

Mastering the CALCULATOR



CASIO fx-82AU PLUS

USQ
AUSTRALIA

UNIVERSITY OF SOUTHERN QUEENSLAND

The Learning Centre | Learning and Teaching Support Unit

Mastering the calculator using the Casio *fx*-82AU PLUS

Learning and Teaching Support Unit (LTSU)
The Learning Centre

Guide book

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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 Casio *fx-82AU*
- Using the Casio *fx-82AU PLUS*
- 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), R-Block
The University of Southern Queensland
Telephone: 07 4631 2751
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Fax: 07 4631 1801
Home page: <http://www.usq.edu.au/learningcentre>

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    

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

(so you are in **Normal** mode.)

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

press  so you are in Degree mode (a “D” will appear on the screen).

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  



- Then down  once

Press  (for **display**).

Press  for dot or

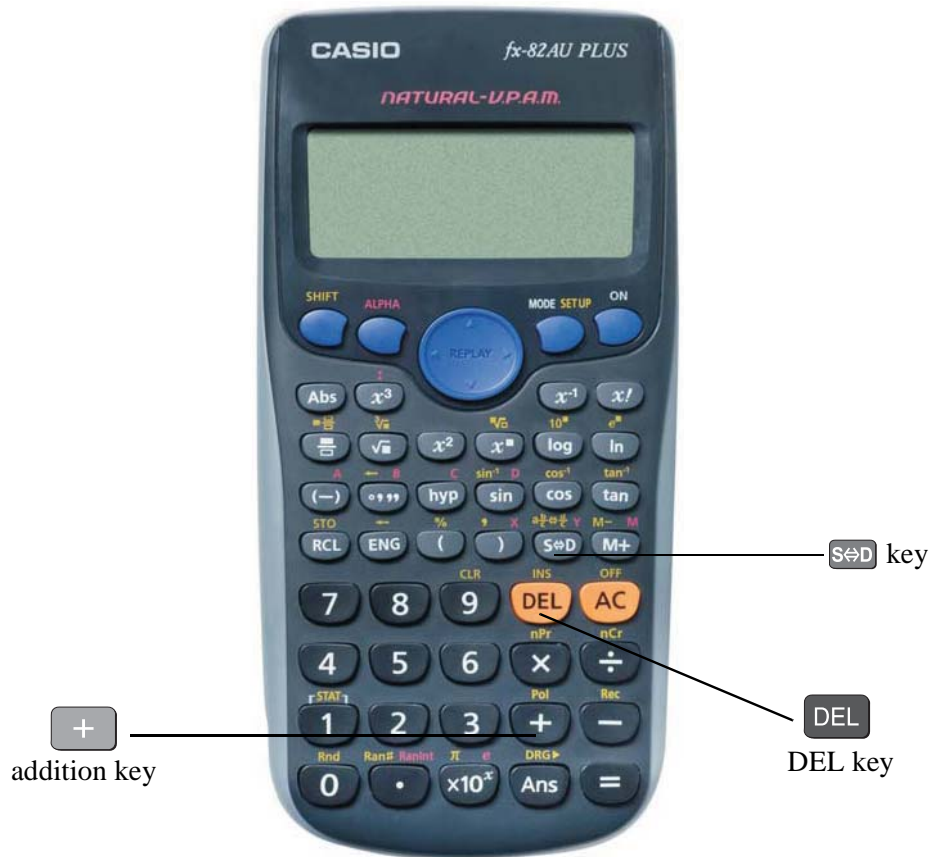
Press  for comma.

- If you are doing normal calculations you should be in math mode.

Press   and “math” should appear on the screen.

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

7 **+** **3** **=**

The display should read 10

To add 7 and 3.1, type

7 **+** **3** **.** **1** **=**

The display will read $\frac{101}{10}$. Press **S⇌D** to get 10.1.

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. Press **DEL** to delete the 4 then, 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 insert anything you omitted.

1.4 To subtract numbers

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

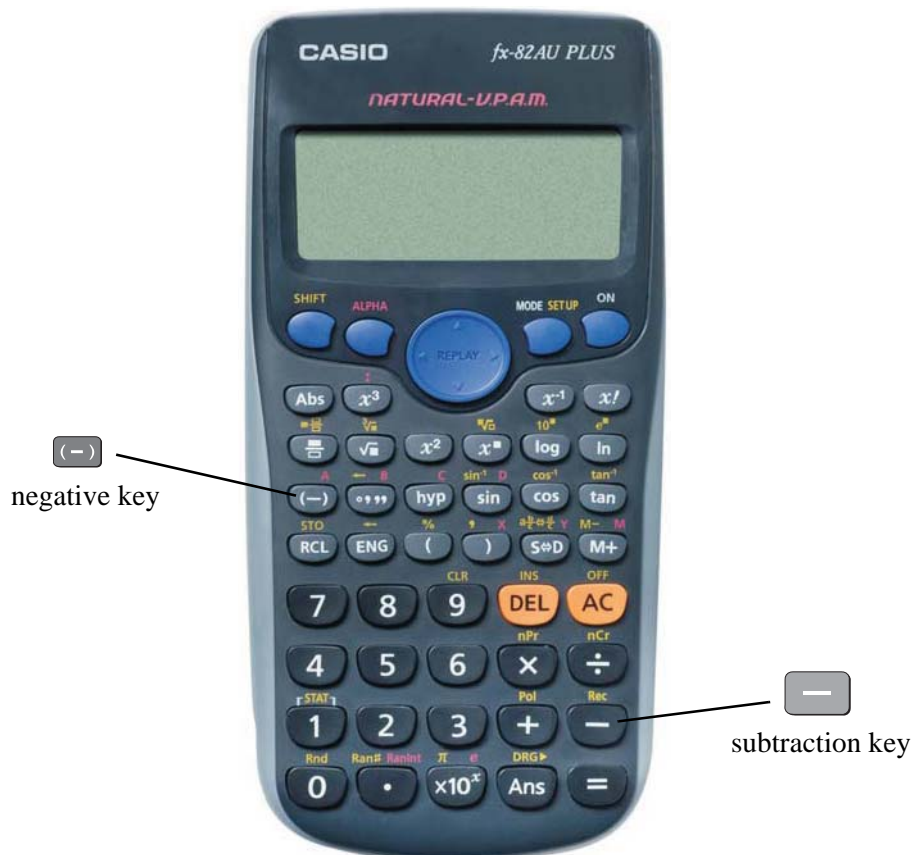
Note: the  key is only used for entering negative numbers.

