

# Mastering the CALCULATOR



SHARP EL-531LH

**USQ**  
AUSTRALIA

**UNIVERSITY OF SOUTHERN QUEENSLAND**

The Learning Centre | Learning and Teaching Support Unit

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# Introduction

This is one in a series of booklets prepared to assist students who are learning to use a calculator. They have been prepared by staff in The Learning Centre from the Office of Preparatory and ACademic Support (OPACS) at USQ. The series comprises:

## Mastering the Calculator

- Using the Casio *fx*-100s (also suitable for Casio *fx*-570)
- Using the Casio *fx*-100AU
- Using the Casio *fx*-82LB
- Using the Casio *fx*-82MS
- Using the Casio *fx*-82TL
- Using the Sharp EL-531LH
- Using the Sharp EL-556L
- Using the Sharp EL-531RH

The instructions in this booklet only explain **some** of the keys available on your calculator necessary for basic work in data manipulation. If you require more assistance please contact The Learning Centre. If you would like information about other support services available from **The Learning Centre**, please contact

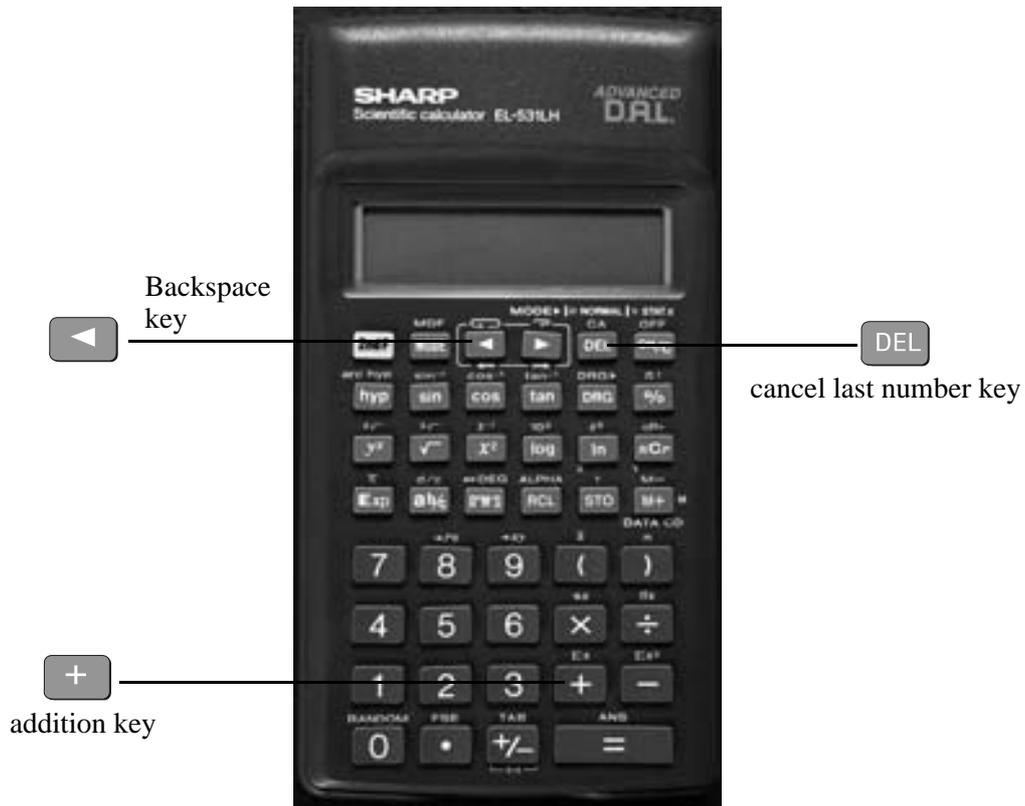
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## A word about starting out

- Make sure you are in the correct mode selection and that all previous data is cleared.
  - For e.g. To perform arithmetic operations press  
  - To clear all values press 
  - To clear memory press    
  - If your calculator has FIX or SCI or ENG on the display press   until the letters disappear
  - If your calculator has RAD or GRAD on the display press  until the letter DEG appears
  - If all else fails press the RESET button on the back of your calculator
- (e.g. - after replacing batteries  
- to clear all memory content  
- when an abnormal condition occurs and all keys are inoperative).

# 1. Addition and subtraction

## 1.1 To add numbers



Find the key

(it is shown on the photograph of the calculator here).

Example

To add 7 and 3, type

The display should read 10

Example

I want to find the total amount I earned in the past four weeks. If I earned \$471, \$575, \$471 and \$528, the key strokes would be

The display should read 2045.

## 1.2 Sometimes you make an error when typing in a number

If this happens use the  key to cancel the number and then type in the correct number and continue.

Example

If you want to enter  $3 + 4$  but accidentally type     
press  to cancel the 5.

Now type  

Note that the  key cancels just the last digit.

Example

If I want to add 471 and 575 but I typed

I can cancel 6 by typing  and then typing  

The display should read 1 046. Each time  is used, the last digit is cancelled.

Try practising cancelling with the  key until you are comfortable with its use.

