hp calculators

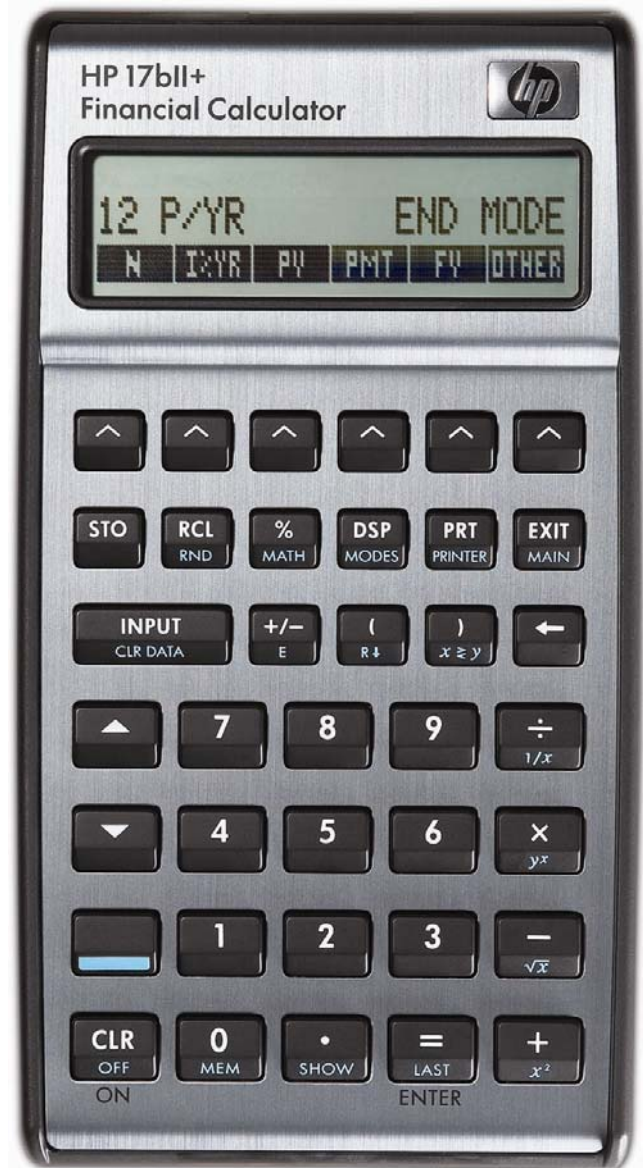**HP 17bII+** The Solver – Real Estate Applications

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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**.

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 – Debt Coverage Ratio

The debt coverage ratio (DCR) is calculated by dividing the net operating income by the annual debt service. Lenders use the DCR as a measure of safety in loan underwriting since it compares property income to the amount needed to meet loan payment obligations. Given constant net operating income, the DCR decreases as the annual debt service increases.

Example 1:   Enter the formula to compute the Debt Coverage Ratio, DCR = NOI ÷ ADS, where DCR is the debt coverage ratio, NOI is the net operating income, and ADS is the annual debt service.

Solution: ▭ ⌧ SOLVE NEW
NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE
NOTE NOTE NOTE NOTE INPUT CLR DATA

```
DCR=NOI÷ADS
CALC  EDIT DELET NEW
```
Figure 11

Answer: The formula should appear as shown above in figure 11.

Example 2:   Use the formula entered in example 1. A lender specifies a minimum DCR of 1.15 for a property with an NOI of $100,000. What is the maximum monthly payment amount the lender will receive from the property?

Solution: CALC 1 0 0 0 0 0 NOI 1 . 1 5 DCR ADS

```
ADS=86,956.52
DCR   NOI   ADS
```
Figure 12

The $86,956.52 is the annual debt service. To compute the monthly amount, divide this by 12.

In RPN mode, press: 1 2 ÷
In algebraic mode, press: ÷ 1 2 =

```
7,246.38
DCR   NOI   ADS
```
Figure 13

Answer: The maximum monthly payment is $7,246.38.

Solver applications – Annual Loan Constant

The annual loan constant (ALS), which is also called loan constant or annual debt constant, is calculated by dividing the annual debt service (ADS) by the loan amount. The annual loan constant is defined by the ratio of the ADS to the loan amount for a loan of $1. The loan constant is usually converted to a percentage, rounded to two decimal places, by using a loan amount of $100 to calculate the ALC.

Example 3:   Enter the formula to compute the annual loan constant, ALC = (ADS ÷ LOAN) x 100, where ALC is the annual loan constant and LOAN represents the size of the loan.

Solution: ▭ ⌧ SOLVE NEW
NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE
NOTE NOTE NOTE NOTE NOTE NOTE x 1 0 0 INPUT CLR DATA

```
ALC=(ADS÷LOAN)×100
CALC  EDIT DELET NEW
```
Figure 14

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

Example 4: Use the formula entered in example 3. A $250,000 loan has an annual debt service of $30,858.36. What is the ALC?

Solution: [CALC] [3] [0] [8] [5] [8] [.] [3] [6] [ADS] [2] [5] [0] [0] [0] [0] [LOAN] [ALC]

ALC=12.34
ALC | ADS | LOAN   Figure 15

Answer: The ALC is 12.34.

Example 5: Use the formula entered in example 1. A loan of $275,000 has an annual loan constant of 12.85%. What is the monthly payment amount? Assume this example is worked immediately after example 4.

Solution: [1] [2] [.] [8] [5] [ALC] [2] [7] [5] [0] [0] [0] [LOAN] [ADS]

ADS=35,337.50
ALC | ADS | LOAN   Figure 16

The $35,337.50 is the annual debt service. To compute the monthly amount, divide this by 12.

In RPN mode, press: [1] [2] [÷]
In algebraic mode, press: [÷] [1] [2] [=]

2,944.79
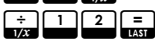ALC | ADS | LOAN   Figure 17

Answer: The monthly payment is $2,944.79.