

7.5 Problem Solving - Mortgages

TVM Solver for Mortgage Calculations

- N = Total number of payments (# of payments X # of years)
- I% = Annual interest rate as a percent
- PV = Present value, or Amount of the mortgage
- PMT = The payment amount (a negative value (-) for mortgages)
- FV = Future value ("0" for paid-off mortgage, otherwise balance of the mortgage)
- P/Y = Number of payments per year
- C/Y = Number of compound periods per year
- PMT: = END for mortgages

Important Notes:

- In Canada, mortgage interest is **always compounded semi-annually** but in the U.S., mortgage interest is compounded monthly. Payments may be made at a different time i.e. monthly or bi weekly, P/Y and C/Y do not need to match.
- Always input C/Y = 2 after P/Y, or the calculator automatically resets C/Y to match the P/Y.
- Cash outflows, like Mortgage Payments, are negative.
- Cash inflows, like the Mortgage Amount, are positive.
- The most common term for mortgages is a five year term. After 5 years you must renew the mortgage, which means taking out a new mortgage at current interest rates for the balance owing after 5 years.

Mortgage Vocabulary

mortgage	mortgage payment	mortgagor	mortgagee
mortgage broker	principal	equity	collateral
down payment	payment frequency	accelerated payment	amortization period
fixed rate	variable rate	CMHC	mortgage insurance
land transfer tax	home inspection fee	closing costs	length of term

Ex. 1 You have a \$173,500 mortgage, with monthly payments, at 3.2%/a over 25 years.

a) Calculate the monthly payments.

N=
I%=
PV=
PMT=
FV=
P/Y=
C/Y=
PMT: END BEGIN

b) How much money have you paid over the first 5 years?

c) How much of the money paid was from the principal?

N=
I%=
PV=
PMT=
FV=
P/Y=
C/Y=
PMT: END BEGIN

d) How much of the money paid was interest?

e) How much money have you paid over the 25 years?

f) How much interest will you pay over 25 years?

g) From your answers, do you pay off more interest or more principal in the first 5 years of your mortgage? Last 5 years?

Ex. 2 Given an interest rate of 5% for a mortgage of \$250 000, determine your monthly payments and compare the total amount of interest paid if you amortize the mortgage over 20 years and over 25 years. Discuss the pros and cons between both options.

20 years

N=
I%=
PV=
PMT=
FV=
P/Y=
C/Y=
PMT: END BEGIN

25 years

N=
I%=
PV=
PMT=
FV=
P/Y=
C/Y=
PMT: END BEGIN

Ex. 3 Given an interest rate of 5% for a mortgage of \$250 000, use your monthly payments from Ex. 2 (with amortization period of 25 years) and halve the amount. This will now be your bi-weekly and semi-monthly payments. Compare how long it will take to pay off the mortgage using bi-weekly vs. semi-monthly payments. Discuss why one frequency of payment is better than the other. Do you think the home owner will find a significant difference in the payments on a weekly basis?

bi-weekly

N=
I%=
PV=
PMT=
FV=
P/Y=
C/Y=
PMT: END BEGIN

semi-monthly

N=
I%=
PV=
PMT=
FV=
P/Y=
C/Y=
PMT: END BEGIN

Ex. 4 Ms. Mes makes monthly payments on a \$ 72 000 mortgage over 25 years at 11.125% for 5 years. After 2 years, she decides to increase the monthly payment by \$100 and at the end of the 4th year she is able to make an extra principal payment of \$ 2000.

a) What is the principal balance owing at the end of 5 yrs? **4 screens needed to complete!**

N=
I%=
PV=
PMT=
FV=
P/Y=
C/Y=
PMT: END BEGIN

N=
I%=
PV=
PMT=
FV=
P/Y=
C/Y=
PMT: END BEGIN

N=
I%=
PV=
PMT=
FV=
P/Y=
C/Y=
PMT: END BEGIN

N=
I%=
PV=
PMT=
FV=
P/Y=
C/Y=
PMT: END BEGIN

b) By how long has the amortization period of the mortgage been shortened?

N=
I%=
PV=
PMT=
FV=
P/Y=
C/Y=
PMT: END BEGIN