fx-991ZA PLUS II

TABLE & STAT MODE

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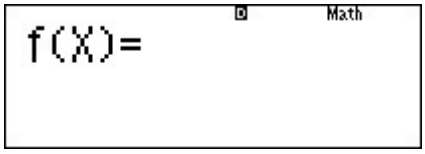
MODE 7: TABLE

MODE

3

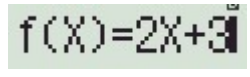


A.GENERATE TABLES TO SKETCH GRAPHS

1. $y = 2x + 3$ $\quad -1 \leq x \leq 3$

- Input *f(x)* formula =
  to input the variable *x*:
  ALPHA)
- *g(x)* = =

And the co-ordinates to plot are:
(-1 ; 1)(0 ; 3)(1 ; 5)(2 ; 7)(3 ; 9)



- Set boundaries for your table:
  Start? (−) 1 =
  End? 3 =
  Step? 1 =

Remember: AC **returns you to the formula**

2. Find the points of intersection of the straight-line $f(x) = x - 3$ **and the parabola** $g(x) = x^2 - x - 6$ **when** $x \in [-3 ; 4]$

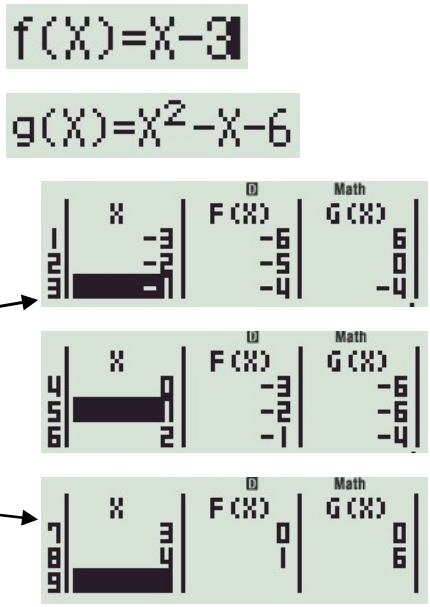
Key Sequence:

- Input f(*x*) formula [=]
- Input g(*x*) formula [=]
- Set boundaries for the table:
  Start? [(-)] [3] [=]
  End? [4] [=]
  Step? [1] [=]

Point of Intersection (-1 ; -4)

Point of Intersection (3 ; 0)

On screen:



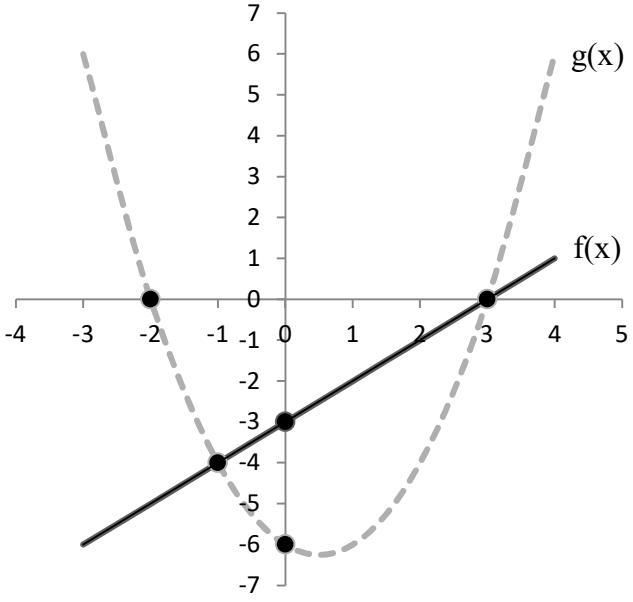
*** ZOOM IN * and find the turning point of g(x)**

Key Sequence:

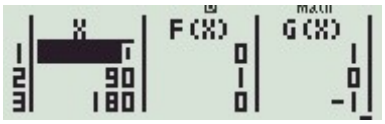
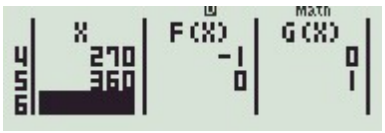
- [AC]
- Change the boundaries of the table
  Start? [0] [=]
  End? [1] [=]
  Reduce the STEPS/INTERVALS for a more detailed table.
  Step? [•] [2] [5] [=]

Turning point of g(x): (0,5 ; -6,25)

On screen:



