Mathematical Finance Project

Project Goals:

- Understand that the mathematics of finance is the science of letting your money work for you!!
- Use the compound interest formula to evaluate the balance of a retirement account.
- Understand the home mortgage process and explain why the term of the loan is important
- Use present value and future value formula to calculate monthly payments on a home and college loan.
- Investigate how much you would actually pay for a house through a 15-year fixed-rate mortgage and a 30-year fixed-rate mortgage, with interest included.
- Investigate price of homes in the area you live in.
- Search for current mortgage interest rates using online resources.
- Calculate a 10% down payment for each house they are interested in researching.
- Calculate the monthly mortgage payment associated with mortgage using a given formula, their scientific or graphing calculator, and online interest rates.
- Calculate the total amount of interest paid for a house.
- Research and calculate the cost of college tuition.

Create a poster for the following purchases and financial calculations described below. The application, website, or design used to create the poster is up to you.

<u>Purchase #1</u>

1. Search for a home to buy in the Elk Rapids/Traverse City area. Include a picture, address, and the list price.

2. Homes for sale in Elk Rapids: https://www.realtor.com/realestateandhomes-search/Elk-Rapids_MI?pos=44.849385,-85.510512,44.976544,-85.287008,12

3. Search for a competitive mortgage rate. Quote at least 3 lenders and their rates for 15 year and 30 year mortgages. Include the name of each lender, conditions, and percentage rates.

4. Mortgage rates: http://www.bankrate.com/mortgage.aspx
5. Calculate the cost of a 10% down payment. How much will that be for your home? How much money will you need to borrow in order to purchase this house?
6. Use the formulas below:

- P = amount borrowed
- $i = \frac{\text{int}\,erest\ \ as\,a\,decimal}{12}$ (Round to 6 decimal places.)

The formula used to calculate a monthly mortgage payment is:

$$R = \frac{Pi}{1-(1+i)^{-n}}$$

R is the monthly payment
P is the amount borrowed (present value or PV)
r is the annual interest rate written as a decimal
i is the interest rate per compounding period. $\frac{r}{12}$
n is the number of months to repay the mortgage

Find the amount of the payment, if you carry the loan for 15 years.
How much will your payments be if you extend the loan for 30 years? (yes, show your work)

7. Using the payment calculations from part 4, how much total will you pay for the house over 15 years? (Monthly payment x 12 months x number of years (15))
   How much of that is interest? (Total payments – original loan amount)
8. Using the payment calculations from part 4, how much total will you pay for the house over 30 years? How much of that is interest? (same formulas as above)

Purchase #2

1. Summarize the rule of 72 and why it is important to know. Give two examples to show that the rule of 72 is a good approximation for how long it will take your money to double. Show how to get your answer algebraically and using the rule of 72.

2. Suppose you start investing $200 per month starting at the age of 18 and you invest until the age of 30 with a rate of 10%. How much would you have in the account on your 30th birthday? If you stop investing on your 30th birthday what will the account balance be when you turn 65? How much did you invest in the account from when you were 18 to 30 years old?

3. Suppose you have a friend that decided to wait until they were 30 years old to invest. She invested $200 per month for 35 years with a 10% interest rate. How much would she have in the account after 35 years? How much did she invest?
4. If you were to start investing after high school what fund would you invest in? Search for a good mutual or index fund. What is the return rate this year? What is the average return rate of the fund?

Purchase #3

1. Research a college or technical school you are interested in attending.
2. Find the price per year and the total price of attending the school. It is your choice to include room and board.
3. What will your monthly payment be if you have a 5% interest rate and a term of 20 years? How much will you pay for your college education? How much of that is interest?

Grading Template for the
“Mathematical Finance” Project

Peer review date:
Final due date:

Buying a home

- ☐ The house- picture, address, price
- ☐ Three mortgage quotes
- ☐ Down payment amount
- ☐ Loan amount
- ☐ 15 year payment
- ☐ 30 year payment
- ☐ 15 year total paid
- ☐ 15 year interest
- ☐ 30 year total paid
- ☐ 30 year interest

Investing

- ☐ Rule of 72 and examples
- ☐ Algebra of rule of 72 using Pert
- ☐ Investment at age 30 if you began at age 18
- ☐ Total amount in account at age 65
- ☐ Total invested
- ☐ Amount your friend would have at age 65
- ☐ Total amount invested by friend
- ☐ Details of fund choice

College loans

- ☐ School attending and area of interest
- ☐ Price per year and total price
- ☐ Monthly payment
- ☐ Total cost
- ☐ Interest paid

Poster Display

- ☐ Neatness
- ☐ Overall Clarity

- Well organized
- Name, Title