

# Mastering the CALCULATOR



CASIO *fx-100AU*

**USQ**  
AUSTRALIA

**UNIVERSITY OF SOUTHERN QUEENSLAND**

The Learning Centre | Learning and Teaching Support Unit

# MASTERING THE CALCULATOR USING THE CASIO *fx*-100AU

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Learning and Teaching Support Unit (LTSU)  
The Learning Centre

Guide book

**Published by**

**University of Southern Queensland  
Toowoomba Queensland 4350  
Australia**

<http://www.usq.edu.au>

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Produced by the Distance and e-Learning Centre using *FrameMaker7.1* on a Pentium workstation.

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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 Learning and Teaching Support Unit (LTSU) 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

The Learning Centre (TLC)  
Learning and Teaching Support Unit (LTSU), S-Block  
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Fax: 07 4631 1801  
Home page: <http://www.usq.edu.au/ltsu>

Note the booklets are also available online at the above address (follow the prompts).

## A word about starting out

- Make sure you are in the correct mode selection and that all previous data is cleared.

- Example: To perform arithmetic operations press  

- To clear all values press 

- To clear memory press  

The screen displays

Mcl	Mode	All
1	2	3

Press   to clear memory

- If your calculator has FIX or SCI on the display press  four times

FIX	SCI	NORM
1	2	3

appears on the screen

press 3, then 2 so you are in Normal mode.

- If your calculator has RAD or GRAD on the display press  three times

DEG	RAD	GRA
1	2	3

appears on the screen

press 1 so you are in Degree mode.

- There is also a mode which gives you a preference for displaying the decimal point as a dot or comma as 34.26 or 34, 26.

Press  five times until DISP 1 is displayed.

Press  then forward  twice

Press  for dot end (separates thousands with comma)

Press  for comma (separates thousands with dot).

# 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 **DEL** 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 **DEL** to cancel the 5.

Now type  

### Example

If I want to add 471 and 575 but I typed

I can cancel 6 by typing **DEL** and then typing  

The display should read 1 046.

‘Try practising cancelling with the **DEL** key until you are comfortable with its use.’

## 1.3 The keys are used when you to delete other data

### Example

If you typed:

$471 + 546$

but you wanted  $471 + 576$

press the  key twice. The 4 flashes. Press . The 7 now replaces the 4.

Press .

The display should read 1 047.

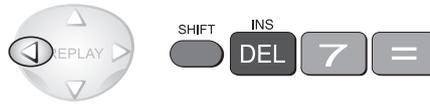
Practice using this key when replacing digits, operation keys (+ − × ÷), or more than one digit (use the DEL key).

You can also use the insert key   to insert anything you omitted.

### Example

If you typed  $471 + 56$

but you wanted  $471 + 576$ , press



the display should read 1047.

## 1.4 To subtract numbers

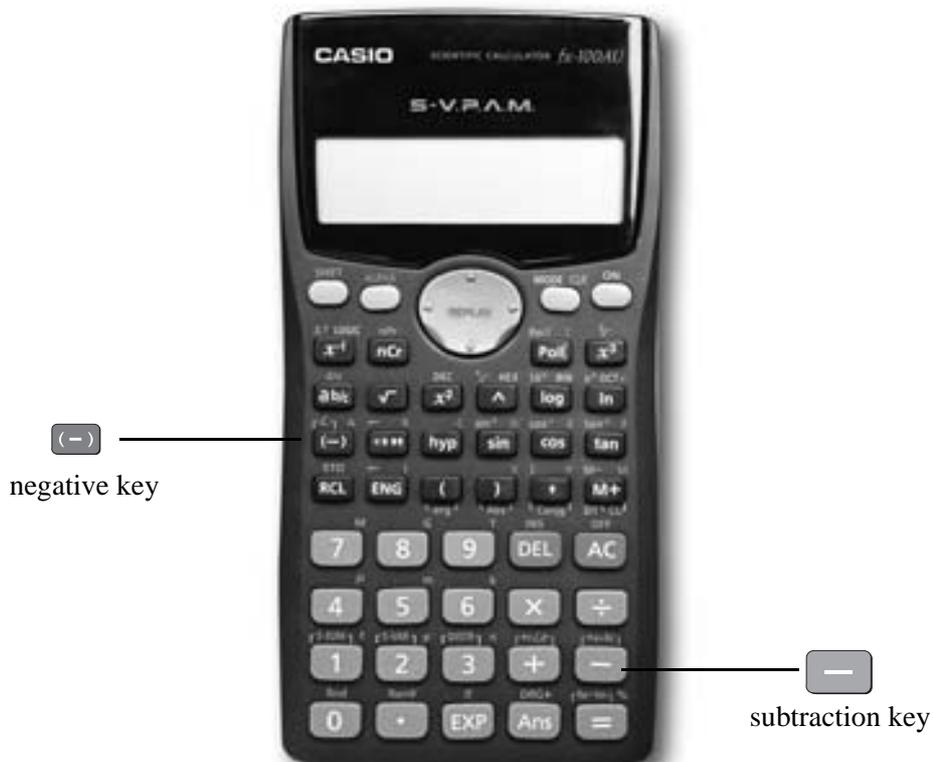
Find the  key (it is shown on the photograph of the calculator following).