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     .

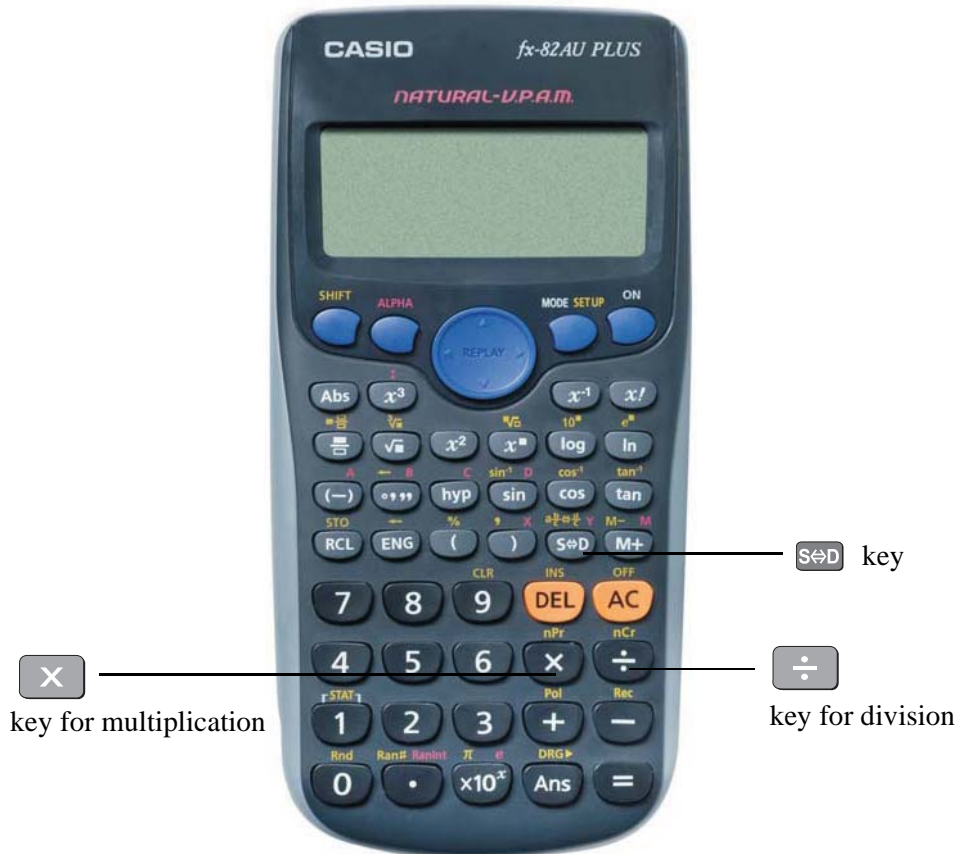
In this case the calculator recognises the - as a negative (not recommended to do it this way).

Note: Avoid using the  key to enter negative numbers

2. Multiplication and division

2.1 To multiply numbers

Find the \times 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 753×492 , type

$753 \times 492 =$

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 $\frac{8}{3421}$

To display in decimal form either press  after pressing  or



If it reads 2.3385×10^{-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 $27 \div 7 \div 4$.

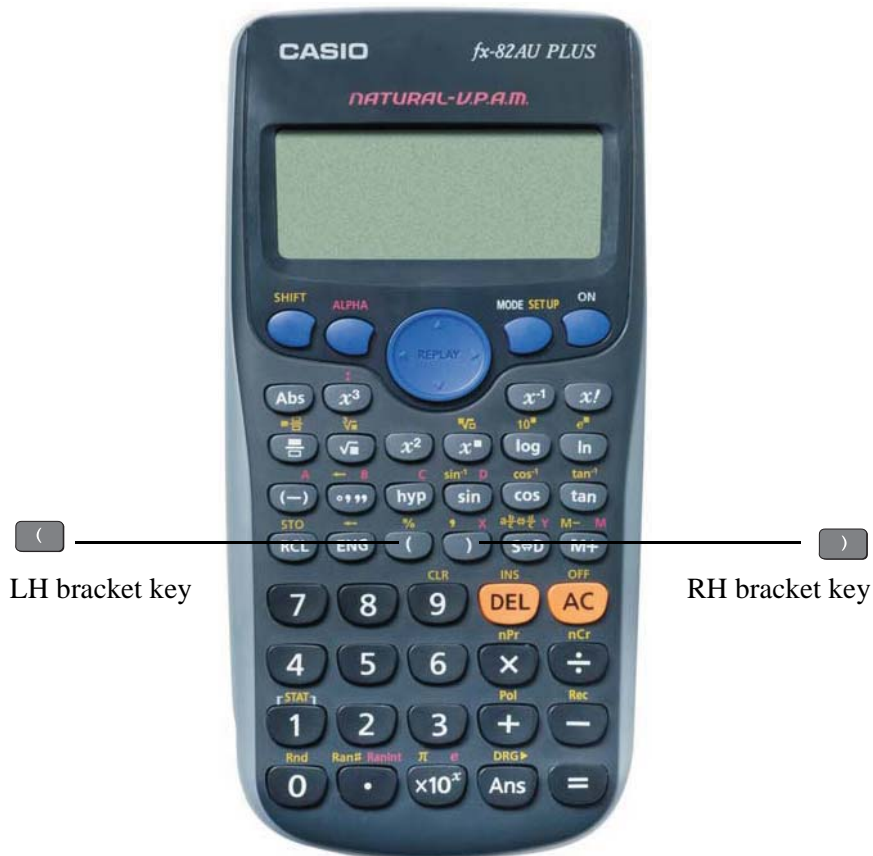
Try it.

The display should read 0.964285714

3. Brackets


Find the set of bracket keys on your calculator.