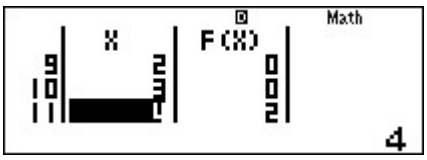
3. Compare: y = sin *x* **and** y = cos *x* ***x* ε [0° ; 360°]**

Key Sequence:	**On screen:**
• Input *f(x)* formula = • Input *g(x)* formula = • Set boundaries for your table: Start? 0 = End? 3 6 0 = **You need to carefully select the STEPS (or INTERVALS) for your graph. Consider the equations as a guideline.** Step? 9 0 =	f(X)=sin(X) g(X)=cos(X)  

B. SOLVING EQUATIONS IN TABLE MODE

Quadratic equation $x^2 - 5x + 6 = 0$

Generate a TABLE for the equation & read off the *x* value where f(*x*) = 0

Key Sequence:	**On screen:**
• Input f(*x*) equation = **to input the variable *x*:** ALPHA) • *g(x)* = = • Set boundaries for your table: Start? − 6 = End? 6 = Step? 1 = $f(x) = 0\ at\ x = 2\ or\ x = 3$	f(X)=X²−5X+6 

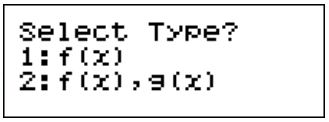
DOMAIN: **Negative & positive values of the constant**
STEPS: **Reciprocal / Inverse of the co-efficient of the highest power of x**

DON'T FORGET
$f(x)$ & $g(x)$ **− 20 *x values***
$f(x)$ **− 30 *x values***

HOW TO CHANGE:

SHIFT MODE ▼

4



STATISTICS

"The practice of collecting and analysing numerical data in large quantities"

Wikipedia

MODE 3: Statistics

1. **Single variable / Data handling**
2. **Linear regression**
3. Quadratic regression
4. Logarithmic regression
5. Exponential regression
6. AB exponential regression
7. Power regression
8. Inverse regression

1. SINGLE VARIABLE DATA HANDLING

1:1-VAR

A. Ungrouped Data

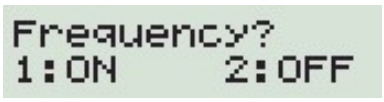
The following data set represents the March rainfall figures (in mls) for the past 12 years for a South African town:

77 75 68 81 110 90 81 42 68 81 95 72

NOTE: some of the values have been repeated - **It is useful to have the frequency table on**

How to set up a frequency table:

SHIFT MODE ▼ 4 1



The frequency table helps:

- to determine mode easily
- to group the data and therefore accommodate more values

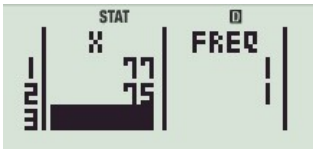
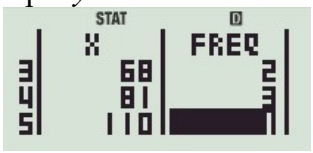
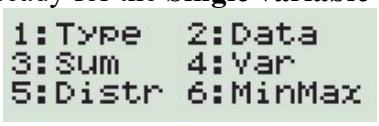
Using your calculator find:

MEASURES OF CENTRAL TENDENCY / AVERAGES

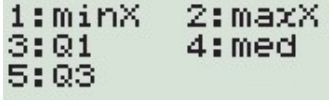
1. **MEAN**: sum of values divided by the number of values
2. **MODE**: value which occurs most often
3. **MEDIAN**: the central number of a data set

MEASURE OF DISPERSION / SPREAD AROUND THE AVERAGE

4. **RANGE**: highest value *minus* lowest value
5. **QUARTILES:** measure the spread of values above and below the mean by dividing the distribution into four groups.
6. **STANDARD DEVIATION**: measure of dispersion around the mean
7. **VARIANCE:** standard deviation squared

Solution:	**Key Sequence:**
Set your calculator to Stats mode for Univariate data	MODE 3 1
Enter the data into the table: Input all the *x*-values first  Use the  arrows to move the cursor to the top of the *y*-column. Input *y*-values  	7 7 = 7 5 = 6 8 = 8 1 = 1 1 0 = 9 0 = 4 2 = 9 5 = 7 2 = ▼ ▶ ▼ ▼ 2 = 3 =
Clear the screen - ready for the **Single variable sub menu**  	AC SHIFT 1

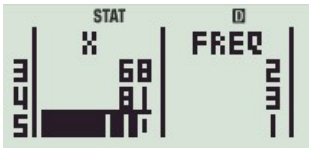
Breakdown of **Single variable sub menu**