### 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.

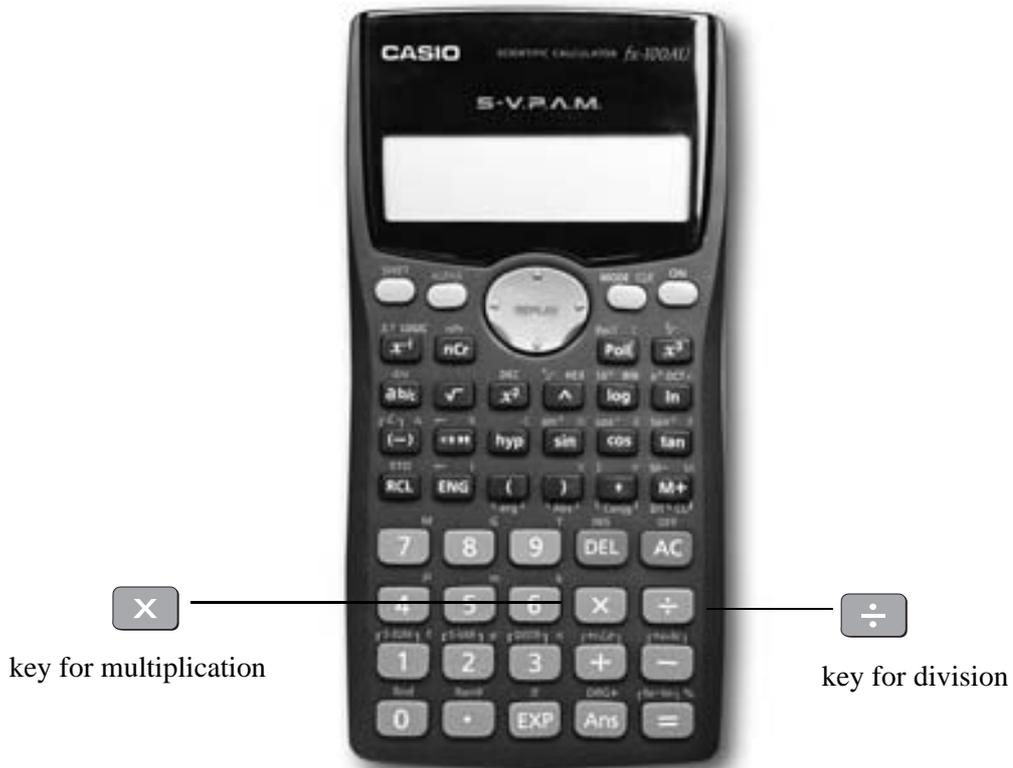
You could also use the keystrokes     .

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

The display should read 21

To find  $753 \times 492$ , type

The display should read 370 476

## 2.2 To divide numbers

Find the  key (it is shown here 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 56 by 23947 type



The display should read 0.002338497

If it reads  $2.3385 \times 10^{-03}$  or something similar, then your calculator is in SCI (Scientific mode). See page 2 to change to NORM (normal mode).

## 2.3 Combining multiplication and division

### Example

If the question is

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

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

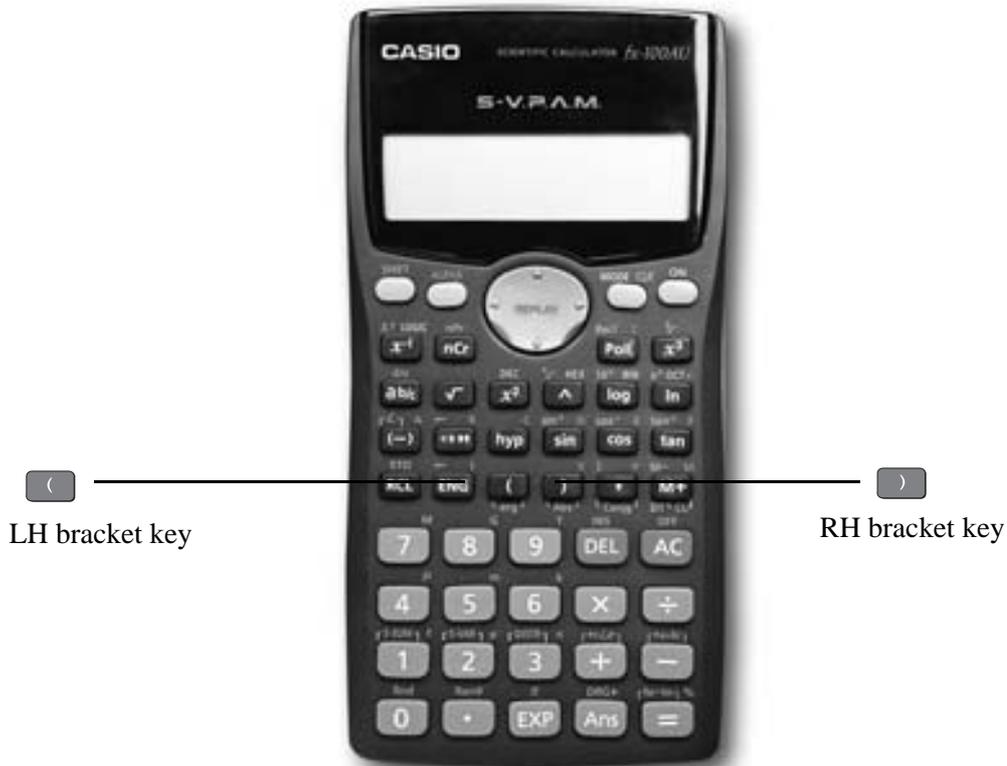
Try it.

The display should read 0.964285714

### 3. Brackets

Find the set of bracket keys on your calculator.

The fx-100AU allows you to use many sets of brackets.



