hp calculators

HP 17bII+ The Solver –
Business Finance Applications
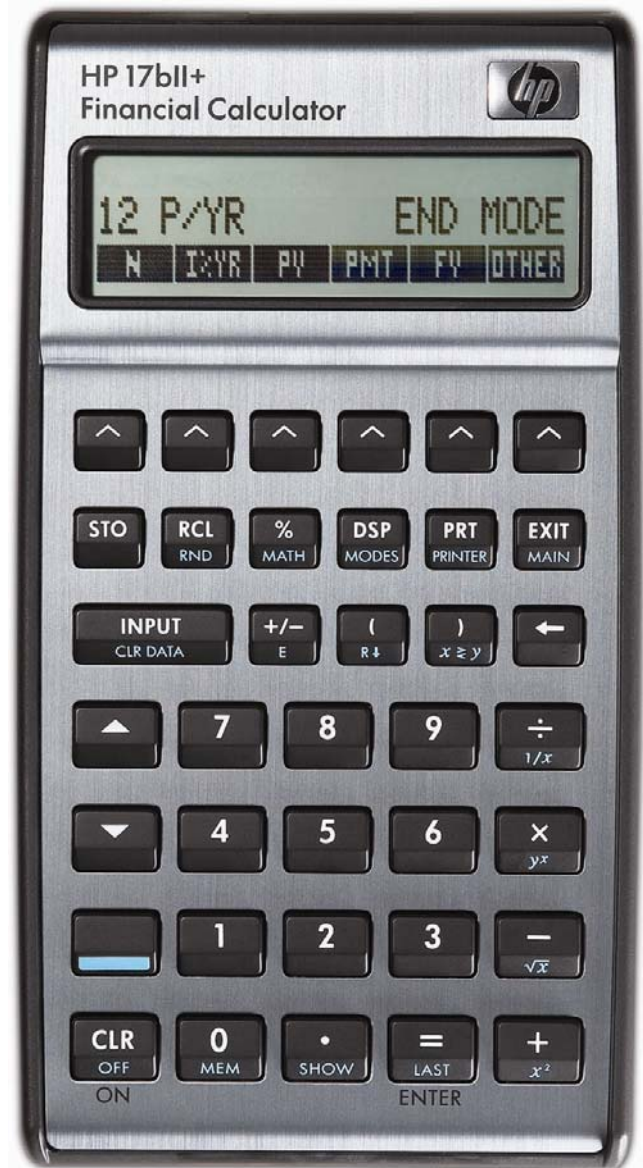
The HP Solver

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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.

```
0.00
FIN | BUS | SUM |TIME|SOLVE|CURRX
```
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.

```
{NEW} FOR NEW EQUATION
CALC | EDIT |DELET| NEW
```
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.

```
A=B+C
CALC | EDIT |DELET| NEW
```
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 CALC 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.

```
TYPE EQUATION; [INPUT]
ABCDE|FGHI |JKLM |NOPQ |RSTUV|WXYZ
```
Figure 4

The prompt is displayed indicating that you should use the displayed alpha menu keys to enter the equation and press INPUT CLR DATA 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 MAIN.

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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.

```
A=B+C
CALC EDIT DELET NEW
```
Figure 5

```
COST=WEIGHT×POUNDS+FE…
CALC EDIT DELET NEW
```
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.

```
0.00
   A    D    C
```
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.

```
A=6.00
   A    D    C
```
Figure 8

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

```
D=2.00
   A    D    C
```
Figure 9

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

```
C=4.00
   A    D    C
```
Figure 10

Solver applications – Return on Equity

The return on equity (ROE) ratio measures the profitability of a company relative to the amount of equity (ownership) capital invested. The measure is usually calculated each year, over a period of five or more years, to identify trends in this measure. Return on equity is also used to compare companies or industries.

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Example 1:   Enter the formula to compute the Return on Equity Ratio, ROE = INCOME ÷ CAPITAL x 100.

Solution: [keystroke icons]
[keystroke icons]
[keystroke icons]
[keystroke icons]

ROE=INCOME÷CAPITAL×100
CALC EDIT DELET NEW

Figure 11

Answer: The formula should appear as shown above in figure 11. Note that since the formula is wider than the display, an ellipsis is present at the right side of the screen.