The fx-82AU PLUS 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 – ( 1)

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]

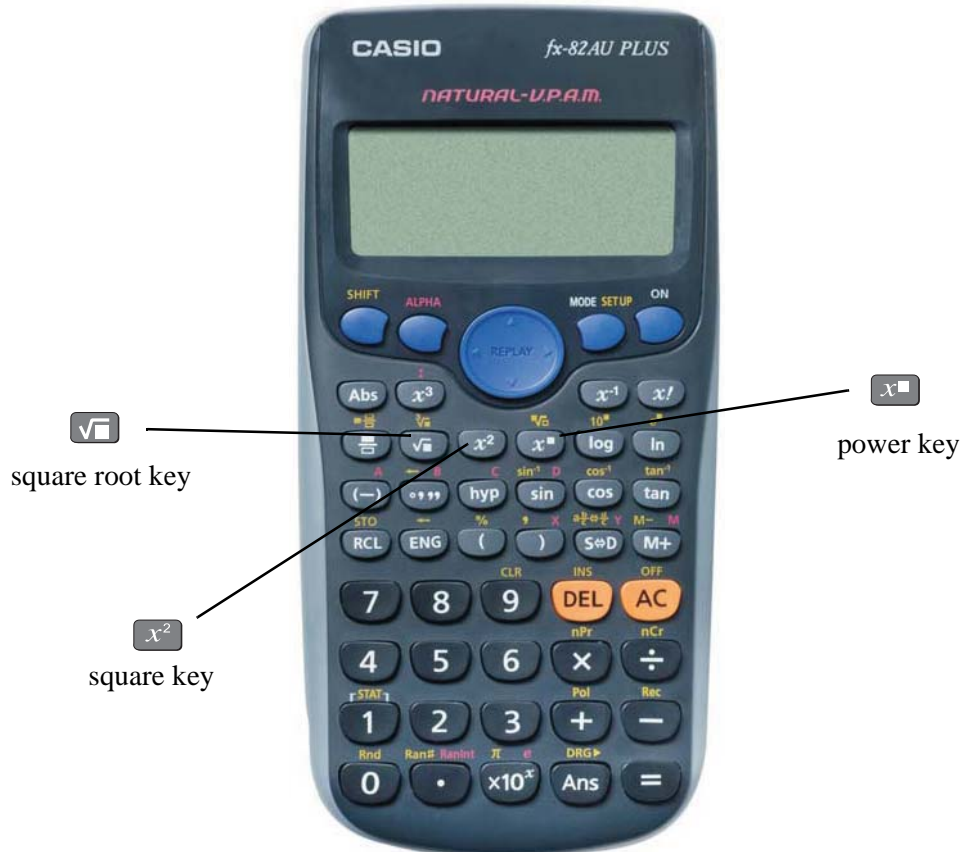
(d) $\frac{5}{(3 + 2)}$

Answers: 30; 180; 104; 1

4. Powers

4.1 Squaring and higher powers

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



Press $\boxed{6} \boxed{x^2} \boxed{=}$

the display should read 36.

Or you can use the power key on your calculator.

Find the $\boxed{x^{\square}}$ key on your calculator (similar to the key on your computer keyboard).

Example

To square 6,

that is, find 6^2 , type

$\boxed{6} \boxed{x^{\square}} \boxed{2} \boxed{=}$

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) 4.096×10^{-3} or 0.004096 (you move the decimal 3 places to the left)[remember to press $\text{S}\leftrightarrow\text{D}$ if you get a fraction].(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

$$\begin{array}{ll} \text{(a)} \sqrt{16} = & \text{(e)} \sqrt{49} = \\ \text{(b)} \sqrt{144} = & \text{(f)} \sqrt{169} = \\ \text{(c)} \sqrt{100} = & \text{(g)} \sqrt{121} = \\ \text{(d)} \sqrt{441} = & \text{(h)} \sqrt{361} = \end{array}$$

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 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**

1. Complete the following without using the calculator

$$\begin{array}{ll} \text{(a)} \sqrt{7^2} = & \\ \text{(b)} \sqrt{10^2} = & \\ \text{(c)} \sqrt{\square^2} = & 10 \\ \text{(d)} \sqrt{\square^2} = & 625 \\ \text{(e)} \sqrt{\square^2} = & 144 \\ \text{(f)} \sqrt{64} = & \square, \quad \text{because } 8^2 = \square \end{array}$$

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

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

Check your answers on the calculator.


Example:

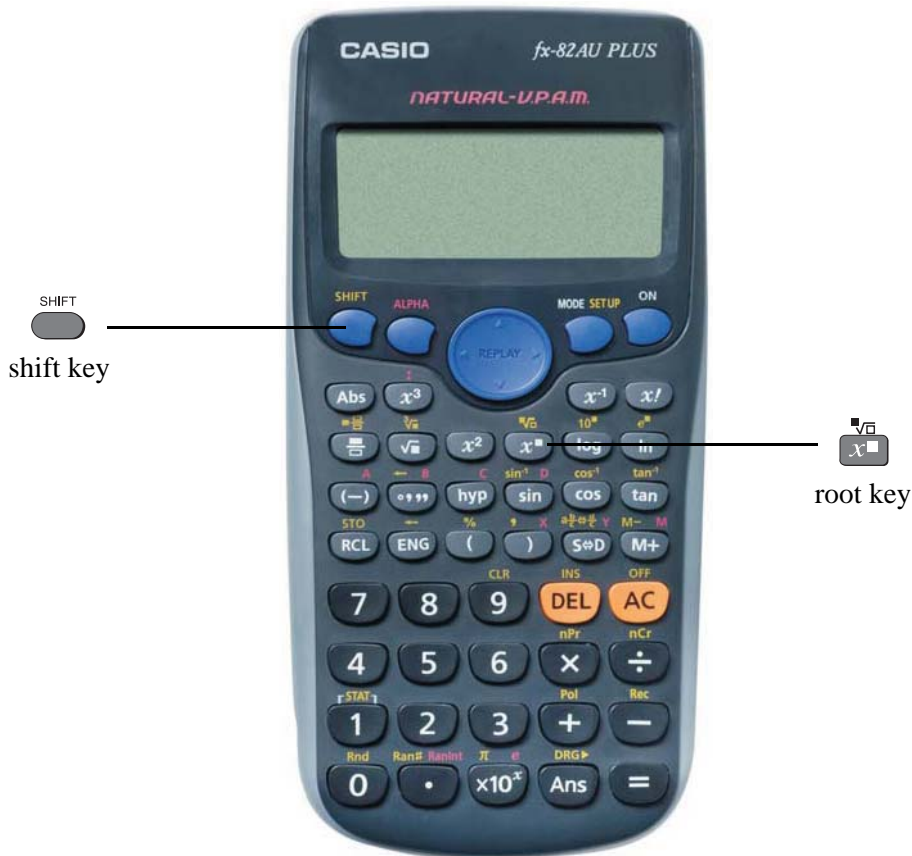
To do the following $\frac{8 + \sqrt{112}}{8}$ first rewrite it: $(8 + \sqrt{112}) \div 8$

The keystrokes will be  Your answer will be ≈ 2.32288 .