#### Example

Do the calculation  $471 - (93 + 11 + 2)$  on the calculator. (Make sure your calculation is in

ordinary comp. mode –   )

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  $18 \times (3 + 7)$ ] but you don't need to press the  $\times$  key

(c)  $4 + 5 [2(3 + 7)]$  [to use two sets of brackets just press the same button]

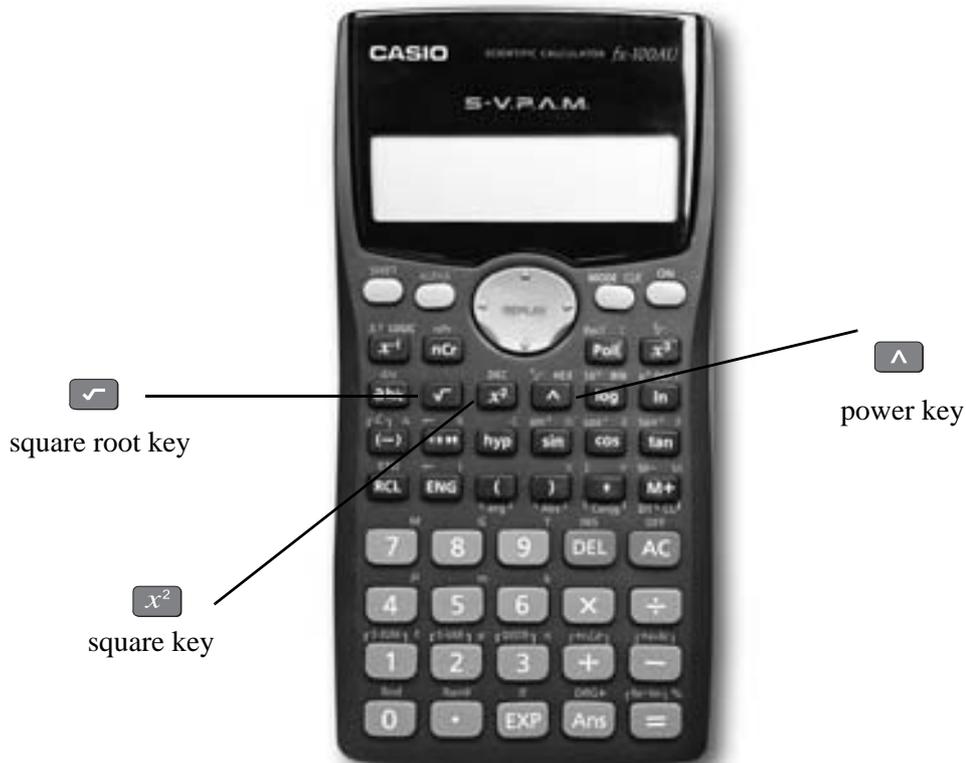
(d)  $\frac{5}{(3 + 2)}$

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  

the display should read 36.

Or you can use the power key on your calculator.

Find the ^ key on your calculator (similar to the key on your computer keyboard).

### Example

To square 6,

that is, find  $6^2$ , type

The display should read 36

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 need to type the brackets in)  
 (e)  $5^{0.4}$   
 (f)  $5^{-4}$
- 

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  
 (f) 0.0016 [Just press   $5^{-4}$  is the same as  $\frac{1}{5^4}$  so you could press  to get the same answer]
- 

**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)

---

What do you think  $\sqrt{-49}$  will be? You should have said ‘you can’t find the square root of a negative’ since you can’t find a number that squares to give a positive. Your calculator will say Math ERROR.

#### 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

- |                    |                    |
|--------------------|--------------------|
| (a) $\sqrt{16} =$  | (e) $\sqrt{49} =$  |
| (b) $\sqrt{144} =$ | (f) $\sqrt{169} =$ |
| (c) $\sqrt{100} =$ | (g) $\sqrt{121} =$ |
| (d) $\sqrt{441} =$ | (h) $\sqrt{361} =$ |
- 

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 operators **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  $8^2 = \square$

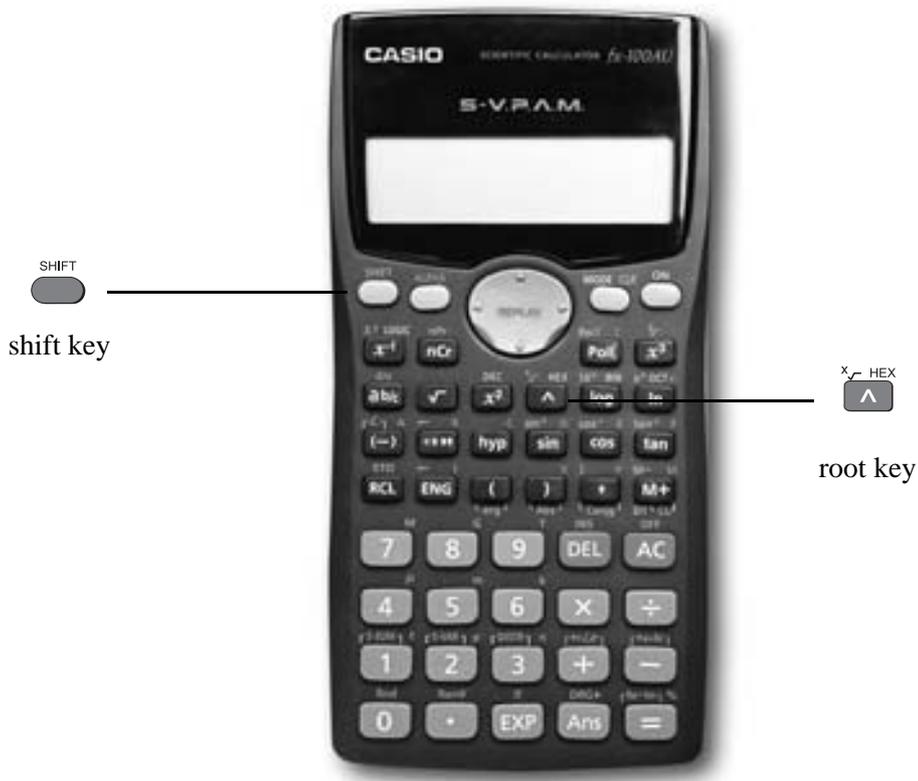
(h)  $\sqrt{121} = \square$ , because  $\square = 121$

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

Check your answers on the calculator.

**4.3 Other roots**

You can also use the root key on the calculator. Find the  $\sqrt{x}$  <sup>HEX</sup> on your calculator. To get to this key you must press **shift** first.



