

Using your *CASIO fx-82MS* In Statistics Mode

KNOW YOUR OWN CALCULATOR AND HOW IT WORKS.

Do not throw away the instruction booklet.

Contents:

- How to put your calculator into statistics mode
- Symbols and Keys
- How to enter data
 - Single
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- How to access some of the required statistics
- Practice
- Using your calculator for Linear Regression

STARTING

To use your Casio *fx-82MS* calculator for calculating statistics, you must become familiar with the process of changing into and out of the required mode. For basic statistics this is

MODE

2

When you are successfully in statistics mode, a symbol sd should appear at the top of your screen.

THE FIRST OPERATION YOU DO WHENEVER YOU START TO PROCESS ANY DATA IS TO CLEAR ANY EXISTING DATA.

THIS DOES NOT HAPPEN SIMPLY BY TURNING THE CALCULATOR OFF!!!

It is important that you are not carrying any previously entered data into the next calculation, so ensure that your memory is cleared.

For the Casio *fx-82MS* this is **SHIFT** **MOD** **1** **=** **OR** **MODE** **2**

NB : Turning your calculator OFF will NOT clear data already entered for the majority of calculators.

TO ENTER THE DATA Data may be entered singly or in multiples of each score.
To enter data singly:

x-value **M+** DT NB This is referred to as the data entry key

It is worthwhile getting into the habit of glancing at the screen before you enter each item of data to check that you have hit the keys you meant to hit!

Practise: (1)Enter: 1, 3, 3, 5, 6, 6, 6, 7, 10 Check that *n* is 9.

Note. You can check data during and after entry by scrolling the replay key, using ↑ and ↓.

If you find an incorrect entry, delete it using **SHIFT** **M+** and then re-enter the correct information.

Try removing the '3' in the data you entered last. Then re-enter it. As you scroll down the entries now, it should read 0, 1, 2, 4, 5, 6, 7, 8, 3 and *n* should still equal 9.

TO ACCESS THE STATISTICS:

for		use			
Sample size	n	SHIFT	S-SUM		
			1	3	=
Mean	\bar{x}	SHIFT	S-VAR		
			2	1	=
Population Standard Deviation	σ_n	SHIFT	S-VAR		
			2	2	=
Sample Standard Deviation	σ_{n-1}	SHIFT	S-VAR		
			2	3	=

To calculate the variance, get the s.d. and then use:

x^2 **=**

To enter multiple data:

For the Casio fx-82 MS use

x -value SHIFT , f (frequency) M+
DT

Test for your calculator by trying to enter six 2's ie

2 SHIFT , 6 M+ (Clear existing data first)

Practise: (Clear again!)

x	f
2	11
3	12
4	16
5	15
6	20
7	17
8	17
9	12

As you enter this set of data, n will equal 11, 23, 39, 54, 74, 91, 108, 120 respectively.

You can still enter **multiple** data by simply pressing the “data” key * the required number of times (eg press “2” and then “data” six times to enter six 2’s), but this should be used only when the frequency is about two or three.

Use the replay key to check entries using \uparrow and \downarrow .

For the data entered in the practice above, $n = 120$, $\bar{x} = 5.66$, $x_{\sigma_n} = 2.127$, $x_{\sigma_{n-1}} = 2.135$ and $x^2 = 4.52$ and 4.56 respectively .

To enter grouped data:

You enter **grouped** data in the same way as above, but you will need to find the mid point

of each interval to use as your x -value
For example

x	f
[148, 152)	3
[152, 156)	9
[156, 160)	13
[160, 164)	15
[164, 168)	7
[168, 172)	2
[172, 176)	1

Midpoints for each of these intervals are 150, 154, 158, 162, 166, 170 and 174 respectively. Using these values and the frequency for each, enter the data as shown for a frequency distribution – that is, (150,3) (154, 9), (158, 13), (162, 15), (166, 7), (170, 2) and (174, 1).