## 1.3 The key is used when you want to delete a whole number

Example

If you typed:

$471 + 566$

but you wanted  $471 + 576$

press the  key. Note the 566 disappears. Press the  key again, the + sign becomes static. Now type in 576 then .

The display should read 1 047.

**Note:** For the EL-531GH calculator, use the  to cancel the last number and use the  to delete a whole number and then retype the new number.

## 1.4 When you want to edit, use the keys to move the cursor to the left or right

### Example

If you typed  $471 + 568 +$ , but you wanted  $576$

Press the  until the number 8 begins to flash [press  to undo]

Press  and “8” disappears. Now type in “7” and press  until the + sign stops flashing.

## 1.5 To subtract numbers

Find the  key (it is shown on the photograph of the calculator following).

### Example

To subtract 35 from 257, type

The display should read 222



Example

$$348 - 24 - 19$$

The keystrokes are



The display should read 305.

Sometimes you may have a sum like this:

$$-7 + 4$$

You can use the  key.

The key strokes are



The display should read -3.

You could also use the keystrokes     .

In this case the calculator recognises the - as a negative (not recommended to do it this way).

## 2. Multiplication and division

### 2.1 To multiply numbers

Find the  key (it is shown on the photograph of your calculator here).



#### Example

To multiply 7 and 3, type

$$7 \times 3 =$$

The display should read 21

To find  $753 \times 492$ , type

$$753 \times 492 =$$

The display should read 370 476

## 2.2 To divide numbers

Find the  key (it is shown on the photograph of the calculator)

Example

To divide 35 by 7, type



The display should read 5

To divide 7 905 by 85, type



The display should read 93

To divide 60 by 5 and then by 4 type



The display should read 3

## 2.3 Combining multiplication and division

Example

If the question is

$$\frac{27}{7 \times 4} \text{ then}$$

it is really  $27 \div 7 \div 4$ .

Try it.

The display should read 0.964285714

### 3. Brackets

Find the set of bracket keys on your calculator.

The EL-531LH allows you to many sets of brackets.



Example

Do the calculation  $471 - (93 + 11 + 2)$  on the calculator.

The keystrokes required are



The display should read 365

Sometimes in calculations you will see other grouping symbols, for example, { } (called braces), [ ] (called square brackets).

Try these examples:

Exercise 1

(a)  $25 + (7 + 2 - 4)$

(b)  $18 (3 + 7)$  [a multiplication sign is understood  $18 \times (3 + 7)$ ]

(c)  $4 + 5 [2 (3 + 7)]$  [to use two sets of brackets just press the same button; this calculator can take up to 6 sets of brackets]

(d)  $\frac{5}{(3 + 2)}$

Answers: 30; 180; 104; 1

## 4. Powers

### 4.1 Squaring and higher powers

$6^2$  means  $6 \times 6$ . You can use the square key to do this calculation. (It is shown on the photograph of your calculator here.)



Press  $6$   $x^2$   $=$

the display should read 36.

Or you can use the power key on your calculator.

Find the  $y^x$  key on your calculator.

## Example

To square 6,

that is, find  $6^2$ , type



The display should read 36

[The first number you put in is the 6. This is the  $y$  and the second number you put in (2) is  $x$ . That is why it is called the  $y^x$  key.]

To find  $27^3$  the required key strokes are



and the display should read 19683.

If you have learnt your multiplication tables you will already know the squares of the whole numbers from 1 to 12 and thus be able to complete much of the following table.

## Exercise 2

Use your calculator to find the squares of the whole numbers from 13 to 25 and any other squares you are unsure of.

$1^2 = 1$	$11^2 =$	$21^2 =$
$2^2 = 4$	$12^2 =$	$22^2 =$
$3^2 = 9$	$13^2 =$	$23^2 = 529$
$4^2 =$	$14^2 =$	$24^2 = 576$
$5^2 =$	$15^2 =$	$25^2 = 625$
$6^2 =$	$16^2 =$	
$7^2 =$	$17^2 =$	
$8^2 =$	$18^2 =$	
$9^2 =$	$19^2 =$	
$10^2$	$20^2$	

## Exercise 3

You can use this key for other powers as well. Try these examples

- (a)  $7^4$   
 (b)  $8^{10}$   
 (c)  $(0.4)^6$  (you **do not** have to type the brackets in)  
 (d)  $(-7)^6$  (you do not need to type the brackets in)  
 (e)  $5^{0.4}$
- 

Answers:

- (a) 2401  
 (b) 1073741824  
 (c)  $4.096 \times 10^{-3}$  or 0.004096 (you move the decimal 3 places to the left)  
 (d)  117649  
 (e) 1.903653939
- 

## 4.2 Square root

Finding the **square root** of a number ‘undoes’ or ‘neutralises’ the squaring of the number and vice versa. The symbol for square root is

$\sqrt{\quad}$  (This is called the radical sign)

The square root of 36 is written as  $\sqrt{36}$

Now because  $6^2 = 36$ ,  $\sqrt{36} = 6$ .

Find the square root key on your calculator and type



The display will read 6.

