Math 1050 Mortgage Project

Group __3, project 2__   Names of Participants __Amanda Walker__
_____ __Misty Dawn Larsen__
_____ __Tina Dellutri__
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Instructions: One group member should fill in sheet using dark pencil or ink, showing steps in the provided work space and answers in answer spaces. Group members must work together to assure correct solutions. The final work shown should be split among group members with each group member providing the work and solution for part of the project. Participants' initials should appear to the right of their work/solutions.

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 $201,000.

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 = 201,000 × .1 =   mortgage = 201,000 − 20,100

Down Payment __$20,100.00__   Mortgage Amount __$180,900.00__

AW   AW

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%.

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

$$PMT = \frac{180900\left(\frac{.04975}{12}\right)}{1 - \left(1 + \frac{.04975}{12}\right)^{-12(30)}}$$

$$= \frac{749.98125}{1 - (1.004145833)^{-360}} = 968.35$$

AW

Write down values you used: P = __$180,900.00__, r = __.04975__, Y = __30__

Monthly Payment for a 30 year mortgage __$968.35__ AW

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.

Amortization Schedule monthly payment for a 30 year mortgage __$968.35__ *AW*
(Note: if this is more than 2 or 3 cents different from your calculation, check your numbers!)

Total interest paid over 30 years __$167,706.00__ *AW*

Total amount paid __$348,606.00__ *AW*

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?

In the beginning of the loan's life, far more of the monthly payment goes toward the interest than the principal. As time goes by, a higher percentage of each payment goes toward the principal. *AW*

Number of first payment when more of payment goes toward principal than interest __194__ *AW*

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?

$$968.35 = \frac{35}{100} x \qquad \frac{968.35 \cdot 100}{35} = x$$

Minimum monthly take home pay = __$2766.71__ *AW*

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? *AW*

Minimum gross annual salary = __$45,480.23__

$$\$2766.71 = \frac{73}{100} g \cdot 12$$

AW

$$g = \frac{2766.71 \cdot 100}{73} \cdot 12$$
$$= \$45,480.23$$

Part II: Selling the House

Tina Dellutri

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.

Value of home 10 years after purchase $299,856.76   T.D

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 $299,856.76   TD

Original down payment $20,100.00   TD

Mortgage paid over the ten years $116,202.00   TD

The principal balance on your loan after ten years $147,036.48   TD

Do you gain or lose money over the 10 years? How much? Show your amounts and summarize   TD
your results: you gain money, which is demonstrated
by the following: $299,856.76 (selling $)

$$
\begin{array}{ll}
- & \begin{array}{l} 20,100.00 \\ 116,202.00 \\ 147,036.48 \end{array} \left) \begin{array}{l} \text{down }\$ \\ \text{mgtg} \cdot \$ \\ \text{princ·bal} \end{array} \right.
\end{array}
$$

$16,518.28

Part III: 15 year Mortgage

Part III: 15 year Mortgage *paid, & the down payment*

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%.

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

$$\frac{180{,}900\left(\frac{.04735}{12}\right)}{1-\left(1+\frac{.04735}{12}\right)^{-12\cdot15}}$$

Write down values you used: P = $\underline{180{,}900}$, r = $\underline{.04735}$, Y = $\underline{15}$

Monthly Payment for a 15 year mortgage = $\underline{\$1405.70}$

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 $\underline{1405.70}$
(Note: if this is more than 2 or 3 cents different from your calculation, check your numbers!)

Total interest paid over 15 years $\underline{\$72{,}125.48}$ $\begin{array}{l}\$180{,}900.00\\ \$72{,}125.48\\ \$253{,}025.48\end{array}$

Total amount paid $\underline{\$253{,}025.48}$ for loan

$20{,}100 + \$253{,}025.48 = 273125.48$ for home
Number of first payment when more of payment goes toward principal than interest $\underline{5}$

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 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 $\underline{163\ months}$

Total interest paid over the life of the loan with additional $100 monthly payments $\underline{\$64{,}712.86}$

Total amount paid with additional $100 monthly payments $\underline{\$245{,}612.86}$ for loan

$\begin{array}{l}\$180{,}900.00\\ 64{,}712.86\\ 245{,}612.86\end{array}$ $\begin{array}{l}245{,}612.86\\ 20{,}100.00\\ 265{,}712.86\end{array}$ $\$265{,}712.86$ for house

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?

Total w/ extra $245,612.86
Total w/out $253,025.48

Difference $\begin{array}{r}\$253025.48\\ -\$245612.86\\ \hline 7412.62\end{array}$

Amount you would save if you paid $100 extra per month would be $7412.62

Amanda Walker

Math 1050

Project 2, Group 3

<p style="text-align:center">Reflective Writing</p>

I already knew that it is advisable to pay as much extra toward the principal each month as possible. I had also been told that a fifteen year loan is much smarter than a thirty year loan. Now I know why both of those statements are true. This project has convinced me that when I buy a house, I should be looking for a purchase price that (less my down payment) allows me to make a monthly payment that is no more than 35% of my monthly take home pay—and make it toward a fifteen year loan. It all goes back to sacrificing something I want now in order to secure something even better in the future. I already save a combined total of 15% percent of my take home pay in my company's 401k and a Roth IRA account. Sometimes that 15% percent hurts, but I know it will be much more valuable to me later in life. This project showed me in exact figures how self-discipline saves money in the long run.

Tina Dellutri

Did this project change the way you think about buying a home? Write one paragraph with AT LEAST FIVE SENTENCES 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've never done too much research into the costs of buying a house since I'm not quite there yet. However, after doing these calculations it appears that it is important to plan ahead in order to save thousands of dollars. By saving up, and getting to a higher wage in your profession before making such a large investment, you can afford to pay more per month in order to spend less over time. It makes a lot of sense if you do the numbers. A few thousand dollars can go a long way some years down.

Misty Larsen

My husband and I have already bought and sold a house. My husband is a math teacher and understands the concepts that are covered here very well and he has taken the time to teach me them. We set up spreadsheets all the time for loans we have because we like to pay them off as quickly as possible. I set one up for our home loan just last week for the purpose of seeing how paying various amounts of extra money would affect when the loan gets paid off because we recently paid off a vehicle. We currently have a 30 year mortgage because it allows us flexibility in our budget for unexpected emergencies that come up with our kids. As we pay off different debts we readjust the amount we pay towards our home loan and then we look how that affects finances and when we would be paying off the loan. Knowing how to do this has allowed us to set our own goals financially and be able to cover the unexpected expenses that have come our way. We simply don't pay the minimum payment because of the amount of money that is saved by extra.