Math 1050 Credit Card Debt Project

Name Meredith Allen_____

You have received your monthly credit card statement and must now deal with the financial realities of last month's birthday celebration. While your milestone in years was deserving of a celebration, dealing with the $2000 in credit card charges will require some planning.

Your credit card statement lists the APR (Annual Percentage Rate) for your balance to be 14.5%. This is the yearly interest rate the credit card company uses in calculating interest due on your balance. The credit card company compounds interest monthly. Your monthly interest rate on credit card charges will be:

$$i = \frac{APR}{12} = \frac{0.145}{12} \approx 0.012083$$

The minimum payment required by your credit card company is $25/month. Assuming that you do not make any new charges to your account, answer the following questions to help you determine the best plan for paying off this credit card debt.

1. To begin with, let's check out the plan of only paying the minimum amount due each month. To get a feel for how this will affect the balance, finish filling in the following table using the minimum monthly payment of $25.

Month	Old Balance	Interest	Payment	New Balance
1	$2000.00	$24.17	$25.00	$1999.17
2	$1999.17	$24.16	$25.00	$1,998.33
3	$1998.33	$24.15	$25.00	$1,997.48
4	$1,997.48	$24.14	$25.00	$1,996.62
5	$1,996.62	$24.13	$25.00	$1,995.75
6	$1,995.75	$24.12	$25.00	$1,994.87
7	$1,994.87	$24.10	$25.00	$1,993.97
8	$1,993.97	$24.09	$25.00	$1,993.06
9	$1,993.06	$24.08	$25.00	$1,992.14
10	$1,992.14	$24.07	$25.00	$1,991.21
11	$1,991.21	$24.06	$25.00	$1,990.27
12	$1,990.27	$24.05	$25.00	$1,989.32

What is the total amount that has been paid to the credit card company at the end of the first year?

The total amount to the credit company is $300.00 (12 x $25.00) in year .

How much of the original balance has been paid off at the end of the first year?

Only $10.68 has been paid toward the original balance. ($2,000-$1,989.32)

From looking at the new balances over the first year, how many years do you think it will take to pay off the $2000? (This is a guess so there is no wrong answer. Before going on to step 2, write down your best estimate.)

I would guess at least 10 years.

Name **Meredith Allen**

2. A formula for calculating the payment, P, required to pay off a debt of amount D in M months with monthly interest rate i is

$$P = \frac{D \cdot i}{1-(1+i)^{-M}}$$

$$\$25 = \frac{2{,}000(0.012083)}{1-(1+0.012083)^{\wedge}\text{-}M}$$

Using this formula, solve for M to determine the number of months it will take to pay off the $2000 credit card debt with minimum monthly payments of $25. Round the number of months to two decimal places. (Attach all work for this assignment to the end.)

Side step 2.5: minus 1 from both sides

1. $25[1-(1+0.012083)]^{\wedge}\text{-}M=2000(0.012083)$

2. $[1-(1+0.012083)]^{\wedge}\text{-}M=\dfrac{2000(0.012083)}{25}$

plug into calc:(0.96664)

3. $-(1.012083)^{\wedge}M=(-\dfrac{2000(0.012083)}{25}$

Side step 3.5: add 1 to both sides

4. $(1+0.012083)^{\wedge}\text{-}M=\dfrac{-2000(0.012083)}{25}+1$

side step 4.5: take natural log (ln) of both sides to bring exponent -M in front

5. $-M \times \ln(1.012083)=\ln(\dfrac{2000(0.012083)}{25}+1)$

side step 5.5: Divide by -ln(1 +0.012083) to solve for M

$M= \dfrac{\ln(\dfrac{-2000(0.012083)}{25}+1)}{-\ln(1+0.012083)}$

How long is this in years, rounded to the nearest tenth of a year?

This would take approximately 23.6 years to pay off at the rate of $25 per month.

What is the total amount paid to the credit card company, rounded to the nearest dollar?

Total amount paid to the credit card company would be approximately $7,080 over the 23.6 years.

3. How many months will be required to pay off the debt if you pay $50 each month? Round to two decimal places.

$\dfrac{\ln(-\dfrac{2000(0.012083)}{50}+1)}{\ln(1+0.012083)} =M$

It would take about 54.97 months to pay off the debt at this rate.

How long is this in years, rounded to the nearest tenth of a year?

Approximately 4.6 years.

What is the total amount paid to the credit card company, rounded to the nearest dollar?

$2,760 dollars

4. How many months will be required to pay off the debt if you pay $75 each month? Round to two decimal places.

Using same equation as above, sub 75 for P.
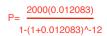
32.38 months to pay off at this rate.

How long is this in years, rounded to the nearest tenth of a year?

2.7 years

What is the total amount paid to the credit card company, rounded to the nearest dollar?

$2,430 paid to credit card company after paying $75 a month for 2.7 years.

Math 1050 Credit Card Debt Project   Name _____

5. How large would your monthly payment have to be in order to pay off your debt in 12 months? Round **up** to the next nearest cent.

$$P= \frac{2000(0.012083)}{1-(1+0.012083)^{-12}}$$

You would have to pay $180.05 a month to pay off your credit card debt in 12 months.

What is the total amount paid to the credit card company, rounded to the nearest dollar?

$2,160.60

6. What is the best plan for paying off the $2000? Why?

The best option would be to pay off the $2,000 in 12 months. This is because the compound interest is drastically decreased at this rate.

What is the worst plan? Why?

The worst option would be to pay the minimum of $25 until the debt is paid off. This would allow the interest to compound monthly until you're paying more than double the original debt, in solely interest.

What should you do if you cannot afford to make the payments required by the best plan?

You should make the maximum payments that you are able in order to avoid compound monthly interest.

7. What are two things that the average consumer can learn by completing this assignment?

i.   To be aware of interest rates on your credit debt to avoid paying more in interest than your original debt.

ii.   To be sure you can pay more than the monthly minimum to avoid paying off debt for extended periods of time, as well as paying loads of interest.