Look at the examples below.

### Examples

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



and the display should read 3.

or



and the display should read 3.

(b)  $8^{1/3}$



and the display should read 2.

(c)  $16^{1/4}$



and the display should read 2.

Note:

- Root key is a function at the back of 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  $8^{1/3} = \sqrt[3]{8}$ .  $8^{1/3}$  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

$a\frac{b}{c}$  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:



and the display will show  $37 \sqcup 252$  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  $8 \sqcup 71 \sqcup 72$  which is read as  $8\frac{71}{72}$

Note if you now press  $\overset{\text{SHIFT}}{\text{a/b/c}}$  the display will read  $\frac{647}{72}$ . So this key turns a mixed fraction into an improper fraction.

If you press the  $\text{a/b/c}$  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

Look at this simple example

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

You can input this in your calculator by pressing

$$7 \ x^{-1} \times 4 =$$

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:

$$( 8 + 3 ) \times 7 = \ x^{-1} \times 4 =$$

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 **EXP** key.



Press **7** **.** **2** **4** **EXP** **3** **=**, the display should read 7240.

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

**8** **.** **3** **4** **EXP** **(-)** **2** **x** **4** **.** **2** **8** **EXP** **5** **=**

and the display will read 35695.2

If you press **MODE** four times then **2** **0** **=** the display will read



which means  $3.56952 \times 10^4$ . Pressing the mode four times gives you

the display

FIX	SCI	NORM
1	2	3

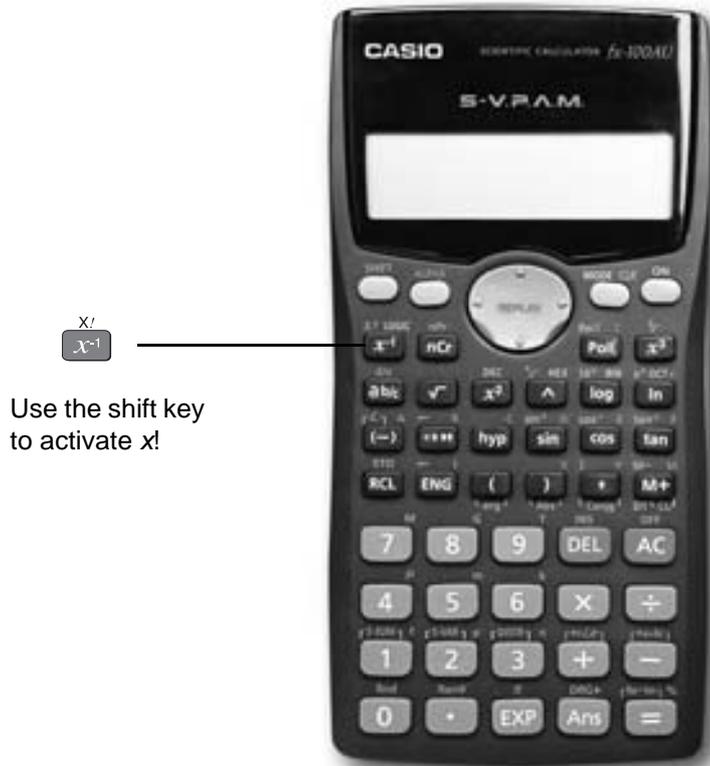
The **2** puts the calculator in scientific notation. The calculator then asks SCI 0~9? This gives the option of how many digits are displayed. The **0** gives you 10 digits. Notice a small sci appears in the screen.

If you press **MODE** four times then **2** **4** the display will read  $3.5670 \times 10^{04}$  which means  $3.570 \times 10^4$ . This rounds the number to 4 digits.

Practise using the **EXP** and **MODE** keys on your calculator

## 8. Factorial $x!$

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



Use it to find the  $3!$  and  $5!$ . Press  $\boxed{3}$   $\boxed{\text{SHIFT}}$   $\boxed{x!}$

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

$3! = 6$                        $5! = 120$

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:

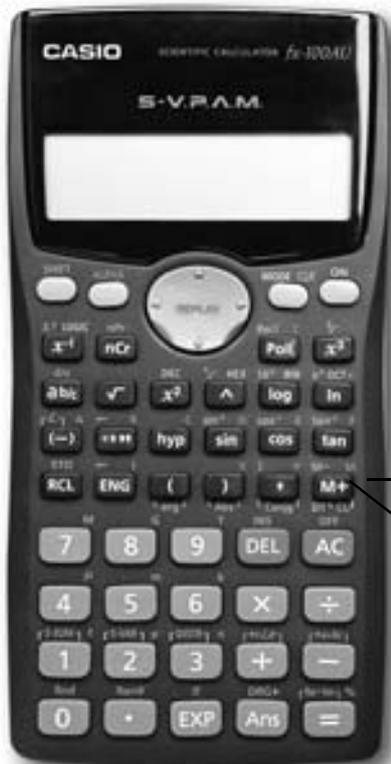
$$n! = n \times (n - 1) \times (n - 2) \times \dots \times 3 \times 2 \times 1$$

## 9. Using memory

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

**Example:**

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



M- M  
M+  
DT LCL

these keys are for memory

Use the  key to activate M-)

To make sure memory is clear, first press



or



and make sure you are in normal calculation mode [may need to press mode 1].

An M appears in the display when you put something in memory.

To do the calculation above, press the following keys

( 9 - 1 6 )  $x^2$   $\div$  1 6 = M+

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

then press

( 2 3 - 1 6 )  $x^2$   $\div$  1 6 = M+

- this adds the second term (3.0625) into memory

then press

( 1 7 - 1 6 )  $x^2$   $\div$  1 6 = M+

- this adds the third term 0.0625 to memory.

To find the answer press RCL M+

The answer should be 6.1875.