You could also use your fraction key to solve this problem.

4.3 Other roots

You can also use the root key on the calculator. Find the  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 $\sqrt[n]{x}$. The 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

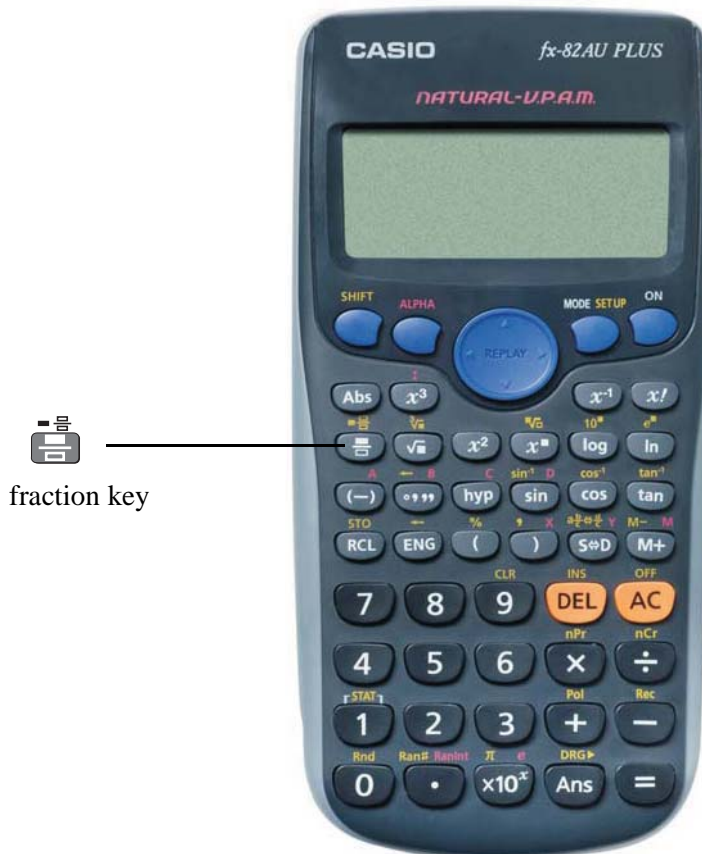
How do you add $\frac{1}{12}$ and $\frac{4}{63}$? Normally you would have to find a common denominator of 252.


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

 key



 fraction key

On the  key the '■' represents the whole part of a mixed

number and the ' $\frac{\square}{\square}$ ' represents the fraction part of a mixed number.

When the number you are typing is a proper or improper fraction the '■' 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 $\frac{37}{252}$

Example

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

Using the calculator the key strokes are:



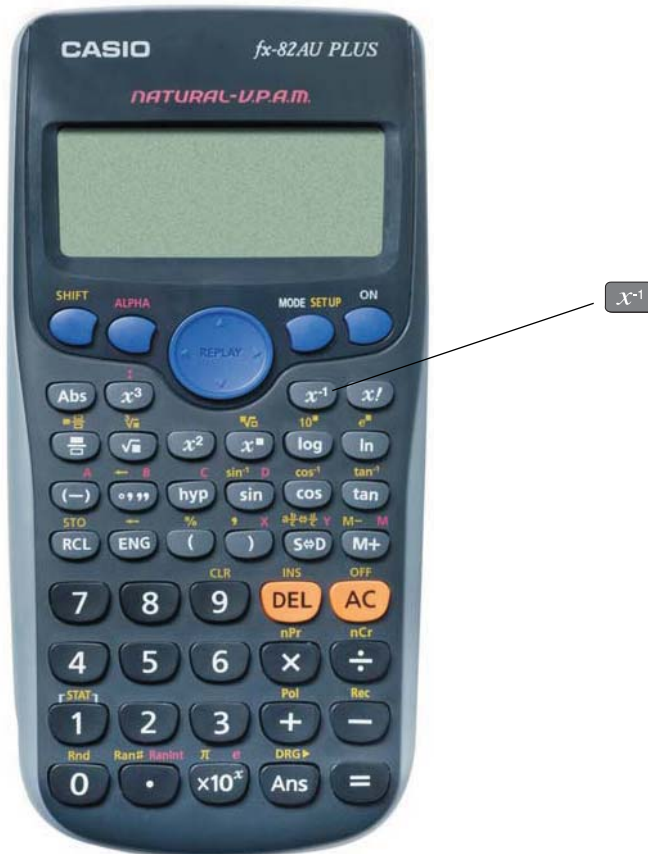
and the display will show $\frac{647}{72}$ press [SHIFT] [S \leftrightarrow D]

to turn it into a mixed fraction $8\frac{71}{72}$

If you press the [S \leftrightarrow D] key 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

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

The answer should be $\frac{4}{7}$ and press $\boxed{S\leftrightarrow D}$ to get 0.571428571. This would be the same as if you just typed $4 \div 7$

Take another example

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

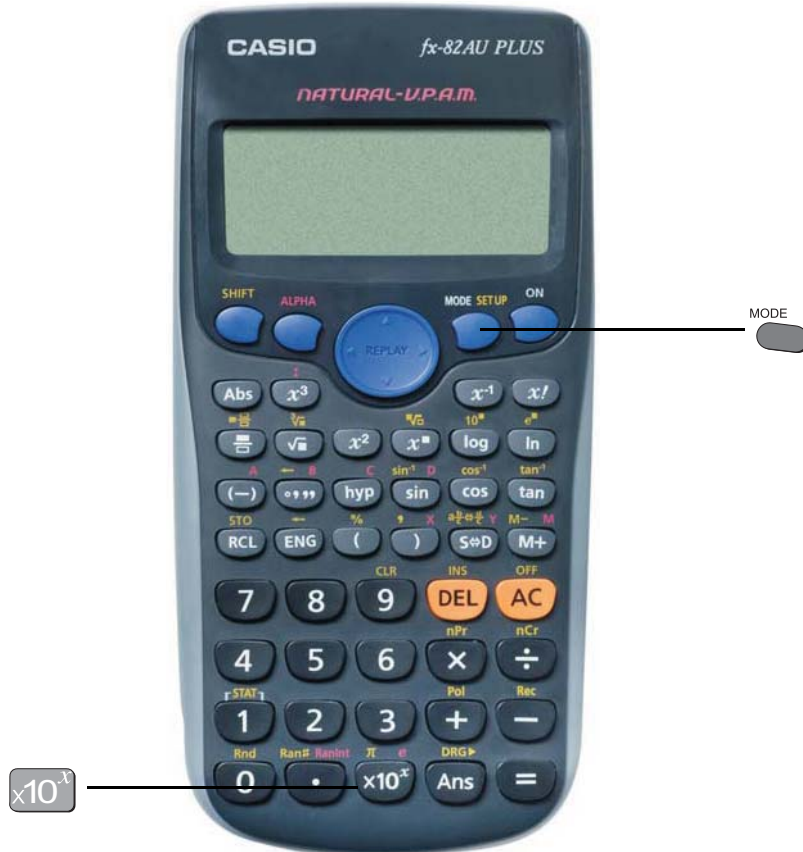
Type:

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

The answer should be $\frac{4}{77}$ and press $\boxed{S\leftrightarrow D}$ to get 0.051948051.

