Math 1030 Project 1 Fall 2016 Name Sarah Radcliff

Due in class on November 1st (For unusual, documented extenuating circumstances, the project may be submitted as late as class time on Thursday November 3rd. Projects will *not* be accepted for credit after class time on Thursday November 3rd.

Buying a House

In this project you will examine a home loan or mortgage. Assume that you have found a home for sale and have agreed to a purchase price of $230,000.

Down Payment: 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 23,000 Mortgage Amount 207,000

Part I: 30 year Mortgage

Monthly Payment: Calculate the monthly payment for a 30 year loan. For the 30 year loan use an annual interest rate of 3.75%

Show work here:

$$P_0 = \frac{d\left(1-\left(1+\frac{r}{k}\right)^{-Nk}\right)}{\frac{r}{k}}$$

$P_0 = 207{,}000$

$d = ?$

$r = .0375$

$k = 12$

$N = 30$

$$207{,}000 = \frac{d\left(1-\left(1+\frac{.0375}{12}\right)^{-30\cdot 12}\right)}{\frac{.0375}{12}}$$

$$\left(\frac{.0375}{12}\right)207{,}000 = d\left(1-\left(1+\frac{.0375}{12}\right)^{-30\cdot 12}\right)$$

$$\frac{646.875}{.6747775408} = \frac{d(.6747775408)}{.6747775408}$$

$$958.65 = d$$

Monthly Payment for a 30 year mortgage $958.65

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, it is possible to construct a schedule that keeps track of the payment number, the principal paid, the interest, and the unpaid balance. We can use a free amortization schedule 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.

Amortization Schedule monthly payment for a 30 year mortgage 958.65 (Note: if this is more than a few cents different from your calculation, check your numbers!)

Total interest paid over 30 years 138,113.52

Total amount paid 345,113.52

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?

The principle payment increases every month and the interest payment decreases until it reaches 0. This happens b/c the interest is added to the the principle payment every month.

Number of first payment when more of payment goes toward principal than interest 139

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.

Show work here: 35% of take-home pay.

$$\frac{958.65}{.35} = \frac{.35(T)}{.35}$$

$$2739 = T$$

Min. monthly take home pay $2,739.00

Minimum monthly take h...

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.

Show work here:

$$\frac{2739}{.73} = \frac{.73(g)}{.73}$$

Monthly gross = 3752.05

x 12

Minimum gross annual salary = $45,024.66

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 find the value of the home 10 years after purchase use the exponential growth model with an annual increase of 4%. Use the **full purchase price** as the starting amount. Show your work.

Show work here: 230,000 , 4% , 10yrs

$P_{10} = 230,000(1 + .04)^{10}$

$P_{10} = \$340,456.19$

Value of home 10 years after purchase $340,456.19

Value of home 10 years after purchase 340,456.19

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 340,456.19

Original down payment 23,000

Mortgage dollars paid over the ten years 115,038

The principal balance on your loan after ten years 161,691.23

Do you gain or lose money over the 10 years? How much? Show your amounts and summarize your results: 23,000
115,038
138,038 → Total paid
161,691.23 → Total owed
299,729.23
340,456.19
299,729.23
+ 40,726.96
You would gain $40,726.96

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. For the 15 year loan use an annual interest rate of 3 %.

Show work here:

230,000 | 23,000 | 207,000

$$207{,}000 = \frac{d\left(1-\left(1+\frac{.03}{12}\right)^{-15\cdot 12}\right)}{\frac{.03}{12}}$$

$$207{,}000 = d\left(\frac{362013678\text{6}}{.0025}\right)$$

$$\frac{207{,}000}{144.8054714} = \frac{1614.805471499}{144.8054714}$$

1429.50 = d

Monthly Payment for a 15 year mortgage = $1429.50

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 1429.50 (Note: if this is more than a few cents different from your calculation, check your numbers!)

Total interest paid over 15 years 50,310.91

Total amount paid $257,310.91

Number of first payment when more of payment goes toward principal than interest 1

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 and how will this affect the total amount of interest paid on the loan? [If you are making extra payments towards the principal, include it in the monthly payment and leave the number of payments box blank.]

Length of time to pay off loan with additional payments of $100 per month 165 mos

Total interest paid over the life of the loan with additional $100 monthly payments $45,876.61

Total amount paid with additional $100 monthly payments $252,876.61

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

257,310.91
− 252,876.61
4434.30

You would spend $4434.30 less if you made the extra principe payment.