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Considering Credit Options

Suggested grade levels: 9 to 12

Math skills: simple interest, percents

Possible subject areas: consumer math, economics, social studies

Overview

We are bombarded in our daily lives with tempting credit offers. Enticing first year credit card rates and zero percent financing on a new car are but a few of these seemingly fantastic offers. As the old adage goes, if something looks to good to be true, it probably is. While the black and white nature of this statement may not be entirely accurate, it is important that we carefully consider the actual implications of such deals before proceeding.

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Consider the following information found on the web regarding offers made by General Motors during July of 2002:

General Motors revives no-interest financing to increase sales
Bloomberg News
Tuesday, July 2, 2002

DETROIT - General Motors Corp. is reviving 0 percent financing on most models as the world's largest auto maker tries to lure customers from rivals Ford Motor Co. and Daimler Chrysler AG.

General Motors is offering 0 percent, 60-month loans or rebates of as much as $4,000 on car models and some trucks, spokeswoman Katie Ferrick said. The company is offering 36-month, no-interest loans or rebates of $2,500 on most truck models.

http://www.businesstoday.com/business/business/ap_gm07022002.htm

Would you be better off taking a 0% loan for 60 months or getting a $4000 rebate? Of course the answer to this question depends on many factors but let's explore some possible scenarios to see which deal appears best.

Before beginning, we should consider some of the basics of interest calculation and how we can apply them. The formula for determining simple interest is: $I = prt$. This means that the amount of interest paid on a simple loan is found by multiplying the principal, the rate, and the term of the loan in years.

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1. Suppose you borrow 2000 at 5% for 2 years. How much interest will you pay?

2. If the interest rate were reduced from 5% to 4% how much extra time would you have to pay back the $2000 loan but still pay the same amount of interest as in example 1?

When we buy a car, is the formula for simple interest applicable? The answer, of course, is NO! Simple interest applies in a case such as example 1 in which $2000 is borrowed and the entire amount, principal plus interest, is repaid all at once at the time on which the term of the loan expires.

A car loan, however, is paid back monthly over the term of the loan. Therefore the principal remaining to be paid is decreasing throughout the period over which we pay it back. A reasonably good approximation of the interest that will be paid on a car loan can be attained by calculating the value of simple interest over the term of the loan, and dividing that amount by 2. The rationale is that the average principal remaining to be paid is the original principal when the first payment is made but is equal to the amount of a single payment when the last payment is made. The average principal is, therefore, only slightly more than half of the original principal.

Before proceeding with the approximation questions that follow, the reader is encouraged to compare the payments calculated by this approximation method to those calculated more accurately by the Saturn payment Estimator.
(http://www.saturnoforlando.com/payment_estimator.asp)

3. Use the Saturn website and input the information needed to estimate monthly payments for a five year car loan on a vehicle priced at $24,000 with a finance rate of 8%. Enter a down payment of 0, and a sales tax of 0%. Use the Saturn payment estimator to determine your monthly payment. Approximate your monthly payments by calculating the total interest paid by multiplying the principal by the rate by the time and dividing this result by 2. Keep in mind that to calculate your monthly payments you will need to add the original principal to the total amount of interest to be paid and divide this sum by the number of monthly payments to be made. By how much per month do these values differ?

4. Use the Saturn website and input the information needed to estimate monthly payments for a three year car loan on a vehicle priced at $20,000 with a finance rate of 6%. Enter a down payment of 0, and a sales tax of 0%. Use the Saturn payment estimator to determine your monthly payment. Approximate your monthly payments by calculating the total interest paid by multiplying the principal by the rate by the time and dividing this result by 2. By how much per month do these values differ?

As indicated by the information regarding General Motors financing, the buyer has an option of getting a 5 year 0% car loan OR getting a rebate of "as much as $4000." The amount of the rebate varies depending on the model and purchase price of the car chosen.

5. Using the approximation method discussed in this module, determine whether the total amount paid for a car with a price (before rebate) of $30,000 would be more if a 0% five

year loan is taken or if the rebate is taken and the buyer gets a five year loan for the remaining $26,000 at 8%.

6. Using the approximation method discussed in this module, determine whether the total amount paid for a truck with a price (before rebate) of $18,000 would be more if a 0% three year loan is taken or if a rebate of $2500 is taken and the buyer gets a three year loan for the remaining $15,500 at 6%.

