EXE]. The result is $\frac{5}{8}$.



To express the ratio $\frac{2}{3} : 1\frac{1}{4}$ in simplest form, press 2 [a b/c] 3 [÷] 1 [a b/c] 1 [a b/c] 4 [EXE]. The ratio is 8 : 15.

Time

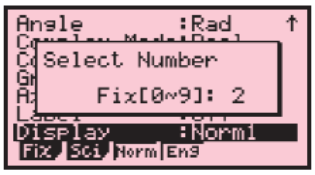
To enter 2 hours 27 minutes, press 2 [OPTN] [F6] [F5] **(ANGL)** [F4] ($^{o\prime\prime\prime}$) 27 [F4] ($^{o\prime\prime\prime}$) [EXE]. This is equivalent to 2.45 hours.



To express 8.17 hours in terms of hours, minutes and seconds, press 8.17 [OPTN] [F6] [F5] **(ANGL)** [F6] [F3] **(▶DMS)** [EXE]. This is equivalent to 8 hours, 10 minutes and 12 seconds.

Rounding

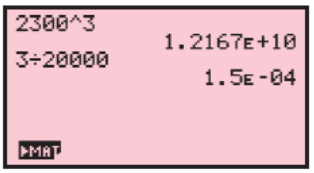
To round to 2 decimal places, select **RUN·MAT** from the Main Menu, and press [SHIFT] [MENU] to enter the setup screen. Scroll down to Display, and press [F1] **(Fix)**. Press 2 [EXE] to select the number of decimal places. Press [EXIT] to return to the home screen.



To unfix the number of decimal places, press [SHIFT] [MENU] to return to the setup screen, scroll down to Display, and press [F3] **(Norm)**.

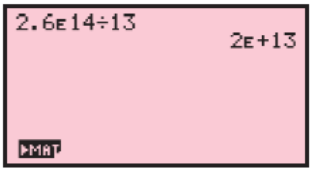
Standard form

To evaluate 2300^3, press 2300 [^] 3 [EXE]. The answer displayed is 1.2167E+10, which means 1.2167×10^{10}.



To evaluate $\frac{3}{20\,000}$, press 3 [÷] 20 000 [EXE]. The answer displayed is 1.5E−04, which means 1.5×10^{-4}.

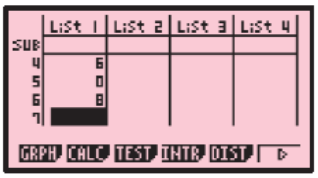
You can enter values in scientific notation using the [EXP] key. For example, to evaluate $\frac{2.6\times10^{14}}{13}$, press 2.6 [EXP] 14 [÷] 13 [EXE]. The answer is 2×10^{13}.



Statistics

Creating a list

Selecting **STAT** from the Main Menu takes you to the **list editor** screen.



To enter the data {2, 5, 1, 6, 0, 8} into **List 1**, start by moving the cursor to the first entry of **List 1**. Press 2 [EXE] 5 [EXE] ..... and so on until all the data is entered.

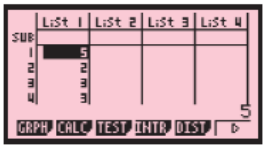
Deleting lists

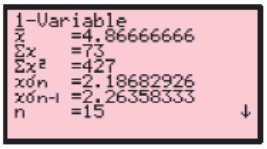
Selecting **STAT** from the Main Menu takes you to the **list editor** screen.

Move the cursor to anywhere on the list you wish to delete, then press [F6] (▷) [F4] **(DEL-A)** [F1] **(Yes)**.

Statistical Calculations

Enter the data into **List 1** using the instructions on page **18**. To obtain the descriptive statistics, press [F6] (▷) until the **GRPH** icon is in the bottom left corner of the screen, then press [F2] **(CALC)** [F1] **(1VAR)**.

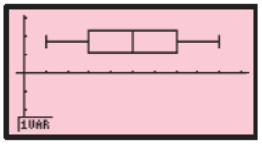




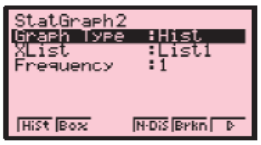
This gives you the mean, variance.

