



Lesson 6-1

Using the Percent Proportion



Interactive Study Guide

See pages 127–128 for:

- Getting Started
- Real-World Link
- 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, 8



Vocabulary

percent proportion

What You'll Learn

- Use the percent proportion to solve problems.
- Apply the percent proportion to real-world problems.



Real-World Link

Snacks With four different kinds of fruit, this healthy fruit salad recipe is the perfect lunch box or after school snack! You can adjust the recipe to make more or less by keeping the proportions the same.

Fruit Salad

- 2 cups pineapple
- 1 cup blueberries
- 3 cups grapes
- 2 cups strawberries



Key Concept Percent Proportion

Words $\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100}$

Symbols $\frac{a}{b} = \frac{p}{100}$, where a is the part, b is the whole and p is the percent.

In a **percent proportion**, one ratio compares *part* of a quantity to the *whole* quantity. The other ratio is the equivalent percent written as a fraction with a denominator of 100.

Example 1



Twelve is what percent of 32?

Words Twelve is what percent of 32?

Variable Let p represent the percent.

Proportion $\left. \begin{array}{l} \text{part} \rightarrow 12 \\ \text{whole} \rightarrow 32 \end{array} \right\} = \frac{p}{100} \text{ percent}$

Twelve is being compared to 32.
So, 12 is the part and 32 is the whole.

$$1a. \frac{12}{32} = \frac{x}{100}$$

$$1b. \frac{100}{25} = \frac{x}{100}$$

$$\frac{12}{32} = \frac{p}{100}$$

Write the percent proportion.

$$12 \cdot 100 = 32 \cdot p$$

Find the cross products.

$$1200 = 32p$$

Multiply.

$$\frac{1200}{32} = \frac{32p}{32}$$

Divide each side by 32.

$$37.5 = p$$

Simplify.

$$1c. \frac{12}{5} = \frac{x}{100}$$

$$1d. \frac{9}{18} = \frac{x}{100}$$

So, 12 is 37.5% of 32.

Got It? Do these problems to find out.

1a. Fifteen is what percent of 20?

1b. One hundred is what percent of 25?

1c. What percent of 5 is 12?

1d. What percent of 18 is 9?


Example 2
What number is 15.5% of 450?

 The percent is 15.5, and the base is 450. Let a represent the part.

$$\frac{a}{450} = \frac{15.5}{100}$$

Write the percent proportion.

$$a \cdot 100 = 450 \cdot 15.5$$

Find the cross products.

$$100a = 6975$$

Multiply.

$$a = 69.75$$

Mentally divide each side by 100.

So, 69.75 is 15.5% of 450.

Check for Reasonableness

Ten percent of 450 is 45. So, the answer should be more than 45.

$$2a. \quad \frac{x}{330} = \frac{11.4}{100}$$

$$2b. \quad \frac{x}{30} = \frac{10.5}{100}$$

$$2c. \quad \frac{x}{425} = \frac{15.3}{100}$$

$$2d. \quad \frac{x}{12} = \frac{63.4}{100}$$

Whole

In percent problems, the whole usually follows the word of.

$$3a. \quad \frac{63}{x} = \frac{30}{100} \quad \frac{63}{x} = \frac{3}{10}$$

$$3b. \quad \frac{3000}{x} = \frac{60}{100}$$

$$3c. \quad \frac{45}{x} = \frac{3}{100}$$

$$3d. \quad \frac{126}{x} = \frac{18}{100}$$

Got It? Do these problems to find out.

2a. What number is 11.4% of 330?

2b. Find 10.5% of 30.

2c. Find 15.3% of 425.

2d. What number is 63.4% of 12?


Example 3
Seventy-eight is 60% of what number?

 The percent is 60%, and the part is 78. Let b represent the whole.

$$\frac{78}{b} = \frac{60}{100}$$

Write the percent proportion.

$$78 \cdot 100 = b \cdot 60$$

Find the cross products.

$$7800 = 60b$$

Multiply.

$$\frac{7800}{60} = \frac{60b}{60}$$

Divide each side by 60.

$$130 = b$$

Simplify.

So, 78 is 60% of 130.

Got It? Do these problems to find out.

3a. Thirty percent of what number is 63?

3b. 3000 is 60% of what number?

3c. Forty-five is 3% of what number?

3d. Eighteen percent of what number is 126?



Key words and phrases indicate which type of percent problem you need to solve.


Concept Summary **Types of Percent Problems**

Type	Example	Proportion
Find the Percent	1 is what percent of 5? or what percent of 5 is 1?	$\frac{1}{5} = \frac{p}{100}$
Find the Part	What number is 20% of 5?	$\frac{a}{5} = \frac{20}{100}$
Find the Whole	1 is 20% of what number?	$\frac{1}{b} = \frac{20}{100}$



Example 4



The table shows the batting statistics for one season for Derek Jeter of the New York Yankees. If he had 639 at-bats, what percent of his at-bats were singles? Round to the nearest tenth.