### Example 2

calculate the following:

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

first  $\overset{\text{SHIFT}}{\square}$   $\overset{\text{MODE CLR}}{\square}$  1 = to clear the memory then

press the following keys:

$\sqrt{\square}$  1 7 = M+ 1 8  $\div$  RCL M+ + 1 7  $\div$  RCL M+

+ 1 2  $\div$  RCL M+ =

your answer should be 11.39917438

(There are other memory keys in your calculator – the A to F keys, accessed by using SHIFT STO and RCL – try them yourselves.)

# 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

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

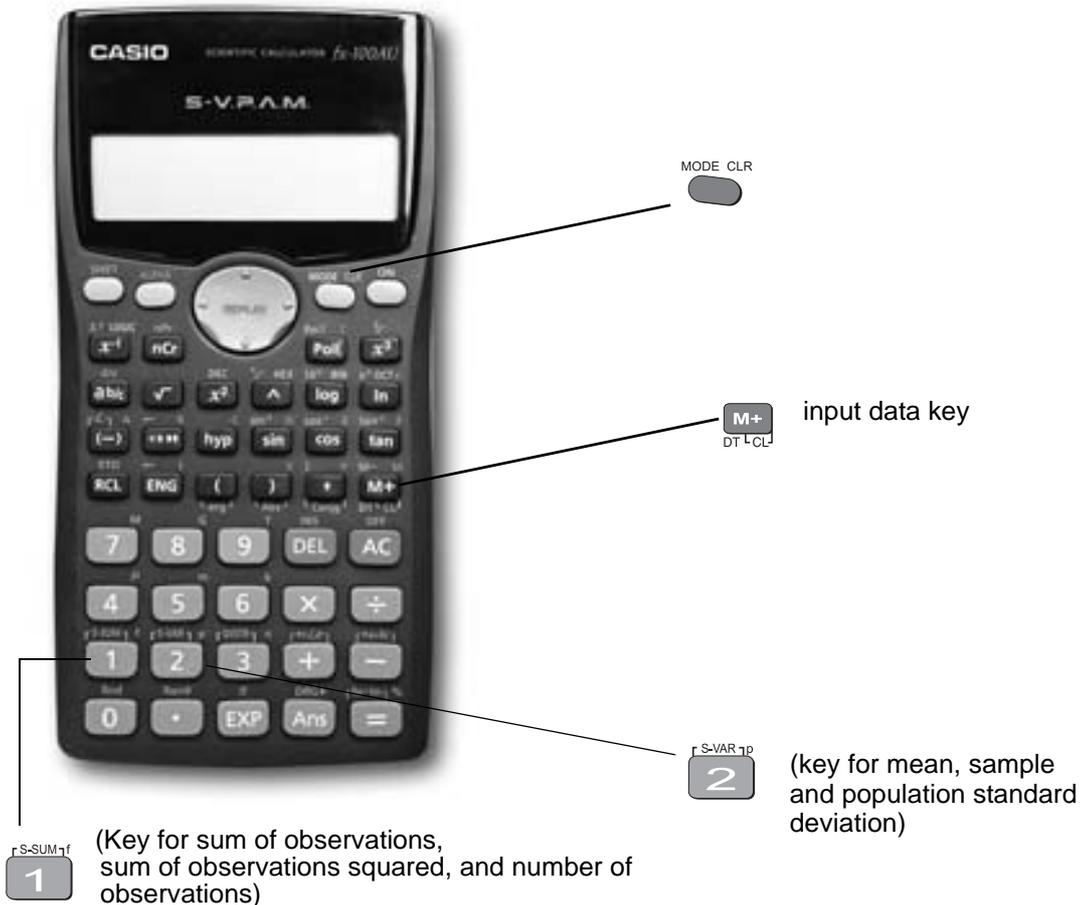
(sample)

$$\sigma_n = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$$

(population)

Your calculator will calculate the mean and standard deviation for you (the population standard deviation  $\sigma_n$  or the sample standard deviation  $\sigma_{n-1}$  – in data calculations you will usually use the sample standard deviation.)

On the Casio *fx-100AU*,  $\sigma$  and  $s$  are found in *s*-VAR. The positions of keys needed are 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  twice followed by  SD will appear in the centre of the screen.

Note that once you are in the statistics mode, the keys shown within the blue lines are active. There are 4 such keys on the Casio fx-100AU. Make sure you can locate them. Before starting any computations always clear the statistic's memories using Scl. Press



I will use the data set A (-5, 2, 3, 4, 11) to demonstrate the use of the calculator. Note that I have shown the use of the  key where necessary.

**Step 1:** Input the observations.

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



The display should read  $n = 5$ . (This means 5 observations have been input).

**Step 3:** Display the mean and standard deviation.

Press 

the display shows three alternatives

$\bar{x}$	$x_{\sigma_n}$	$x_{\sigma_{n-1}}$
1	2	3

Press   gives  $\bar{x} = 3$

Press    gives  $x_{\sigma_n} = 5.099019514$

Press     gives  $x_{\sigma_{n-1}} = 5.700877126$

**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)

---

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

    and the display will read 3

   and the display will read 13.87443693

 and the display will read 192.5

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

The    button accesses a number of extra statistical functions.

    =  $\Sigma x^2$  = 815

     =  $\Sigma x$  = 15

     =  $n$  = 5

If you have made an **error** with inputting your data you can correct it by using the up and down key.



For example, you input

4, 5, 60, 7, 9 and you meant to input 6 instead of 60. Press the  key until the display

reads  $x3 = 60$ , then press  . You now have the correct data.

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.

