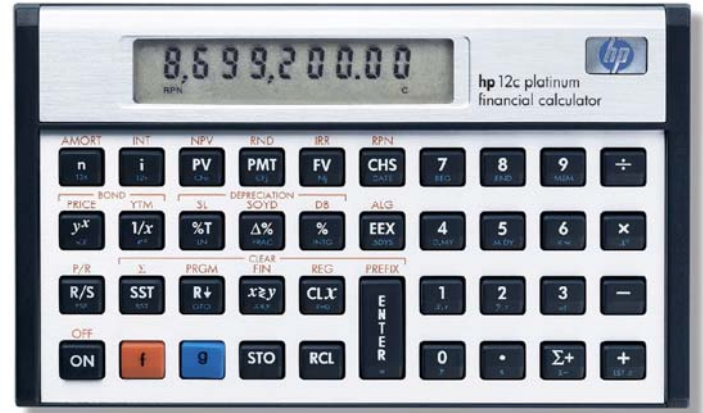




hp calculators

HP 12C Platinum
Mortgages with loan fees (points)



- Mortgages with loan fees
- The HP12C Platinum TVM
- Cash flow diagrams and sign conventions
- Practice solving mortgage problems with loan fees

Mortgages with loan fees (points)

It is not unusual that, in some mortgage loans, there are related fees charged at the moment the loan amount is disbursed. These fees are often taken as percentages ("points") of the loan amount. In essence, these fees are an instant repayment of part of the loan. However, the periodic payment is computed on the loan amount before these fees are repaid. This has the effect of raising the effective interest rate being paid on the loan. For example, a \$100,000 loan with 2 points would have the payment calculated on the \$100,000 amount even though 2 points (2% or \$2,000 in this instance) would be repaid immediately. The payment would be made as if \$100,000 were owed when in fact only \$98,000 is owed on the loan.

The HP12C Platinum TVM

A set of mathematics tools has been developed with the purpose of evaluating the time value of money (TVM), and the concepts of the present value of money (*PV*), future value of money (*FV*), periodic payments (*PMT*), interest rates (*i*), and the number of compounding periods (*n*). There are many standard situations where TVM calculations can be used to solve problems, like calculating loan and mortgage variables. The standard HP12C Platinum has features to solve problems like these with the five TVM keys \boxed{n} , \boxed{i} , \boxed{PV} , \boxed{PMT} and \boxed{FV} .

Cash flow diagrams and sign conventions

The sign conventions for cash flows in the HP12C Platinum 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 relation with the TVM variables.

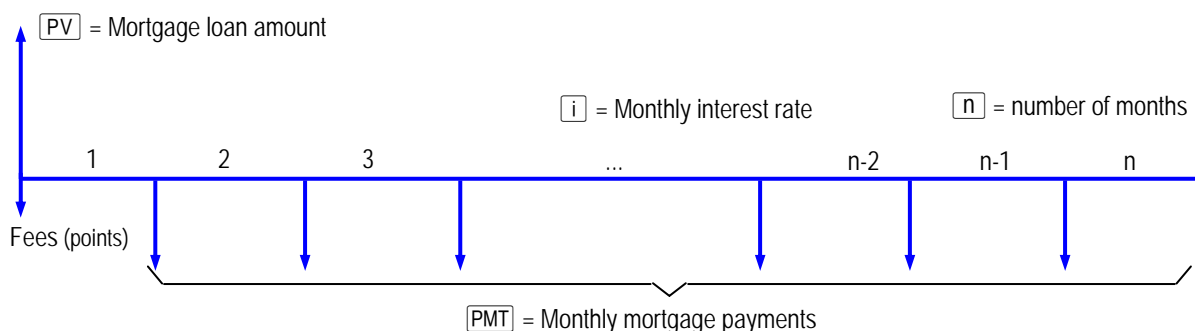


Figure 1

There are also two functions meant to be an aid when entering or retrieving annual values for \boxed{n} and \boxed{i} : $\boxed{12x}$ and $\boxed{12\div}$. Pressing $\boxed{9} \boxed{12x}$ is the same as pressing $\boxed{ENTER} \boxed{1} \boxed{2} \boxed{\times} \boxed{n}$ in RPN mode or $\boxed{\times} \boxed{1} \boxed{2} \boxed{=} \boxed{n}$ in algebraic mode, meaning the number of years can be keyed in and stored as number of months automatically. Pressing $\boxed{9} \boxed{12\div}$ is the same as pressing $\boxed{ENTER} \boxed{1} \boxed{2} \boxed{\div} \boxed{i}$ in RPN mode or $\boxed{\div} \boxed{1} \boxed{2} \boxed{=} \boxed{i}$ in algebraic mode, 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 $\boxed{RCL} \boxed{9} \boxed{12x}$ (number of years) and/or $\boxed{RCL} \boxed{9} \boxed{12\div}$ (yearly interest rate) whenever necessary.

