Amortizing a Mortgage

Mortgage Interest Rates
Under Canadian law, interest on mortgages can be compounded at most <u>semi-annually</u>. However, mortgage payments are often made <u>monthly</u>. The <u>monthly</u> payments form an annuity whose present value is the principal originally borrowed.

Since the payment period and compounding period are <u>different</u>, we cannot calculate the monthly payment on a mortgage by using the formula for the present value of an ordinary simple annuity. We use the <u>TVM Solver</u> instead. To represent monthly payments and semi-annual compounding, we set P/Y = <u>12</u> and C/Y = <u>2</u>.

Example 1: The Cafirmas take out a mortgage of $210 000 at 5% per year compounded semi-annually for 25 years.
a) What is their monthly payment?
b) What is the total interest paid over the 25 years?

Solution:

a) N =
   I% =
   PV =
 * PMT =
   FV =
   P/Y =
   C/Y =
   PMT: END

b) Method 1:
   $\sum$Int(1,   )

Method 2:

total payments = # payments * payment/month

Total interest = total payments - principal

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A mortgage is <u>amortized</u> when both the principal and interest are paid off with a series of <u>equal</u>, <u>regular</u> payments. For example, the mortgage in Example 1 was amortized by making monthly payments of $ _____ over an <u>amortization period</u> of 25 years.

To simplify the math, we assumed that the interest rate is <u>fixed</u> for the entire amortization period.

In reality, mortgage interest rates are fixed for a shorter length of time called the <u>term</u> of the mortgage. The <u>term</u> normally ranges from <u>6</u> months to <u>10</u> years. At the end of the term, the mortgage must be <u>paid off</u> or <u>renewed</u> at the current rate of interest.

Amortization table

We can use an **<u>amortization table</u>** to analyse how a mortgage is repaid. The <u>amortization table</u> gives a detailed breakdown of the <u>interest</u> and <u>principal</u> paid by each payment and the <u>loan balance</u> after the payment.

Example 2

Here is a partial amortization table for a mortgage of $175 000 with a rate of 6.25% amortized for 25 years.

Payment number	Monthly payment	Interest paid	Principal paid	Outstanding balance
0				$175 000.00
1	$1145.80	$899.81	$245.99	$174 754.01
2	$1145.80	$898.55	$247.25	$174 506.76
3	$1145.80	$897.28	$248.52	$174 258.24
4	$1145.80	$896.00	$249.80	$174 008.44
5	$1145.80	$894.71	$251.09	$173 757.35
6	$1145.80	$893.42	$252.38	$173 504.97
⋮	⋮	⋮	⋮	⋮
295	$1145.80	$34.71	$1111.09	$5640.29
296	$1145.80	$29.00	$1116.80	$4523.49
297	$1145.80	$23.26	$1122.54	$3400.95
298	$1145.80	$17.49	$1128.31	$2272.64
299	$1145.80	$11.69	$1134.11	$1138.53
300	$1144.38	$5.85	$1138.53	$0.00

a) How much interest and principal is paid in the 5th payment?

How much do they still owe after this payment?

b) What is the outstanding balance after 6 months?

c) Compare the interest and principal paid in the first 6 months of the mortgage with the interest and principal paid in the last 6 months of the mortgage. What do you notice?

d) Why is the monthly payment decreased for the 300th payment?

e) What percent of the total amount paid is interest?
- What is the total amount paid?

- What is the total amount of interest paid?

- What percent of the total amount paid is interest?

p. **451 #3.** Determine the monthly payment for each mortgage. The interest is compounded semi-annually.

a) principal borrowed = 65 000
Interest rate = 4%
Length of mortgage = 15 years.

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

b)   Determine the total interest paid over the life of the mortgage.

Homework: Pg. 450: #1-7