7. Scientific notation

Sometimes you may have numbers expressed in scientific notation, i.e., 7.24×10^3 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 $\times 10^x$ key.



Press $\boxed{7} \boxed{\cdot} \boxed{2} \boxed{4} \boxed{\times 10^x} \boxed{3} \boxed{=}$, the display should read 7240.

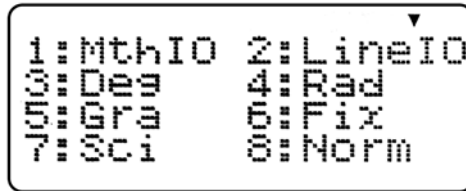
If you want to multiply two numbers e.g. $8.34 \times 10^{-2} \times 4.28 \times 10^5$. Press

$\boxed{8} \boxed{\cdot} \boxed{3} \boxed{4} \boxed{\times 10^x} \boxed{(-)} \boxed{2} \boxed{\times} \boxed{4} \boxed{\cdot} \boxed{2} \boxed{8} \boxed{\times 10^x} \boxed{5} \boxed{=}$

and the display will read $\frac{178476}{5}$ then press $\boxed{S\leftrightarrow D}$ to obtain 35695.2.

If you press $\overset{\text{SHIFT}}{\text{MODE}}$ then $\boxed{7}$, then $\boxed{0} \boxed{=} \boxed{\text{S}\Rightarrow\text{D}}$ the display will read 3.56952×10^4 .

Note: Pressing the $\overset{\text{SHIFT}}{\text{MODE}}$ gives you the display



The $\boxed{7}$ puts the calculator in scientific notation. The calculator then asks SCI 0~9? This gives the option of how many digits are displayed. The $\boxed{0}$ gives you 10 digits. Notice a small sci appears in the screen.

If you press $\overset{\text{SHIFT}}{\text{MODE}}$ then $\boxed{7}$ and then $\boxed{4}$ and then $\boxed{\text{S}\Rightarrow\text{D}}$ the display will read

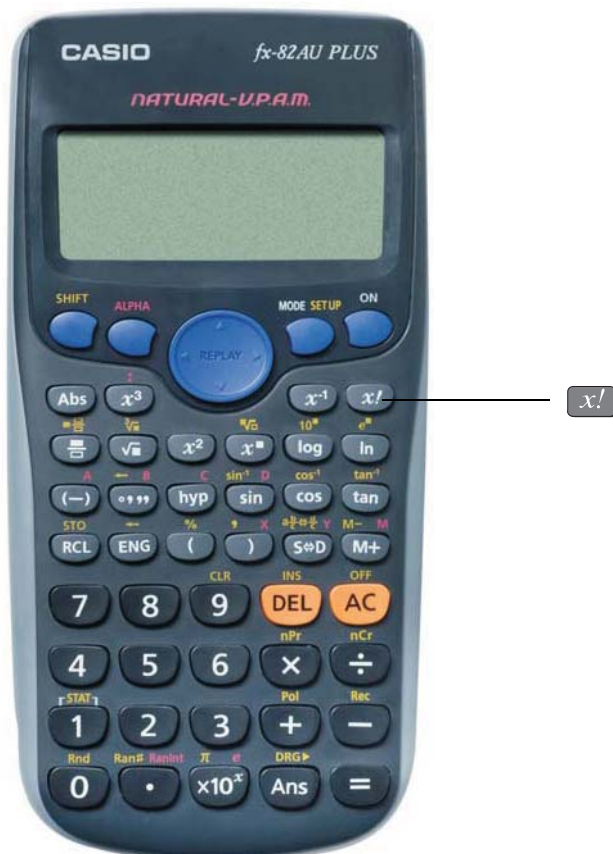
3.570×10^4 which means

3.570×10^4 . This rounds the number to 4 digits.

Practise using the $\boxed{\times 10^{\uparrow}}$ and $\overset{\text{SHIFT}}{\text{MODE}}$ 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 $\boxed{3} \boxed{x!} \boxed{=}$

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:

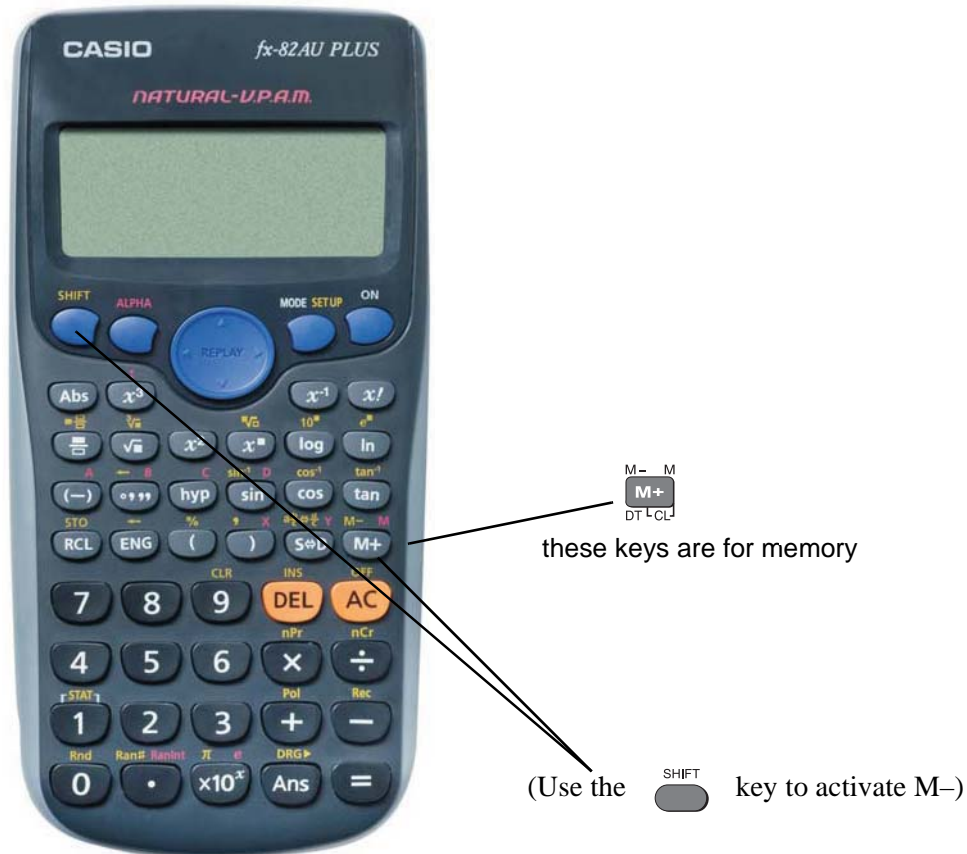
$$n! = n \times (n-1) \times (n-2) \times \dots \times 3 \times 2 \times 1$$

