Calculators

Getting to Know Your Scientific Calculator

Your calculator may be different from the one pictured above; however it will have the same functions. Possibly the functions will be positioned differently and possibly they will have a slightly different notation but the calculator pictured is a good place to start!

An important button to note is the *shift* button (the top left button in the above picture), this button is like the shift key on a keyboard in that it allows you to activate the secondary function of the other buttons. However, you don't hold it down (like you do on a keyboard), instead you just press it (a small s should appear on the screen) then press the desired button. You may also have an *alpha* button, which activates a third function of the buttons. The relative functions are colour coded.

FIRST STEPS

1) Make sure your calculator is, at this stage, in the normal computation mode:
   a) Press the MODE key, you should see some options such as "COMP", "STAT", "VERIF", and "CMPLX" (for some models you may have to press more the once).
   b) Select the number (usually 1) related to COMP.
   c) If you find your calculator is giving strange results, or has a strange display, you may have accidently left COMP mode and should repeat these steps.

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2)   Also at this stage, we will setup your preferences for how maths, angles, and numbers are displayed:

   a)   Press the $\boxed{\text{SHIFT}}$ key then the $\boxed{\text{MODE}}$ key to access the SETUP menu, a lot of options will appear (some calculators access these options by pressing the mode key multiple times)

   b)   "MthIO" and "LineIO" allows you to change how maths objects (things such as fractions and roots) are displayed. MathIO is the natural math mode and displays things just as you would write them on paper, while LineIO displays everything in a single line. Selecting MathIO is recommended (you may then be asked for "MathO" or "LineO", select MathO)

   c)   The next three items are "Deg", "Rad", and "Gra". These allow you to choose what units angles are measured in: degrees, radians, or grads. If you are unsure what radians are, you should select degrees. You can change your preference at any time, even in the middle of a calculation.

   d)   The last three items (at least on the first page) are "Fix", "Sci", "Norm". These allow you to change how numbers are displaced.

       i.   Fix: displays numbers with a fixed number of decimal places that you specify.
       ii.   Sci: displays numbers in scientific notation.
       iii. Norm: displays numbers in the normal notation. Selecting this option is recommended, you may then be asked for Norm 1 or Norm 2, select Norm 2 to avoid scientific notation for as long as possible (Norm 1 uses scientific notation for numbers less than 0.01, that is it would write 0.005 as 5×10^{-3}, while Norm 2 uses decimals until the numbers are smaller than 0.000000001).

3)   Become familiar with the ordinary operators in maths:

   a)   Addition, $+$, Subtraction, $-$, Multiplication, $\times$, and Division, $\div$.

   b)   Brackets/Parentheses, ( ), are also very useful.

   c)   The calculator recognises the conventional *order of operations* and so any straightforward calculation may simply be typed in following the order from left to right, including brackets (do not press $=$ until the entire expression is entered).

   d)   If a negative number is needed, then use the $\boxed{\text{(-)}}$ key. On some calculators, $\div$ is represented by $/$.

Example

Calculate $5 + 3 \times -2 - 4 \div 2$

Type from left to right, pressing $\boxed{\text{(-)}}$ then $\boxed{2}$ for -2 and the calculator display should show exactly the calculation above. Pressing the $\boxed{=}$ key should give the result -3. (This is because the calculator does the multiplication and division first, so it does $5 + -6 - 2$, that is, it uses the conventional, correct, order). If brackets are inserted at all, the calculation will be changed. There is no need to press $\boxed{=}$ until all the full expression has been entered.

If you want to know more about the order of operations in mathematics, have a look at *Calculations – Order of Operations in Mathematics*.

CLEARING AN ENTRY; CLEARING EVERYTHING

You wish to calculate $3 + 5 - 2 \times 6$. But, oops! You typed $3 + 5 \oplus 2 \times 6$. You can easily correct the error without having to retype the whole calculation:

- The $\boxed{\text{Replay}}$ button (the large one in the middle) gives a cursor. Press the left side of $\boxed{\text{Replay}}$ until the cursor is immediately after the character you want to correct (this time it's the second $+$).
- Press the $\boxed{\text{DEL}}$ key and type the $\boxed{-}$. Press $\boxed{=}$ and the correct answer is displayed (-4).

