



hp calculators

HP 30b Canadian Mortgages –
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The time value of money application

The time value of money application built into the HP 30b is used to solve compound interest problems and annuities that involve regular, uniform payments. Compound interest problems require the input of 3 of these 4 values:

\boxed{N} $\boxed{I/YR}$ \boxed{PV} \boxed{FV} . Annuity problems require the input of 4 of these 5 values: \boxed{N} $\boxed{I/YR}$ \boxed{PV} \boxed{PMT} \boxed{FV} . Once these values have been entered in any order, the unknown value can be computed by pressing the key for the unknown value.

The time value of money application operates on the convention that money invested is considered positive and money withdrawn is considered negative. In a compound interest problem, for example, if a positive value is input for the \boxed{PV} , then a computed \boxed{FV} will be displayed as a negative number. In an annuity problem, of the three monetary variables, at least one must be of a different sign than the other two. For example, if the \boxed{PV} and \boxed{PMT} are positive, then the \boxed{FV} will be negative. If the \boxed{PMT} and \boxed{FV} are both negative, then the \boxed{PV} must be positive, etc. An analysis of the monetary situation should indicate which values are being invested and which values are being withdrawn. This will determine which are entered as positive values and which are entered as negative values.

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. The stated annual nominal interest rate is always entered into $\boxed{I/YR}$, as shown in the examples.

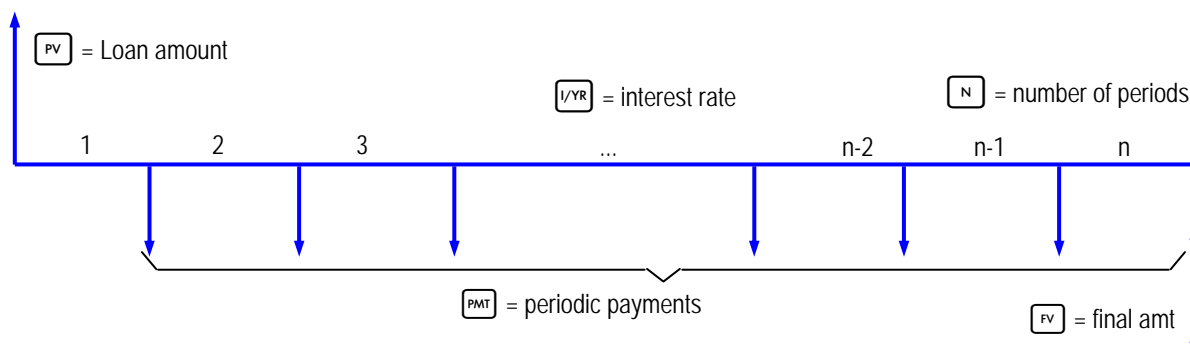
Additional information can be found in the learning module covering time value of money basics.

Loan payments

Nearly everyone makes loan payments at one time or another, since few of us are able to always pay cash for houses and cars. Loan payments are computed so that part of the payment made pays for interest that has accrued on the loan since the last payment and part goes toward reducing the outstanding loan balance. Over the life of the loan, the portion of each payment that goes toward interest and the outstanding loan balance (or principal) changes, with the portion of each payment going toward principal increasing throughout the lifetime of the loan. This aspect of a loan is explained in greater detail in the learning module on loan amortizations.

Cash flow diagrams and sign conventions

The sign conventions for cash flows in the HP 30b 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 most common borrower viewpoint and their relationship to the TVM variables.



Canadian mortgages

A Canadian mortgage differs from a "standard" mortgage in that the payment frequency and the interest compounding frequency are not the same: payments are made monthly, but interest is compounded semiannually.

NOTE: This has the effect of lowering the amount of interest paid over the life of the loan and lowering the size of the periodic payment.



The HP 30b handles Canadian mortgages with a setting in the MODE menu, accessed by pressing   . The HP 30b display will show either "TVM Standard" or "TVM Canada" depending on the current mode.



Figure 1



Figure 2

If you are in one mode and wish to change to the other, press . Once you have changed modes, press  to return to the HP 30b calculation environment.






When the HP 30b is in TVM Standard mode, pressing  will store the displayed value as the number of periods per year. However, in TVM Canada mode, pressing  displays the input environment shown below. Note that the value displayed may be different than the 2 displayed in the figure.



Figure 3

At this point, a value may be keyed and  pressed to change the value stored for the number of periods per year. Pressing  or  will then display the following:

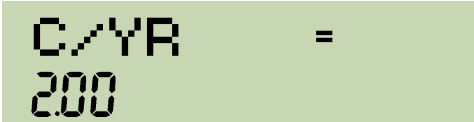




Figure 4

This prompt is displaying the number of compounding periods per year. In TVM Standard mode, these two values, P/YR and C/YR are equal. In TVM Canada mode, they can be different. At this point, a value may be keyed and  pressed to change the value stored for the number of periods per year. Press  to return to the HP 30b calculation environment. For a monthly Canadian mortgage, the value for P/YR will be 12 and the value for C/YR will be 2.

Practice solving for loan payments

Example 1: Johnny wants to buy a house that costs \$180,000 and pay for it with a 30-year loan at 6% interest, compounded monthly. What is the size of Johnny's monthly house payment? Assume a standard, non-Canadian mortgage.

Solution:

If the HP 30b displays "TVM Canada" then press . Otherwise, go to the next step.

PMT =
- 1079.19

Figure 5

Answer: \$-1,079.19.

Example 2: Johnny wants to buy a house that costs \$180,000 and pay for it with a 30-year loan at 6% interest, compounded monthly. What is the size of Johnny's monthly house payment? Assume a Canadian mortgage.

Solution:

If the HP 30b displays "TVM Standard" then press . Otherwise, go to the next step.

PMT =
- 1070.68

Figure 6

Answer: \$-1,070.68

Example 3: Heather and Howard are buying a house that costs \$250,000. They must pay 20% down and can finance the remaining amount over 15 years at 5.65%, compounded monthly. What is the size of their monthly payment? Assume a standard, non-Canadian mortgage.

Solution: 20% of \$250,000 is \$50,000, so they will finance \$200,000 as shown below.

If the HP 30b displays "TVM Canada" then press . Otherwise, go to the next step.



Figure 7

Answer: \$-1,650.13 per month.

Example 4: Heather and Howard are buying a house that costs \$250,000. They must pay 20% down and can finance the remaining amount over 15 years at 5.65%, compounded monthly. What is the size of their monthly payment? Assume a Canadian mortgage.

Solution: 20% of \$250,000 is \$50,000, so they will finance \$200,000 as shown below.

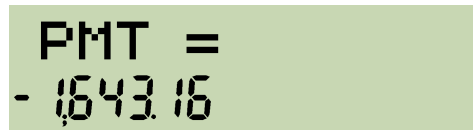
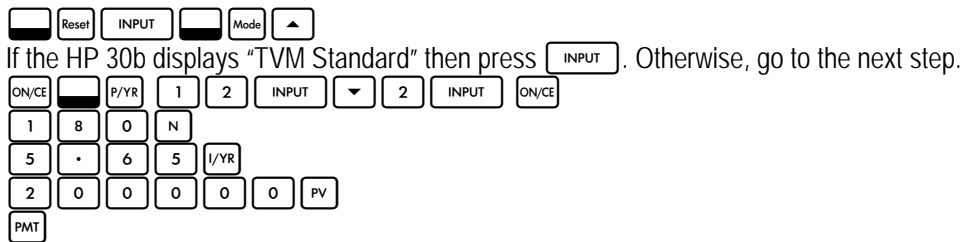


Figure 8

Answer: \$-1,650.13 per month.