What do you think  $\sqrt{81}$  is?  $\sqrt{81} =$

---

You should have said 9 because  $9^2 = 81$

(Check your calculator)

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## Exercise 4

Try these by looking at the table of squares you completed on the previous page and then check your answers on your calculator

$$\begin{array}{ll} \text{(a) } \sqrt{16} = & \text{(a) } \sqrt{49} = \\ \text{(a) } \sqrt{144} = & \text{(a) } \sqrt{169} = \\ \text{(a) } \sqrt{100} = & \text{(a) } \sqrt{121} = \\ \text{(a) } \sqrt{441} = & \text{(a) } \sqrt{361} = \end{array}$$


---

The answers are 4, 12, 10, 21, 7, 13, 11, 19.

Let's now check that taking the square root neutralises squaring.

Try this on your calculator.

Find the square root of 3 squared that is,  $\sqrt{3^2}$

The key strokes required are



The display should read 3

Because **squaring** and taking **square roots** are **inverse operations**, the **order** of the operations **can be reversed** and the number is unaffected.

So the square, of the square root of 3, should also equal 3

Try it on your calculator. The key strokes required are



## Exercise 5

Complete the following without using the calculator

(a)  $\sqrt{7^2} =$

(b)  $\sqrt{7^2} =$

(c)  $\sqrt{10^2} =$

(d)  $\sqrt{\square}^2 = 10$

(e)  $\sqrt{\square}^2 = 625$

(f)  $\sqrt{\square}^2 = 144$

(g)  $\sqrt{64} = \square$ , because  $8^2 = \square$

(h)  $\sqrt{121} = \square$ , because  $\square = 121$

(i)  $\sqrt{225} = \square$ , because  $\square = \square$

Check your answers on the calculator.

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### 4.3 Other roots

You can also use the root key on the calculator. Find the  $\sqrt[x]{y}$  on your calculator. To get to this key you must press  $2^{\text{nd}}$  F first.



Look at the examples below.

Examples

(a)  $9^{1/2}$

$$\sqrt{\quad} \quad 9 \quad =$$

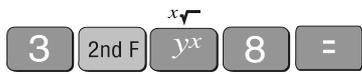
and the display should read 3.

or

$$2 \quad 2^{\text{nd}} \text{ F} \quad \sqrt[x]{\quad} \quad 9 \quad =$$

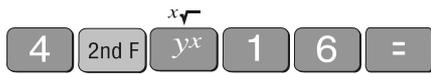
and the display should read 3.

(b)  $8^{\frac{1}{3}}$



and the display should read 2.

(c)  $16^{\frac{1}{4}}$



and the display should read 2.

Note:

- Root key is a function above the power key, so you will need to activate it with the SHIFT key
- See the key  $\sqrt[x]{\phantom{x}}$ . The  $x$  stands for the root you want to take so it is typed first.
- From the examples above you may have seen that  $8^{\frac{1}{3}} = \sqrt[3]{8}$ .  $\frac{1}{3}$  is called a fractional index.

## 5. Fractions

How do you add  $\frac{1}{12}$  and  $\frac{4}{63}$ ? Normally you would have to find a common denominator of 252.

So:

$$\frac{1}{12} + \frac{4}{63} = \frac{21}{252} + \frac{16}{252} = \frac{37}{252}$$

Or you can use your calculator to add fractions. Find the

$\frac{b}{a \cdot c}$  key



On the  $a\frac{b}{c}$  key the 'a' represents the whole part of a mixed number and the ' $\frac{b}{c}$ ', represents the fraction part of a mixed number.

When the number you are typing is a proper or improper fraction the 'a' is zero and there is no need to type a value for it.

The key strokes required for the calculation  $\frac{1}{12} + \frac{4}{63}$  are:

1 a b/c 1 2 + 4 a b/c 6 3 =

and the display will show 37 1/252 which is read as  $\frac{37}{252}$

Example

Find  $8\frac{1}{9} + \frac{63}{72}$

Using the calculator the key strokes are:



and the display will show  $8 \text{ } \overline{\text{r}} \text{ } 71 \text{ } \overline{\text{r}} \text{ } 72$  which is read as  $8\frac{71}{72}$

Note if you now press  $\text{2nd F}$   $\text{ab/c}$  the display will read  $647 \text{ } \overline{\text{r}} \text{ } 72$ . So this key turns a mixed fraction into an improper fraction.

If you press the  $\text{ab/c}$  key a second time the decimal equivalent is displayed, i.e. 8.9861111

## 6. Using the $x^{-1}$ key

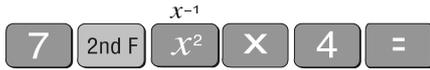


This is a very useful key in more complex calculations. Find the  $x^{-1}$  key on your calculator.