Graphs and Diagrams

To obtain a boxplot of the data, press [EXIT] [EXIT] [F1] **(GRPH)** [F6] **(SET)**, and set up **StatGraph 1** as shown. Press [EXIT] [F1] **(GPH1)** to draw the boxplot.

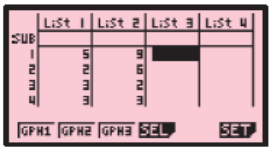


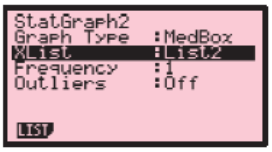
To obtain a vertical bar chart of the data, press [EXIT] [F6] **(SET)** [F2] **(GPH 2)**, and set up **StatGraph 2** as shown. Press [EXIT] [F2] **(GPH 2)** to draw the bar chart (set Start to 0, and Width to 1).

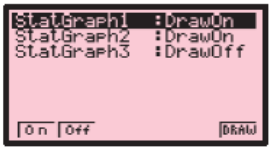


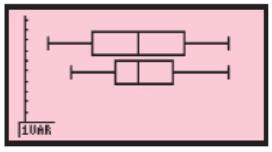
We will now enter a second set of data, and compare it to the first.

Enter the data set 9 6 2 3 5 5 7 5 6 7 6 3 4 4 5 8 4 into **List 2**, then press [F6] **(SET)** [F2] **(GPH2)** and set up **StatGraph 2** to draw a boxplot of this data set as shown. Press [EXIT] [F4] **(SEL)**, and turn on both **StatGraph 1** and **StatGraph 2**. Press [F6] **(DRAW)** to draw the side-by-side boxplots.

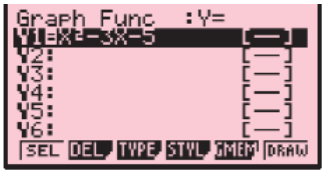






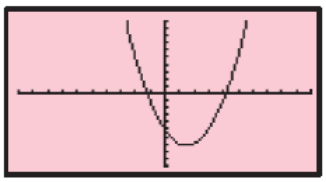


Graphing Functions

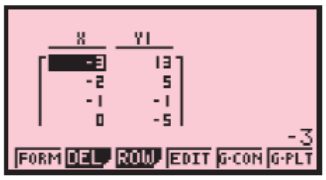


Selecting **GRAPH** from the Main Menu takes you to the Graph Function screen, where you can store functions to graph. Delete any unwanted functions by scrolling down to the function and pressing DEL F1 **(Yes)**.

To graph the function $y = x^2 - 3x - 5$, move the cursor to **Y1** and press X,θ,T x^2 − 3 X,θ,T − 5 EXE. This stores the function into **Y1**. Press F6 **(DRAW)** to draw a graph of the function.

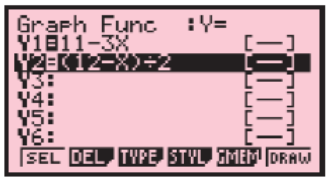


To view a table of values for the function, press MENU and select **TABLE**. The function is stored in **Y1**, but not selected. Press F1 **(SEL)** to select the function, and F6 **(TABL)** to view the table. You can adjust the table settings by pressing EXIT and then F5 **(SET)** from the Table Function screen.



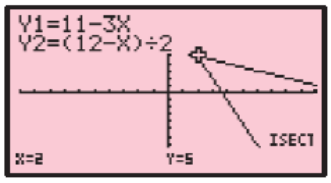
Points of intersection

We can solve $y = 11 - 3x$ and $y = \dfrac{12 - x}{2}$ simultaneously by finding the point of intersection of these two lines. Select **GRAPH** from the Main Menu, then store $11 - 3x$ into **Y1** and $\dfrac{12 - x}{2}$ into **Y2**. Press F6 **(DRAW)** to draw a graph of the functions.



To find their point of intersection, press F5 **(G-Solv)** F5 **(ISCT)**. The solution $x = 2,\ y = 5$ is given.

Note: If there is more than one point of intersection, the remaining points of intersection can be found by pressing ▶.