Example 2:   Use the formula entered in example 1. Your company has after tax earnings of $2,500,000 and a net worth of $18,000,000. What is the return on equity?

Solution: [keystroke icons]
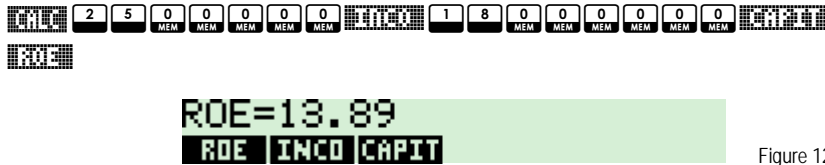[keystroke icons]

ROE=13.89
ROE INCO CAPIT

Figure 12

Answer: The ROE is 13.89%. Note that since two of the variable names used in the formula are somewhat long, the screen cannot display the entire name as a menu key.

Example 3:   Your industry averages 14.76% ROE. Given the capital investment in example 2, what would your after tax income need to be to match that return on equity?

Solution: [keystroke icons]
[keystroke icons]

INCOME=2,656,800.00
ROE INCO CAPIT

Figure 13

Answer: Your income would need to be $2,656,800.

Solver applications – Bond interest coverage ratio

The bond interest coverage ratio is a measure of a bond's quality and financial safety. It is a ratio of the funds available to pay interest during a given year to the interest requirements associated with a bond issue. The calculation can be made several ways, depending on the legal status of different issues of bonds, interest costs on other than bond debt, and whether the company has issued preferred stock. All other things being equal, the higher the coverage ratio, the higher the quality of the bond.

Example 4:   Enter the formula to compute the bond interest coverage ratio, COVER = (EARN + INT) ÷ INT.

Solution: [keystroke icons]

[keystroke icons]

[keystroke icons]

[keystroke icons]

```
COVER=(EARN+INT)÷INT
 CALC | EDIT |DELET| NEW
```
Figure 14

Answer: The formula should appear as shown above in figure 14.

Example 5: Use the formula entered in example 4. What is the interest coverage ratio of a bond with annual interest payments of $2,000,000 and corporate earnings of $8,000,000?

Solution: [keystroke icons]

[keystroke icons]

```
COVER=5.00
 COVER EARN | INT
```
Figure 15

Answer: Five dollars of funds are available to pay each dollar of bond interest.

Example 6: Use the formula entered in example 4. Suppose the average bond interest coverage ratio in your industry is 4.85. Calculate how much you could pay in annual interest payments if you borrowed additional funds so that your bond interest ratio matched that of the industry. Assume this example is worked immediately after example 5.

Solution: [keystroke icons]

[keystroke icons]

```
INT=2,077,922.08
 COVER EARN | INT
```
Figure 16

Answer: You could pay approximately $78,000 more in interest payments. Note that the solver searches for a numerical solution and displays intermediate answers.

Solver applications – Price-to-earnings ratio

The price-to-earnings ratio is used by investors to indicate how much they are investing to obtain one dollar of earnings. Individual securities are often compared to the ratios of the stock market indices or averages.

Example 7: Enter the formula to compute the price-to-earnings ratio, PE = PRICE ÷ EARN.

Solution: ▨▨ 🔲 🔲 🔲

▨▨▨ ▨▨ ▨▨▨ ▨▨ 🔲 ▨▨▨ ▨▨ ▨▨▨ ▨▨ ▨▨▨ 🔲 ▨▨▨ ▨▨ ▨▨▨ ▨▨ 🔲

▨▨▨ ▨▨ ▨▨▨ ▨▨ ▨▨▨ ▨▨ ▨▨▨ ▨▨ 🔲

```
PE=PRICE÷EARN
CALC EDIT DELET NEW
```
                                                                        Figure 17

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

Example 8: Use the formula entered in example 7. Your company stock is selling for $75 a share and has earnings of $6 per share. What is the price-to-earnings ratio?

Solution: 🔲 🔲 🔲 🔲 🔲 🔲

🔲 🔲

```
PE=12.50
PE PRICE EARN
```
                                                                        Figure 18

Answer: The PE ratio is 12.5.