9. Using memory

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

Example 1

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



these keys are for memory

(Use the SHIFT key to activate M-)

To make sure memory is clear, first press



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 ÷ 1 6 = M+

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

then press

(2 3 - 1 6) x^2 ÷ 1 6 = M+

- this adds the second term (3.0625) into memory

then press

(1 7 - 1 6) x^2 ÷ 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 (or $\frac{99}{16}$).

Example 2

calculate the following:

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

first $\overset{\text{SHIFT}}{\square}$ $\overset{\text{CLR}}{9}$ 2 = AC to clear the memory then

press the following keys:

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

+ 1 2 ÷ RCL M+ =

your answer should be 11.39917438

(There are other memory keys in your calculator – the A, B, C, D, X and Y pink 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 $\bar{x} = \frac{\sum x}{n}$

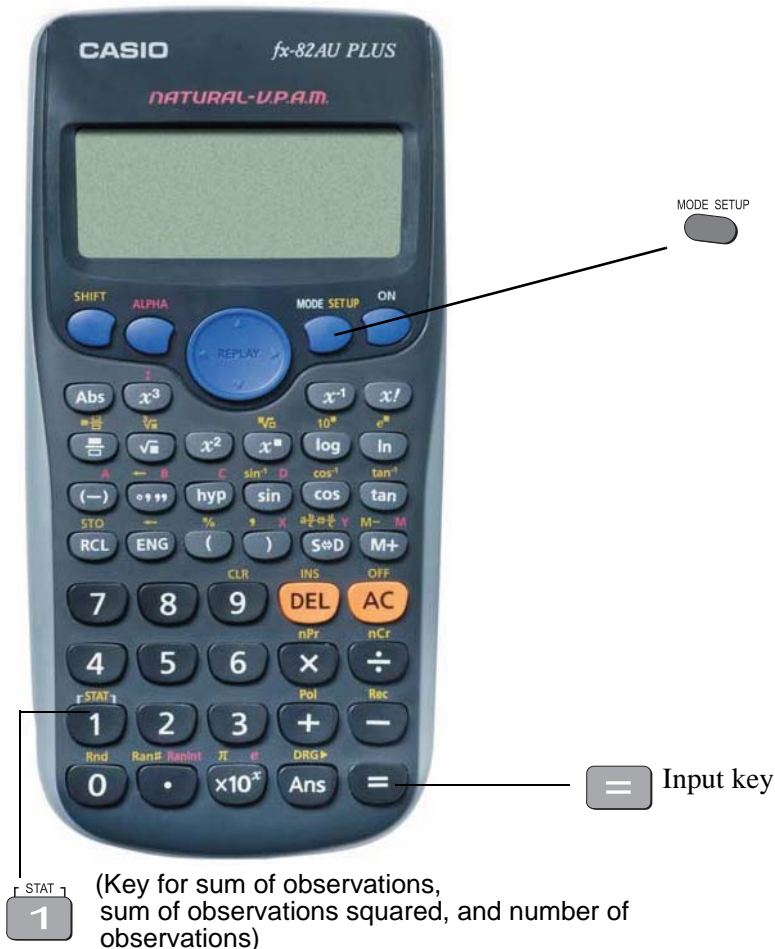
The formulas for the sample standard deviation are

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




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

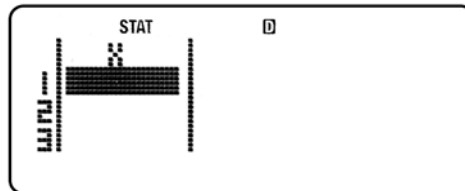
Your calculator will calculate the mean and standard deviation for you (the population standard deviation σ_n or the sample standard deviation σ_{n-1} – in data calculations you will usually use the sample standard deviation.)


On the Casio fx-82AU PLUS, σ and s are found in STAT. 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  once followed by  and  SD will appear in the centre of the screen.



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.

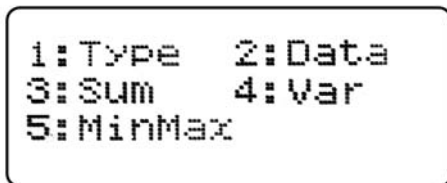
Step 1: Input the observations.

            then press 

Step 2: Display the mean and standard deviation.

Press  




the display shows five alternatives



Press  then   gives $\bar{x} = 3$

Press      gives $s_{on} = 5.099019514$

Press      gives $s_{on-1} = 5.700877126$

Note: to clear stat data, just press    again.






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) and inputted data set B, 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.

     = Σx^2 = 815



     = Σx = 15

     = n = 5

If you have made an **error** with inputting your data you can correct it by going back to the data. Press   

For example, you input

4, 5, 60, 7, 9 and you meant to input 6 instead of 60. Go to the data no. 3, 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 $s^2 = 1.4$ kg²

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









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.

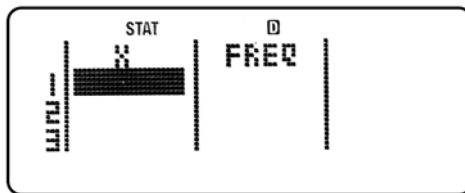
The calculator usage now has a small modification because we have been given the frequencies for the variable values. (There is no need to input each single observation.)

