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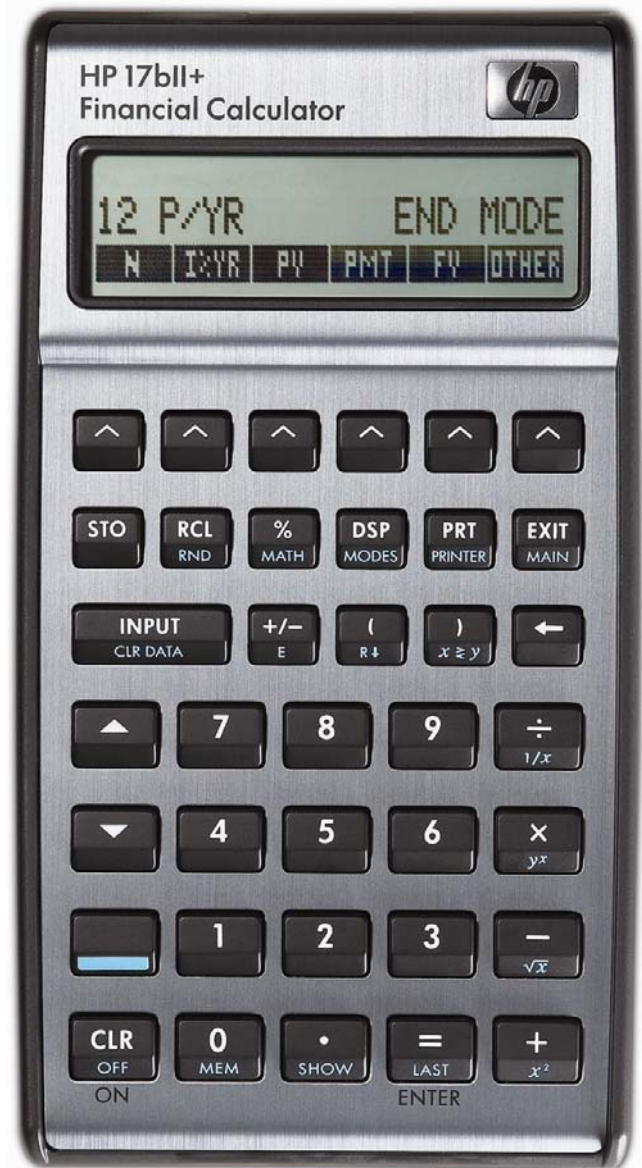
Solving an equation

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The HP Solver

One of the most powerful tools contained in the HP 17bII+ calculator is the HP Solver. This tool allows you to key in an equation in algebraic format, enter values for the variables you know, and then automatically solve for the unknown variable. For example, you could key in the equation $A = B + C$, and if you know the value of A and C, automatically solve for the unknown variable B – without any programming. Very complicated equations can be entered and solved in this manner.

The HP solver allows the user to customize the HP 17bII+ calculator to suit their own personal needs and circumstances. It is unique to HP and demonstrates HP’s continuing commitment to give users flexibility to find their own solutions.

More information is found in the learning module that introduces the solver.

Accessing the solver

The HP Solver is accessed from the main menu, as shown below.

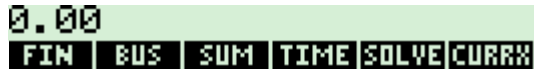


Figure 1

Pressing **SOLVE** will do one of two things. If there are no existing equations in the HP 17bII+ calculator, then the screen in figure 2 is displayed. This indicates that you must press **NEW** to enter an equation.



Figure 2

If the HP 17bII+ already has some equations in the equation catalog, a screen similar to the one shown in figure 3 would be displayed. The equation is shown on the top line of the screen.



Figure 3

The **EDIT** key allows you to edit the currently displayed equation. The **DELET** key allows you to remove the currently displayed equation from the catalog. The **SOLVE** key will enter the equation calculation environment for the currently displayed equation where you can solve for variables within the equation.

Entering an equation

When you are in the equation catalog and the **NEW** menu key is displayed, pressing it allows you to enter a new equation into the catalog. Pressing **NEW** displays the screen as shown in figure 4.



Figure 4

The prompt is displayed indicating that you should use the displayed alpha menu keys to enter the equation and press **INPUT** when you are finished. Each of the displayed alpha menu keys will access a second screen that allows the entry of the individual letters shown. For example, the **WXYZ** key allows you to enter **W**, **X**, **Y**, or **Z**. If you press the second screen is shown as below. To exit this screen, press one of the letter menu keys or **EXIT**.






Suppose you wish to enter $A = B + C$ into the solver. If the screen from figure 4 is still displayed, you would press the following keys:   $=$  $+$  $=$ . If you pressed the keys correctly, the screen should look like figure 5 below. If your equation is too long to fit in the display, it may look like the screen in figure 6 below with an ellipsis at the end of the equation indicating that the text continues off the display. The example in figure 6 also shows that you can use long variable names if you wish.



