



## hp calculators

HP 17bII+ Mortgages with balloon payments

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### The time value of money application

The time value of money application built into the HP 17bII+ is used to solve compound interest problems and annuities that involve regular, uniform payments. This application is accessed from the main menu level of the HP 17bII+ by pressing **2nd** then **FV**. Note that to access these menus, you must press the appropriate **2nd** key just below the symbols on the screen. If you do not see **2nd** displayed on the screen, you may be inside a different menu. You can return to the main menu and select the **2nd** menu by pressing **2nd** **EXIT** **MAIN**.

When you enter the TVM environment for the first time, the screen will appear as shown in Figure 1 below.



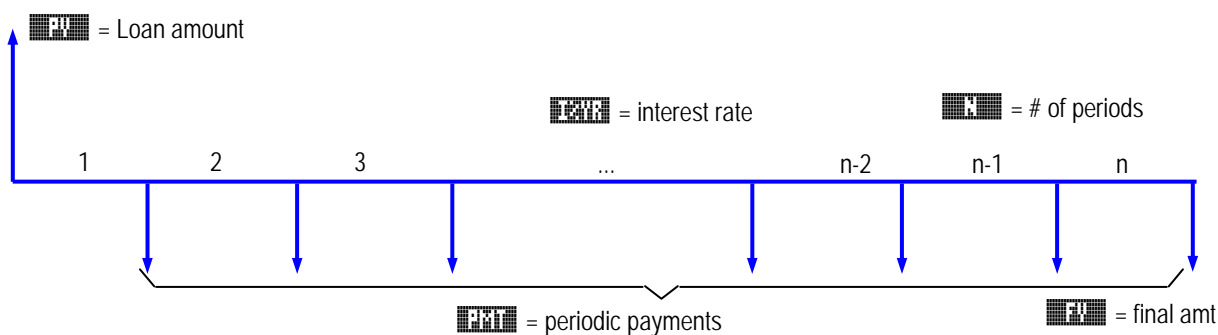
Figure 1

Compound interest problems require the input of 3 of these 4 values: **N**, **I:YR**, **PV**, **FV**. Annuity problems require the input of 4 of these 5 values: **N**, **I:YR**, **PV**, **PMT**, **FV**. Once these values have been entered in any order, the unknown value can be computed by pressing the key for the unknown value.

Interest rates are always entered as the number is written in front of the percent sign, i.e., 5% is entered as a 5 rather than as 0.05. Values for N are always the total number of periods – if a problem has an interest rate that is compounded monthly and the time frame is 5 years, the value entered for N would be 60 total periods. Additional information can be found in the learning module covering time value of money basics. Additional information can be found in the learning module covering time value of money basics.

### Cash flow diagrams and sign conventions




The sign conventions for cash flows in the HP 17bII+ follow the simple rule: money received is positive (arrow pointing up), money paid out is negative (arrow pointing down). The key is keeping the same viewpoint through each complete calculation. The regular use of cash flow diagrams allows a faster approach to the solution in most TVM-related problems. The cash flow diagram below represents the borrower viewpoint of the most common mortgage problems with fees and their relationship with the TVM variables.



### Balloon payments

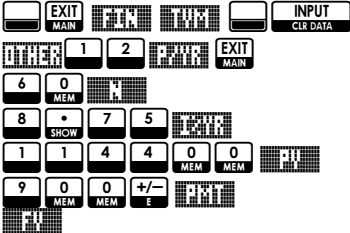
A loan with a balloon payment has a larger than normal payment at the end. This may be by design or may occur when the loan is to be paid off early. The solution approach is to treat the balloon amount as a Future Value as shown on the cash flow diagram above. The + / - sign of the balloon payment will follow the same conventions as normal – a negative balloon payment is money to be paid out and a positive is money to be received.

Practice solving mortgage problems with balloon payments

**NOTE:** Once you begin working these problems, the keystrokes shown assume you do not leave the TVM menu environment. Should you leave that environment and then decide to work a problem below other than Example 1, you should press    to return to the TVM environment.

**Example 1:** A home priced at \$114,400 is bought with a mortgage with a \$900 monthly payment for the next 30 years. The bank quoted an interest rate of 8.75%. If after five years the house must be sold, what is the amount still owed on the house?

**Solution:**



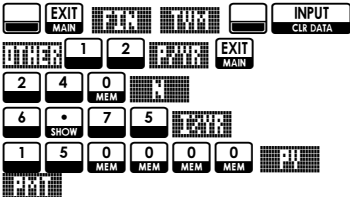
**FV=-109,467.03**  
**N I%YR PV PMT FV OTHER**

Figure 2

**Answer:** After five years, a balloon payment of \$109,467.03 must be made to bank.

**Example 2:** A \$150,000 house is bought with a 20-year mortgage loan having an annual interest rate of 6.75%, compounded monthly. After eight years the family needs to move to another state and the house must be sold. If they were to pay off the remaining balance on the loan, what would the final balloon payment be?


**Solution:** The regular payment for the 20-year original mortgage plan must be calculated first:



**PMT=-1,140.55**  
**N I%YR PV PMT FV OTHER**

Figure 3

The monthly payment is \$-1,140.55. Then enter the elapsed time and calculate the balloon payment.



**FV=-112,357.70**  
**N I%YR PV PMT FV OTHER**

Figure 4

**Answer:** The final amount owed on the loan, which is a balloon payment, is \$-112,357.70.

## HP 17bII+ Mortgages with balloon payments

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Example 3: The family from previous example was informed (in time) that they would not need to move for two more years. What would the balloon payment be at that time with this unexpected change?

Solution: Assuming that all previous data is kept in the calculator, simply enter the new period and calculate the balloon payment again:



Figure 5

Answer: The balloon payment will then be \$99,329.83 after ten years.