Statistics Using the CFX-9850GB Plus Calculator

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Rationale

Both in the current junior and senior mathematics syllabuses statistical methods are a requirement. The range of knowledge covers histograms, identifying and calculating five number summaries, box-and-whisker plot, scatterplot, line-of-best-fit, linear regression, correlation coefficient and coefficient of determination. The new senior syllabus has an expectation that calculators will be used routinely for calculation in learning these statistical concepts. The graphics calculator can be used to model real life data or as a tool for simulation to enhance the learning experiences of students.

Getting Started with the CFX-9850GB Plus

Turning ON

- Press the [AC^ON] key.

When you turn your CFX-9850GB Plus on, you will see the main menu screen. Each icon on the main menu screen stands for a MODE on the calculator.
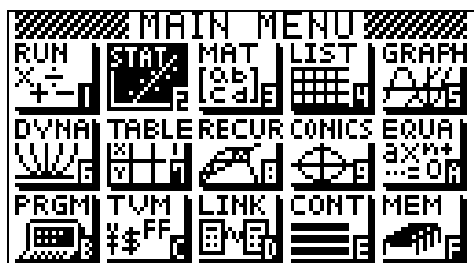

For today's session, we will be using the following modes:

RUN – The scientific calculator
STAT – For statistical calculations
LIST – To manipulate lists (can also be done in **STAT** mode) or change List Files.

Important keys:

- [SHIFT] or Second function key.
- **Function Keys** – F-Key(s) – that is the [F1] to [F6] keys. These keys correspond to options that appear along the bottom of the calculator screen once a mode has been entered.
- [EXE] should be pressed to enter a mode and also after entering information into the calculator.
- [EXIT] will take you back a step.
- [MENU] will take you back to the Main Menu.
- cursor keys to move the cursor around the screen.
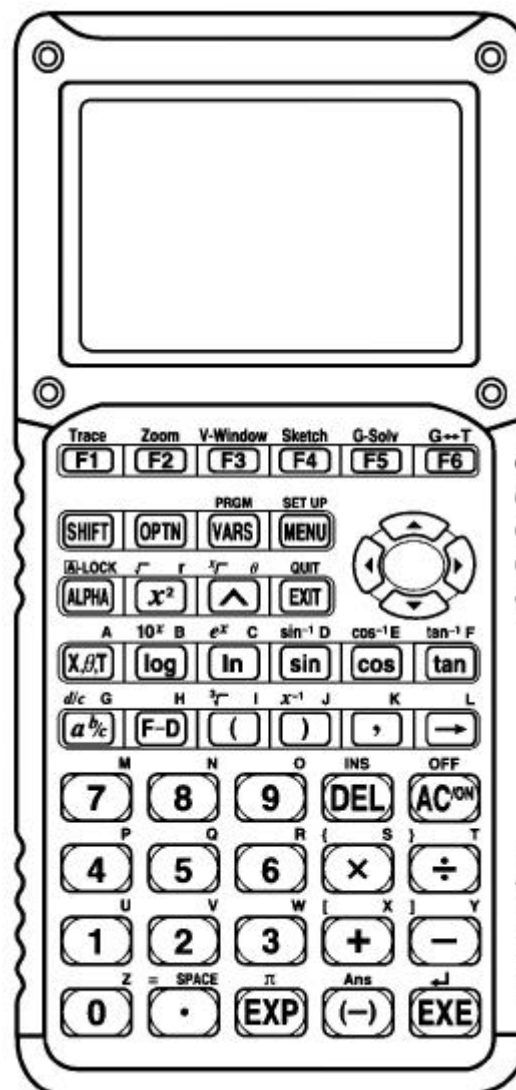
Activity 1: **Use a Casio CFX-9850GB Plus graphics calculator to enter and store data, and calculate simple statistics of this data.**

Turn on the calculator, highlight **STAT** on the MAIN MENU then press ⌈EXE⌉.

You may need to delete information in the lists. To do this now or at any time, press ⌈F6⌉ to bring up the second screen. Put the cursor in the column you wish to clear and press **DEL A** ⌈F4⌉. A **YES** or **NO** prompt will appear. Press ⌈F1⌉ for yes. Repeat the process for any other column containing data. After press ⌈F6⌉.

