



hp calculators

HP 17bII+ Using algebraic mode

Calculation modes

Order of Operations

Use of Parentheses

Functions of a single number in algebraic

A simple example in algebraic

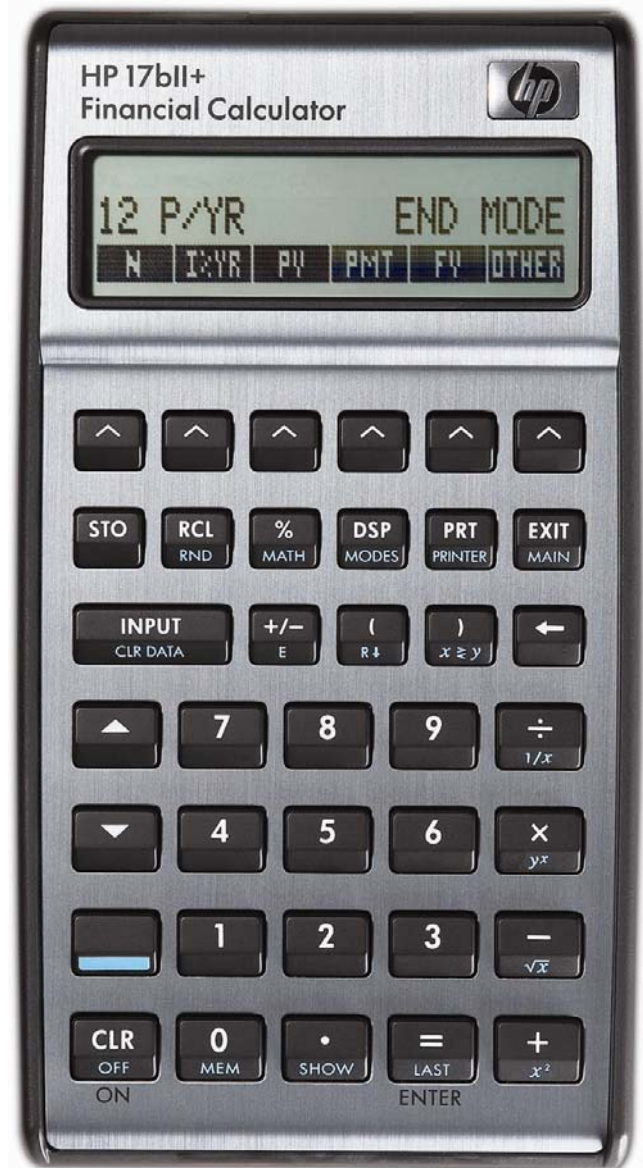
Another example - the area of a piece of carpet

Making corrections

Functions of two numbers

Algebraic operator precedence







Reusing a previous result







Calculation modes







The HP 17bII+ allows calculations to be made in “RPN” mode or in “algebraic” mode.

RPN mode is the traditional way most HP calculators work. To add 1 and 2, keys are pressed in the order









   . (Note that in RPN mode,  can be used instead of  if desired). This mode is very suitable for calculations where the user is working towards a solution, without having a particular formula to work on. This mode is described in another learning module.

Algebraic mode is the way many newer HP calculators work. It is also the way most other calculators work. To add 1 and 2, keys are pressed in the order    . This way of working is most suitable when the user just needs to type a formula and get an answer.



Order of Operations

In algebraic mode, the HP 17bII+ solves problems by evaluating functions in the order in which they are entered. For example, the calculation $1 + 2 \times 3 =$ will be solved by the HP 17bII+ by first pressing     at which point, the HP 17bII+ will evaluate the $1 + 2$ part of the calculation, generating the intermediate answer of 3. Then pressing   will cause the HP 17bII+ to multiply the intermediate answer of 3 by 3 to get the final result of 9.

Use of Parentheses

If you wish to change the order of execution of functions, then you can use parentheses to tell the HP 17bII+ to perform certain functions before others. For example, to evaluate the calculation $1 + 2 \times 3 =$ so that the multiplication is performed before the addition, press:         and the result of 7 will be displayed (note that to access the parentheses, the shift key must be pressed in the keystroke list above). In this case, the parentheses told the HP 17bII+ to evaluate the calculation starting inside the parentheses and working outward. Note that inside parentheses, the HP 17bII+ will evaluate calculations in the order in which they are entered, unless another level of parentheses is used.

Functions of a single number in algebraic

As an example, in algebraic mode, to square a number, type the number and press  . This is the way all functions of a single number work in algebraic.

A simple example in algebraic

Example 1: A gardener wants to plant a triangular piece of ground and to put protective edges around the plot. The plot will have a right angle and the two shorter edges will be 1.2m long and 0.5m long. How long will the third edge be?

Solution: The length can be calculated using Pythagoras' formula. From $a^2 + b^2 = c^2$ the third side is:

$$c = \sqrt{a^2 + b^2}$$

To try this, first set algebraic mode, pressing . Now to square 1.2 and 0.5 and add them together, type:



Figure 1

Answer: 1.69. To find the length of the third side at this point, press $\sqrt{\quad}$ $\frac{\square}{\square}$.

Note: When functions are printed, some come before the number, for example $\sqrt{2}$ or $\log(30)$. Others are printed with the function after the number, examples are $6!$ or 5^2 . Calculators rarely work like this; on the HP 17bII+, all functions of one number are calculated by typing the number first, followed by the function.

Another example - the area of a piece of carpet

Here is another example to show how arithmetical calculations involving addition and multiplication are carried out using parentheses in algebraic mode.

