PROBLEM SOLVED

MAKING SENSE OF MATHEMATICS

You have a credit card with an *Annual Percentage Rate* (APR) of 21.15%. At the beginning of the year you have a balance of $200. Say you do not make any additional purchases and do not pay off the current balance. The interest is compounded monthly, and you are not charged any late fees.

1. How much would you owe after one month?

   a. What is the initial balance?

   b. What is the monthly interest rate for the given APR? Note that 21.15% is the annual rate.

   c. What is the balance you owe after one month?

2. How much would you owe after one year?

   a. One way to solve this is to think recursively. Recursion involves a repeated application of a procedure to find successive results. You can write a recursive equation using two pieces of information. First, you need to know the initial amount you owe. Second, you need to know the repeated procedure. In this case, multiplying by 1.017625 to find the amount owed at the end of the month. Using the terms *Now* and *Next*, write a recursive equation.

   b. Use your recursive equation to complete the table and find the amount you would owe after one year.

Month	NOW (Balance at the Beginning of the Month)	NEXT (Balance at the End of the Month)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

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c. Another way to solve this problem is to think explicitly. In other words, if you know the number of months you can use an equation to directly find the amount you owe after one year. The equation for the amount owed after n months in this situation is *amount owed = $P(1 + r)^n$* where P is the initial balance, r is the monthly interest rate, and n is the number of months. Using this equation, how much would you owe at the end of one year?

d. Compare this equation to your table. Explain why this equation works.

3. What is the *Effective Annual Rate* (EAR) for this credit card? Note that the EAR takes into account that interest is compounded 12 times per year.

4. How much would you owe after one year if you assume the APR is a simple interest rate, that is, compounding occurs only one time?

5. What is the difference between the APR and EAR for this scenario?

6. Many credit card statements only list the APR. How might this mislead a customer?

7. Which rate, the APR or EAR, is more useful to you when thinking about credit card debt?

8. What other factors will impact the total amount owed on a credit card if you do not make any payments for one year?

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