The following data is a set of marks for 7 students out of 40.

$$35, 20, 24, 28, 26, 22, 24$$

In **STAT** mode, in the list editing screen enter the test scores into **List 1** (type in the number followed by ⌈EXE⌉).

Press **CALC** (⌈F2⌉) then **1VAR** (⌈F1⌉) to calculate and display the summary statistics. Scroll down the screen using the down arrow cursor key to check those statistics not initially displayed. Press ⌈EXIT⌉ to return to the list editing screen and press ⌈EXIT⌉ again.
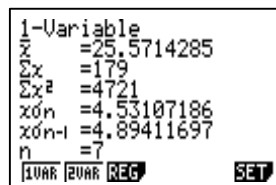
Now clear the data for the next activity.

Activity 2: **Use a Casio CFX-9850GB Plus graphics calculator to enter and store data, and draw a histogram of this data.**

In the following procedures we will use the data in the table below. The data has been obtained by rolling a die 36 times. The *x* variable will be the score and *y* variable will be the frequency.

Score (x)	1	2	3	4	5	6
Frequency (y)	2	5	4	8	5	6

You would normally enter into the **STAT** mode first time but you are already in this mode, so enter the score and frequency into **List 1** and **List 2** respectively.

Press ⌈SHIFT⌉, and then select **SET UP** (⌈MENU⌉). This brings up the Set Up options screen. The cursor will be on the **Stat Wind** option. Select **Man** (⌈F2⌉) to indicate that you wish to manually create the histogram. Press ⌈EXIT⌉ to return to the list-editing screen.

Now press ⌈SHIFT⌉ and select **V-WIN** (⌈F3⌉) to set the dimensions of the viewing window. Note that **Xmin** is set to 1, **Xmax** is set to 7 one unit higher than the highest score (6), **Ymin** to -2 and **Ymax** to 10, so that the entire histogram can fit properly on the screen. Press ⌈EXE⌉ after each change. When you have finished all changes press ⌈EXIT⌉ to return to the **List** screen.

'**GRPH**' is on the first screen. You may need to press [F6] to bring up this screen. Select **GRPH** ([F1]).

You will need to select **SET** ([F6]) to set the type of graph: **STATGRAPH 1** will appear.
The entries you will need are:
- **Graph type: Hist** (press the continuation key ([F6]), followed by [F1] to select the Histogram Plot)
- **X list:** List 1 ([F1]).
- **Frequency:** List 2 ([F3]).
- **Graph colour:** 'your choice'

If any of these entries are incorrect, highlight and change them. When everything is correct press [EXE].

Now select **GPH1** ([F1]). This will prompt you for the starting value of the first column and pitch or column width. Make these both 1, and then select **DRAW** ([F6]).

To view the frequency values on the histogram, press [SHIFT] **Trace** ([F1]) and then use the right arrow cursor key to move the cursor over the value points.

Press [EXIT] twice to get back to the list edit screen.

Activity 3: **Use a Casio CFX-9850GB Plus graphics calculator to enter and store data, and draw a box-and-whisker plot of this data.**

The following data is a set of marks for 11 students out of 35. Use your graphics calculator to draw a box-and-whisker plot for this data. Clear any previous data first.

To construct the box-and-whisker plot firstly enter each score in **List 1**.

21, 24, 25, 25, 26, 27, 29, 30, 31, 32, 34.

'**GRPH**' is on the first screen. You may need to press [F6] to bring up this screen. Press [F1] for graph.

You will need to **SET** the type of graph:
Select **SET** ([F6]) and **STATGRAPH 1** will appear.
The entries you will need are:
- **Graph type:** Med box (press the continuation key ([F6]), followed by [F2] to select **BOX**)
- **X list:** List 1
- **Frequency:** 1 ([F1])
- **Graph colour:** 'your choice'
- **Outliers:** on ([F1])

If any of these entries are incorrect, highlight and change them. When everything is correct press [EXE].

Press [SHIFT], and then select **SET UP** ([MENU]). This brings up the Set Up options screen. The cursor will be on the **Stat Wind** option. Select **Auto** ([F1]). Press [EXIT] to return to the list-editing screen.

Now select **GRPH** ([F1]) then **GPH1** ([F1]) to draw the graph.

Press [SHIFT] **Trace** ([F1]) and then use the right arrow cursor key. As the cursor moves across the screen the values of the minimum, lower quartile, median, upper quartile and the maximum scores will appear.