Key	**Menu Item**	**Explanation**
1: Type	Stats menu	Change statistical calculation type
2: Data		Displays inputted data
3: Sum		1. Sum of squares 2. Sum
4: Var		1. Number of samples 2. Mean **3. Population standard deviation** 4. Sample standard deviation
5: Distr		Perform normal distribution calculations
6: MinMax		1. Minimum value 2. Maximum value 3. First quartile 4. Median 5. Third quartile

1. MEAN

SHIFT 1 4 2 = $\bar{x}$ =

2. MODE

AC SHIFT 1 2 Find the highest frequency 

=

3. MEDIAN

AC SHIFT 1 6 4 = 4:med =

4. RANGE

AC SHIFT 1 6 2 − SHIFT 1 6 1 = maxX-minX =

5. QUARTILES

AC SHIFT 1 6 3 = Q1 =

AC SHIFT 1 6 5 = Q3 =

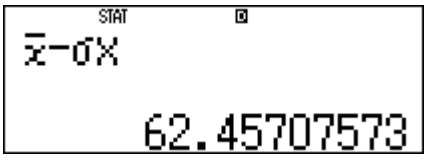
Using the five-number summary (maximum, minimum, median & quartiles) you can draw a box and whisker diagram.

6. STANDARD DEVIATION (POPULATION)

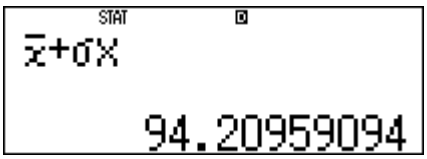
AC SHIFT 1 4 3 = σx =

DETERMINE THE PERCENTAGE OF THE RAINFALL FIGURES WITHIN ONE STANDARD DEVIATION FROM THE MEAN.

AC SHIFT 1 4 2 − SHIFT 1 4 3 =

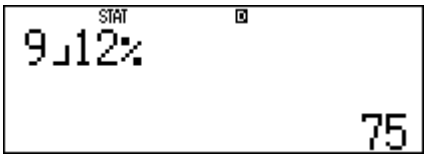


◀ ◀ DEL + =



AC 9 ▤ 1 2 SHIFT (=

(77) (75) (68) (81) 110 (90) (81) 42 (68) (81) 95 (72)



B. Grouped Data

When data is grouped it is first necessary to find a single value to represent each class. This single value is the midpoint of the interval.

- Suppose you asked a group of men to count the number of items in their pockets.

NOTICE:

- The data items in the table below are groups, so first you need to find the **midpoints of the groups**.
  Notice that the numbers 0, 1, 2, 3 and 4 are included in the group 0 – 4. The middle score is thus 2.

a) First calculate the midpoint X of each of the groups

No of items	Frequency
0 – 4	6
5 – 9	11
10 – 14	6
15 – 19	4
20 – 24	3
	***n* = 30**

Midpoint of groups
2
7

b) Input the data into the calculator – AS SHOWN IN THE PREVIOUS EXAMPLE.
c) Calculate the value of the mean.

SHIFT 1 4 2 = $\bar{x}$ =

d) Find the Standard Deviation correct to 2 decimal places.

AC SHIFT 1 4 3 = σx =

How to set your calculator to round off to 2 decimal places

1:MthIO 2:LineIO 3:Deg 4:Rad 5:Gra 6:Fix 7:Sci 8:Norm	**Key Sequence:** SHIFT MODE 6 Now select decimal places 2	Fix 0~9?

How to clear your calculator from rounding off to 2 decimal places

1:MthIO 2:LineIO 3:Deg 4:Rad 5:Gra 6:Fix 7:Sci 8:Norm	**Keys Sequence:** SHIFT MODE 8 **Select** 2	Norm 1~2?

Norm 1 is the **default setting** and gives answers in scientific notation.
e.g. $1 \div 50\,000 = 2 \times 10^{-5}$
Norm 2 is **generally preferred** as answers are only expressed in scientific notation when they are too big to fit on the screen.
e.g. $1 \div 50\,000 = 0.00002$

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2. LINEAR REGRESSION

2:A+BX

Linear Regression predicts a relationship between a dependent variable (y) and an independent variable (x)
Where the relationship approaches that of a straight line.