Practice solving mortgage problems with points

Example 1: A family wants to settle a mortgage to buy a home rated \$114,400. The bank offers a 30-year mortgage loan with a 2-point fee, and with an annual interest rate of 8.75%. What are both the actual loan amount and the monthly payment? The cash flow diagram in Figure 2 illustrates this example.

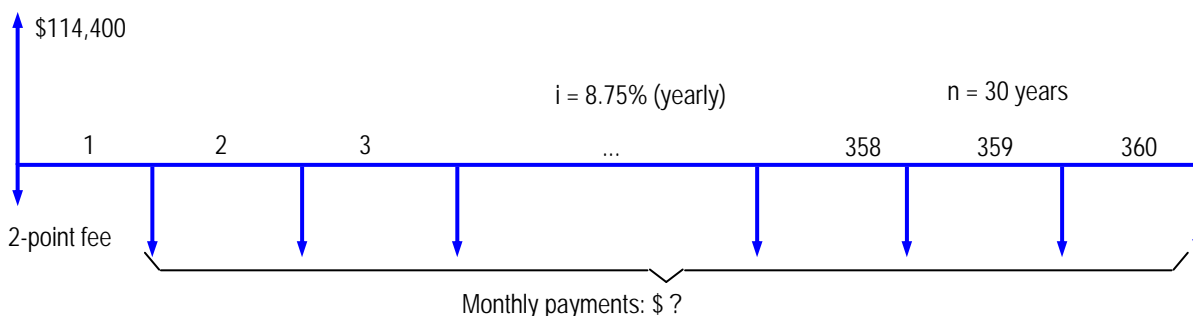


Figure 2

Solution: First, the actual loan amount must be calculated and already set as PV. If the amount disbursed is \$114,400, and it has a 2-point fee embedded, then the procedure to calculate the actual loan amount is the same one used to calculate price given margin and cost:

In RPN mode: `1 1 4 4 0 0 ENTER 1 ENTER 2 % - ÷ PV`
 In algebraic mode: `1 - 2 % = ÷ 1 1 4 4 0 0 x=y = PV`



Figure 3

Now it is enough to enter the remaining values in any order and compute the PMT:

`8 . 7 5 9 12 ÷ 3 0 9 12 x 0 FV PMT`



Figure 4

Answer: For this 2-point fee mortgage, the actual loan amount is \$116,734.69 and the monthly payment is \$918.35.

Example 2: Having all data from previous example still in the calculator memory, calculate the effective annual percentage rate (APR).

Solution: To calculate the effective APR, the disbursed amount of money (\$114,400) is then taken as the PV:

`1 1 4 4 0 0 PV i (1) RCL 9 12 ÷`



Figure 5

¹ The interest calculated with `i` is the monthly interest; with the keystroke sequence `RCL 9 12 ÷` the annual rate is brought to the display

HP 12C Platinum Mortgages with loan fees (points)

Answer: The effective APR is 8.97%.

Example 3: A small commercial building needs improvements and a local bank offers a 25-year, \$350,000.00 mortgage at 6.85% annual interest with a 2.5-point fee. Calculate both the disbursed amount and the monthly payment.

Solution: First the monthly payment is obtained when the actual loan amount is considered as PV:

`3 5 0 0 0 0 PV 6 . 8 5 9 12 ÷ 2 5 9 12 x 0 FV PMT`



Figure 6

To calculate the disbursed amount given the loan actual amount, simply subtract 2.5% from it:

In RPN mode: `RCL PV 2 . 5 % -`
In algebraic mode: `RCL PV - 2 . 5 % =`



Figure 7

Answer: The regular monthly payment will be \$2,440.34 and the actual amount available for improvements with this mortgage is \$341,250.