Press [EXIT] twice to get back to the list edit screen.

Extension Activity 3: **Use a Casio CFX-9850GB Plus graphics calculator to enter and store two sets of data, and draw a box-and-whisker plot of these data sets – comparing two sets of data**

You will need to delete the previous data first so that the following data can be entered.
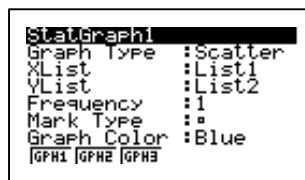
Resting Heart Rate   – RHR
Active Heart Rate   – ACR

RHR   67, 69, 72, 68, 74
ACR   82, 85, 98, 80, 97

You would normally enter into the **STAT** mode first time but you are already in this mode, so enter the resting and active heart rates into **List 1** and **List 2** respectively.
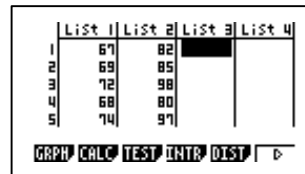
Select the **GRPH** (F1) command followed by **SET** (F6) to determine the type of graph that you want to select.

To set **StatGraph1** scroll down to Graph Type, press the continuation key (F6), followed by F2 to select a **Median Box Plot**. Scroll back to the top of the screen and select **GPH2** (F2), then select another **Median Box Plot**. Importantly, continue to scroll down the screen to **XList** and select **List2** (F2) and change the colour of **StatGraph2** if you desire.
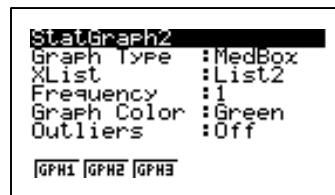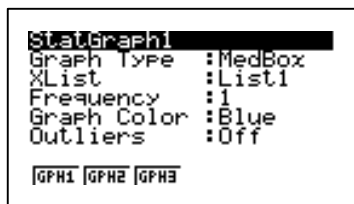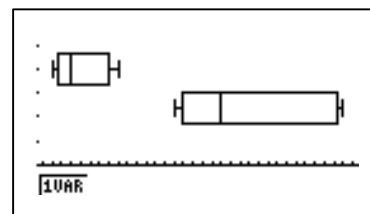
Now, press the EXIT key followed by **SEL** (F4) to select both graphs drawn at the same time.
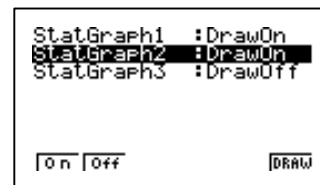
(**StatGraph1** will be **On**, scroll down to **StatGraph2** and turn **On** using F1).

Select **DRAW** (F6) to view the two median box plots simultaneously.

Trace the graphs (SHIFT Trace F1) to obtain and record their respective five number statistical summaries.

If you press the down arrow cursor key you will be able to trace the second plot.

Activity 4: Scatterplot, Line of Best Fit, and Linear Regression on paired-variable data.

The theme from the senior mathematics syllabus is the exploration of the data i.e. emphasis is on drawing conclusions from data. A typical task from Q Maths or Future Maths for 11 and 12 A and B students might be constructing a scatterplot from bivariate data to draw conclusions. For example, determine if there is a relationship between the two variables *x* and *y*, by constructing a scatterplot for the data below which compares the unemployment rate as a percentage (*x*) with the number of civil disturbances (*y*) of five cities.
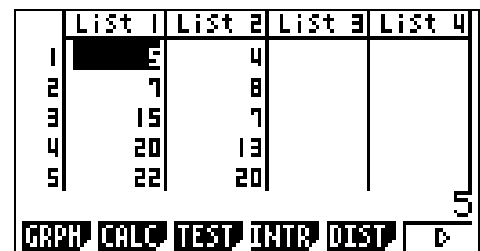
Unemployment Rate (%) and Number of Civil Disturbances by City.

City	A	B	C	D	E
Unemployment (x)	5	7	15	20	22
Civil Disturbances (y)	4	8	7	13	20

Scatterplot

Clear any previous data from the list screen.
Enter the above data using the same procedures as before.


Press **F6** until the **GRPH** and **CALC** menu options come into view at the bottom of the screen.