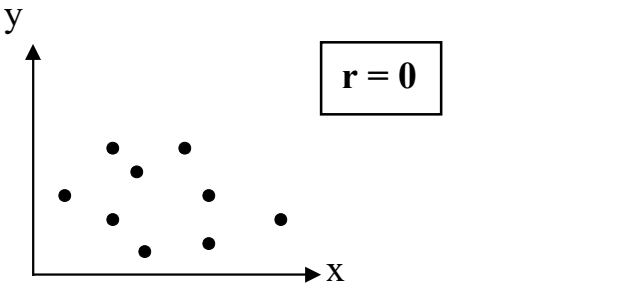
$$y = A + Bx$$

Correlation Co-efficient (r) is the measure of the strength of the relationship between the variables.

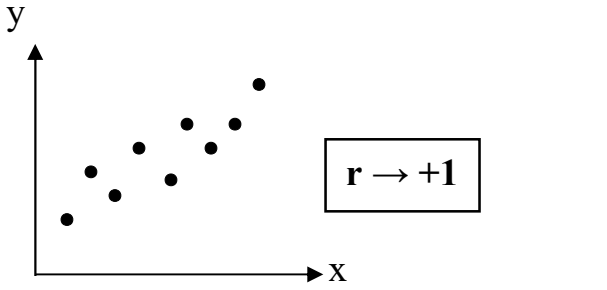
$$-1 \leq r \leq 1$$

Our conclusion for "r" always includes strength and direction.

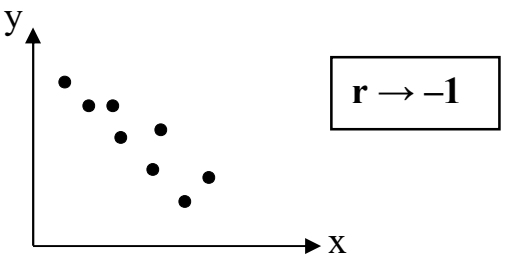
Scatter Plots showing Correlation:



