Credit Card Loans

Student Worksheet   **Name:**_____

Recall the formula for **simple interest**
$$I = P * r * t$$
     where, I is the interest owed
            P is the principal amount outstanding
            r is the interest rate
            t is the time in years.
Note: to express 1 month in terms of years, divide by 12, so that to calculate the interest over a period of 1 month, t = 1/12

Recall the general form for **compound interest** (an **exponential growth model**) is the equation:
$$A = P(1 + \frac{r}{n})^{nt}$$
     where, P is the principal amount, or the original amount of money before any growth
            occurs
            r is the annual nominal interest rate or the **growth rate** in decimal form
            n is the number of times the interest is compounded per year
            t is the number of years, and A is the new amount.

Formula for Interest Compounded Monthly: $A = P(1 + \frac{r}{12})^{12t}$

You made a purchase of $1,000 on your credit card.
1. Brainstorms some things that cost $1,000.

2. You get your monthly credit card statement and are offered the option of making a minimum payment of $15 per month. If the credit card company charged you NO interest (which would never happen!) how many months would it take you to pay off the $1,000?

3. BUT… Your credit card company has given you a moderate APR of 13%. With this interest rate, estimate the number of months do you think it would take you to pay off your balance of $1,000 if you paid $15 each month?

4. How much do you think you will end up paying in interest in the end?

5. If the 13% APR was a simple interest rate with no term (meaning you didn't have to pay it back in any specific amount of time) – how much would you pay in interest (let t = 1)?

6. Is this number NOT correct?

7. What if you decided not to pay anything on this loan for 1-year. Using the formula for interest compounding monthly, calculate the amount of interest that you would accrue from not paying on the loan for one year.

8. As mentioned, credit card loans are compounded. Begin to fill in the chart below to see what happens to your monthly payments of $15 each month with an APR of 13% compounded monthly. This assumes that you make NO MORE charges on your credit card.

To calculate the interest at each month interval – use the **simple interest formula**.
9. Why do you use the simple interest formula instead of the compound interest formula when you calculate each monthly payment?

Loan Amount = $1,000
APR = 13%
Monthly Payment = $15

Month	Balance (P)	Payment	Interest on Balance	Principal
0	1st: $1,000	$15.00	2nd: $I = P*r*t$	3rd: Payment – Interest (I)
1	4th: Previous Balance – Principal			
1	$1,000	$15.00	$I = \$1,000*0.13*\frac{1}{12}$ $I = \$10.83$	$15.00 - $10.83 = $4.17
2	$1,000 - $4.17 = $995.83	$15.00	$I = \$995.83*0.13*\frac{1}{12}$ $I = \$10.78$	$15.00 - $10.78 = $4.21

These calculations show that after the first month of this loan, the lender owes $10.83 in interest. However, you only are making a payment of $15.00, then as $10.83 of that goes to pay the interest for that month, only $4.17 is applied towards the actual loan balance. This process

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repeats each month. As the balance begins to go down slowly, so does the interest payment, and the payment that goes towards that balance (the principal column) starts to increase. Eventually the proportion of the $15.00 payment going towards the principal exceeds the interest.

Complete these calculations to see how much of the $1,000 balance you would pay off after 1 year of paying $15.00 per month.

Loan Amount = $1,000
APR = 13%
Monthly Payment = $15

Month	Balance (P)	Payment	Interest on Balance	Principal
0	$1,000	$15.00	1st: $$I = P*r*t$$	2nd: Payment – Interest (I)
1	3rd: Previous Balance – Principal			
1	$1,000	$15.00	$I = \$1,000*0.13*\frac{1}{12}$ $I = \$10.83$	$15.00 - $10.83 = $4.17
2	$1,000 - $4.17 = $995.83	$15.00	$I =$ $995.83*0.13*1/12$	
3		$15.00		
4		$15.00		
5		$15.00		
6		$15.00		
7		$15.00		
8		$15.00		
9		$15.00		
10		$15.00		
11		$15.00		
12		$15.00		
Total	--	$180.00		

10. What is your current balance?

11. How much have you paid in interest so far?

12. How much of the $1,000 have you paid off after 1 year (the total principal)?

13. Do these numbers change your projection of the amount of time it will take you to pay this off?

14. What percentage of your original balance do you have left?

In fact, paying off your credit card in this way will take you 119 months – that is almost 10 years. AND you will end up paying an additional $785.27 in interest.

15. After all is said and done, you borrowed $1,000 but had to pay the lender back $1,785.27. What percentage of your original loan did you end up paying back?

16. How do you think increasing or decreasing your monthly payments would affect:
    a. The time needed to pay back a loan?

    b. The amount of interest paid?

17. In fact, *increasing* your monthly payment to $30.00 per month would *decrease* your number of payments to 41 months, and *decrease* the amount of interest you pay to $248. How do these numbers compare to making payments of $15.00 per month?

18. Also, if you *decreased* your monthly payment to $11.00 per month, you would *increase* your number of payments to 393 months, and *increase* the amount of interest you pay to $3,333.51! How do these numbers compare to making payments of $15.00 per month?

19. What if there was also a monthly fee of $5. How would that change the amount that you owe?

20. How would an increase or decrease in your interest rate affect your payments?

21. Calculate the first 4 months of payment on this balance with an APR of 30%.

Loan Amount = $1,000

APR = 30%

Monthly Payment = $15

Month	Balance	Payment	Interest on Balance	Principal
1	$1,000.00	$15.00		
2		$15.00		
3		$15.00		
4		$15.00		