Example

$\frac{4}{7}$  is the same as  $4 \times \frac{1}{7}$

You can input this in your calculator by pressing



The answer should be 0.571428571. This would be the same as if you just typed  $4 \div 7$

Take another example

$$\frac{4}{(8 + 3) \times 7}$$

Type:



The answer should be 0.051948051

## 7. Scientific notation

Sometimes you may have numbers expressed in scientific notation, i.e.,  $7.24 \times 10^3$  instead of 7240. When a number is multiplied by  $10^3$ , you move the decimal point three places to the right. You can do this on the calculator by using the  $\text{Exp}$  key.



Press **7** **.** **2** **4** **Exp** **3** **=**, the screen shows



Where 7.24E03 is the calculator's computational symbols for  $7.24 \times 10^3$

Example

If you want to multiply two numbers e.g.  $8.34 \times 10^{-2} \times 4.28 \times 10^5$ . Press



and the display will read 35695.2

If you want this answer in scientific notation press both **2nd F** and **FSE** until sci appears on top of the screen and your display should read  $3.56952 \times 10^4$ . If you wish to fix the number of digits displayed, press **2nd F** **TAB** **+/-** 3, which rounds the number to 3 decimal places.

Practise using the **Exp** key on your calculator

## 8. Factorial $n!$

Look at your calculator and find the key with the symbol  $n!$  on it. You will come across this symbol when doing the Binomial Distribution. This is called the factorial key.



$n!$   
 Use **2nd F** to activate  $n!$

Use it to find the  $3!$  and  $5!$ . Press **3** **2nd F**  **$n!$**  **=**

$3!$  means  $3 \times 2 \times 1$

$3! = 6$

**5** **2nd F**  **$n!$**  **=**

and  $5! = 5 \times 4 \times 3 \times 2 \times 1$

$5! = 120$

How many ways would you guess that we could arrange ten people?

That is, how large would you estimate  $10!$  to be? Use your calculator to find  $10!$

You should get 3 628 800.

$$10! = 10 \times 9 \times 8 \times \dots \times 3 \times 2 \times 1$$

(Thank goodness this can be done on the calculator.)

## Factorial rule

The number of ways of arranging  $n$  items in order is known as 'factorial  $n$ ' which is symbolised as  $n!$  where:

$$n! = n \times (n - 1) \times (n - 2) \times \dots \times 3 \times 2 \times 1$$

## 9. Using memory

To calculate the following it may be useful to use the memory key for each term:

Example:

$$\frac{(9 - 16)^2}{16} + \frac{(23 - 16)^2}{16} + \frac{(17 - 16)^2}{16}$$



RCL STO M+ M  
these keys are for memory

To make sure memory is clear, first press



or



and make sure you are in normal calculation mode [may need to press mode 0].

A small M appears in the display when you put something in memory.

To do the calculation above, press the following keys



- this puts the first term (3.0625) into the memory

then press



- this adds the second term (3.0625) into memory

then press



- this adds the third term 0.0625 to memory.

To find the answer press M

The answer should be 6.1875.

- Note:**
- **For the Sharp EL-531GH**, just pressing gives you the answer to the above calculation.
  - To clear memory, press and 'M' will disappear.
  - To store a number in memory, press after the number and pressing will recall the number.

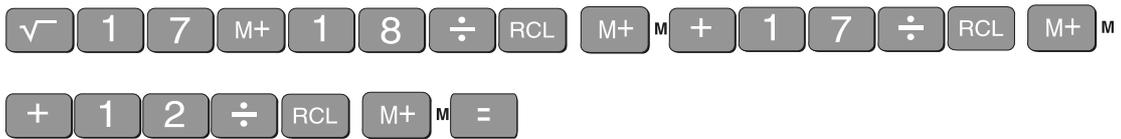
## Example 2

calculate the following:

$$\frac{18}{\sqrt{17}} + \frac{17}{\sqrt{17}} + \frac{12}{\sqrt{17}}$$

to clear the memory press   

press the following keys:



your answer should be 11.39917438

(There are other memory keys in your calculator – the X, Y keys, accessed by using STO and RCL – try them yourselves.)

## Example



or



## 10. Statistics

### 10.1 Mean and standard deviation – single data

The formula for the mean is  $\bar{x} = \frac{\sum x}{n}$

The formulas for the sample standard deviation are

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n - 1}} \quad \text{(Theoretical formula)}$$