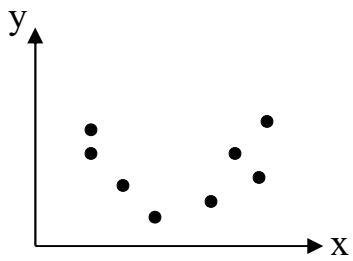
NO RELATIONSHIP BETWEEN X AND Y



STRONG POSITIVE CORRELATION



STRONG NEGATIVE CORRELATION

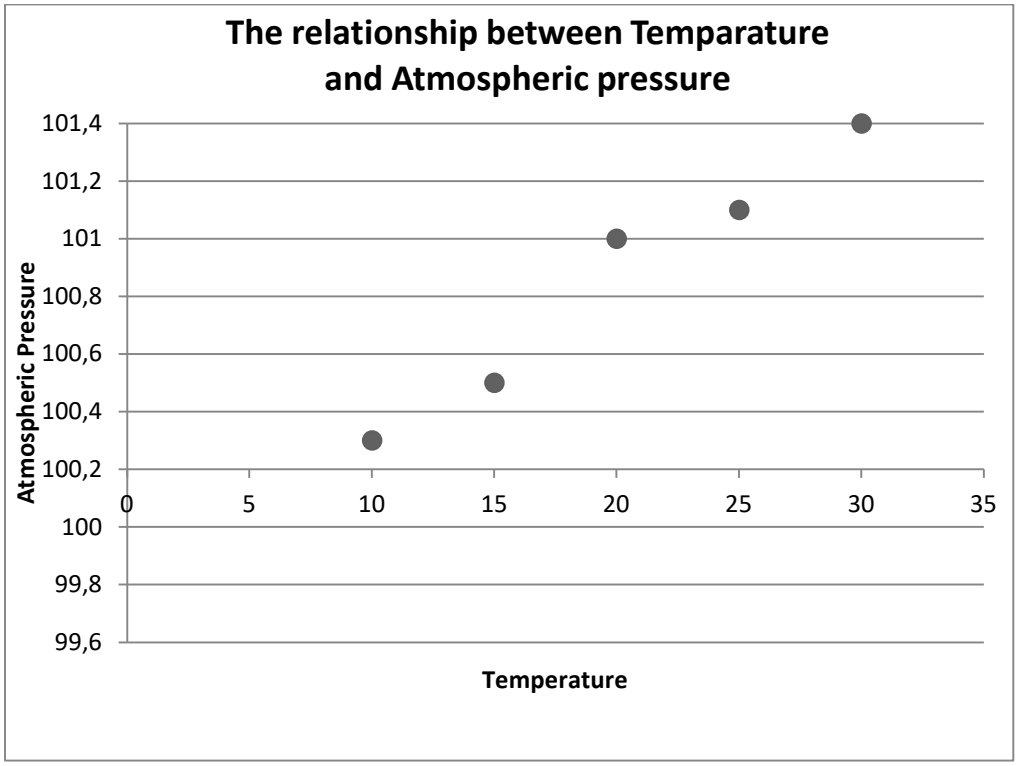


NON-LINEAR CORRELATION

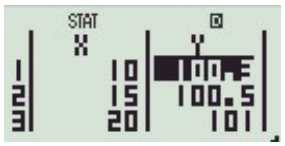
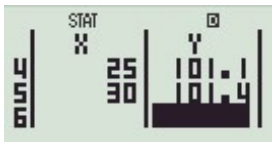
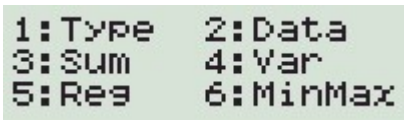
Consider the following table:
Let's investigate whether there is a linear relationship between temperature & atmospheric pressure.

x **Temperature (°C)**	***y*** **Atmospheric pressure (kPa)**
10	100,3
15	100,5
20	101,0
25	101,1
30	101,4

Pressure is dependent on temperature,
so, temperature is the *x* variable and pressure the *y* variable.



Solution:	**Key Sequence:**
Set your calculator to Stats mode for Bivariate data	MODE 3 2

Enter the data into the table: Input *x*-values Use the [REPLAY] arrows to move the cursor to the *y*-column. Input *y*-values  	[1] [0] [=] [1] [5] [=] [2] [0] [=] [2] [5] [=] [3] [0] [=] [▼] [▶] [1] [0] [0] [•] [3] [=] [1] [0] [0] [•] [5] [=] [1] [0] [1] [=] [1] [0] [1] [•] [1] [=] [1] [0] [1] [•] [4] [=]
Clear the screen - ready for the **Regression sub menu** 	[AC] [SHIFT] [1]

Breakdown of **Regression sub menu**

Key	Menu Item	Explanation
5: Reg		1. Regression co-efficient of A 2. Regression co-efficient of B 3. Correlation co-efficient r 4. Estimated value of x 5. Estimated value of y

1. **CORRELATION CO-EFFICIENT**

[SHIFT] [1] [5] [3] [=] 

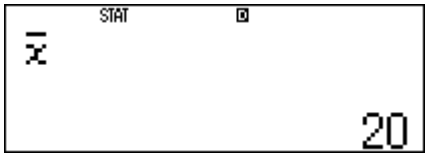
r is very close to ……. Hence there is a…….... **linear correlation** between temperature and atmospheric pressure.

2. **CALCULATE A (y intercept) & B (gradient)** to determine the **line of best fit:** $y = A + Bx$

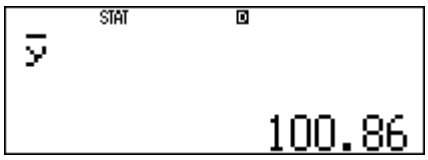
- Calculate **A** [AC] [SHIFT] [1] [5] [1] [=] 
- Calculate **B** [AC] [SHIFT] [1] [5] [2] [=] 

So, the line of best fit is: y =

3. **FIND A SECOND POINT TO PLOT THE LINE OF BEST FIT**

[AC] [SHIFT] [1] [4] [2] [=] 

AC SHIFT 1 4 5 =



Once you plot the linear equation you can then make projections using your scatter plot.

HOW TO MAKE PROJECTIONS ON THE CALCULATOR

***RULE*:** **Step 1: Input what is given**
Step 2: Regression sub menu select which variable is required

A. What is the approximate temperature if the atmospheric pressure is 100 kPa?

AC 1 0 0 SHIFT 1 5 4 =

The temperature is……°C when the pressure is 100 kPa

Extrapolation: value predicted lies outside the domain and range of the data set given

B. What is the approximate atmospheric pressure when the temperature is 18°C?

AC 1 8 SHIFT 1 5 5 =

The pressure is……kPa when the temperature is 18 °C

Interpolation: value predicted lies within the domain and range of the data set given

---

SELECTING RANDOM SAMPLES

Let **the calculator** choose a random sample of Integers between 1 and 52, to play the lotto:

ALPHA , 1 SHIFT) 5 2) =

NOTE every calculator will give a different string of numbers (Integers are repeated)