You can correct an entry as you go or after you have found an answer, as long as the calculation is still displayed. You do not have to clear everything each time you operate the calculator. If you have obtained an answer from a calculation by pressing $\boxed{=}$, then you can begin a new calculation straight away. However, if you do need to clear everything, press $\boxed{\text{AC}}$.

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FIXED AND SCIENTIFIC NOTATION

Fix refers to "fixing" the number of decimal places to which you would like a calculation to be accurate ("rounding"). For example, you may do the calculation 9.61 × 5.83 but you only want two decimal places in your answer (you might buy 9.61 kg of potatoes at $5.83 per kg).

   a) Press SHIFT then Mode (Mode repeatedly depending on calculator model) until the "Fix", "Sci", and "Norm" options are reached.
   b) Select Fix. It asks how many decimal places you require: in this case press 2.
   c) Enter the calculation: instead of the answer 56.0263, you will see 56.03.

To return to the normal amount of decimal places, select Norm (see the First Steps section above).

Sci refers to *scientific notation*. This enables very large or very small numbers to be displayed using powers of 10. Sci asks you to nominate the number of *significant figures* you wish displayed in your answer. (Significant figures are different from decimal places. If you need further explanation, please refer to *Ways of Writing Numbers – Scientific Notation, Significant Figures, and Decimal Places*.)

For example, calculate 6693.82 × 41365.3, giving your answer in scientific notation, correct to 3 significant figures. (The answer in "normal" notation is 276 891 872.4 (quite a large number!).

   a) Press SHIFT then Mode (Mode repeatedly depending on calculator model) until the "Fix", "Sci", and "Norm" options are reached.
   b) Select Sci
   c) Press 3 for the number of significant figures
   d) Enter the calculation as usual, when you press $=$, the scientific notation for the answer is displayed: 2.77×10^8. There are 3 significant figures in this result (2, 7 and 7) and the power of 10 (8) tells us that the 2 represents two hundred million!

To return to the normal display, select Norm (see the First Steps section above).

FRACTIONS

This information is about the calculator entries required for calculating with fractions. If you need practice with fraction calculations by hand, please refer to *Fractions – 1. Manipulating Fractions*.

The fraction key may look different on your calculator.

On the Casio fx-82AU PLUS II it is: $\boxed{\frac{\blacksquare}{\square}}$ While on the Casio fx-100AU, it is: $\boxed{a\frac{b}{c}}$
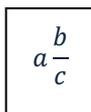
To enter $\frac{3}{4}$ into the calculator, press: $\boxed{3}$ $\boxed{\frac{\blacksquare}{\square}}$ $\boxed{4}$ or press the $\boxed{\frac{\blacksquare}{\square}}$ key and fill in the boxes.

Note that in inline mode $\frac{3}{4}$ is represented by 3⌋4.

To enter a mixed number, press SHIFT then $\boxed{\frac{\blacksquare}{\square}}$ and fill in the boxes, or on earlier models press the fraction key after each number, e.g. to enter $2\frac{3}{4}$:

$\boxed{2}$ $\boxed{a\frac{b}{c}}$ $\boxed{3}$ $\boxed{a\frac{b}{c}}$ $\boxed{4}$

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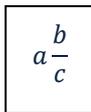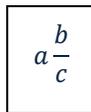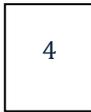
Example to try:

$$3\frac{1}{2} + \frac{3}{4} \times 4\frac{1}{5}$$

RAISING A NUMBER TO A POWER (FOR EXAMPLE, SQUARING)

Pressing a number followed by the $\boxed{x^2}$ button squares the number. For example 3^2 is found by entering $\boxed{3}$ followed by $\boxed{x^2}$. (Answer 9.)

To square a minus (negative) number, you MUST use brackets.