Figure 5



Figure 6

Solving an equation



When an equation is displayed in the equation catalog, pressing the  key will enter the equation calculation environment you can solve for variables within the equation. What the HP 17bII+ does at this point is scan through the equation to verify that it is valid. If the equation is valid, the HP 17bII+ will scan through the equation for variable names and create a custom menu key screen for the variables in the equation. If the equation $A = D + C$ were the one chosen, then the solver screen would appear as shown in figure 7 below after  was pressed. Note: although you can use long variable names in equations, names longer than 4 or 5 characters long may not be displayable in a menu key location in the display.



Figure 7



At this point, you can enter values for any two variables that you know and solve for the unknown variable. If $A = 6$, you press  . The display appears as shown in figure 8.



Figure 8

If $D = 2$, press  . The display appears as shown in figure 9.



Figure 9

To solve for C , just press . Figure 10 shows the result.



Figure 10

Using functions

In the solver basics learning module a solver equation is presented that uses the factorial function to compute solve for the number of permutations of n items taken r at a time. In fact, the HP 17bII+ solver has a multitude of functions available for use within solver equations. These functions range from (of course) the basic math functions found on the keyboard to other functions that are available only within the solver. These functions are listed in table 12-2 of the HP 17bII+ Users Guide.

The Σ and IF functions

IF(cond:exp1:exp2) Evaluates the conditional expression cond. If cond is true, exp1 is evaluated. If cond is false, exp2 is evaluated. This function is covered in another learning module.

Σ (ctr:c1:c2:s:expr) Sums the algebraic expression expr for values of the counter variable ctr stepping from the value of c1 to the value of c2, incrementing by the step value s. This function is covered in another learning module.



Note that the arguments to these functions are separated with a colon. This character is entered when the alpha mode is active within the solver by pressing one of the letter selection keys, such as , and then pressing . The colon character is the first character on the menu page displayed, as shown in figure 12 below.



Figure 11



Figure 12




The Σ character is entered in a similar manner. When the alpha mode is active within the solver, press one of the letter selection keys, such as , and then press . Now press . The Σ character is the second character on the menu page displayed, as shown in figure 13 below.



Figure 13

These functions will be used within the examples below. They are shown to illustrate possible uses that may prove of value to you as you use the HP 17bII+ calculator.

Practice using solver functions - IF

Example 1: Use the IF function to evaluate: If X is greater than 100, return the value of A divided by X, otherwise return the value of A multiplied by 32.25. Store the answer in the variable ANS.

Solution:



Figure 14

Answer: The formula should appear as shown above in figure 13.

Example 2: Use the formula from example 1 to compute the value returned for the following situations:

- 1) A = 50, X = 90
- 2) A = 250, X = 105
- 3) A = 100, X = 100

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Solution: 



Figure 15

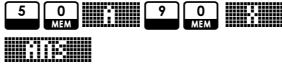




Figure 16

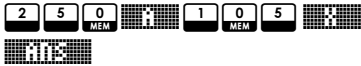




Figure 17

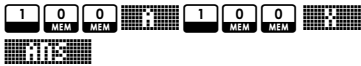




Figure 18

Answer: The IF statement appears to be working as it should.

Practice using solver functions – Σ

Example 3: Enter this solver function which will sum the digits from 1 to N (incrementing by one each time to count each number from 1 to N) and save the result in the variable SUM.

Solution:





Figure 19

Answer: The formula should appear as shown above in figure 19.

Example 4: Use the formula from example 3 to find the sum of the numbers from 1 to 100.

Solution:



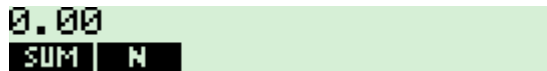
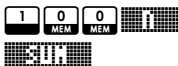


Figure 20



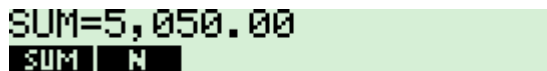


Figure 21

Answer: The answer is 5050.

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Example 5: Enter this solver function which will sum the digits from 1 to N but only counting the odd digits and save the result in the variable SUM.



Figure 22

Answer: The formula should appear as shown above in figure 22.

Example 6: Use the formula from example 3 to find the sum of the odd numbers from 1 to 100.



Figure 23



Figure 24

Answer: The answer is 2500.

Example 7: Use the formula from example 3 to find the sum of the odd numbers from 1 to 99. Note: Since 100 is an even number, the sum should be the same.



Figure 25



Figure 26

Answer: The answer is 2500, which agrees with example 6, as it should.