



## Using a Calculator

Calculators are a great tool for speeding up calculations and solving problems, but it's important to know how to use them properly. For many of the things you need to do in math and science courses, a few tips and tricks can go a long way towards making you more efficient at calculations.

For what you do at VCC in Adult Basic Education, College Foundations or University Transfer courses, you're going to need a scientific calculator. There are two main styles of calculators. Older calculators use a system called **post-fix calculation**. The buttons that perform functions other than the four basic operations change the value on the display without needing the [=] key. Newer calculators have displays that show the symbols for these functions, and let you type things in the same order that you'd write them down or see them in your textbook. We'll call this **natural calculation**.

If you're not sure which kind of calculator you have, try this experiment: Clear your calculator and press these keys:

**4** **5** **cos**

Note: no [=] key! If the number in the display has already changed to a decimal number at this stage, you have a postfix calculator. It might be worth buying a newer calculator, since they have more functionality, including some of the very useful features that are in the following tips and tricks.

### HOW TO GET THE MOST OUT OF A SCIENTIFIC CALCULATOR

- Keep your numbers in your calculator while you're performing a sequence of calculations. **Don't use the Clear key between calculations** if you're continuing with the result of the previous calculation. Let's say you have to calculate  $(6 \div 7) \times 0.35$ ; many students will do this:

6	÷	7	=	0.8571429	
C	C	C	C	C	0.
0	.	8	5	×	
0	.	3	5	=	0.2975

The answer sheet, however, says that it's 0.3 exactly. Is the student's answer wrong? Is it close enough? The reason the answers don't match exactly is that the student rounded (by clear-clear-clearing the calculator and typing only the beginning of the number — it's not even rounded properly!) and the person who wrote the answer sheet didn't. The instructor probably kept the 0.8571429 (and any other digits that the calculator doesn't have room to show, but are still in memory) and typed [ × ][ 0 ][ . ][ 3 ][ 5 ][ = ] to get a more accurate answer.



In science courses, calculations where you reuse a number you just calculated are very common. Every time you clear a calculator and retype, the final answer becomes a little more incorrect. For better answers, resist the urge to clear your calculator.

- Sometimes a calculation uses a previous result, but it's awkward or impossible to use that result at the start. In the previous tip, we're able to multiply 0.85714... by another number because the calculator remembered it. Consider:  $19 \div \sqrt{23}$ . We'll need to know  $\sqrt{23}$  before we can divide 19 by it. Most calculators will let you do the whole calculation at once, but let's assume that the  $\sqrt{23}$  is already a complicated calculation, or a number that part (a) of a question wants, so we have a reason to get that result before we divide into 19. To avoid having to write down what  $\sqrt{23}$  is and retype it into the calculator, we **use the Ans key** (short for "Answer"). Some calculators have an [ANS] key by itself, while others make it a second function of some other key (like the [=] key). This key allows us to insert the previous answer in our next calculation anywhere we want.

√	2	3	=	4.7958315	
1	9	÷	Ans	=	3.9617739

Note that the Ans key works differently from the memory keys. If the next calculation you did also involved  $\sqrt{23}$  (but not  $19 \div \sqrt{23}$ ), the last answer is 3.96..., so you'd need to enter  $\sqrt{23}$  again.

- If you make a typing mistake on your calculator, most modern calculators have cursor and delete keys! You can **edit what you've typed into the calculator**, rather than pressing clear and typing everything over again. This can save you time in an exam.
- There's a key that will do **scientific notation** on your calculator. The key is either marked [Exp] or [EE]. (What does it stand for? We wish we knew. To help you remember, think of the "e"xponent that's always part of scientific notation.) It replaces the phrase "times ten to the". You only need to type the numbers at the beginning and at the end. Instead of:

6	•	0	2	2	x	1	0	y <sup>x</sup>	2	3		
you can type...												
6	•	0	2	2	Exp	2	3					6.022 <sup>23</sup>

Typing it the long way usually works, but it occasionally causes errors with order of operations (which modern calculators all use). This key enters the amount as a number, rather than as another set of steps for the calculator to perform.

- When entering the contents of a fraction into calculator, evaluating the numerator and denominator has the same priority in BEDMAS as brackets. To be sure that something like  $\frac{6+\sqrt{15}}{4}$  gets entered correctly, **put the numerator and denominator in brackets**.
- Finally, if your calculator gets stuck in some weird mode that you can't get out of, you can always **push the reset button** on the back of the calculator with the tip of a pen.



## HOW TO GET THE MOST OUT OF A GRAPHING CALCULATOR

First, decide whether you actually need one. There's no course at VCC that requires it, and the jump from a heavy-duty non-programmable scientific calculator to a full-screen graphing calculator is about \$100. You can borrow a graphing calculator at the Learning Centre (though it can't leave the library), and use a scientific calculator for everyday homework. (You also generally aren't allowed graphing calculators in exams.)

If you do decide to get one, or when you borrow one of ours, here's what you can do:

- You can **change the view of a graph** using the [WINDOW] key just below the screen. Xmin and Xmax define the positions of the left and right edges of the screen, and Ymin and Ymax do the same for the top and bottom edges. These default to -10 and 10 for both directions, and that works for most, but not all, graphs you'll be doing. Xscl and Yscl determine where the tick marks on the axes go. Xres doesn't do much, really.
- If you need to **put two graphs on the same screen**, you can change the line display for one of them so you can tell them apart. Press the left cursor key on one of the equations you've entered into the calculator over to the \ to the left of the equation. The \ should now be blinking. Press enter to cycle through the possible line displays. (This feature lets you graph inequalities as well, but you have to tell it which side of the graph to shade.)
- The calculator will produce a **table of values** for you. After you've entered an equation, press [2nd][<sup>TABLE</sup>GRAPH] to get the table, which you can scroll through. If you want the table to start at a different value, or increment by a different value, press [2nd][<sup>TBLSET</sup>WINDOW] to access the table's set-up menu. TblStart is the lowest value the table will display, and  $\Delta$ Tbl is the amount by which each row of the table advances. (The default is 1, but if you set it to, say, 0.5, then a table will display values for -3, -2.5, -2, -1.5, -1, and so on.)
- The calculator can do **scatterplots, histograms and boxplots**. Press [STAT], then choose [1] to enter or edit lists of data. You can then use [2nd][<sup>STATPLOT</sup>Y=] to define what kind of graph you want, and which lists of data to use. Be sure to set the plot to On in order to display it. You can see the graph using the [GRAPH] key. (If there are graphs of equations already there, you'll need to turn them off under the [Y=] menu, and of course, your Window settings have to be set to show the area of the graph where the plot would be found.)

If you just need the mean or standard deviation of a set of statistical data, you can get it by going to [LIST], then moving the cursor right to CALC... and selecting the kind of statistics you want: 1-Var Stats for mean and standard deviation, and LinReg for a regression line. On the other hand, your scientific calculator probably has a stats mode that will also do this for you. Look at your manual to see how to use it.

### SINCE WE CAN'T COVER EVERYTHING...

As a final note, most calculators have a manual online. Calculators have a model number printed on them, and if you Google the brand, the model number and "manual" together, you can look at an online copy. Find out what your calculator is capable of!