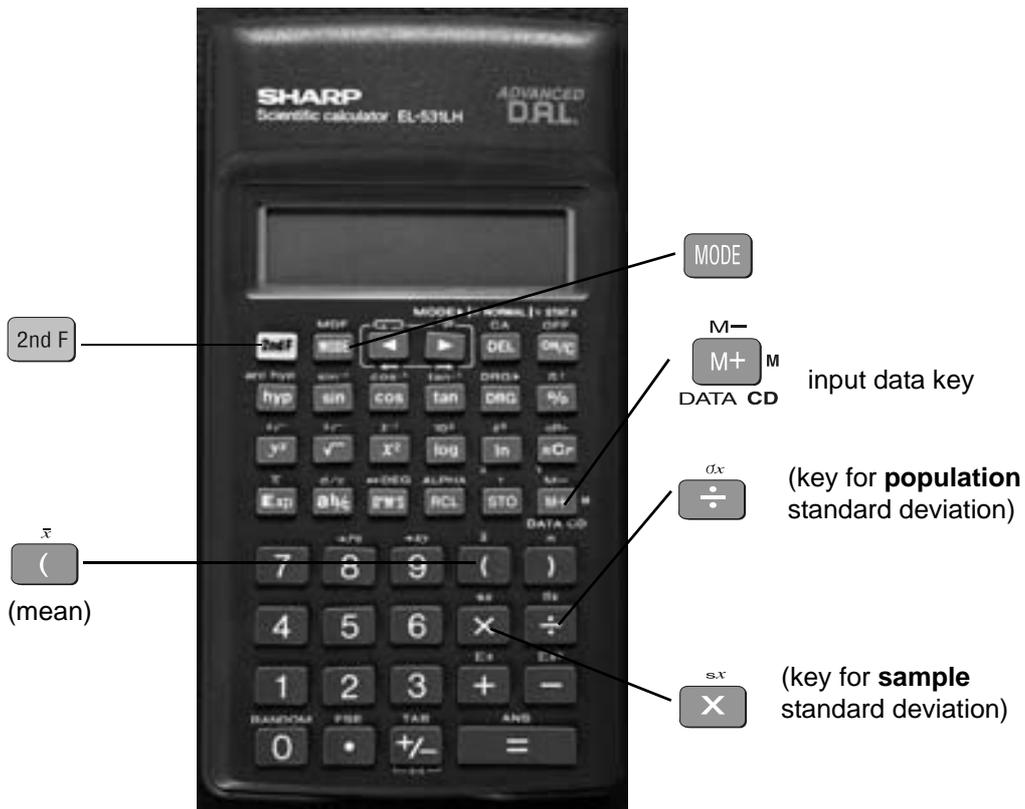
$$s = \sqrt{\frac{\sum x_i^2 - (\sum x_i)^2 / n}{n - 1}} \quad \text{(Working formula)}$$

Your calculator will calculate the mean and standard deviation for you (the population standard deviation  $\sigma_x$  or the sample standard deviation  $s_x$  – in data calculations you will usually use the sample standard deviation.)

**Note:** For the EL-531GH, the keys are as follows for e.g. 2



The difference between  $\sigma$  and  $s$  varies with different calculators. On the Sharp EL-531LH,  $\sigma$  is denoted by  $\sigma_x$  and  $s$  is denoted by  $s_x$ . The positions of these green keys is shown on the diagram below.

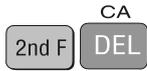


To find the mean and standard deviation,

firstly you must access the statistics mode of the calculator by using the keys **MODE** followed by **1** STAT 0 will appear on the right of the screen.

Note that once you are in the statistics mode, the keys shown in green are active. Make sure you can locate them.

**IMPORTANT:** Before starting any computations always clear the statistic's memories using



I will use the data set A (-5, 2, 3, 4, 11) to demonstrate the use of the calculator.

**Step 1:** Input the observations.

Use the  key to input data (no need to press ).



**Step 2:** Check that the correct number of observations have been inputted. The screen should show  $n = 5$ .

Or press  

The display should read  $n = 5$ .

**Step 3:** To display the mean press  

and the display should read 3

**Step 4:** Display the standard deviation (assume the data set is a **sample**) press  

and the display should read 5.7008771

Example

Use your calculator to find the mean, standard deviation and variance for data set B: -18, 1, 3, 9, 20.

(the variance is the square of the standard deviation)

**Note:****For the Sharp EL-531GH**

Step 3:  $\boxed{2\text{nd F}} \boxed{\bar{x}}$

Step 4:  $\boxed{2\text{nd F}} \boxed{s^x}$

After you are in the statistics mode and cleared the statistics memories, the keystrokes required are:

$\boxed{1} \boxed{8} \boxed{+/-} \boxed{M+} \boxed{1} \boxed{M+} \boxed{3} \boxed{M+} \boxed{9} \boxed{M+} \boxed{2} \boxed{0} \boxed{M+}$

The screen should display  $n = 5$ .

OR

$\boxed{\text{RCL}} \boxed{\overset{n}{)}} \text{ and the display will read 5 (you can skip this step)}$

$\boxed{\text{RCL}} \boxed{\bar{x}}$  and the display will read 3. This is the mean  $\bar{x}$

$\boxed{\text{RCL}} \boxed{s^x}$  and the display will read 13.87443693. This is the sample standard deviation  $s$

$\boxed{\chi^2} \boxed{=}$  and the display will read 192.5. This is the variance  $s^2$

The mean is 3, the standard deviation is 13.87 and the variance is 192.5.

The  $\boxed{\text{RCL}}$  button accesses a number of extra statistical functions.

$\boxed{\text{RCL}} \boxed{\overset{\Sigma x^2}{-}} = \Sigma x^2$

$\boxed{\text{RCL}} \boxed{\overset{\Sigma x}{+}} = \Sigma x$

In the example below, the progressive calculations are shown simply to give you some understanding of the underlying processes – you should do one or two examples in detail and then check them by calculator.