Example 9: Use the formula entered in example 7. A major stock index is at a price of $4,510 and the earnings of the index are at $409.50. Is your company stock doing better or worse than this market index in terms of price-to-earnings ratio? Assume this example is worked immediately after example 8.

Solution: 🔲 🔲 🔲 🔲 🔲 🔲 🔲 🔲 🔲 🔲 🔲 🔲

🔲 🔲

```
PE=11.01
PE PRICE EARN
```
                                                                        Figure 19

Answer: The price to earnings ratio for your stock is higher than the market index, indicating that your stock is more attractive as an owner of the stock when compared to the index.

Solver applications – Return on investment

One way of evaluating a new investment is through a simple return on investment (ROI) analysis. Return on investment is the ratio of net profit after taxes to the assets used to make the profit.

Example 10: Enter the formula to compute return on investment, ROI = (REV x PROF ÷ 100) ÷ INV x 100, where ROI is the return on investment, REV are the total revenues, PROF is the net profit as a percent of revenues, and INV is the capital investment in the project.
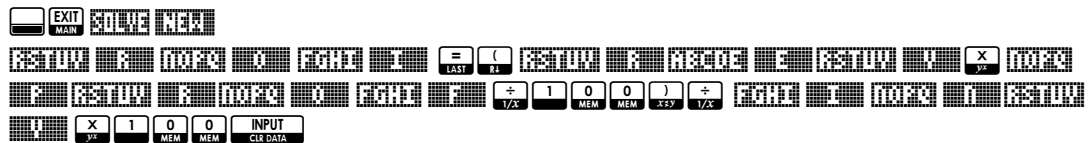
Solution: ▨▨ 🔲 🔲 🔲

▨▨▨ ▨▨ ▨▨▨ ▨▨ ▨▨▨ ▨▨ 🔲 🔲 ▨▨▨ ▨▨ ▨▨▨ ▨▨ ▨▨▨ ▨▨ 🔲 ▨▨▨

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```
ROI=(REV×PROF÷100)÷IN…
 CALC  EDIT  DELET  NEW
```
Figure 20

Answer: The formula should appear as shown above in figure 20.

Example 11: Use the formula entered in example 10. A new store requires $480,000 in new assets. The anticipated revenues the first year are $1,000,000. Your net profit goal is 10%. Assuming the net profit goal is met, calculate the return on investment.

Solution: CALC 4 8 0 0 0 0 INV 1 0 PROF 1 0 0 0 0 0 0 REV
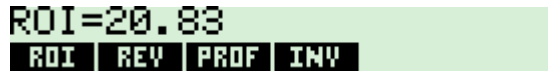ROI

```
ROI=20.83
 ROI   REV   PROF   INV
```
Figure 21

Answer: The ROI is 20.83%.

Example 12: Use the formula entered in example 10. The store's sales are actually $750,000 the first year. Calculate the ROI. Assume this example is worked immediately after example 11.

Solution: 7 5 0 0 0 0 REV
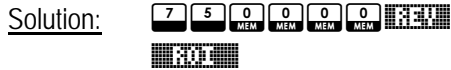ROI

```
ROI=15.63
 ROI   REV   PROF   INV
```
Figure 22

Answer: The actual ROI was 15.63%.

Example 13: Use the formula entered in example 10. At the level of revenues from example 12, what total investment in the store can you sustain to achieve an ROI of 18%? Assume this example is worked immediately after example 12.

Solution: 1 8 ROI
INV

```
INV=416,666.67
 ROI   REV   PROF   INV
```
Figure 23

Answer: You can sustain an investment of $416,666.67 at an ROI of 18%.

Example 14: Use the formula entered in example 10. Suppose you realize a 5% net profit on revenues of $750,000 with $480,000 of investments. What is the ROI? Assume this example is worked immediately after example 13.

Solution: 4 8 0 0 0 0 INV 7 5 0 0 0 0 REV 5 PROF
ROI

```
INV=416,666.67
 ROI   REV   PROF   INV
```
Figure 24

Answer: You can sustain an investment of $416,666.67 at an ROI of 18%.