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CHAPTER 2 Interpreting Percents

As you solve problems that involve percents, be sure that you understand what the percents in the problems mean.

In many situations, percents are used to describe a part of a whole.

EXAMPLE 1 Use a percent to describe a part of a whole

Of the 70 students who regularly attend drama club meetings, only 42 auditioned for parts in the school play. So, 42 out of 70 or 60% of the students who regularly attend drama club meetings auditioned for the school play. ■

Using percents to describe parts of a whole allows us to compare parts of two different wholes.

EXAMPLE 2 Use percents to compare parts of two different wholes

At Lake High School, 120 out of 480 students participated in a county-wide service project. At Morris High School, 150 out of 750 students participated in the same service project. The school with better participation will receive a trophy. If the trophy were awarded to the school with more participants, Morris High School would receive the trophy, but this wouldn't be fair because Morris has the advantage of having more students. By comparing the percentages of students who participated from each school, we eliminate Morris High School's advantage. At Lake High School, 25% of the students participated, and at Morris High School, 20% participated. Based on percentages, Lake High School will receive the trophy. ■

Tax and surcharge rates are often expressed in terms of percents. In these cases, the amount of tax or surcharge is proportional to another amount.

EXAMPLE 3 Find the amount of a surcharge

For some online auctions, there is a surcharge added to the winning bid. This surcharge is called the buyer's premium. Suppose that Mr. Johannes has a winning bid of $240 for an antique rug in an auction that has a 10% buyer's premium. Find the amount of the buyer's premium. Then find the total cost of the rug and the premium.

Solution:

The buyer's premium is proportional to the amount of the winning bid. We can use the formula $p = 0.10b$ to calculate the premium p for the winning bid b, where the percent has been expressed as a decimal. So, Mr. Johannes's premium is $p = 0.10(\$240) = \$24$.

To find the total cost, we can add the amount of the winning bid and the amount of the buyer's premium: $\$240 + \$24 = \$264$. ■

Some catalog and online vendors offer a flat rate for shipping, while others determine the amount of shipping based on the total price or weight of the products purchased.

EXAMPLE 4 Compare shipping prices

Troy wants to purchase a video game that is offered by two different online vendors for $39.95. Vendor A charges $7 for shipping and handling regardless of the size of the order. Vendor B charges 15% of the purchase price for shipping and handling.
Find the amount that Vendor B would charge Troy for shipping and handling. Which vendor will charge him less?

Solution:

Vendor B will charge 15% of \$39.95 for shipping and handling: 0.15(\$39.95) ≈ \$5.99. Since \$5.99 is less than \$7, Vendor B will charge Troy less. ■

Percents are also used to describe changes in quantities, such as populations, prices of consumer products, and values of investments. In these situations, the amount that the quantity changes is proportional to its original value.

EXAMPLE 5 Estimate the value of a home

The Wests purchased a home one year ago for \$295,000. Since then, home prices in their neighborhood have increased by about 14%. Estimate the value of the Wests' home.

Solution:

The value of the Wests' home is about 14% greater than the price they paid one year ago. This means that the value is now 114% of the price they paid: 114% of \$295,000 is 1.14(\$295,000) = \$336,300. ■

You should also be able to distinguish between a constant rate of growth and growth by a certain percentage.

EXAMPLE 6 Comparing population growth

Suppose that the population of a city was 100,000 a year ago and is now 103,000. What will its population be one year from now if it increases again by the same amount? What will its population be one year from now if it increases again by the same percentage? Which is greater?

Solution:

The population increased by 3000 in the past year. So, if the population increases by the same amount during the next year, the population one year from now will be 103,000 + 3000 = 106,000.

The population increased 3000 out of 100,000 or 3% over the past year. So, if the population increases by the same percentage during the next year, the population one year from now will be 103% of the current population or 1.03(103,000) = 106,090.

The population will be greater if it increases again by the same percentage. ■

Practice

1. Angela has two jobs. Last week she earned \$30 babysitting for her nephew and \$20 cleaning for her neighbor. What percentage of her total earnings for the week came from cleaning?

