Lesson 6-3

Using the Percent Equation

Interactive Study Guide

See pages 131–132 for:
- Getting Started
- Vocabulary Start-Up
- Notes

Essential Question

How can you use proportional relationships to solve real-world percent problems?

Common Core State Standards

Content Standards
7.RP.2, 7.RP.2c, 7.RP.3, 7.EE.3

Mathematical Practices
1, 3, 4, 7

Vocabulary

percent equation

What You'll Learn

- Solve percent problems using percent equations.
- Solve real-world problems involving taxes.

Real-World Link

Elephants An African elephant can walk forward and backward, travel up to 25 miles per hour, and climb mountainous terrain—while weighing up to 15,000 pounds! Asian elephants are the African elephants' smaller cousins.

Percent Equation

A **percent equation** is an equivalent form of the percent proportion in which the percent is written as a decimal.

$$\frac{\text{Part}}{\text{Whole}} = \text{Percent}$$ ← The percent is written as a decimal.

$$\frac{\text{Part}}{\cancel{\text{Whole}}} \cdot \cancel{\text{Whole}} = \text{Percent} \cdot \text{Whole}$$ Multiply each side by the whole.

$$\text{Part} = \text{Percent} \cdot \text{Whole}$$ ← This form is called the *percent equation*.

Example 1

Tutor

Find 62% of 75.

Estimate $\frac{3}{5}$ of 75 is 45.

The percent is 62 and the whole is 75. You need to find the part.

Words	What number is 62% of 75?
Variable	Let a represent the part.
Equation	part = percent • whole $a = 0.62 \cdot 75$

$a = 0.62 \cdot 75$ Write the percent equation.

$= 46.5$ Multiply.

Check for Reasonableness $46.5 \approx 45$ ✓

Got It? Do these problems to find out.

1a. Find 60% of 96. **57.6**

1b. Find 45% of 70. **31.5**

Estimation
To determine whether your answer is reasonable, estimate before finding the exact answer.

Example 2

Tutor

287 is what percent of 410? **Estimate** $\frac{287}{410} \approx \frac{300}{400}$ or $\frac{3}{4}$, which is 75%.

The whole is 410 and the part is 287. Let p represent the percent.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$287 = p \cdot 410$ Write the percent equation.

$\frac{287}{410} = \frac{p \cdot 410}{410}$ Division Property of Equality

$0.7 = p$ Simplify.

By definition, the percent is expressed as a decimal. Convert 0.7 to a percent.

Since 0.7 = 70%, 287 is 70% of 410.

Check for Reasonableness $70 \approx 75\%$ ✓

Got It? Do these problems to find out.

2a. 15 is what percent of 125? **12%**

2b. 20 is what percent of 400? **5%**

Watch Out!
Remember that the percent is written as a decimal in the percent equation. So, use 0.55, not 55.

Example 3

Tutor

33 is 55% of what number? **Estimate** 33 is 50% of 66.

The part is 33, and the percent is 55%. Let b represent the whole.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$33 = 0.55 \cdot b$ Write the percent equation.

$\frac{33}{0.55} = \frac{0.55b}{0.55}$ Division Property of Equality

$60 = b$ Simplify.

So, 33 is 55% of 60.

Check for Reasonableness $60 \approx 66$ ✓

Got It? Do these problems to find out.

3a. 18 is 30% of what number? **60**

3b. 79 is 80% of what number? **98.75**

The table summarizes the three types of percent problems.

Concept Summary **The Percent Equation**

Type	Example	Equation
Find the Percent	15 is what percent of 60?	$15 = p(60)$
Find the Part	What number is 25% of 60?	$a = 0.25(60)$
Find the Whole	15 is 25% of what number?	$15 = 0.25b$

Solve Real-World Problems Involving Taxes

The percent equation can be used to solve real-world problems involving taxes.

Example 4

Tutor

A camera costs $250. If a 6% sales tax is added, what is the total cost?

Method 1 **Find the tax first. Then add.**

Find the amount of the tax, or the part. Let t represent the amount of tax.

$t = 0.06 \cdot 250$ Write the percent equation, writing 6% as a decimal.

$= 15$ Multiply.

The tax is $15. The total cost is $250 + $15 or $265.