**Note:** For the Sharp EL-531GH, clear all memory in statistics mode using   and use  instead of  to access all other statistical functions.

## 10.2 Mean and standard deviation of frequency distribution

Given below is the frequency table for the weights (kg) of a random sample of 30 first year university female students. Find the standard deviation, the variance and the mean.

Graduate's weight (kg)	Frequency	Cumulative frequency
60	2	2
61	14	16
62	8	24
63	1	25
64	5	30

The calculations needed to obtain the standard deviation without statistical keys for these data are:

$$\Sigma x^2 = 60^2 \times 2 + 61^2 \times 14 + 62^2 \times 8 + 63^2 + 64^2 \times 5 = 114\,495$$

$$\Sigma x = 60 \times 2 + 61 \times 14 + 62 \times 8 + 63 + 64 \times 5 = 1\,853$$

$$s = \sqrt{\frac{\Sigma x_i^2 - (\Sigma x_i)^2/n}{n-1}}$$

$$= \sqrt{\frac{114\,495 - (1\,853)^2/30}{29}} = \sqrt{\frac{114\,495 - 114\,453.6333}{29}} = \sqrt{1.4264}$$

Thus:  $s = 1.2$  kg and  $s^2 = 1.4$  kg<sup>2</sup>

$$\bar{x} = \frac{\Sigma x}{n} = \frac{1853}{30} = 61.8 \text{ kg}$$

Note: In calculations like the above you should carry as many decimals as possible until the final result. The number of decimals to be retained at the end depends on the accuracy of the data values – one rule of thumb is to have one more decimal than in the original data.

Notice how the frequencies were used in the above calculation.

The calculator usage now has a small modification because we have been given the frequencies for the variable values. (There is no need to input each single observation.)

Note: Check that you have cleared all previous data. Press  $\text{2nd F}$   $\overset{\text{CA}}{\text{DEL}}$

The keystrokes required are:

$\text{6}$   $\text{0}$   $\text{STO}$   $\text{2}$   $\text{M+}$   $\text{6}$   $\text{1}$   $\text{STO}$   $\text{1}$   $\text{4}$   $\text{M+}$   $\text{6}$   $\text{2}$   $\text{STO}$   $\text{8}$   
 $\text{M+}$   $\text{6}$   $\text{3}$   $\text{M+}$   $\text{6}$   $\text{4}$   $\text{STO}$   $\text{5}$   $\text{M+}$

The display should read  $n = 30$

Press  $\text{RCL}$   $\overset{\bar{x}}{(\text{)}$  and the display should read 61.766667 as the mean  $\bar{x}$

Press  $\text{RCL}$   $\overset{s_x}{\times}$  and the display should read 1.1943353 as the sample standard deviation  $s$

$\text{x}^2$   $\text{=}$  and the display should read 1.4264369 as the variance  $s^2$

Thus, as expected

$$s = 1.2 \text{ kg}, s^2 = 1.4 \text{ kg}^2 \text{ and } \bar{x} = 61.8 \text{ kg}$$

### Exercise 6

Find the mean, standard deviation and variance of

(a) The annual rainfall data for the years 1971 – 1990

<b>Year</b>	<b>1971</b>	<b>1972</b>	<b>1973</b>	<b>1974</b>	<b>1975</b>	<b>1976</b>	<b>1977</b>	<b>1978</b>	<b>1979</b>	<b>1980</b>
<b>Rain (mm)</b>	1 340	990	1 120	1 736	260	1 100	1 379	1 125	1 430	1 446
<b>Year</b>	<b>1981</b>	<b>1982</b>	<b>1983</b>	<b>1984</b>	<b>1985</b>	<b>1986</b>	<b>1987</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>
<b>Rain (mm)</b>	1 459	1 678	1 345	978	1 002	1 110	1 546	1 672	1 467	1 123

**Note:** For the EL-531GH, the key strokes are

$\text{6}$   $\text{0}$   $\times$   $\text{2}$   $\text{M+}$   $\text{6}$   $\text{1}$   $\times$   $\text{1}$   $\text{4}$   $\text{M+}$   $\text{6}$   $\text{2}$   $\times$   $\text{8}$   
 $\text{M+}$   $\text{6}$   $\text{3}$   $\text{M+}$   $\text{6}$   $\text{4}$   $\times$   $\text{5}$   $\text{M+}$

(b) The sample of snail foot lengths

Snail foot length (cm)							
2.2	4.1	3.5	4.5	3.2	3.7	3.0	2.6
3.4	1.6	3.1	3.3	3.8	3.1	4.7	3.7
2.5	4.3	3.4	3.6	2.9	3.3	3.9	3.1
3.3	3.1	3.7	4.4	3.2	4.1	1.9	3.4
4.7	3.8	3.2	2.6	3.9	3.0	4.2	3.5

Answers:

(a) Rainfall statistics

mean:

$$\bar{x} = 1\,265.3 \text{ mm}$$

standard deviation:

$$s = 336.4 \text{ mm (sample standard deviation)}$$

variance:

$$s^2 = 113141.7 \text{ mm}^2$$

(b) Snail statistics

mean:

$$\bar{x} = 3.4 \text{ cm}$$

standard deviation:

$$s = 0.70 \text{ cm}$$

variance:

$$s^2 = 0.49 \text{ cm}^2$$

## 11. Trigonometric functions

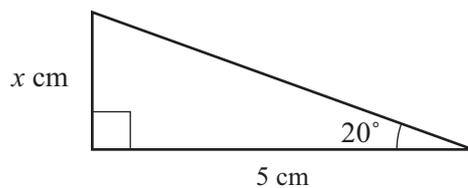
The keys involved are:



**Important:** Make sure that your calculator is in the correct mode. For example, if your calculator has RAD or GRAD on the display and you wish to work in degrees, press the DRG key until the display shows DEG.