Example

To calculate the square of -3. You would use $(-3)^2$. The actual buttons to press would be: $\boxed{(}\ \boxed{(-)}\ \boxed{3}\ \boxed{)}\ \boxed{x^2}\ \boxed{=}$. <u>You will never get a negative answer when you square a single positive or negative number.</u> For further information, please refer to *Calculations – Order of Operations in Mathematics* and *Directed Numbers – Sorting the Positives From the Negatives*.

To raise numbers to powers other than 2, the button to use is written differently on various calculators. It could be $\boxed{x^y}$, $\boxed{x^\blacksquare}$, or $\boxed{\wedge}$ (for example). For this resource, we will use $\boxed{x^\blacksquare}$.

An example might be:

$$2^4 + 3^2 - 5^3.$$

This would be entered as:

$$\boxed{2}\ \boxed{x^\blacksquare}\ \boxed{4}\ \boxed{+}\ \boxed{3}\ \boxed{x^2}\ \boxed{-}\ \boxed{5}\ \boxed{\wedge}\ \boxed{3}\ \boxed{=},$$

and the answer is -100. Make sure you leave powers box by pressing right on the replay button after entering 4 if you are in natural math mode.

You can also use $\boxed{x^\blacksquare}$ (or its equivalent on your calculator) to do squaring.

CALCULATING A SQUARE ROOT

Most whole numbers do not have an exact whole number square root. So do not be surprised to see a large number of decimal places for something that looks as simple as $\sqrt{5}$, for example. The square root is found using the $\boxed{\sqrt{\ }}$ key.

Find the square root of 5: press $\boxed{\sqrt{\ }}$ followed by $\boxed{5}$ and get 2.2360 .... Some calculators require brackets for the number and automatically insert the first bracket. You need to close the brackets by using the $\boxed{)}$ key. Some other calculators will keep you under the square root sign until you tell it to leave by pressing right on the replay button.

Often you are asked to find the square root of a quite complex calculation. For example: $\sqrt{15^2 + 13.2^2}$. Here you press the $\boxed{\sqrt{\ }}$ first, then immediately the open bracket $\boxed{(}$ key. Press $\boxed{1}\ \boxed{5}$, then $\boxed{x^2}$ followed by $\boxed{+}$ then $\boxed{1}\ \boxed{3}\ \boxed{.}\ \boxed{2}$ then $\boxed{x^2}$. Close the brackets with $\boxed{)}$. Press $\boxed{=}$. Answer: 19.980 ... (if you are in natural math mode you don't need the brackets, but there is no harm in having them!)

More complicated: $\sqrt{\dfrac{12.8^3}{3} - \dfrac{5.3^2}{2}}$

STATISTICS MODE

If you decide to try STAT mode you will be given a range of statistics modes. "SD" or "1-VAR" gives calculations such as mean, standard deviation, total scores, sums of squares. "Reg", "A+BX", "AX^B" and other such formulas allow two variables to be entered at once and the coefficient of correlation, and the regression equation's coefficients

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are calculated. It may be easiest to refer to your calculator booklet to find out the way to enter data and to calculate these values.

LOGARITHMS

For further information about the meaning and uses of logarithms, please refer to *Powers and Logarithms – 2. Logarithms*.

There are generally two logarithm keys on your scientific calculator. The first is obvious: $\boxed{\log}$, but the second is not quite so obvious: $\boxed{\ln}$. This is actually the letters l and n (not "I" and n). Pressing $\boxed{\log}$ followed by a number will calculate the logarithm to base 10, ($\log_{10} number$), and pressing $\boxed{\ln}$ followed by a number gives the logarithm to base e ($\log_e number$). The context (or formulas) will tell you which one to use.

You will notice that there are still many buttons and functions that we have not explained in this resource. If you would like further information or if this information did not cover anything you feel you require, the please make an appointment with the Maths Support Lecturer, Learning Development, through reception on 02 4221 3977, or Level 2 (top floor), Building 11, or through your campus.

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