## 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:

$$\Sigma x^2 = 60^2 \times 2 + 61^2 \times 14 + 62^2 \times 8 + 63^2 \times 1 + 64^2 \times 5 = 114\,495$$

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

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

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

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

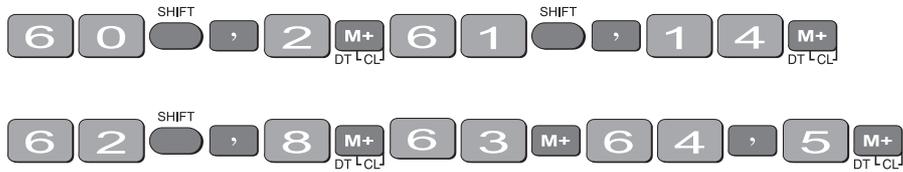
$$\bar{x} = \frac{\Sigma x}{n} = \frac{1853}{30} = 61.8 \text{ kg}$$

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.

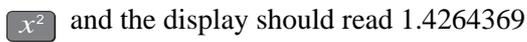
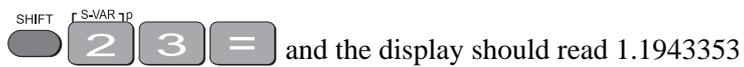
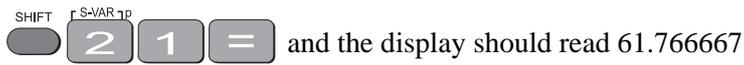
Notice how the frequencies were used in the above calculation.

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.)

The keystrokes required are:



The display should read  $n = 30$ .



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

(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:

$$\mu = 1\,265.3 \text{ mm}$$

standard deviation:

$$\sigma_{n-1} = 336.4 \text{ mm}$$

variance:

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

(b) Snail statistics

mean:

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

standard deviation:

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

variance:

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

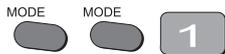
# 11. Normal distributions

When studying statistics, you will need to standardize scores and find probabilities (area under the standard curve).

For example, if you had 10 people aged as follows:

24 21 25 27 23 28 24 24 26 29

Input the values in SD mode as normal



24 **M+** 21 **M+** etc.

To find the standardized score (i.e. do  $z = \frac{\bar{x} - u}{\sigma}$  )

for an age e.g. 25

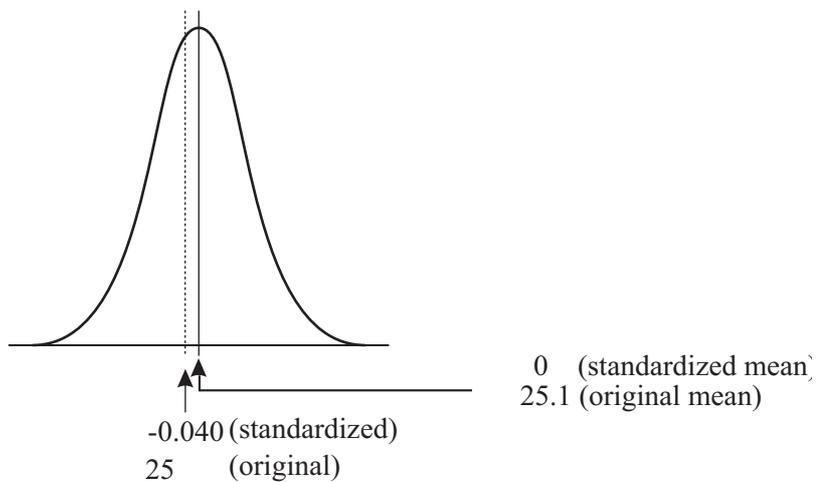
Press



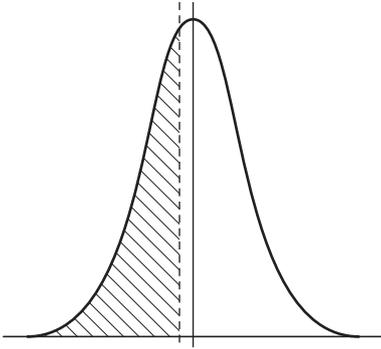
The display reads 25 → t

-0.04347

This means the value 25 is about -0.04 standard deviations below the mean (25.1)



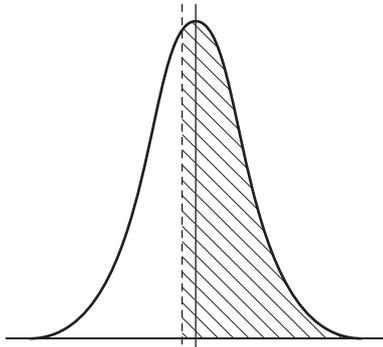
You can find the area under the curve to the left, to the right or between the value and the mean.



To the left press:



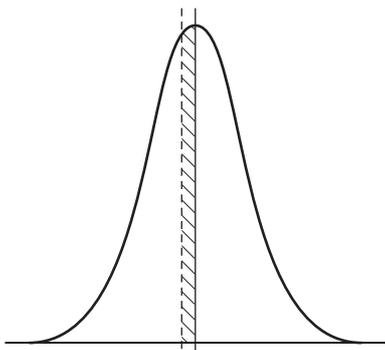
The answer  $\approx 0.48$  which means  $P(\bar{x} < 25.1) = 48\%$



To the right press:



The answer is  $\approx 0.52$  which means  $P(\bar{x} > 25.1) = 52\%$

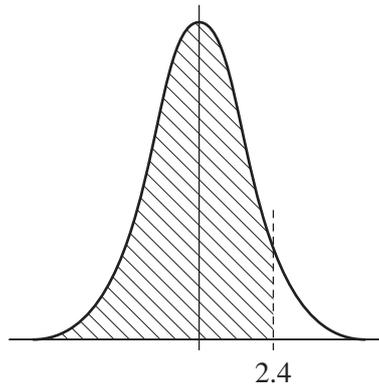


Between the value and the mean press:



