Math 1050 Mortgage Project

100

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In this project we will examine a home loan or mortgage. Assume that you have found a home for sale and have agreed to a purchase price of **$198,500**.

Down Payment: Assume that you are going to make a 10% down payment on the house. Determine the amount of your down payment and the balance to finance.

Down Payment $19,850 　　　　　　Mortgage Amount $178,650

Part I: 30 year Mortgage

Monthly Payment: Calculate the monthly payment for a 30 year loan (rounding up to the nearest cent) by using the following formula. Show your work. [PMT is the monthly loan payment, P is the mortgage amount, r is the annual percent rate for the loan *in decimal*, and Y is the number of years to pay off the loan. For the 30 year loan use an annual interest rate of 4.975%.

$$PMT = \frac{P\left(\frac{r}{12}\right)}{1 - \left(1 + \frac{r}{12}\right)^{-12Y}}$$

$$PMT = \frac{178650\left(\frac{.04975}{12}\right)}{1 - \left(1 + \frac{.04975}{12}\right)^{-12(30)}}$$

$$PMT = \frac{178650\,(.004145833)}{1 - (1 + .004145833)^{-360}}$$

$$PMT = \frac{740.653125}{1 - (1.004145833)^{-360}}$$

$$PMT = \frac{740.653125}{1 - (0.225504633)}$$

$$PMT = \frac{740.653125}{0.774495367}$$

$$PMT = 956.3041389$$

Monthly Payment for a 30 year mortgage = $956.31

Note that this monthly payment covers only the interest and the principal on the loan. It **does not cover** any insurance or taxes on the property.

Amortization Schedule: In order to summarize all the information regarding the amortization of a loan, construct a schedule that keeps track of the payment number, the principal paid, the interest, and the unpaid balance. A spreadsheet program is an excellent tool to develop an amortization schedule. We can use a free amortization spreadsheet on the web. The web address is: http://www.bretwhissel.net/amortization/amortize.html. Enter the **amount of the loan**, i.e. the selling price minus the down payment, the **interest rate**, and the appropriate **number of years**. Check the box to show the schedule. If you are making extra payments towards the principal, include it in the monthly payment and leave the number of payments box blank.

Amortization Schedule monthly payment for a 30 year mortgage = $956.30
(Note: if this is more than 2 or 3 cents different from your calculation, check your numbers!)

Total interest paid over 30 years = $165,618.00

Total amount repaid = $244,268.00

Notice that the amount of the payment that goes towards the principal and the amount that goes towards the interest are not constant. What do you observe about each of these values?

With every payment made the amount towards principal increases & the amount going towards interest decreases

Find the number of the first payment when more of the payment goes toward principal than interest.

Payment 194

As already mentioned, these payments are for principal and interest only. You will also have monthly payments for home insurance and property taxes. In addition, it is helpful to have money left over for those little luxuries like electricity, running water, and food. As a wise home owner, you decide that your monthly principal and interest payment should not exceed 35% of your monthly take-home pay. What minimum monthly take-home pay should you have in order to meet this goal? Show your work for making this calculation.

$$\frac{monthly\ payment}{\%\ of\ take\ home} = \frac{956.31}{.35} = \$2732.32$$

Minimum monthly take home pay = $2732.32 .

It is also important to note that your net or take-home pay (after taxes) is less than your gross pay (before taxes). Assuming that your net pay is 73% of your gross pay, what minimum gross annual salary will you need to make to have the monthly net salary stated above? Show your work for making this calculation.

$$\frac{Monthly\ take\ home}{\%\ gross\ pay} = \frac{2732.32}{.73} = \$3742.91 \times 12\ months = \$44,914.92$$

Minimum gross annual salary = $44,914.92

Part II: Selling the House

Let's suppose that after living in the house for 10 years, you want to sell. The economy experiences ups and downs, but in general the value of real estate increases over time. To calculate the value of an investment such as real estate, we use continuously compounded interest.

Find the value of the home 10 years after purchase assuming a continuous interest rate of 4%. Use the full purchase price as the principal. Show your work.

$$A = Pe^{rT}$$
$$A = 198500e^{.04(10)}$$
$$A = \$296,127.20$$

Assuming that you can sell the house for this amount, use the following information to calculate your gains or losses:

Selling price of your house $296,127.20

Original down payment $19,850.00

Mortgage paid over the ten years $114,756.00

= cum prin + cun int
33,441.45 + 81,314.55

The principal balance on your loan after ten years $145,208.55

Do you gain or lose money over the 10 years? How much? Show your amounts and summarize your results:

$114,756.00 paid on mortgage
+ $145,208.55 owed on mortgage

$259,964.55
+   19,850.00 down payment

$279814.55

$296,127.20 - current value
- $279,814.55

$16,312.65 GAIN

Part III: 15 year Mortgage

Using the same purchase price and down payment, we will investigate a 15 year mortgage.

Monthly Payment: Calculate the monthly payment for a 15 year loan (rounding up to the nearest cent) by using the following formula. Show your work. [PMT is the monthly loan payment, P is the mortgage amount, r is the annual percent rate for the loan *in decimal*, and Y is the number of years to pay off the loan. For the 15 year loan use an annual interest rate of 4.735%.

$$PMT = \frac{P\left(\frac{r}{12}\right)}{1 - \left(1 + \frac{r}{12}\right)^{-12Y}}$$

$$PMT = \frac{178,650\left(\frac{.04735}{12}\right)}{1 - \left(1 + \frac{.04735}{12}\right)^{-12(15)}}$$

$$PMT = \frac{178,650(.003945833)}{1 - (1 + .003945833)^{-180}}$$

$$PMT = \frac{704.9230655}{1 - (1.003945833)^{-180}}$$

$$PMT = \frac{704.9230655}{1 - (.492208756)}$$

$$PMT = \frac{704.9230655}{0.507791244}$$

$$PMT = \$1388.22$$

Monthly Payment for a 15 year mortgage = $\underline{\$1388.22}$

Use the amortization spreadsheet on the web again, this time entering the interest rate and number of payments for a 15 year loan.

Amortization Schedule monthly payment for a 15 year mortgage = $\underline{\$1388.21}$
(Note: if this is more than 2 or 3 cents different from your calculation, check your numbers!)

Total interest paid over 15 years = $\underline{\$71,227.80}$

Total amount repaid = $\underline{\$249,877.80}$

Find the number of the first payment when more of the payment goes toward principal than interest.

Payment #5

Suppose you paid an additional $100 towards the principal each month.

How long would it take to pay off the loan with this additional payment?
13 years & 7 months

What is the total amount of interest paid over the life of the loan?
$62,980.26

Compare this total amount repaid to the total amount repaid without any extra payments. How much more or less would you spend if you made the extra principal payments?

$71,227.80 - $62,980.26 = $8247.54 less spent on interest

Part III: Reflection

Did this project change the way you think about buying a home? Write one paragraph stating what ideas changed and why. If this project did not change the way you think, write how this project gave further evidence to support your existing opinion about buying a home. Be specific.

I have worked at Granite Credit Union for 9 years. Because of that I was already knowledgable on amorization tables, budgeting, extra principal payments, etc. With that said this is a very good project for those that don't know about mortgages and how they work. The project broke down the difference of terms & how adding a little extra to a payment every month can save some much money going to interest. This project did teach me how to calculate a mortgage payment when I don't have a website to plug the numbers into. :)