



## hp calculators

### HP 17bII+ The Solver – Business Finance Applications – Part 2

The HP Solver

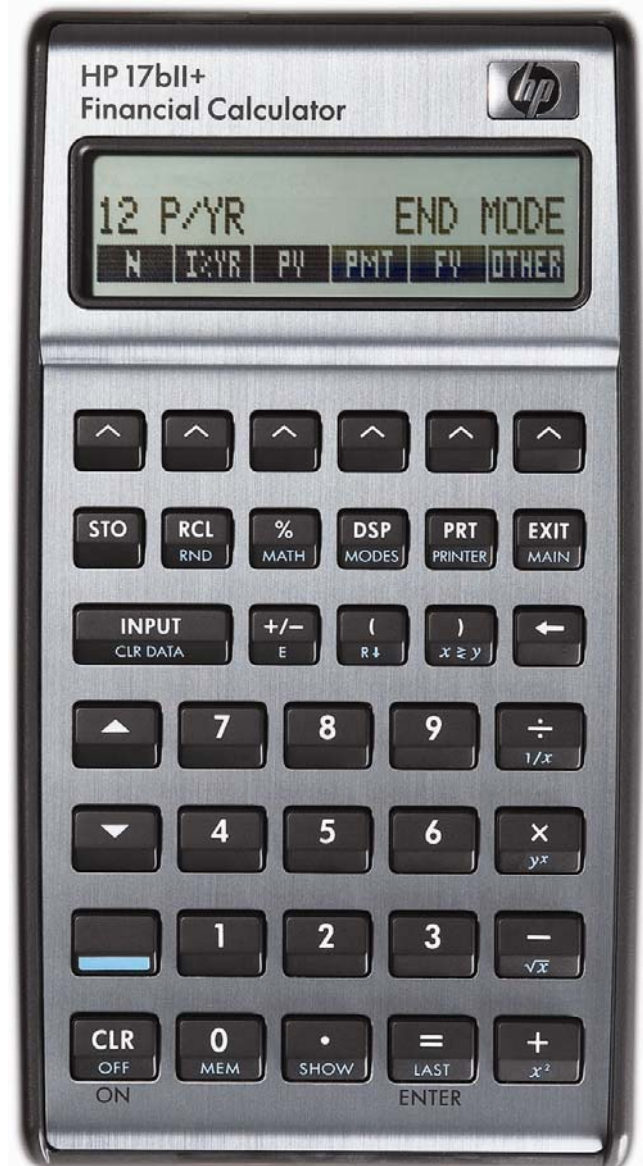
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## The HP Solver

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 **ABCDE** key allows you to enter **A**, **B**, **C**, **D**, or **E**. 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:  $\text{[F5]}$   $\text{[F6]}$   $\text{[F7]}$   $\text{[F8]}$   $\text{[F9]}$   $\text{[F10]}$   $\text{[F11]}$   $\text{[F12]}$   $\text{[F13]}$   $\text{[F14]}$   $\text{[F15]}$   $\text{[F16]}$   $\text{[F17]}$   $\text{[F18]}$   $\text{[F19]}$   $\text{[F20]}$   $\text{[F21]}$   $\text{[F22]}$   $\text{[F23]}$   $\text{[F24]}$   $\text{[F25]}$   $\text{[F26]}$   $\text{[F27]}$   $\text{[F28]}$   $\text{[F29]}$   $\text{[F30]}$   $\text{[F31]}$   $\text{[F32]}$   $\text{[F33]}$   $\text{[F34]}$   $\text{[F35]}$   $\text{[F36]}$   $\text{[F37]}$   $\text{[F38]}$   $\text{[F39]}$   $\text{[F40]}$   $\text{[F41]}$   $\text{[F42]}$   $\text{[F43]}$   $\text{[F44]}$   $\text{[F45]}$   $\text{[F46]}$   $\text{[F47]}$   $\text{[F48]}$   $\text{[F49]}$   $\text{[F50]}$   $\text{[F51]}$   $\text{[F52]}$   $\text{[F53]}$   $\text{[F54]}$   $\text{[F55]}$   $\text{[F56]}$   $\text{[F57]}$   $\text{[F58]}$   $\text{[F59]}$   $\text{[F60]}$   $\text{[F61]}$   $\text{[F62]}$   $\text{[F63]}$   $\text{[F64]}$   $\text{[F65]}$   $\text{[F66]}$   $\text{[F67]}$   $\text{[F68]}$   $\text{[F69]}$   $\text{[F70]}$   $\text{[F71]}$   $\text{[F72]}$   $\text{[F73]}$   $\text{[F74]}$   $\text{[F75]}$   $\text{[F76]}$   $\text{[F77]}$   $\text{[F78]}$   $\text{[F79]}$   $\text{[F80]}$   $\text{[F81]}$   $\text{[F82]}$   $\text{[F83]}$   $\text{[F84]}$   $\text{[F85]}$   $\text{[F86]}$   $\text{[F87]}$   $\text{[F88]}$   $\text{[F89]}$   $\text{[F90]}$   $\text{[F91]}$   $\text{[F92]}$   $\text{[F93]}$   $\text{[F94]}$   $\text{[F95]}$   $\text{[F96]}$   $\text{[F97]}$   $\text{[F98]}$   $\text{[F99]}$   $\text{[F100]}$ . 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  $\text{[F5]}$  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  $\text{[F5]}$  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  $\text{[F6]}$   $\text{[F7]}$ . The display appears as shown in figure 8.



