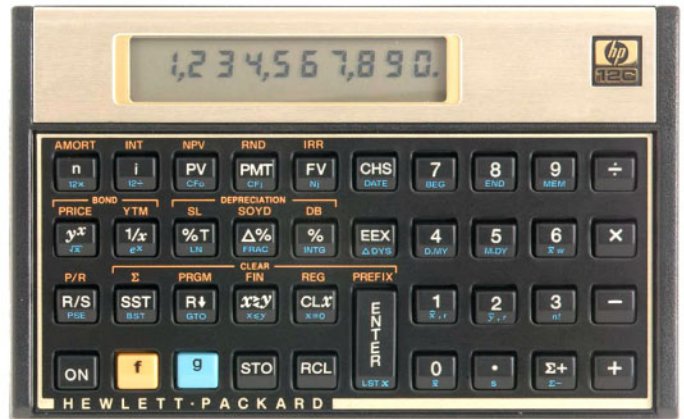




## hp calculators

HP 12C Mortgages with balloon payments



The HP12C TVM

Cash flow diagrams and sign conventions

Practice solving mortgage problems with balloon payments

**The HP12C TVM**

A set of mathematical tools are built into the HP12C for evaluating the time value of money (TVM), and the concepts of the present value of money (*PV*), the future value of money (*FV*), periodic payments (*PMT*), interest rates (*i*), and the number of periods (*n*). There are many standard situations where TVM calculations can be used to solve problems, such as calculating loan and mortgage variables. The standard HP12C features allow these problems to be solved easily.

**Cash flow diagrams and sign conventions**

The sign conventions for cash flows in the HP12C follow this 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 solve most TVM-related problems. The cash flow diagram below represents the borrower viewpoint of the most common mortgage problems with balloon payment and their relation to the TVM variables.

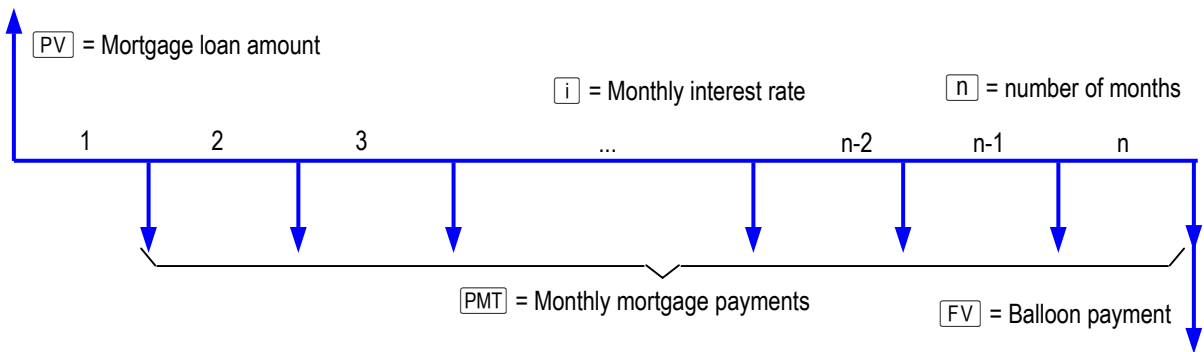


Figure 1

There are also two functions meant to be an aid when entering or retrieving annual values for *n* and *i* :  $12X$  and  $12\div$ . Pressing  $g 12X$  is the same as pressing  $ENTER 1 2 \times n$ , meaning the number of years can be keyed in and stored as number of months automatically. Pressing  $g 12\div$  is the same as pressing  $ENTER 1 2 \div i$ , meaning the yearly interest rate can be keyed in and stored as monthly interest rate automatically. It is also possible to retrieve the yearly-related values by pressing  $RCL g 12X$  (number of years) and/or  $RCL g 12\div$  (yearly interest rate) whenever necessary.

**Practice solving mortgage problems with balloon payment**

**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? The cash flow diagram in Figure 2 illustrates this example.

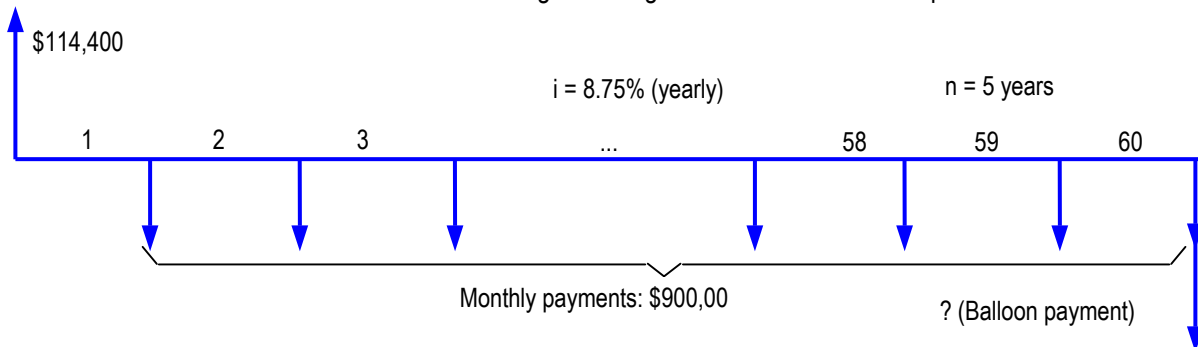


Figure 2

HP 12C Mortgages with balloon payments

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Solution: Enter the relevant values in any order and compute the FV:

8 . 7 5 9 12÷ 5 9 12x 1 1 4 4 0 0 PV 9 0 0 CHS PMT FV



Figure 3

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, how much would the final balloon payment be?

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

6 . 7 5 9 12÷ 3 0 9 12x 1 5 0 0 0 0 PV 0 FV PMT



Figure 4

This is the monthly payment. Now the new period is established prior to calculate the balloon payment:

8 9 12x FV



Figure 5

Answer: The final amount owed on the loan, which is a balloon payment, is \$133,620.41.

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, it is enough to set the new period and calculate the balloon payment again:

1 0 9 12x FV



Figure 6

Answer: The balloon payment will then be \$127,951.50 after ten years.