You need to set up your display for inputting frequencies:

Press:

-   (for stats)
-  (for 1-variable)
-     (for STAT)
-  (for frequency **ON**)

the display should look like this.

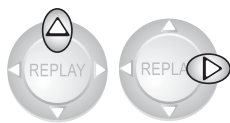



Now press

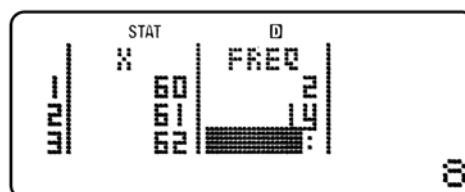


Now put frequencies

Move the cursor to the Freq column



add each frequency followed by  to get a display



Press **AC** then

SHIFT **1** **4** **2** **=** and the display should read 61.766667

SHIFT **1** **4** **4** **=** and the display should read 1.1943353

x² **=** and the display should read 1.4264369

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

Year	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Rain (mm)	1 340	990	1 120	1 736	260	1 100	1 379	1 125	1 430	1 446
Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Rain (mm)	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:

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

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:

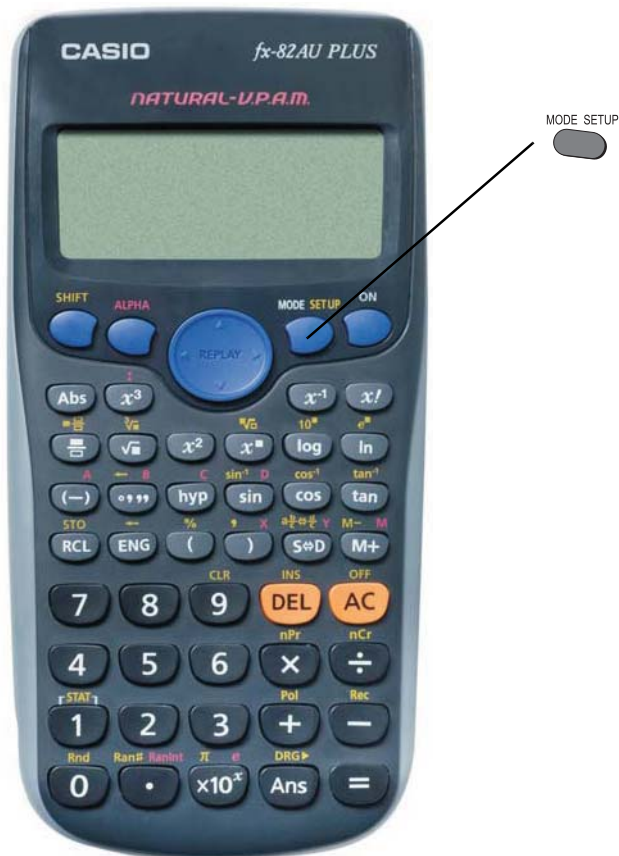
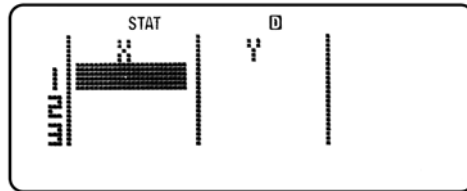
$$s^2 = 0.49 \text{ cm}^2$$

[Remember to reset the display with **FREQ OFF** press



11. Linear regression

To access the linear regression mode you press  key followed by  , the display






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  once then  

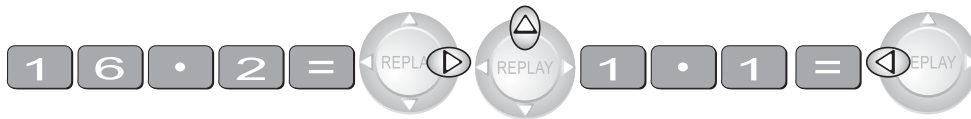
(2 = **Linear** Regression; there are 7 other types)

2. 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:






Continue in this manner. Use the  to move around the columns



After you have input all the numbers, don't forget to press 

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    (for Reg).

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

\overline{x} : $\overline{\text{SHIFT}}$ 1 4 2 to get the mean thickness or the standard deviation.

\overline{x} : $\overline{\text{SHIFT}}$ 1 4 2 = 15.94

$x_{\sigma_{n-1}}$: $\overline{\text{SHIFT}}$ 1 4 4 = 0.6432

\overline{y} : $\overline{\text{SHIFT}}$ 1 4 5 = to get 1.05

$y_{\sigma_{n-1}}$: $\overline{\text{SHIFT}}$ 1 4 7 = to get 0.1434

You can also use the $\overline{\text{SHIFT}}$ 1 5 to predict the length, given the thickness. If 0.6 is the

thickness then press 0 . 6 $\overline{\text{SHIFT}}$ 1 5 4 = = 5.47mm.

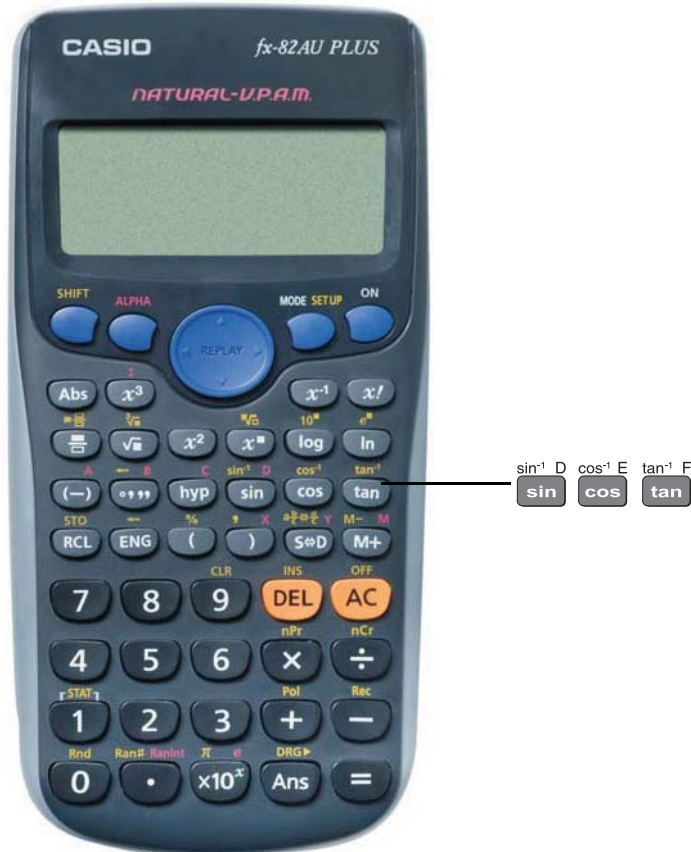
Similarly, if the length is 12mm then press



1 2 $\overline{\text{SHIFT}}$ 1 5 5 =

to get 0.88 mm as the predicted thickness.

