105 Math in My Life Project, Fall 2020

Concept #1

Everyone is going to retire at some point in their life. They may inherit a sum of money from a family member, or win the lottery, or put money into a 401K. They could retire young, or work until they are in their 70s. But for me, I want to be able to retire in my late 50s or early 60s. I want to set myself up now, so that when I am done with my career and ready to retire, I can live comfortably and not have to stress about bills or leisure activities. In order for me to do this, I need to have a set amount of money I would like to be paid each month in retirement. In doing so, this will help me to know how much money I need to be saving from here on out until I retire. The method I am using to calculate how much money I will need in my retirement account is called a payout annuity. With a payout annuity, you start with money in an account and then pull out money on a regular basis. For me, I will want to do this monthly. The remaining money that stays in the account after each withdrawal will continue to earn interest.

Concept Overview

In order for me to be comfortable and not feel like I am barely scraping by, I would like to be able to pull $3000 out of my retirement each month. I will do this for a total of 30 years. If the retirement account I have is earning 6% interest, how much will I need in my retirement account when I retire?
The formula for this payout annuity is:

Po=d(1-(1+r/k)^-n*k)/(r/k)
Po = is how much money I need in my retirement account
d= the monthly withdrawal. In this case, it is $3000
r= the annual interest rate. 6%
k= the withdrawals. Since I am doing monthly withdrawals it will be 12
N= the number of years. 30 years is how long I would like to withdraw.

Application

Now that I have my formula and a set plan for what I want to withdraw monthly, I will plug in the numbers into the formula to find how much I need for retirement.
Po= 3000(1-(1+0.6/12)^-30*12)/(0.06/12)
Po= 3000(1-(1.005)^-360)/(0.005)
Po= 500,374.84
The amount I need to have in my retirement is $500,374.84.

Another interesting fact is the if you multiply 3000 by 360 (12 months in a year multiplied by 30 years), that equates to $1,080,000. This is the amount of money that I will withdraw over a 30 year period. The difference in what I withdraw and the amount I started with is the amount of interest my retirement account will earn.
$1,080,000-$500,374.84 = $579,625.16 in interest.

Concept #2

In my everyday life, I work for my money and then I use that money to pay bills. Have you ever heard the phrase, “You spend what you make”? Being in the medical field, I hear this being said by nurses all around me. They make amazing wages, yet they live paycheck to paycheck because they overspend. They are able to buy whatever they want to but then it can backfire and they are left barely getting by until the next paycheck. Ever since I started nursing school, I have always told myself that when I become a nurse, I won’t be like those people. I won’t spend every dime I make. In order for me to accomplish that goal, I need to set myself up now so that I can create good habits instead of bad ones. To do this, I am going to create a pie chart that shows my current monthly bills. Seeing it laid out in a pie chart will help me prioritize my bills and find areas where I can cut back or pay things off so that I can stick more money into savings than paying monthly bills.

Concept Overview and Application

A pie chart is a chart that displays data in a circular graph. Each pie piece represents the relative size of each value. The monthly bills that I have written out will be put into a spreadsheet of data and then I will create a pie chart based on that data.

My monthly bills include utilities (power, water, cable, internet), student loans, rent, groceries, vehicle loans, and leisure activities (shopping, movies, eating out, etc.), and savings

Utilities $95
Student Loans $130
Vehicle Loans $575
Rent $950
Groceries $400
Leisure Activities $200
Total: $2350

