

### 7.8 Saving Plans and Loans: Creating Amortization Tables

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.

# 7.8 Amortization Tables FULL.notebook

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Ex 1:

You want to buy a bicycle for \$500 and want to pay for it during a 6 months period of time by making regular payments toward the principal and interest. Calculate the regular payments that you will have to make then look at an amortization table that would show the amortizing process if the interest rate is 6% /a compounded monthly.

Financial Screen:  
 N= 6 ← half a yr  
 I% = 6% ← 0.5 x 12  
 PV = 500  
 PMT = ?  
 FV = 0  
 P/Y = 12  
 C/Y = 12  
 PMT: END BEGIN

∴ my regular payments are \$84.80

extra How much interest did you pay  
 Interest (84.80 x 6) - 500 = 88.80 ∴ \$8.80 in interest

Look at the chart to see how it works:

Total Cost: \$500		Annual Rate: 6%		
Regular Payment 84.80		Monthly Rate: $\frac{6\%}{12} = 0.005$		
		Number of Payments		
Payment #	Payment (\$)	Interest Paid (\$)	Principal Paid (\$)	Outstanding Balance
0				500
1	84.80	$500 \times 0.005 = 2.5$	$84.80 - 2.5 = 82.30$	$500 - 82.30 = 417.70$
2	84.80	$417.70 \times 0.005 = 2.09$	$84.80 - 2.09 = 82.71$	$417.70 - 82.71 = 334.99$
3	84.80	$334.99 \times 0.005 = 1.67$	$84.80 - 1.67 = 83.13$	$334.99 - 83.13 = 251.86$
4	84.80	$251.86 \times 0.005 = 1.26$	$84.80 - 1.26 = 83.54$	$251.86 - 83.54 = 168.32$
5	84.80	$168.32 \times 0.005 = 0.84$	$84.80 - 0.84 = 83.96$	$168.32 - 83.96 = 84.36$
Total 6	84.80	$84.36 \times 0.005 = 0.42$	$84.80 - 0.42 = 84.38$	$84.36 - 84.38 = 0.0$
		8.78		

Ex 2

Compare the amount of interest earned, at age of 65, on an RRSP at 6%/a compounded annually for each option:

Option 1: Making an annual deposit of \$1000 starting at age 20

Option 2: Making an annual deposit of \$3000 starting at age 50

Option 1

$$\begin{aligned}
 N &= 45 \quad \leftarrow 65 - 20 \\
 I\% &= 6 \\
 PV &= 0 \\
 PMT &= -1000 \\
 ? \quad FV &= ? \\
 P/Y &= 1 \\
 C/Y &= 1 \\
 PMT & \text{ END } \text{ BEGIN}
 \end{aligned}$$

$$FV = 212743.51$$

Total amount deposited:

$$\begin{aligned}
 &= 45 \times 1000 \\
 &= 45000
 \end{aligned}$$

Interest Earned:

$$\begin{aligned}
 &= 212743.51 - 45000 \\
 &= 167743.51
 \end{aligned}$$

Compare:

$$\begin{aligned}
 &167743.51 - 24827.91 \\
 &= 142917.60
 \end{aligned}$$

∴ I would make 142917.60 more  
by choosing option 1

Option 2

$$\begin{aligned}
 N &= 15 \\
 I\% &= 6 \\
 PV &= 0 \\
 PMT &= -3000 \\
 ? \quad FV &= ? \\
 P/Y &= 1 \\
 C/Y &= 1 \\
 PMT & \text{ END } \text{ BEGIN}
 \end{aligned}$$

$$FV = 69827.91$$

Total amount deposited:

$$\begin{aligned}
 &= 15 \times 3000 \\
 &= 45000
 \end{aligned}$$

Interest Earned:

$$\begin{aligned}
 &= 69827.91 - 45000 \\
 &= 24827.91
 \end{aligned}$$

Google [Mortgage Amortization Schedule Generator](#) - Fiscal Agents

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

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

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

Now let's use the graphing calculator to find the payments and total interest paid for a \$250 000 mortgage, 5%/a interest, with monthly payments and a 25 year amortization length

Financial Screen:

N = 300 ← 25 × 12

I% = 5

PV = 250000

? PMT =  $\square$

FV = 0

P/Y = 12

C/Y = 2 ←

PMT: END BEGIN

Important Note

In Canada mortgage interest is compounded **semi-annually**, Always input C/Y = 2 **after** P/Y, or the calculator automatically resets C/Y to match the P/Y.

∴ you will pay \$1454.01 /mo.

To find interest paid press 2nd Quit then Apps Enter then scroll down to A:  $\Sigma$ Int (1,300)

the value 1 is the starting payment number and the value 300 is the end payment number

$$\Sigma \text{Int}(1, 300) = 186203.74$$

∴ you pay \$186203.74

OR

$$\begin{aligned} &\text{Total pmts} - \text{principal} \\ &= 300(1454.01) - 250000 \\ &= 186203 \end{aligned}$$

↑ Be sure your calc. is not rounding  
use Mode | Float

HMWK  
p 518 # 2, 5, 7-10  
and  
Mortgage Practice Hand out