12. Trigonometric functions

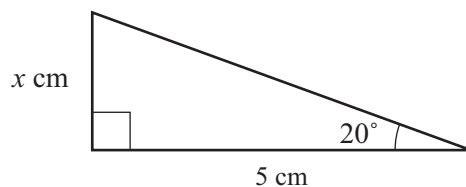
The keys involved are:



Important: Make sure that your calculator is in the correct mode. For example, if your calculator has R or G on the display and you wish to work in degrees, press   and then select 3 for degrees. Your screen should now display D.

Example 1

In the right-angled triangle below, the length of the side opposite the 20° angle needs to be calculated.



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

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

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

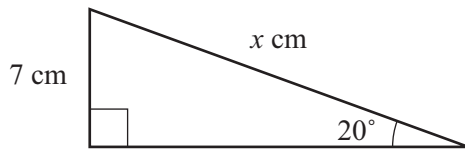
The keystrokes on the calculator are:



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:

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

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

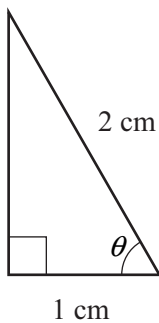
The keystrokes on the calculator are:



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 θ in degrees:



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

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

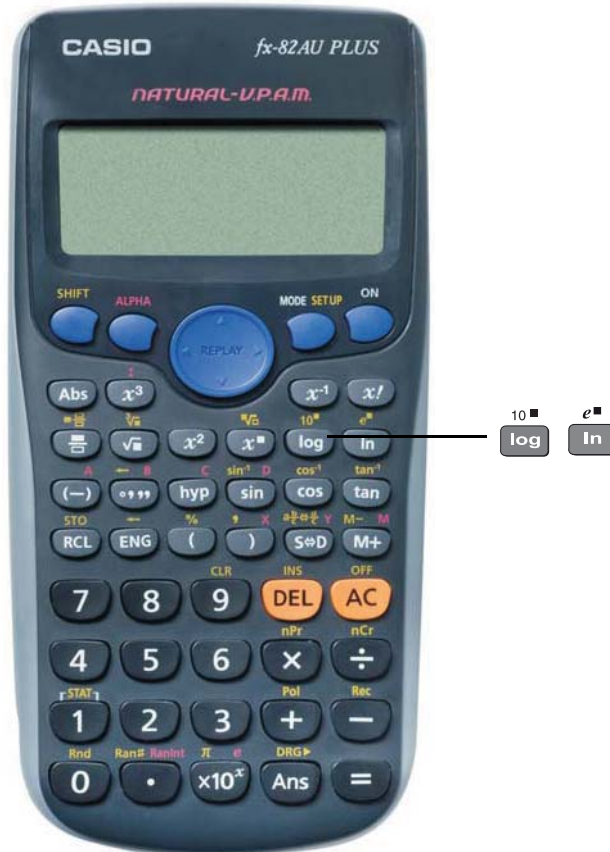


Note: You must first get the value of the division by using the () brackets, but this calculator automatically inserts the first one for you.

Your display should read 60° . If it does not, check that you are in degree mode.

13. 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;

$$\begin{aligned}\log 2^a &= \log 20 \\ \Rightarrow a \log 2 &= \log 20 \\ \Rightarrow a &= \frac{\log 20}{\log 2}\end{aligned}$$

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 x^y 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:



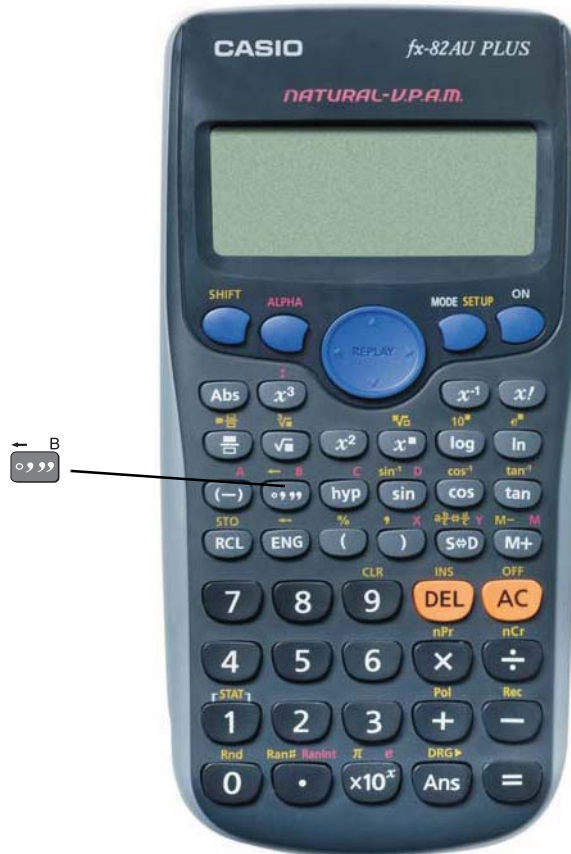
Your display should now read 3.3019272

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



14. 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° , 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 $13^\circ 38' 19''$.

Press $\overset{\text{SHIFT}}{\text{°'°}}$ and the display should read 13.63861111.

Review calculator exercises

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

Calculator solutions

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

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

Either $345.6 - 17.2x^2 = \sqrt{\text{Ans}} = \div 5 =$ 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: $0.1366 x^2 \div 6 + .2 x^2 \div 6 = \sqrt{\text{Ans}} = \times 2.015 = \text{M+}$
 $+ 4.1333 - 3 =$
 $4.1333 - 3 - \text{RCL} \text{M+} =$

(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) Σx (ii) Σx^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 = 6.2 = (-) 2.1 = .04 = 8.2 = 7.4 = 2.1 = (-) 1.7 =

(i) 22.64 Press the key that says Σx (SHIFT STAT 1 4 2 =)

This gives the total growth over the last 8 years

(ii) 178.4016 Press the key that says Σx^2 (SHIFT STAT 1 4 1 =) This gives the sum of the squares of the growth in each year

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