Now let's turn to the use of credit cards. A website entitled Lowcards.com has evaluated numerous credit card offers and rated them from best to worst. A quick perusal of this site indicates that two of the top five credit cards offer an introductory period at a 0% rate followed by their regular rate of 9.99% with no annual fee. No one would argue against the initial 0% rate but it is important to keep in mind that this rate applies only for a limited time! Many sensible shoppers use credit cards in lieu of cash. If the entire balance is paid each month, no interest charges will be incurred. However, many credit card users maintain a running balance that extends beyond the initial grace period. The worst of such offenders pay only the minimum required payment each month!

7. What will the monthly finance charge be on an unpaid balance of $1000 on a credit card with an annual rate of 9.99%?

The minimum required payment on most credit is relatively small compared to the unpaid balance. Therefore individuals who pay only the minimum each month will take a long time to pay off their initial purchase and they will pay far more than the initial price.

8. Suppose you have an unpaid balance of $2000 and the annual percentage rate is 10. You decide to pay 1/20th of the unpaid balance each month, what percent of your payment will go toward reducing the balance and what percent will be eaten up by the finance charge?

9. Does the amount of the unpaid balance affect the percentage of your payment that goes toward reducing the balance?

Credit cards provide us with the freedom to make immediate purchases that we might not otherwise be able to make but as we have seen this freedom comes at a price. Before making any purchase you should carefully consider how long it will take you to pay off your credit card and how much money will be paid in finance charges during this time.

For the teacher

Answers

1. The formula for determining simple interest is: $I = prt$. This means the amount of interest paid on a simple loan is found by multiplying the principal, the rate, and the time of the loan.
In this situation, $I = (2000)(.05)(2) = 200$. You would pay $200 interest.

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2. Since the principal remains the same, in order for the amount of interest to remain the same, the product of interest rate and time must be a constant, making rate and time inversely proportional. Since rate has been multiplied by 4/5, the time must be multiplied by 5/4. Thus the new time will be (2)(5/4) = 5/2 = 2.5 years. Thus you would have an additional half year to pay back the loan at a rate of 4% and still pay $200 in interest.

Alternately, we could find this answer by substituting $200 into the formula, I = Prt: 200 = (2000)(.04)(t). Solving for t yields: t = 200/80 = 2.5. So again, the time you would have to pay back this loan would be 2.5 years.

3. The Saturn Payment Estimator yields a monthly payment of $486.63. Our approximation method would calculate the amount of interest paid as (24000)(.08)(5)(.5) = 4800. Thus a total of 28800 must be repaid over the next 60 months, yielding an approximate monthly payment of 480. Thus our approximation is $6.63 less than the actual monthly payment amount.

4. The Saturn Payment Estimator yields a monthly payment of $608.44. Our approximation method would calculate the amount of interest paid as (20000)(.06)(3)(.5) = 18000. Thus a total of 21800 must be repaid over the next 36 months, yielding an approximate monthly payment of 605.56. Thus our approximation is $2.88 less than the actual monthly payment amount.

5. The total amount paid if the 0% five year loan is taken will be $30,000. The amount of interest paid on a loan of $26,000 if the rebate is taken will be approximately (26000)(.08)(5)(.5) = 5200. Thus the total amount paid will be $31,200. In this case the buyer would be better off taking the 0% loan since the amount saved in interest is more than the rebate.

6. The total amount paid if the 0% three year loan is taken will be $18,000. The amount of interest paid on a loan of $15,500 if the $2500 rebate is taken will be approximately (15500)(.06)(3)(.5) = 1395. Thus the total amount paid will be $16,895. In this case the buyer would be better off taking the rebate since the rebate is more than the amount that would be saved in interest.

7. The finance charge on an unpaid balance of $1000 on a credit card with a 9.99% rate will be: (1000)(.0999)(1/12) = $8.32. We multiply by 1/12 since the rate of 9.99 applies to a full year not a single month.

8. You will pay (2000)(1/20) or $100. The finance charge will be (2000)(.1)(1/12) or $16.67. Thus (16.67/100)(100) or approximately 16.67% of the payment will be used to pay the finance charge and the remaining 83.33% will reduce the principal.

9. No. Regardless of the amount of the unpaid balance (B), 83.35% of your payment will go toward paying it. The fractional part paid for the finance charge will be ((B)(.1)(1/12))/((B)(1/20)) = (.1)(20)/(12) = .0167. Multiplying by 100 to convert to percent yields 16.67% for finance charge, leaving 83.33% being applied to the balance.

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Additional References

http://www.bankrate.com/ndaq/news/auto/20020703a.asp

http://www.businesstoday.com/business/business/ap_gm07022002.htm

http://www.gmacfs.com/

http://www.lowcards.com/

http://www.saturnoforlando.com/payment_estimator.asp