Figure 8

If  $D = 2$ , press  $\text{[F8]}$   $\text{[F9]}$ . The display appears as shown in figure 9.



Figure 9

To solve for C, just press  $\text{[F5]}$ . Figure 10 shows the result.



Figure 10

### Solver applications – Simple payback period

The simple payback period method determines the length of time (in years) required for a business to recover its entire investment in a capital expenditure. Capital expenditures are purchases of assets such as machinery or equipment that have lives of one year or more. The shorter the payback period, the better – the sooner the investment is recovered the sooner the funds can be used for another project. For a capital expenditure to be considered profitable its life must exceed the length of the payback period.





Figure 14

Answer: The formula should appear as shown above in figure 14. Since the formula is wider than the screen an ellipsis is shown at the right side of the display.

Example 5: Use the formula entered in example 4. You receive a bill with the credit terms 2/10, net 30. What is the cost of not taking the cash discount?

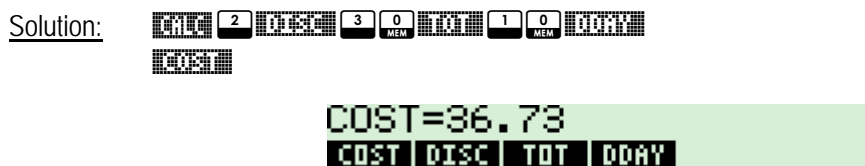


Figure 15

Answer: The cost of not taking the discount is a rate of 36.73% annual interest. Unless you have a better use for your funds, the discount is a very good offer.

Example 6: Use the formula entered in example 4. Another bill has credit terms of 3/10, net 180. What is the cost of not taking this discount? Assume this example is worked immediately after example 5.



Figure 16

Answer: The cost is only 6.55% on an annual basis. This is due to the 180 period before you must pay the bill on net terms.

### Solver applications – Operating leverage

Operating leverage focuses on a company's fixed operating costs. These costs include administrative costs, rent, and depreciation expenses, but do not include interest on debt. The degree of operating leverage is defined as the percentage change in earnings before interest and taxes as a result of a percentage change in units sold. The greater a firm's degree of operating leverage, the more its earnings before interest and taxes vary with unit sales fluctuations.

Example 7: Enter the formula to compute operating leverage:  $OPLEV = 1 \div (1 - \text{FIX} \div (\text{UNITS} \times (\text{PRICE} - \text{VAR})))$  where OPLEV is the degree of operating leverage, FIX are the fixed costs, UNITS are the number of units sold, PRICE is the sales price per unit, and VAR is the variable cost per unit.

Solution:

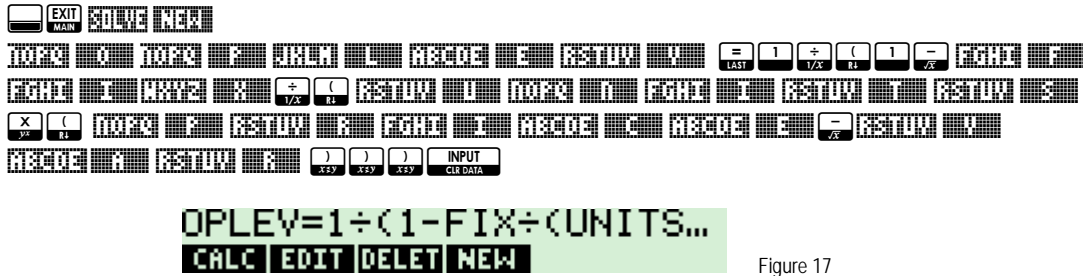


Figure 17

Answer: The formula should appear as shown above in figure 17.