Example 2: A new carpet is needed for two rooms, one 6 yards long, one 8 yards long, both 5 yards wide. What is the total area of carpet to be bought?

Solution: The area is calculated using the expression $(6 + 8) \times 5$.

In algebraic mode the total length can be calculated first, 6 yards + 8 yards. Then the length is multiplied by the width, 5 yards.

So these keys would be typed:

| | | | |
|----------|---|---|---|
| $($ | | | This enters the open parentheses to put around (6+8) |
| 6 | + | 8 | This gives the 6+8 |
|) | | | This enters the close parentheses |
| \times | 5 | | This multiplies by 5 |
| = | | | This tells the calculator that the formula is finished so it can now get the answer |

and the answer would be shown



Figure 2

Answer: The total area of carpet is 70 square yards.

To continue a calculation after pressing the $\frac{\square}{\square}$ key it is enough to press another calculation key. For example if the carpet costs \$17.32 per square yard, it is easy to continue the calculation and get the total price of the carpet. First press $\frac{\square}{\square}$. Then finish the calculation by pressing 17.32×70 , with the result as shown below.



Figure 3

The total price is \$1,212.40.

Making corrections

In algebraic mode, digits in a number that is being typed can be deleted with the \leftarrow key. If a number has been completed or calculated, this key deletes it completely.

In algebraic mode, addition, subtraction, multiplication and division are not carried out immediately. If a wrong key was pressed, $\frac{+}{x^2}$ and $\frac{-}{\sqrt{x}}$ should be followed by a $\frac{0}{MEM}$ and $\frac{x}{y^x}$ or $\frac{\div}{1/x}$ should be followed by a $\frac{1}{}$.

Functions of two numbers

Unlike functions of a single number, the arithmetical operations $\frac{+}{x^2}$, $\frac{-}{\sqrt{x}}$, $\frac{x}{y^x}$ and $\frac{\div}{1/x}$ use two numbers, but there are also some mathematical functions that use two numbers.

An often-used two-number function is the exponentiation or “power” function, and this works in the same way as $\frac{+}{x^2}$, $\frac{-}{\sqrt{x}}$, $\frac{x}{y^x}$ and $\frac{\div}{1/x}$ in algebraic mode.

Example 3: What is 2 to the power 10?

Solution: The calculation is 2^{10} using the $\frac{x}{y^x}$ key.

In algebraic mode, type 2, press $\frac{x}{y^x}$, type 10, and press $\frac{=}{LAST}$ to complete the calculation.




Figure 4

Answer: Two to the power 10 is 1,024, often called 1k in computing.

$\frac{x}{y^x}$ works exactly like the arithmetical operators and is often considered to be one of them.

Algebraic operator precedence

In algebraic mode the HP 17bII+ calculates using without using “operator precedence”. This means that a combination of several $\frac{+}{x^2}$ and $\frac{-}{\sqrt{x}}$ operations (or several $\frac{x}{y^x}$ and $\frac{\div}{1/x}$ operations) is calculated from left to right as operations are encountered. To change this behavior, use parentheses.

Example 4: What is the result of calculating $1 \div 2 \div 3$ in algebraic mode?

Solution: Type the keys $\frac{1}{}$ $\frac{\div}{1/x}$ $\frac{2}{}$ $\frac{\div}{1/x}$ $\frac{3}{}$ $\frac{=}{LAST}$.



Figure 5

Answer: The result is equal to $1 \div 6$, in other words the calculation goes from left to right, $1 \div 2$, and the result divided by 3. If the calculation went the other way, it would be $1 \div (2 \div 3)$, or $3 \div 2$, giving 1.5 as the result.

Example 5: In what order is the calculation $1 + 2 \times 3 =$ carried out?

Solution: Type the keys .



Figure 6

Answer: The operations are evaluated in the order in which they are entered. $1 + 2$ is evaluated first, giving an answer of 3. This intermediate result is then multiplied by 3 giving a result of 9.

Example 6: Evaluate the previous example again, making sure that the multiplication occurs before the addition.

Solution: Type the keys .

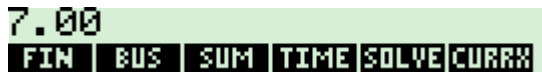


Figure 7

Answer: Parentheses alter the evaluation of operations such that operations within parentheses are evaluated in the order in which they are entered.

Example 7: In what order is the calculation $1 + (0.5 + 1.5) \times 1.5^{3!}$ carried out?

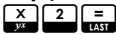
Solution: Type the keys .



Figure 8

Answer: The calculation in brackets is carried out first, giving the result 2. This is added to the 1 at the start of the calculation. The multiplication by 1.5 is carried out next followed by the raising of this result to the factorial of 3 power.

Reusing a previous result

Once a result has been computed, it can be used to start a new calculation by pressing the next function key. For example, if the previous result now needed to be multiplied by 2, pressing  would show the proper result.

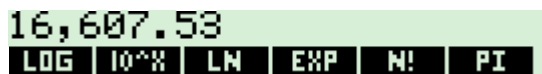



Figure 9

However, there are times when you wish to reuse a previous result but that result does not begin the next calculation. In such cases, the HP 17bII+ provides a LAST function on the keyboard that will recall the previous result back to the display so that it can be used. It is accessed by pressing .

Example 8: Evaluate $(5 + (6 \times 2)) =$ and then $3.5 \div (5 + (6 \times 2)) =$

Solution: Type the keys



Figure 10

Now press:



Figure 11

Answer: The use of LAST is often a very big time saver.