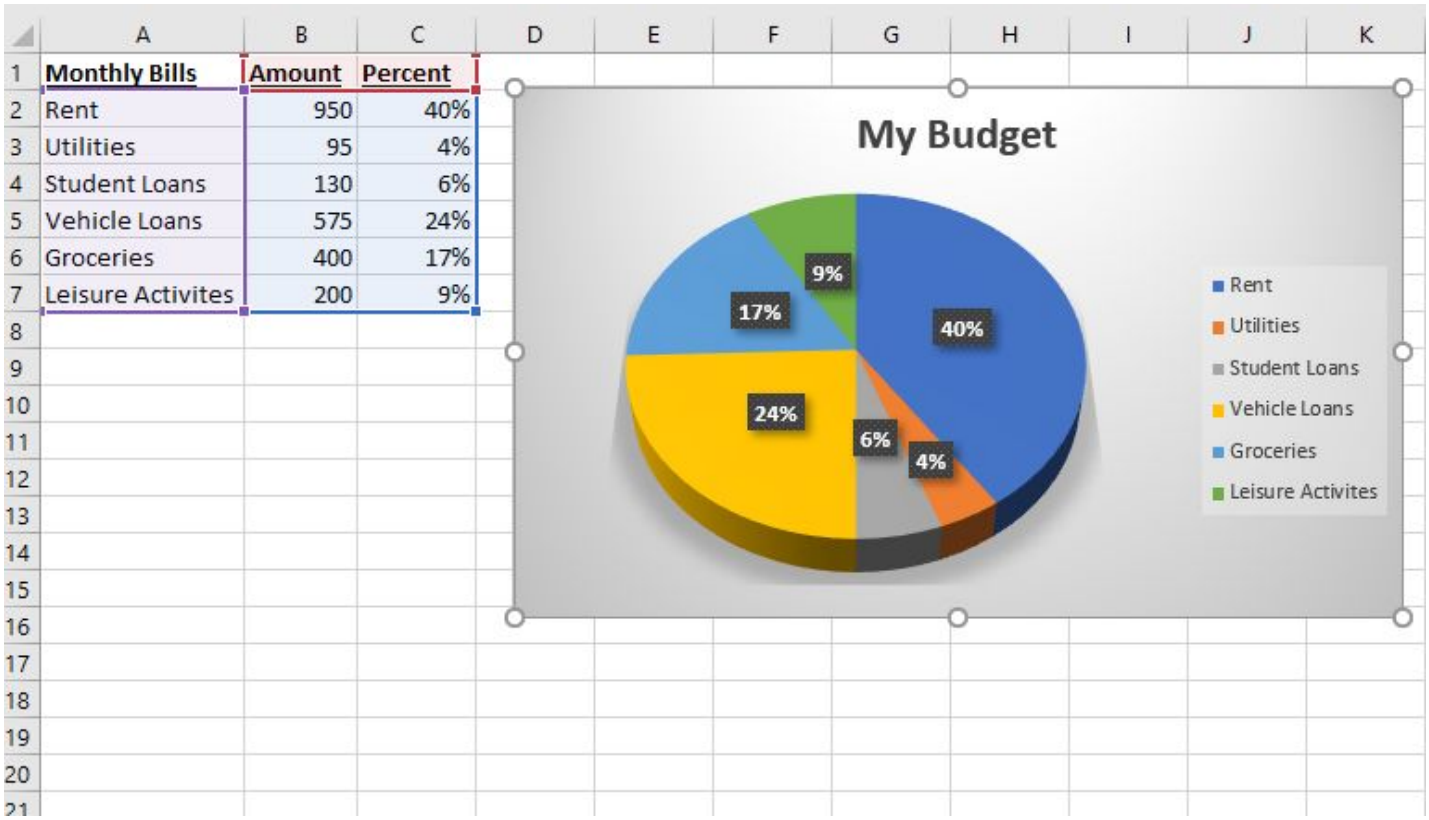
In the pie chart below, I made a column for my monthly bills, their amount, and the percentage of my budget that the monthly bill is. To calculate the percentage, I added up the total bills and then divided each bill by the total.

95/2350 = 0.04
130/2350 = 0.06
575/2350 = 0.24
950/2350 = 0.40
400/2350 = 0.17
200/2350 = 0.09

If I wanted to calculate the degrees of each slice, I would take the percentage and multiply by 360 (the whole degree of a complete circle).

0.04*360 = 14.4
0.06*360 = 21.6
0.24*360 = 86.4
0.40*360 = 144
0.17*360 = 61.2

0.09*360 = 32.4
TOTAL: 360



	A	B	C
1	Monthly Bills	Amount	Percent
2	Rent	950	40%
3	Utilities	95	4%
4	Student Loans	130	6%
5	Vehicle Loans	575	24%
6	Groceries	400	17%
7	Leisure Activites	200	9%

By making this pie chart, I am able to see what my budget truly looks like based on percentages and the degree of each slice. This helps me to see that I need to cut down on my vehicle loans by paying them down, or paying them off if I can, so that I am able to save more each paycheck and not overspend or end up having to live paycheck to paycheck.

Concept #3

My husband and I are just renting a house right now. We have three kids and two of them are having to share a room because we live in a three-bedroom home. In the past few weeks, our children have been talking about us buying a house and each one of them getting their own room. They even have high hopes that they will have an extra room that can be their playroom. After searching the market, we realize that house prices are very high right now. We want to be able to own our own home, but we also need to be realistic about how much we can afford. We don't want to be "house poor" and have the majority of our income go towards the mortgage. In order to move forward with buying a house, we have determined that we can afford a $2000 monthly payment. We want to see how big of a mortgage we can afford with a $2000 payment and then we can start searching for homes in that price range.

Concept Overview

A loans formula is the same formula that I used in my concept #1, the Payout Annuity. This formula works the same as the payout annuity, but it is flipped. Instead of saving money and then getting a payout, we would be borrowing money and then making monthly payments towards the loan.

Application

Loans formula is as follows:
Po=d(1-(1+r/k)^-N*k)/(r/k)
Po= The mortgage amount I want to determine
d= monthly loan payment (2000)
r= interest rate (0.03, rates are great right now)
k= number of compounding periods in a year (12 monthly payments)
N= the length of loan, in years (30 years)

Po= 2000(1-(1+0.03/12)^-30*12)/(0.03/12)
Po= 2000(1-(1.0025)^-360)/(0.0025)
Po= 474,378.76

Now that we have calculated this formula, we know that we can afford a mortgage of $474,379. To calculate the total amount that we will pay, we multiply our monthly mortgage by 12 months and then multiply it again by 30, since it is a 30 year mortgage.
2000*12*30 = 720,000. We will pay a total of $720,000 over the life of the loan.
If we take the total amount and subtract it from the original loan amount, this will tell us the amount of interest that we will pay over the life of the loan.
720,000-474,379 = $245,621 in interest.

Looking at these numbers makes me want to just rent forever! But in all actuality, owning our own home and having a place to call ours will be the icing on the cake. We want to grow old in our forever home and we look forward to giving our children the space that they so badly need.