2. Quincy invited 25 people to his birthday party. Only 21 were able to attend. What percentage of the people was able to attend?

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CHAPTER 2

Interpreting Percents *continued*

3. Ms. Li earns $942 each week. If 28% of her earnings are withheld for taxes and social security, how much does she pay in taxes and social security each week?

4. A salesperson receives 35% of his total sales in commission. If the salesperson sells $12,500 in merchandise in one month, how much is his commission for the month?

5. At the end of last year, Mr. Rodriguez's financial portfolio was worth $450,000. His financial adviser earns a commission equal to 0.5% of the value of the portfolio. What was the financial adviser's commission for the year?

6. Sophie bought a necklace in an online auction. Because the seller was in a different state, she did not have to pay sales tax. However, she did have to pay shipping costs of $4.95 and a 10% buyer's premium on her winning bid of $29.50. What was her total?

7. At the beginning of the year, the population of a town is 42,156. If the population of the town grows by 3% during the year, what will its population be at the end of the year? Round to the nearest whole number.

8. Mr. Hassan took a job with a starting salary of $52,000. After one year, he will get a 5% raise. What will his salary be after the raise?

9. One online vendor charges a flat rate of $12 for the shipping and handling on any size order. A second vendor charges 6% of the merchandise total for shipping and handling. Find the value of the merchandise for which the shipping and handling costs are the same for both vendors.

10. One auction company charges a flat rate of $5 to sell an item. Another company charges 7% of the winning bid. For what winning bid would the charges for both companies be the same? Round to the nearest cent.

11. In a competition between two schools, the school whose team performs best on the obstacle course will receive ten new computers from a local businessman. Greene High School had ten participants in the event of whom six completed the course within the time limit. Hamilton High School had 15 participants of whom eight completed the course within the time limit.

    a. If the computers go to the school with more students finishing the course within the time limit, which school will win?

    b. If the computers go to the school with higher percentage of students finishing the course within the time limit, which school will win? Give the percentages as part of your answer.

12. Greg and Kayla live in two different states. The sales tax laws are different in the two states. Both want to buy a DVD from an online store that costs $18.95. The store charges $5.95 shipping and handling for a single DVD.

    a. Greg lives in a state where sales tax is charged on the total cost of the DVD and shipping and handling. If Greg's sales tax rate is 7%, what will be his total with shipping, handling and sales tax?

b. Kayla lives in a state where sales tax is charged only on the cost of the DVD and not on the shipping and handling. If Kayla's sales tax rate is 8%, what will be her total with shipping, handling and sales tax?

c. Who will pay more, Greg or Kayla?

13. Ms. Kumori bought several shares of a stock at $32.40 per share. One week later the stock was valued at $34.50 per share.

a. By how much did the value of a share increase during the week?

b. By what percentage did the value of a share increase? Round to the nearest tenth of a percent.

c. If the value of a share increases by the same amount during the next week how much will it be worth?

d. If the value of a share increases by the same percentage during the next week how much will it be worth? Round to the nearest cent.

e. Would Ms. Kumori prefer for the value to increase by the same amount or by the same percentage? Explain.

14. A candidate for a statewide office received 5482 votes in Marion County and 82,389 votes in Bay County. The candidate concludes that because he received more votes in Bay County than in Marion County, he is more popular in Bay County.

a. Explain the problem with the candidate's conclusion.

b. If the population of Marion County is 9492 and the population of Bay County is 344,678, what would you conclude about the candidate's popularity? Use percentages to support your reasoning.

15. Miss Cardoza bought a house for $217,000. One year later the house was valued at $289,000.

a. If the house's value increases by the same amount, what will it be worth after one more year?

b. If the house's value increases by the same percentage, what will it be worth after one more year? Round to the nearest hundred thousand.

16. Use the internet or some other reliable resource to find the percent increase in housing prices last year in a city near you. Then, assuming that housing prices will increase by the same percentage this year, estimate the value of a house on December 31 that was worth $500,000 on January 1.

17. The number of students at Garland High School participating in community service activities was 75 in 2004, 150 in 2005, and 200 in 2006. Why might the principal have been somewhat disappointed in the increase between 2005 and 2006?