Press **SHIFT** and select **SET UP** (**MENU**). This brings up the **Set Up** options. The cursor will be on the **Stat Wind** option. Select **Auto** (**F1**) to indicate that you wish to have the calculator automatically create the best window for the scatter plot. Press **EXIT** to return to the list-editing screen.

Select **GRPH** (**F1**) and then **SET** (**F6**) to set up the scatterplot options. Move the cursor to **Graph Type** then select **Scat** (**F1**) to select the **Scatter** option. When finished, press **EXE** to return to the list-editing screen.

Select **GPH1** (**F1**) to graph the scatterplot then **SHIFT** followed by **Trace** (**F1**) to display significant points on the plot as you move the cursor keys.
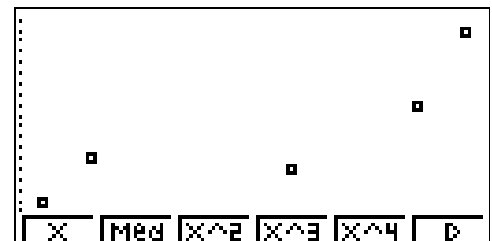
Students should be encouraged to discuss the plot in regard to the following questions.

1. Is there any relationship between the variables? How do you know?
2. What general statement could you make about the pattern or relationship between civil disturbances and unemployment?

Line of Best Fit

Once the scatterplot is drawn, a clearer picture can be seen of the relationship between unemployment and civil disturbances. A line of best fit can now be drawn to help make predictions. A typical task from Q Maths 11 and 12 A and B, might be: construct a line of best fit to gauge the strength of the relationship between the two variables.

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With the scatterplot on the screen, press MENU then select **RUN** with the cursor key on the **MAIN MENU**, then press EXE. You now have entered **RUN** mode.

Now press SHIFT, and select **SKTCH** (F4), then select **GRPH** (F5) followed by **Y=** F1.

Enter **1x** by typing 1 then press X,θT, followed by EXE. Students should now comment on the line, i.e. is it the best fit for the data. After press AC.

Repeat this process by pressing F1, then using 0.5, then press X,θT, followed by EXE. Students should now comment on the line and estimate what they should try next to get a better fit. After press AC.

Repeat this process by pressing F1, then using 0.75, then press X,θT, followed by EXE.
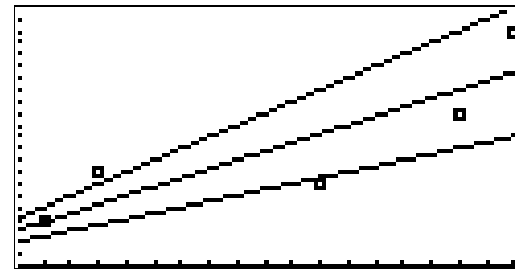
Students should recognise they have a reasonable line-of-best-fit for the data now. Students should be encouraged to comment on the line and the clustering of the points about the line. Discussion might be about what sort of correlation could be expected and why. Press MENU, then move the cursor to **STAT** and press EXE.

Plot the Regression Line for the Data
Now students could move on to the Pearson Correlation Coefficient as suggested in Q Maths using the graphics calculator.

Select **GRPH** (F1) then **GPH1** (F1), followed by **x** (F1) to view the regression statistics. Students should discuss the significance of the regression statistics i.e. slope, *y* intercept, and correlation's. Now select **DRAW** (F6) to draw the regression line on the scatterplot.

Now press SHIFT and select **Trace** (F1) to trace over various points in the scatter plot as you move the cursor keys.
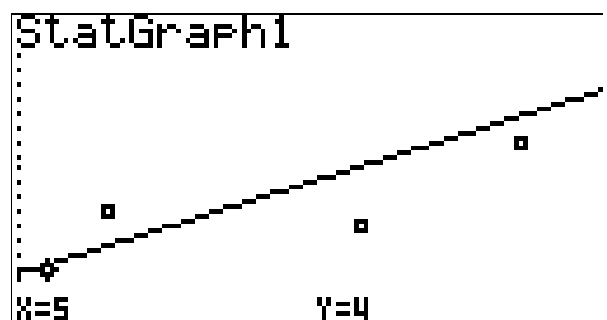
For other methodologies using the CASIO CFX-9850GB Plus graphics calculator visit: http://www.school.casio.com.au/wor_page.html then select Key Instructions.