Results should be

$$n = 50, \bar{x} = 159.92, x_{\sigma_n} = 5.26, x_{\sigma_{n-1}} = 5.32 \text{ and } x^2 = 27.63 \text{ and } 28.24 \text{ respectively}$$

Practice:

Practise now some of the examples from your text, which involve frequency distributions as well. The following are a selection from past exam papers:

1. The following data shows the amount spent (\$) on textbooks by a random sample of 15 students.

43	0	105	74	93	230	157	89
96	128	84	99	110	123	34	

- a. Calculate the mean. b. Calculate the value of s^2 .
Ans: \$97.67 and \$2873.5

2. In a recent study of the weights (kg) of newborn babies delivered at a local hospital, a sample of 10 weights was obtained:

3.5	3.5	3.7	3.1	3.4
4.0	3.4	3.3	3.6	2.9

Calculate the sample mean and standard deviation. *Ans: 3.44 and 0.306*

3. Use the following information to answer questions (a) and (b):

2.2	2.7	3.8	4.5	4.9	8.7	9.6
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- (a) What is the mean? (b) What is the standard deviation? *Ans: 5.2 and 2.869*

4. A purchasing manager for a wool textile firm has the lab results for a sample of wool. Twenty one fibres were randomly selected and measured. The fibre length in cm and the number of fibres are listed as:

Length (cm)	number of fibres
20.5	1
20.0	1
19.5	2
19.0	2
18.5	2
18.0	2
17.5	2
17.0	1
16.5	1
16.0	1
15.5	1
15.0	1
14.5	1
14.0	1
13.5	1
13.0	1

- a. Calculate the mean length. b. Calculate the variance of the length
Ans: 17.17 and 4.96

- 5 The stem-and-leaf display below represents the number of vitamin supplements sold by a health food store in a sample of 16 days. Calculate the mean and standard deviation.

Stem unit = 10
 1H 9 9
 2L 0 1 2 3
 2H 5 6 7
 3L 0 3 4
 3H 5 6 8
 4L 1

Ans. 28.0625; 7.289

- 6 Consider this frequency table:

x	2	3	4	5	6	7	8	9	Total
f	7	5	4	4	0	5	4	1	30

Calculate the mean and variance of this distribution.

Ans. 4.7, 5.39

- 7 This frequency distribution was obtained by asking 300 students how many siblings each one had:

Number of siblings	0	1	2	3	4	5	6	7	8	9	10
Frequency	9	53	128	56	31	12	4	4	2	0	1

Calculate the mean, variance and standard deviation.

Ans: 2.463; 2.049; 1.431

- 8 A survey of 100 individuals on credit-card ownership reveals that 15 have no credit cards, 38 have one only, 43 have two and four people have 3. Calculate the mean and standard deviation of the number of cards owned per person.

Ans: 1.36; 0.7852

- 9 The following stem-and-leaf display represents the test marks for a sample of 25 pupils in one class: $n = 25$

Stem unit = 10, Leaf unit = 1
 4 8
 5 8 9 9
 6 0 2 2 3 5 7
 7 0 3 5 6 6 6 7 9
 8 1 5 7 8
 9 2 6 8

Calculate the mean and standard deviation of the test marks.

Ans: 73.28, 13.05

10. An airline collects data on the number of “No shows” which is the number of people who reserve a seat but do not turn up in time for the flight.

Number of “no shows”	Number of flights
0	68
1	17
2	6
3	3
4	0
5	1
6	1

- (a) What is the mean number of “no shows”?
 (b) What is the standard deviation?

Ans: (n = 96) (a) 0.510, (b) 1.046

11. A weed ecologist studies the distribution of Californian thistles in a pasture. A hoop of one square metre area is randomly placed in a number of areas in a field and the number of thistles recorded for each sample.

Number of thistles	Number of samples
0	23
1	12
2	21
3	25
4	14
5	3
6	2
7	0

- (a) What is the mean number of thistles per sample?
 (b) What is the variance?

Ans : (n=100) (a) 2.12, (b) 2.45

12. The following is the duration in minutes of a sample of long-distance phone calls made within the continental United States reported by one long-distance carrier.