Example 1

In the right-angled triangle below, the length of the side opposite the  $20^\circ$  angle needs to be calculated.



To find the length of the side labelled  $x$  cm, use

$$\tan 20^\circ = \frac{x}{5}$$

$$\Rightarrow x = 5 \tan 20^\circ$$

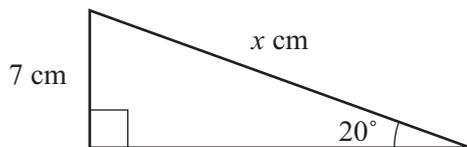
The keystrokes on the calculator are:



The display should read 1.819851171, so the length of  $x$  is about 1.8 cm.

### Example 2

In the right-angled triangle below, the length of the hypotenuse needs to be calculated.



To find the length of the side labelled  $x$  cm, use:

$$\sin 20^\circ = \frac{7}{x}$$

$$\Rightarrow x = \frac{7}{\sin 20^\circ}$$

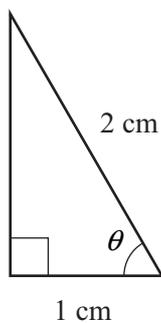
The keystrokes on the calculator are:



The display should read 20.466631, so the length of the hypotenuse is about 20.5 cm.

### Example 3

Given the lengths of two of the sides in the right-angled triangle below, find the value of the angle  $\theta$  in degrees:



In the diagram,  $\cos \theta = \frac{1}{2}$

To find the value of  $\theta$ , you need to use the  $\cos^{-1}$  key. The calculator keystrokes are:



Note: You must first get the value of the division by using brackets.

Your display should read  $60^\circ$ . If it does not, check that you are in degree mode.

## 12. Exponential and logarithmic functions

There are two log keys on your calculator, with their associated exponential keys. The latter are accessed by first using the yellow 2ndF key:



The 'log' key uses base 10 and the 'ln' key uses base  $e$  (natural logarithm).

Example 1

Solve equation  $2^a = 20$

Taking logs of both sides;

$$\log 2^a = \log 20$$

$$\Rightarrow a \log 2 = \log 20$$

$$\Rightarrow a = \frac{\log 20}{\log 2}$$

To find the value of  $a$ , the keystrokes are:



The display should read 4.3219281.

So,  $2^{4.32} \approx 20$ . Confirm this by using the  $y^x$  key.

### Example 2

Given  $\log y = 1.584$ , find the value of  $y$

$$\log y = 1.584$$

$$\Rightarrow y = 10^{1.584}$$

The  $10^x$  key is above the log key. Hence the keystrokes are:



The display should read 38.370725

### Example 3 (harder)

Given  $\log_x 6 = 1.5$ , find the value of  $x$

$$\log_x 6 = 1.5$$

$$\Rightarrow \frac{\log 6}{\log x} = 1.5$$

$$\Rightarrow \frac{\log 6}{1.5} = \log x$$

To find  $\log x$ , the calculator keystrokes are:



The display should read 0.5187675.

Since this is the value of  $\log x$ , you still need to find  $x$  where  $x = 10^{0.5187675}$

To utilize the answer of 0.5187675 on your display, use the stored ANS key (which is above the = key). Press



Your display should now read 3.3019272

Note: You could use the 'ln' key instead of the 'log' key – the answer would still be the same. Try it!



## 13. Degrees, minutes, seconds

The key involved is



This key can be used for problems involving degrees, minutes and seconds or hours, minutes and seconds.

### Example 1

Suppose that you have a trigonometric problem where the angle involved is given in degrees and minutes. e.g. Find  $x$  where  $x = 4 \times \sin 25^\circ 36'$

The keystrokes involved are:



The display should show 1.728343, so  $x$  is approximately 1.73

#### Example 2

If you wish to convert an angle in degrees to its equivalent in degrees, minutes and seconds:

e.g.  $34.88^\circ$ , the keystrokes are:



The display should read  $34^\circ 52' 48.00$

#### Example 3

To find the sum of 5 hours 52 minutes 30 seconds and 7 hours 45 minutes 49 seconds:

The keystrokes are:



The display should now read  $13^\circ 38' 19.00$  which is 13 hours 38 minutes and 19 seconds.

To convert this number on the display into hours, minutes and seconds, press



The display should read 13.638611 (hours).

