

Chapter 4 Project

How Much Will This Cell Phone Cost?

An activity to demonstrate the use of percent increases and decreases in real life.

Sergio works in electronics sales. He wants to purchase a new cell phone from his place of employment, which offers a 10% employee discount. Sales tax is 7% in the city where the store is located. The original price of the cell phone Sergio wants to buy is \$500.

For the following problems, round monetary amounts to the nearest cent. Otherwise, do not round unless indicated.

1. Suppose the store calculates the discount before applying sales tax.
 - a. What is the price of the phone following the 10% discount, before tax?
 - b. What is the total after applying tax to the answer in part a.?
2. Let's compare the price Sergio pays to the original price of the phone.
 - a. Does the price Sergio pays represent an increase or a decrease from the original price? By how much?
 - b. What percent of the original price for the phone is the price that Sergio pays in Problem 1 part a.?
 - c. Does the answer to part b. represent a percent increase or a percent decrease from the original price?
 - d. Calculate the percent increase or percent decrease of the price of the phone.
3. Consider whether the order of applying the discount and applying the tax matters.
 - a. Find the cost of the phone if the tax is applied first, followed by the discount.
 - b. How does the cost found in part a. compare to the cost found in Problem 1 part b.?
4. Sergio's coworker Haruto is looking at a cell phone with an original price of \$450. Consider whether this change in original price will affect the *percent* of the original price he will pay after the employee discount.
 - a. Repeat Problem 1 parts a. and b. and Problem 2 part b. for the phone Haruto is interested in.
 - b. Does the value from part a. represent a percent increase or a percent decrease from the original price? By how much?
 - c. How does the value in part b. compare to the value from Problem 2 part d.?
5. Zendaya works at the same store as Sergio and Haruto. The final price she pays for a cell phone, including both the discount and tax, is \$311.53. What was the original price for her cell phone?
6. Marya works at another electronics store in the same city (which means the sales tax is also 7%), but her employer only offers a 5% employee discount. Like Sergio, she is looking at a cell phone with an original price of \$500.
 - a. Repeat Problem 1 parts a. and b. and Problem 2 part b. for the phone Marya is interested in.
 - b. Does this represent a percent increase or a percent decrease? By how much?
 - c. How do the percents for the employee discount and tax determine if there is a percent increase or a percent decrease?

7. Suppose Sergio does not have the money on hand to pay the value calculated in Problem 1 part b. in full, so he decides to finance the phone on a 2-year plan that will charge a 30% interest rate, compounded monthly.
 - a. Determine the final cost of the phone when Sergio has paid it off in full after 2 years. Round to the nearest hundredth. (**Hint:** You will need to use the compound interest formula.)
 - b. What percent of the original price of \$500 will Sergio have paid?
 - c. Does this represent a percent decrease or a percent increase? By how much?
8. What if Sergio trades in his previous cell phone for \$100? Calculate the final cost of the new phone after paying it off using the same 2-year financing plan and determine by how much there is a percent increase or decrease when compared to the original price of \$500. Round to the nearest hundredth of a percent.

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1. a. $(1 - 0.10) \cdot 500 = \$450$ will be the price after tax.
 b. $(1 + 0.07) \cdot 450 = \$481.50$ will be the total cost after applying tax.
2. a. Sergio's payment is a decrease of \$18.50 from the original price.
 b. \$481.50 is 96.3% of \$500.
 c. This represents a percent decrease.
 d. The percent decrease is 3.7%.
3. The following shows that the order of applying the discount and applying the tax does not matter.
 a. If tax is applied first, the cost before the discount is $(1 + 0.07) \cdot 500 = \$535$. Applying the discount to this results in $(1 - 0.10) \cdot 535 = \$481.50$.
 b. The answer in part a. is the same as the answer found in Problem 1 part b.
4. a. Haruto pays $(1 - 0.10) \cdot 450 = \$405$ after the discount but before tax. After tax, he pays \$433.35. \$433.35 is 96.3% of \$450.
 b. This represents a percent decrease by 3.7%.
 c. This is the same as the answer to Problem 2 part d.
5. After rounding to the nearest hundredth of a dollar, \$311.53 is 96.3% of \$323.50. \$323.50 is the original price of her cell phone.
6. a. Before tax, Marya has $(1 - 0.05) \cdot 500 = \$475$ to pay. After tax, she has $(1 + 0.07) \cdot 475 = \$508.25$ to pay. \$508.25 is 101.65% of the original price.
 b. This represents a percent increase by 1.65%.
 c. Answers may vary. Students should mention that if the employee discount is less than the sales tax, then there is a percent increase in price. If the employee discount is greater than the sales tax, then there is a percent decrease in price.
7. a. $A = P \left(1 + \frac{r}{n} \right)^{nt} = 481.50 \left(1 + \frac{0.30}{12} \right)^{12(2)} \approx \870.90 is what he will pay after financing.
 b. \$870.90 is 174.18% of \$500.
 c. This represents a percent increase of 74.18%.
8. With a trade-in, Sergio will have \$381.50 left to pay after the employee discount and the tax but before applying the financing.
 $A = P \left(1 + \frac{r}{n} \right)^{nt} = 381.50 \left(1 + \frac{0.30}{12} \right)^{12(2)} \approx \690.03 is what he will pay after financing. This is approximately a 38.01% percent increase.