<u>Time (in Minutes)</u>	<u>Frequency</u>
0 but less than 5	37
5 but less than 10	22
10 but less than 15	15
15 but less than 20	10
20 but less than 25	7
25 but less than 30	7
30 or more	2

Calculate the mean and standard deviation of the phone calls. *Ans: 9.85, 8.48*

Using your *fx-82MS* calculator for Linear Regression:

- Put your calculator in Linear Regression mode.

MODE 3 1

- Enter the data as ordered pairs:

x-value , y-value M⁺

- Once the data is entered, you can access:

ΣX^2	ΣX	ΣY	ΣY^2	ΣXY
SHIFT 1 1 =	SHIFT 1 2 =	SHIFT 1 \Rightarrow 2 =	SHIFT 1 \Rightarrow 1 =	SHIFT 1 $\Rightarrow \Rightarrow$ 3 =

constant, b_0 : SHIFT 2 \Rightarrow \Rightarrow 1 =

gradient, b_1 : SHIFT 2 \Rightarrow \Rightarrow 2 =

Correlation, r : SHIFT 2 \Rightarrow \Rightarrow 3 =

as well as mean and s.d. for both sets of data, x and y.

- You can also check predicted values:

To find Y given X: x-value SHIFT 2 \Rightarrow \Rightarrow \Rightarrow 2 =

To find Y given X: y-value SHIFT 2 \Rightarrow \Rightarrow \Rightarrow 1 =

Practice using your calculator for Linear Regression

1 (2001 Second Semester)

A candy manufacturer wants to estimate the effect of price on sales. Six randomly selected stores sold the candy at different prices. The prices and sales are shown in the table below.

Store	Price	Sales
1	\$1.30	100
2	\$1.60	90
3	\$1.80	90
4	\$2.00	40
5	\$2.40	38
6	\$2.90	32

- Calculate the linear regression coefficients b_0 and b_1 .
- Interpret the linear equation.
- Find sales if price is \$2.40
- What price should be charged if 60 sales required?

Solution: $\Sigma x = 12, \Sigma x^2 = 25.66, \Sigma y = 390, \Sigma y^2 = 30268, \Sigma xy = 700$

(a) $\hat{Y} = 161.39 - 48.19X$. (b) *Estimated sales* = $161.39 - 48.19 \times \text{price}$.

(c) Sales = 46 (d) Price = \$2.10

2 (2003 First Semester) (Clear entered data as before)

A local charity runs a regular appeal for funds. They believe that the amount raised is determined largely by the number of collectors and want to predict the amount that will be raised in their next appeal. The data from the last five appeals is as follows:

Number of collectors	\$ Amount raised
31	5,750
42	7,402
49	7,850
63	8,135
72	8,320

Calculate the linear regression coefficients b_0 and b_1 for this data. Interpret the linear equation.

Solution: $\Sigma x = 257, \Sigma x^2 = 14279, \Sigma y = 37457, \Sigma y^2 = 284875229, \Sigma xy = 1985329$

and $\hat{Y} = 4605.12 + 56.15X$.

That is *Estimated amount* = $4605.12 + 56.15 \times \text{no. collectors}$.

3 (2000 Second Semester)

During the 1950's, radioactive material leaked from a storage area near Hanford, Washington, into the Columbia River nearby. For nine counties downstream in Oregon, an index of exposure X was calculated (based on the distance from Hanford). Also the cancer mortality Y was calculated (deaths per 100,000 person-years, 1959 – 1964). This data is summarised as follows:

County	Radioactive exposure	Cancer Mortality
Clatsop	8.3	210
Columbia	6.4	180
Gilliam	3.4	130
Hood River	3.8	170
Morrow	2.6	130
Portland	11.6	210
Sherman	1.2	120
Umatilla	2.5	150
Wasco	1.6	140

Calculate the linear regression coefficients b_0 and b_1 for this data. Interpret the linear equation.

Solution:

$\Sigma x = 41.4, \Sigma x^2 = 287.42, \Sigma y = 1440, \Sigma y^2 = 239800, \Sigma xy = 7500$

and $\hat{Y} = 118.45 + 9.03X$

That is, *Estimated cancer mortality* = $118.45 + 9.03 \times \text{Radioactive exposure}$.