Example 8: Use the formula entered in example 7. Your company sold 10,000 units last year at \$20 each. Fixed costs were \$50,000 and variable costs were \$5. Calculate your degree of operating leverage.

Solution:

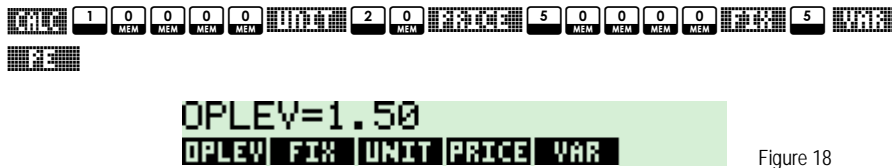


Figure 18

Answer: The degree of operating leverage is 1.50.

### Solver applications – Financial leverage

Financial leverage focuses on a company's financial fixed costs. The primary example is the interest expense on borrowed funds. The degree of financial leverage is defined as the percentage change in earnings per share as a result of a percentage change in earnings before interest and taxes. The greater a firm's degree of financial leverage, the greater the fluctuations in return on owner's equity.

Example 9: Enter the formula to compute the degree of financial leverage:  
 $FINLEV = 1 \div (1 - \text{INT} \div (\text{UNITS} \times (\text{PRICE} - \text{VAR}) - \text{FIX}))$   
 where FINLEV is the degree of financial leverage, INT are the annual interest expenses, UNITS are the number of units sold, PRICE is the sales price per unit, VAR is the variable cost per unit and FIX are the fixed costs.

Solution:



Figure 19

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

Example 10: Use the formula entered in example 9. Use the same information from example 8, but add that your company's interest expense is \$20,000. NOTE: If you have just worked example 8, all that you have to

enter is the new interest expense amount into the INT menu variable. This is because the values in menu variables are kept until you delete them. If you have not just worked example 8, store these amounts into the proper menu key variables: 10,000 units, price \$20 each, fixed costs of \$50,000 and variable costs per unit of \$5.

Solution:

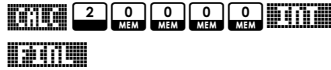


Figure 20

Answer: The degree of financial leverage is 1.25.

**Solver applications – Combined leverage**

The degree of combined leverage measures the total leverage caused by both operating fixed costs and financial fixed costs. The degree of combined leverage indicates the percentage change in net after-tax earnings due to a one percent change in sales. Combined leverage increases as operating leverage and financial leverage increase. The degree of combined leverage measures the impact of operating and financial fixed costs on the variability of net income.

Example 11: Enter the formula to compute the degree of combined leverage:

$$\text{COMBLEV} = 1 \div (1 - (\text{FIX} + \text{INT}) \div (\text{UNITS} \times (\text{PRICE} - \text{VAR})))$$

where FINLEV is the degree of financial leverage, INT are the annual interest expenses, UNITS are the number of units sold, PRICE is the sales price per unit, VAR is the variable cost per unit and FIX are the fixed costs.

Solution:

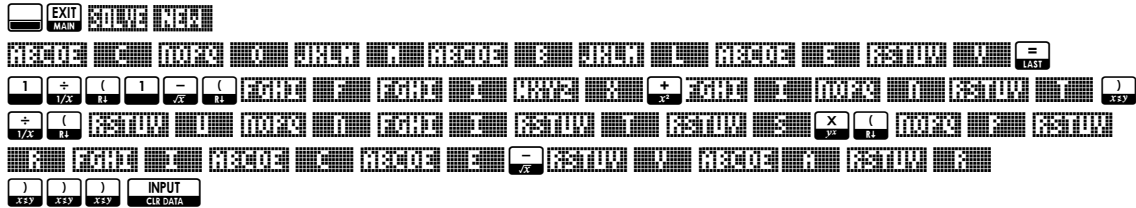


Figure 21

Answer: The formula should appear as shown above in figure 21.

Example 12: Use the formula entered in example 11. The combined leverage formula uses the same shared menu variables as the financial and operating leverage formulas. If you have worked through these examples in succession, compute the combined leverage.

Solution:



Figure 22

Answer: The degree of combined leverage is 1.88.