## Review calculator exercises

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### 1. Perform the following calculations

(i)  $(5 + 4) \times 3$

(ii)  $12.5 - 8 \div 0.5$

(iii)  $\frac{3 \times 6 - 8}{4}$

(iv)  $\frac{12.8}{16.5 - 3.8}$

(v)  $\frac{7 \times 0.41 + 17}{(4 + 7) \times 2}$

(vi)  $\frac{\frac{2.4}{3}}{4}$

(vii)  $\sqrt{145.6 - 17.2^2} / 5$

(viii)  $\sqrt{345.6 - 17.2^2} / 5$

(ix)  $25 + \frac{3 \times 27}{1.02 \sqrt{30}}$

(x)  $(4.1333 - 3.000) \pm 2.015 \sqrt{\frac{0.1366^2}{6} + \frac{0.2000^2}{6}}$

(xi)  $\frac{(100 - 90)^2}{90} + \frac{(50 - 60)^2}{60} + \frac{(20 - 30)^2}{30}$

2. The following data is on growth (in \$m) in an economy over a 8 year period:

2.5    6.2    -2.1    0.04    8.2    7.4    2.1    -1.7

Calculate (i)  $\Sigma x$     (ii)  $\Sigma x^2$     (iii)  $(\Sigma x)^2$     Explain in words what each of these mean.

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## Calculator solutions

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1.

$$(i) \quad (5 + 4) \times 3 = 27$$

Make sure your calculation is in comp mode.

$$(ii) \quad 12.5 - 8 \div 0.5 = -3.5$$

$$(iii) \quad \frac{3 \times 6 - 8}{4} = 2.5$$

Either  $(3 \times 6 - 8) \div 4$ , or  $3 \times 6 - 8 \div 4 =$

$$(iv) \quad \frac{12.8}{16.5 - 3.8} = 1.007874$$

Either  $12.8 \div (16.5 - 3.8) =$ , or  $16.5 - 3.8 =$  2nd F  $x^{-1}$   $\times 12.8 =$

$$(v) \quad \frac{7 \times 0.4 + 17}{(4 + 7) \times 2} = 0.9$$

Either  $\dots \div ((4 + 7) \times 2)$  or  $\dots \div (4 + 7) \div 2$

$$(vi) \quad \frac{2.4}{\frac{3}{4}} = 3.2$$

Either  $2.4 \div (3 \div 4)$ , or  $2.4 \div 3 \text{ ab/c } 4 =$

$$(vii) \quad \sqrt{145.6 - 17.2^2} / 5 = 9.296..$$

$\sqrt{(145.6 - 17.2x^2) \div 5} =$

$$(viii) \quad \sqrt{345.6 - 17.2^2} / 5 = 1.41..$$

$\sqrt{(345.6 - 17.2x^2)} = \sqrt{\div 5} =$

$$(ix) \quad 25 + \frac{3 \times 27}{1.02 \sqrt{30}} = 39.4985$$

$25 + 3 \times 27 \div 1.02 \div \sqrt{30} =$

$$(x) \quad (4.1333 - 3.000) \pm 2.015 \sqrt{\frac{0.1366^2}{6} + \frac{0.2000^2}{6}} = 1.3325 \text{ or } 0.9341$$

Calculator keys:  $2.015 \times \sqrt{(0.1366x^2 \div 6 + 0.2x^2 \div 6)} =$  **M+**  $+ 4.1333 - 3 =$

Display reads 1.3325

then press **ON/C** **+/-** **RCL** **M+**  $+ 4.1333 - 3 =$

Display reads 0.9341

$$(xi) \quad \frac{(100 - 90)^2}{90} + \frac{(50 - 60)^2}{60} + \frac{(20 - 30)^2}{30} = 6.1111$$

Calculator keys:  $(100 - 90) x^2 \div 90 + (50 - 60) x^2 \div 60 + (20 - 30) x^2 \div 30 =$

2. The following data is on growth (in \$m) in an economy over a 8 year period:

2.5    6.2    -2.1    0.04    8.2    7.4    2.1    -1.7

Calculate (i)  $\Sigma x$     (ii)  $\Sigma x^2$     (iii)  $(\Sigma x)^2$     Explain in words what each of these mean.

To do this on the calculator, you must be in SD mode. Enter the data:

**MODE** **1** 2.5 M+ 6.2 M+ 2.1 +/- M+ 0.04 M+ 8.2 M+ 7.4 M+ 2.1 M+ 1.7 +/- M+

Display reads  $n = 8$

(i) 22.64    Press the key that says  $\Sigma x$  ( **RCL**  **$\overset{\Sigma x}{+}$**  )

This gives the total growth over the last 8 years

(ii) 178.4016    Press the key that says  $\Sigma x^2$  ( **RCL**  **$\overset{\Sigma x^2}{-}$**  ) This gives the sum of the squares of the growth in each year

(iii) 512.5696    Press  $\Sigma x$  and  $x^2$ . This gives the square of the sum of the growth.

Press **RCL**  **$\overset{\Sigma x}{+}$**   **$x^2$**  **=**

## Your Notes

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