Using your *CASIO fx-82AU PLUS*
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

    Grouped

- How to access some of the required statistics

- Practice

- Using your calculator for Linear Regression

STATISTICS MODE

To use your Casio *fx-82AU PLUS* calculator to carry out statistical calculations, press the

MODE button. Notice the screen contains two options 1:COMP and 2: STAT

Press 2 to enter STAT mode, then choose the type of calculation you want to perform.

Eg For Single-variable (1-VAR) statistics, press 1

The Stat Editor should now appear on the screen.

(**Note**: When the calculator is in statistics mode, you will see STAT at the top of the screen.)

CLEAR ANY EXISTING DATA BEFORE STARTING TO PROCESS ANY DATA.

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

BEFORE ENTERING YOUR DATA:

Delete any previous Stat Editor contents by pressing SHIFT then press:

1 to select the *STAT* menus, 3 to select the *Edit* menu, then 2 to *Delete All*

Note that you must have the Stat Editor display on your screen for the above to work.

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

To enter data singly:

Enter each data value into a separate row of the Stat Editor, pressing $\boxed{=}$ after each entry.

**Practice**:   Enter: 1, 3, 3, 5, 6, 6, 6, 7, 10.   *Check the display shows 9 data values.*

 If you notice you have entered a value incorrectly:
- move to the cell containing the data you want to change (press the up/down REPLAY key),
- type in the new data and press $\boxed{=}$

When you are satisfied the data is all correct, **close the Stat Editor** by pressing $\boxed{\text{AC}}$

ACCESSING STATISTICAL VALUES:

First make sure you have closed the Stat Editor - the display screen should be empty.

Press $\boxed{\text{SHIFT}}$ $\boxed{1}$ followed by the appropriate keys for the value you require:

for	Symbol	Keys to press	Meaning for the keys
Sample size	n	$\boxed{4}$ $\boxed{1}$ $\boxed{=}$	4:Var 1:n
Mean	$\bar{x}$	$\boxed{4}$ $\boxed{2}$ $\boxed{=}$	4:Var 2: $\bar{x}$
Population Standard Deviation	σ_x	$\boxed{4}$ $\boxed{3}$ $\boxed{=}$	4:Var 3: σ_x
Sample Standard Deviation	s_x	$\boxed{4}$ $\boxed{4}$ $\boxed{=}$	4:Var 4: s_x

To calculate the variance, get the s.d. and then press: $\boxed{x^2}$ $\boxed{=}$

For the data entered in the practice above, $n = 9, \bar{x} = 5.22, \sigma_x = 2.485, s_x = 2.635$

and the variance, $s_x^2 = 6.944$

To enter multiple or grouped data:

The Stat Editor can be set to display a FREQ (frequency) column beside the X (data) column:

First press the following keys:

SHIFT   MODE   ↓   3   (to obtain the STAT options),

then press 1 to turn the Frequency display ON.

Now display the Stat Editor in the **frequency format:**

MODE   2   (to obtain the STAT options),

then 1   to see the 1-VAR Data Display

Enter all the data values, followed by all the associated frequencies:

<u>Example</u> (Clear existing data first)

To enter the data 1, 2, 2, 3, 3, 3, 4, 4, 5 using the FREQ column to specify the number of repeats for each of the values 1, 2, 3, 4, 5:

a) Enter the values 1, 2, 3, 4, 5 into the X column of the Stat Editor

(remember to press = after each entry)

b) Press ↓   →   to move the cursor to the FREQ column

c) Enter the frequencies: 1, 2, 3, 2, 1, pressing =   after each entry.

Obtain the sample size, sample mean and sample standard deviation for this data - see previous page for appropriate keys. (Remember to press AC to close the Stat Editor, then SHIFT   1   so you can access the STAT options.)

$$(n = 9, \bar{x} = 3.0, \ s_x = 1.225)$$

Practice: (Clear the Stat Editor first!)

X	Freq
2	11
3	12
4	16
5	15
6	20
7	17
8	17
9	12

For the data entered in the practice above, $n = 120, \bar{x} = 5.667, \sigma_x = 2.127, s_x = 2.135$

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	Freq
[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 $n = 50, \bar{x} = 159.92, \sigma_x = 5.261, s_x = 5.314$

Practice:
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

(a)   What is the mean? (b)   What is the standard deviation?   *Ans: 5.2 and 2.869*

4   The stem-and-leaf display below represents the number of vitamin supplements sold be 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

5   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*

6   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

7   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

8.   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: 0.510; 1.046

Using your *fx-82AU PLUS* calculator for Linear Regression

For linear regression you have *pairs* of values, each pair consists of an X value and a Y value. For this section you do **not** want the Stat Editor displaying a Freq column, so make sure the FREQ display is turned off by pressing the following keys:

| SHIFT | | MODE | | ↓ | | 3 | (to obtain the STAT options),

then press | 2 | to turn the Frequency display OFF.

- Put your calculator into Linear Regression mode by pressing:

| MODE | | 2 | to enter STAT mode, then | 2 | for Linear Regression (A+Bx)

The Stat Editor should display a column for the X values and a column for the corresponding Y values.

- Enter each of the X values, then each of the Y values into the appropriate column.

- Once the data is entered, press | AC | to close the Stat Editor.

- Access regression information by pressing | SHIFT | | 1 | to access the STAT menu,

  followed by the appropriate keys as required:

	Keys to press	Meaning of Keys
constant, b_o :	**5** **1** **=**	5: Reg 1: A
gradient, b_1 :	**5** **2** **=**	5: Reg 2: B
correlation coefficient, r :	**5** **3** **=**	5: Reg 3: r
ΣX^2	**3** **1** **=**	3: Sum 1: ΣX^2
ΣX	**3** **2** **=**	3: Sum 2: ΣX
ΣY^2	**3** **3** **=**	3: Sum 3: ΣY
ΣY	**3** **4** **=**	3: Sum 4: ΣY
ΣXY	**3** **5** **=**	3: Sum 5: ΣXY

- **You can also find the predicted value of Y for a given X value:**
  eg to find the value of y when x = **10** you would use the sequence

  10 | SHIFT | | 1 | | **5** | | **5** | | **=** |

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

(a)   Calculate the linear regression coefficients b_0 and b_1.

(b)   Interpret the linear equation.   (c) Find sales if price is $2.40

Solution:

(a) $b_0 = 161.39, b_1 = -48.19$.   (b) *Estimated sales* $= 161.39 - 48.19 \times price$.

(c) Sales = 46

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

2   (2003 First Semester)
(Remember to clear the previous data before starting.)

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: $b_0 = 4605.12, b_1 = 56.15$

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

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

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3 (2000 Second Semester)

During the 1950's, radioactive material leaked form 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: $b_0 = 118.45, b_1 = 9.03$

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

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

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

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