Method 2 **Find the total percent first.**

Find 100% + 6% or 106% of $250. Let T represent the total cost, including tax.

$T = 1.06 \cdot 250$ Write the percent equation, writing 106% as a decimal.

$= 265$ Multiply.

Using either method, the total cost is $265.

Percent Increase
For a value of x, an increase of 6% means $x + 0.06x$. It is the same as $1.06x$.

Got It? **Do this problem to find out.**

4. **Financial Literacy** Mr. Potter bought a house for $175,000. Five years later, he sold it for a 24% profit. What was the sale price of the house? **$217,000**

Example 5

Tutor

Mr. Li bought a memory card for $138.89 including tax. The card had a sticker price of $129.20. What percent sales tax did he pay?

Method 1 **Use the percent equation to find the percent of sales tax.**

The tax is $138.89 − $129.20 or $9.69.

$9.69 = p \cdot 129.20$ Write the percent equation.

$\frac{9.69}{129.20} = \frac{p \cdot 129.20}{129.20}$ Division Property of Equality

$0.075 = p$ Simplify.

So, since 0.075 = 7.5%, Mr. Li paid 7.5% sales tax.

Method 2 **Divide the total cost of the memory card by the sticker price.**

$T = \frac{138.89}{129.20}$ Divide.

$= 1.075$

The total cost is 1.075 or 107.5% of the sticker price, so the tax is 7.5%.

Got It? **Do this problem to find out.**

5. A $45.00 mixer sold for $47.70 with tax. What is the percent of sales tax? **6%**

Guided Practice

Check

Solve each problem using a percent equation. (Examples 1-3)

1. What is 40% of 75? **30**
2. Find 13% of 27. **3.51**
3. 30 is what percent of 90? **$33\frac{1}{3}$%**
4. 15 is what percent of 300? **5%**
5. 55 is 20% of what number? **275**
6. 24 is 80% of what number? **30**

7. Last year, Kimberly sold 95 boxes of cookies. This year she wants to sell 20% more boxes than she sold last year. How many boxes will Kimberly have to sell this year to reach her goal? (Example 4) **114 boxes**

8. Martin wants to buy a motor scooter. The cost of a motor scooter is $4968. If the total, including tax, is $5290.92, what is the percent of sales tax? (Example 5) **6.5%**

Independent Practice

eHelp

Go online for Step-by-Step Solutions

Solve each problem using a percent equation. (Examples 1-3)

9. Find 16% of 64. **10.24**
10. What is 36% of 50? **18**
11. 8 is what percent of 40? **20%**
12. 54 is what percent of 60? **90%**
13. 16 is 25% of what number? **64**
14. 64 is 32% of what number? **200**
15. 39 is 50% of what number? **78**
16. 27 is 10% of what number? **270**

17. A commission is a fee paid to a salesperson based on a percent of sales. Suppose a salesperson at a jewelry store earns a 6% commission. What commission would be earned for selling a ring that costs $1300 dollars? (Example 4) **$78**

18. Roberto wants to buy a new ski jacket that costs $96. If the total cost, including tax, is $101.28, what is the percent of sales tax? (Example 5) **5.5%**

B **Solve each problem using a percent equation.**

19. Find 52.5% of 76. **39.9**
20. Find 23.6% of 90. **21.24**
21. 33.8 is what percent of 130? **26%**
22. 79.8 is what percent of 114? **70%**

23. **Financial Literacy** The cost, including a 6.75% sales tax, of a digital home theater system with a 40-inch high-definition television is $2668.75. What is the original cost of the television and theater system? **$2500**

24. The results of a Wimbledon Women's Championship match is shown in the table.

	Marion Bartoli	Venus Williams
1st Serves In	40 of 63	35 of 50
Receiving Points Won	16 of 50	30 of 63
Break Point Conversions	1 of 2	4 of 10
Net Approaches	3 of 6	12 of 17

Joe Atlas/Brand X Pictures

   a. What was Bartoli's percent of receiving points won? **32%**

   b. Which player had a greater percent of their first serves in? **Willams**

   c. Suppose in Williams' next match she has 16 break point opportunities. Based on this match, how many times will she convert on break point opportunities? **6 times**