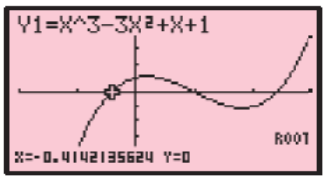


Solving

To solve $x^3 - 3x^2 + x + 1 = 0$, select **GRAPH** from the Main Menu and store $x^3 - 3x^2 + x + 1$ into **Y1**. Press F6 **(DRAW)** to draw the graph.

To find where this function cuts the x-axis, press F5 **(G-Solv)** F1 **(ROOT)**. The first solution $x \approx -0.414$ is given.

Press ▶ to find the remaining solutions $x = 1$ and $x \approx 2.41$.

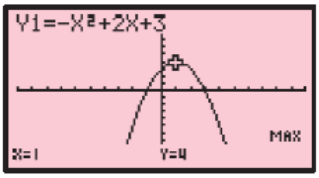


Turning points

To find the turning point (vertex) of $y = -x^2 + 2x + 3$, select **GRAPH** from the Main Menu and store $-x^2 + 2x + 3$ into **Y1**. Press F6 **(DRAW)** to draw the graph.

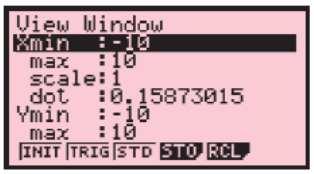
From the graph, it is clear that the vertex is a maximum, so to find the vertex press F5 **(G-Solv)** F2 **(MAX)**.

The vertex is (1, 4).



Adjusting the axes

The viewing window can be adjusted by pressing SHIFT F3 **(V-Window)**. You can manually set the minimum and maximum values of the x and y axes, or press F3 **(STD)** to obtain the standard viewing window $-10 \leqslant x \leqslant 10$, $-10 \leqslant y \leqslant 10$.

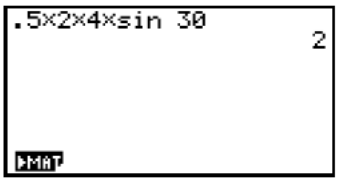


Trigonometry

To solve equations including trigonometric functions:

For this example, use the equation for area = $\frac{1}{2}a \cdot b \cdot \sin C$.

Let $a = 2$, $b = 4$, and $C = 30°$



1. To calculate the area with the given parameters, press: [•] [5] [×] [2] [×] [4] [×] [sin] [3] [0] [EXE].
   The area is 2.

The inverse trigonometric functions $\sin^{-1}$, $\cos^{-1}$ and $\tan^{-1}$ are the secondary functions of [sin], [cos] and [tan] respectively. They are accessed by using the secondary function key [SHIFT].

For example, if $\cos x = \frac{3}{5}$, then $x = \cos^{-1}\left(\frac{3}{5}\right)$.

To calculate this, press [SHIFT] [cos] [(] 3 [÷] 5 [)] [EXE].

Angles

To set the calculator to calculate in degrees:

1. From the Main Menu, highlight the RUN•MAT icon and press [EXE] or [1].

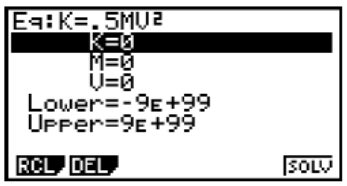
2. Make sure the calculator is in degree mode by pressing [SHIFT] [MENU], move the cursor down to Angle. Press [F1] (Deg) to change it into degrees, then [EXIT].

Equation Solver

For this example, we will use the equation for kinetic energy, KE = 0.5 mv^2.

Let m = 10 kg, v = 25 $\frac{m}{\sec^2}$.

1. From the Main Menu, highlight the EQUA icon and press EXE or 8, then press F3 (SOLV).



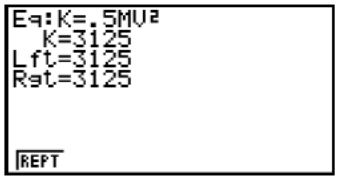
2. To input the equation, press:

   ALPHA • SHIFT • • 5 ALPHA 7 ALPHA 2 x^2 EXE

   Note: *k* is used to represent KE.

3. Enter 10 for M and 25 for V, and then highlight K.

4. Press F6 (SOLV).



6. Kinetic energy for this example is 3125 kg•$\frac{m}{\sec^2}$.

7. To use the Solver to find *m* , input values for K and V, highlight M and press F6 to find the value for M. Use this same method to find V.