

7.5 Problem Solving-Mortgages

If you buy a car or a house or basically are making an expensive purchase that you cannot pay for in one payment there is a way to pay back the amount by making payments over some period of time.

Usually you sign a contract agreeing to repay (**amortize**) the loan plus the interest on that loan.

Amortization- is the process of gradually reducing a debt through equal regular payments of principal and interest.

Some times you can reduce the amount of the loan by making a payment at the time of the purchase which is called a **down payment**.

The process of completely exhausting the debt on your account can be shown in an amortization table.

Let's look at how much a mortgage can cost and how you can easily save \$\$\$

Look at the completed chart below:

Using a fixed term of 5 years and a 5% rate of interest, your payments for a \$250 000 at various payment frequency's (i.e. monthly or weekly) and Amortization lengths (ie 25 years and 20 years) are displayed.

Note the difference in interest paid at the end of the amortization period.

You can compare other rates and terms by using [Mortgage Amortization Schedule Generator - Fiscal Agents](#)

25 year Amortization		20 year Amortization		
Weekly Payments	Total interest	Weekly Payments	Total interest	For weekly payments, how much do you save in total by choosing a 20 year term instead of a 25 year?
\$335.24	\$184080	\$379.11 <i>(only \$43.87 more/week)</i>	\$143210	\$40870
Monthly Payments	Total interest	Monthly Payments	Total interest	For monthly payments, how much do you save in total by choosing a 20 year term instead of a 25 year?
\$1454.01	\$186204	\$1642.81 <i>(only \$188.80 more/month)</i>	\$144275	\$41929
How much do you save in total by choosing to pay weekly instead of monthly in a 25 year Amortization?	\$2124	How much do you save in total by choosing to pay weekly instead of monthly in a 20 year Amortization?	\$1065	\$1059

Don't write -just read-this is on your homework handout

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)
- P/Y =number of payments per year
- C/Y = number of compound periods per year
- PMT: = place cursor to indicate whether payments are made at the end or beginning of each payment period (use END for mortgages)

Other Important Items:

- In Canada mortgage interest is **always compounded semi-annually**, (but in the U.S. mortgage interest is compounded monthly) and payments may be made at a different time ie monthly or bi weekly so your 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.
- To calculate an unknown value move the cursor to the correct line and press:
ALPHA: ENTER, which accesses the "SOLVE" command.
- A small black box to the left of the screen indicates which variable you have solved for.
- You must quit the TVM Solver (2nd: MODE) before using other FINANCE applications (like "bal", "Σ Int").
- The most common term for mortgages is a five year term. After 5 years you must renew the mortgage, 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	

Problem Solving....

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

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

N=	25 × 12
I%=	3.2
PV=	173500
PMT=	838.99
FV=	0
P/Y=	12
C/Y=	2
PMT:	END BEGIN

① Monthly payments
of \$838.99

② 5 yrs @ 838.99/month
 $838.99 \times 12 \times 5$
= 50 339.40

b) How much of that was the principal

Leave PMT as
- 838.99

Set N to 60
(5 yrs)

Solve for FV

$$FV = 148863.91$$

Actual value of loan
after 5 yrs is \$148863.91

∴ Paid
 $173500 - 148863.91$
= 24636.09

\$ 24636.09 in Principal

c) how much was interest?

$$50\ 339.40 - 24636.09$$

$$= 25703.24$$

∴ Paid \$25703.24

Ex. 2

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

- a) What is the principal balance owing at the end of 5 yrs?
- b) By how long has the amortization period been shortened.

START

N = 25 x 12
 I% = 11.125
 PV = 72000
 PMT = -699.21
 FV = 0
 P/Y = 12
 C/Y = 2
 PMT: (END) BEGIN

Balance after 2 years

N = 12 x 2
 I% = 11.125
 PV = 72000
 PMT = -699.21
 FV = 70754.78
 P/Y = 12
 C/Y = 2
 PMT: (END) BEGIN

2 more years with a bigger payment

N = 2 x 12
 I% = 11.125
 PV = 70754.78
 PMT = -799.21
 FV = 66541.06
 P/Y = 12
 C/Y = 2
 PMT: (END) BEGIN

She paid \$2000 directly

N = 12 x 1
 I% = 11.125
 PV = 66541.06 - 2000
 PMT = -799.21
 FV = 61837.64
 P/Y = 12
 C/Y = 2
 PMT: (END) BEGIN

- b) By how long has the amortization period been shortened.

N = 133.9
 I% = 11.125
 PV = 61837.64
 PMT = -799.21
 FV = 0
 P/Y = 12
 C/Y = 2
 PMT: (END) BEGIN

∴ The value is \$ 61837.64 after 5 years

Originally → 25 years

Now, 5 years + 133.9 months
 193.9 months
 = 16.16 years

∴ She shaved 25 - 16.16 years (8.84) from her mortgage



Homework:

Handout- 7.5 Using the TVM Solver for Mortgage Calculations

Text p 567 # 10, 11, 12, 14

Test Review

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