The answer  $\approx 0.016$  which means  $P(25.1 < \bar{x} < 25) = 1.6\%$

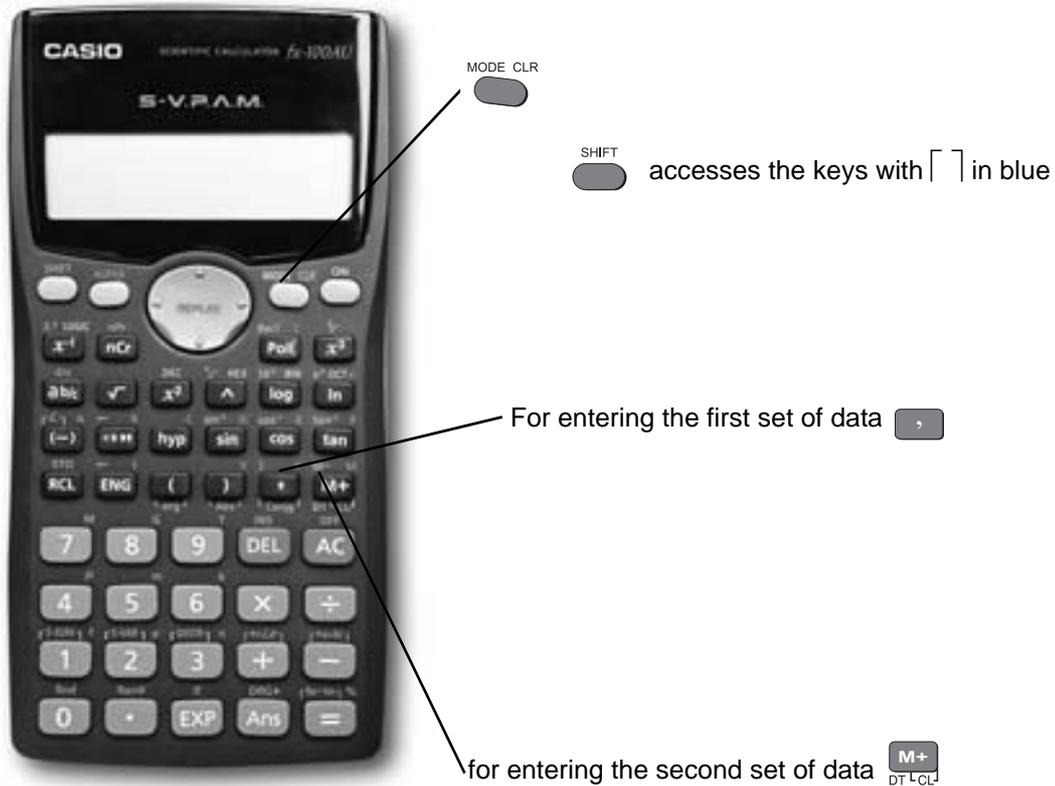
If you just want a probability from a  $z$  score, just do the last step. For example, what is  $P(z < 2.4)$ ?



The answer is 0.9918 or about 99%.

## 12. Linear regression

To access the linear regression mode you press **MODE CLR** key twice followed by **2 1**, then a small REG appears



### Example

Suppose we had a sample of 10 of the same type of banana. Their lengths and skin thicknesses were measured. Below is a summary of the results.

Banana	1	2	3	4	5	6	7	8	9	10
Length (mm)	16.2	15.8	16.5	14.9	16.9	16.8	15.6	15.6	15.7	15.4
Thickness (mm)	1.1	1.2	1.1	1.0	0.9	1.2	1.1	1.2	0.9	0.8

### STEPS

- To put the calculator into regression mode press **MODE** twice then **2 1**  
(1 = **Linear** Regression; there are 5 other types)
- Think of the sample of bananas as having two variables:
  - let  $x$  be the variable length of banana
  - let  $y$  be the variable thickness of banana

For each banana you have to put in both numbers.

To put in the first set of numbers, press the following keys:



is used for the 1st variable

is used for the 2nd variable

Continue in this manner



After you have input all the numbers.

The display should read  $n = 10$

To find the linear regression equation in the form

$$y = a + bx$$

you need to find the value of a and b. These keys are found under

Press a is 0.3651

Press b is 0.0430

$\therefore$  the equation is  $y = 0.3651 + 0.0430x$

To find the correlation coefficient press

$$r = 0.1928$$

There is not a high correlation between the thickness of bananas and the length of bananas tested.

The calculator will also give you other statistics about this sample. Use to get the mean thickness (1.055mm) or the standard deviation (0.64mm).

$\bar{x}$ : 15.94

$x_{\sigma_{n-1}}$ : 0.6432

Press  to get

$\bar{y}$ :   1.05

$y_{\sigma_{n-1}}$ :   0.1433

You can also use the   to predict the length, given the thickness. If 0.6 is the thickness then press

          = 5.47mm.

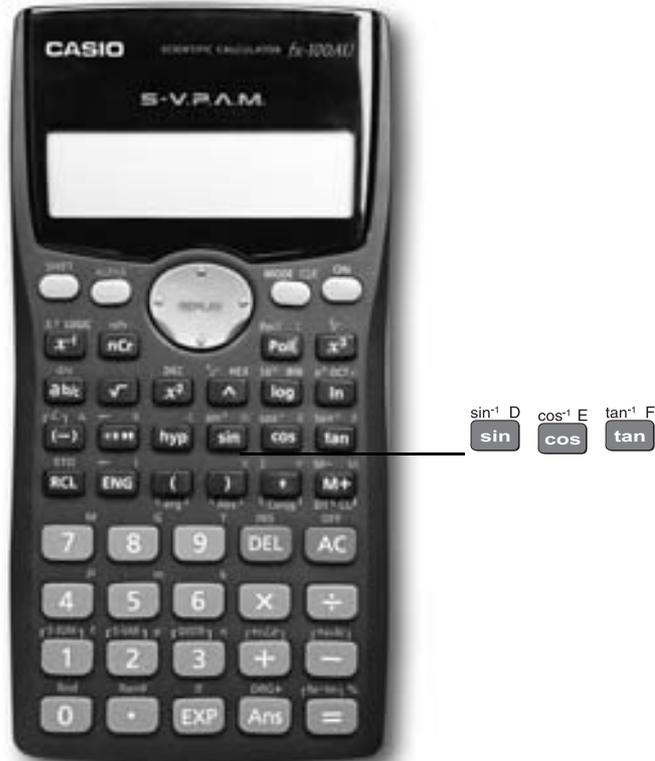
Similarly, if the length is 12mm then press

to get 0.88 mm as the predicted thickness.

## 13. Trigonometric functions

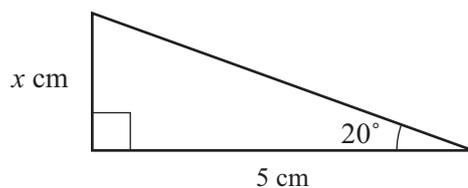
The keys involved are:



**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 mode twice and then select 1. Your screen should now display D.

### Example 1

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

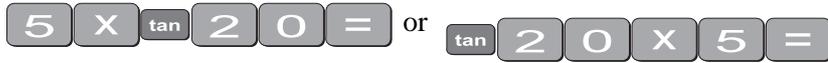


To find the length of the side labelled  $x$  cm, use

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

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

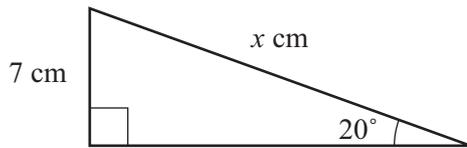
The keystrokes on the calculator are:



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:

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

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

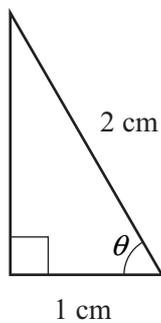
The keystrokes on the calculator are:



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.

## 14. 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 shift 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  $\wedge$  key.

## Example 2

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

$$\begin{aligned}\log y &= 1.584 \\ \Rightarrow y &= 10^{1.584}\end{aligned}$$

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  $x$

$$\begin{aligned}\log_x 6 &= 1.5 \\ \Rightarrow \frac{\log 6}{\log x} &= 1.5 \\ \Rightarrow \frac{\log 6}{1.5} &= \log x\end{aligned}$$

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  $x = 10^{0.5187675}$

Without removing the answer of 0.5187675 on your display, press:



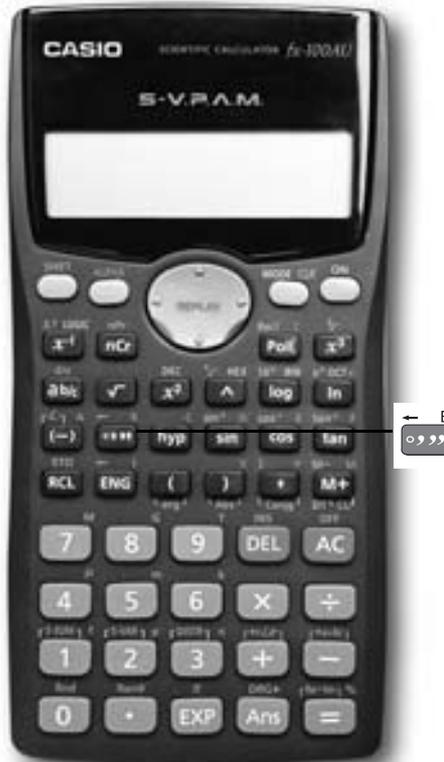
Your display should now read 3.3019272

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



## 15. 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  $34^{\circ}52'48$ .

### 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 read  $13^{\circ}38'19$  which is 13 hours 38 minutes and 19 seconds.

To convert this number on the display into hours, press



The display should now read 13.63811 (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)  $\frac{2.4}{\frac{3}{4}}$

(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)  $(5 + 4) \times 3 = 27$   
 Make sure your calculation is in comp mode.

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

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

(iv)  $\frac{12.8}{16.5 - 3.8} = 1.007874$   
 Either  $12.8 \div (16.5 - 3.8) =$  or  $16.5 - 3.8 = x^{-1} \times 12.8 =$

(v)  $\frac{7 \times 0.4 + 17}{(4 + 7) \times 2} = 0.9$   
 Either  $\dots \div ((4 + 7) \times 2) =$  or  $\dots \div (4 + 7) \div 2 =$

(vi)  $\frac{2.4}{\frac{3}{4}} = 3.2$   
 Either  $2.4 \div (3 \div 4) =$ , or  $2.4 \div 3 \text{ ab/c } 4 =$

(vii)  $\sqrt{145.6 - 17.2^2} / 5 = 9.296..$   
 Either  $145.6 - 17.2x^2 \div 5 = \sqrt{=}$ , or  $\sqrt{(145.6 - 17.2x^2) \div 5} =$

(viii)  $\sqrt{345.6 - 17.2^2} / 5 = 1.41..$   
 Either  $345.6 - 17.2x^2 = \sqrt{\div 5} =$  or  $(345.6 - 17.2x^2) \sqrt{\div 5} =$

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

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

Calculator keys:  $0.1366 x^2 \div 6 + .2 x^2 \div 6 = \sqrt{\phantom{x}} = x 2.015 =$  **Ans** **M+**  
 $+ 4.1333 - 3 =$   
 $4.1333 - 3 -$  **RCL** **M+**  $=$

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

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+ .04 M+ 8.2 M+ 7.4 M+ 2.1 M+ (-) 1.7 M+

(i) 22.64    Press the key that says  $\Sigma x$  ( **SHIFT** **r-SUM** **1** **2** )

This gives the total growth over the last 8 years

(ii) 178.4016    Press the key that says  $\Sigma x^2$  ( **SHIFT** **r-SUM** **1** **1** ) 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.

## Your Notes

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