Stat	Number
single	151
double	39
triple	4
home run	12
walk	56
strikeout	100

Compare the number of singles, 151, to the total number of at-bats, 639. Let p represent the percent.

$$\frac{151}{639} = \frac{p}{100} \quad \text{Write the percent proportion.}$$

$$151 \cdot 100 = 639 \cdot p \quad \text{Find the cross products.}$$

$$15,100 = 639p \quad \text{Simplify.}$$

$$\frac{15,100}{639} = \frac{639p}{639} \quad \text{Divide each side by 639.}$$

$$23.6 \approx p \quad \text{Simplify.}$$

So, about 23.6% of time Derek's at-bats were singles.

Check for Reasonableness

The number of at-bats is about 640. The fraction $\frac{160}{640}$ is equal to $\frac{1}{4}$, which is 25%. So, $\frac{151}{640}$ would be slightly less than 25%.

The answer is reasonable. ✓



Got It? Do these problems to find out.

- 4a. To the nearest tenth, what percent of Derek Jeter's at-bats were strikeouts?
- 4b. **Financial Literacy** The number of mutual funds that increased in value during the third quarter of the fiscal year was 15. If this is 60% of the total number of mutual funds offered, how many mutual funds were offered?

Guided Practice



Use the percent proportion to solve each problem. (Examples 1-3)

1. 18 is what percent of 72?
2. What percent of 8 is 20?
3. What is 74% of 56?
4. 9 is 20% of what number?
5. What percent of 2 is 8?
6. Find 6% of 300.
7. Find 9% of 255.
8. Find 97% of 900.
9. 16 is 80% of what number?
10. 18 is 5% of what number?



11. Of the 120 math tests, 47 were Bs. To the nearest tenth, what percent of the math tests were Bs? (Example 4)



12. An Aztec Salad gets 28 of its Calories from protein. If this is 20% of the total number of Calories, how many Calories does the salad have? (Example 4)

Independent Practice

Go online for Step-by-Step Solutions

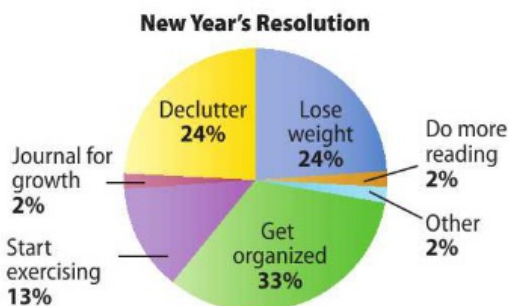


Use the percent proportion to solve each problem. (Examples 1-3)

- 13. 4% of what number is 10?
- 14. 55% of what number is 22?
- 15. 21 is what percent of 50?
- 16. 16 is what percent of 64?
- 17. What percent of 145 is 52.2?
- 18. What percent of 36 is 19.8?
- 19. What is 60% of 120?
- 20. What is 80% of 125?
- 21. Find 65% of 440.
- 22. Find 83% of 200.
- 23. 12 is 40% of what number?
- 24. 34 is 20% of what number?
- 25. 80% of what number is 12?
- 26. 4% of what number is 15?
- 27. Sixteen of the 80 dogs at a kennel are golden retrievers. What percent of the dogs at the kennel are golden retrievers? (Example 4)
- 28. The number of lime-flavored gumballs in a gumball machine is 85. If this is 17% of the number of gumballs in the machine, how many gumballs are in the machine? (Example 4)

29 Use the circle graph that shows the results of a survey about New Year's resolutions.

- a. Determine about how many of the 2947 people surveyed said their most important New Year's resolution was to get organized.
- b. About how many said their most important New Year's resolution was to do more reading or to declutter?



30. **Financial Literacy** Accessories Central is having a summer clearance on sunglasses. Maria wants to buy a pair of sunglasses that cost \$48 with a 65% discount. The same pair of sunglasses costs \$38 with a 55% discount at Shades, Inc. Which store has the better price for the pair of sunglasses? Explain your reasoning.

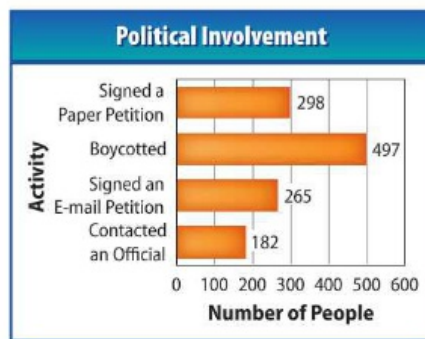
31. **CCSS Identify Repeated Reasoning** A pattern of equations is shown.

$$2\% \text{ of } 100 = 2 \quad 4\% \text{ of } 50 = 2 \quad 8\% \text{ of } 25 = 2 \quad 16\% \text{ of } 12.5 = 2$$

- a. Describe the pattern.
- b. Find the next equation in the pattern.

32. The bar graph shows the results of an online survey of 1242 people aged 15–25 about their political involvement over the last 12 months.

- a. What percent of the people boycotted? Round to the nearest percent.
- b. Of the people who signed an e-mail petition, 20% were 18 years old. How many 18-year-olds signed an e-mail petition?
- c. Based on the results of the survey, predict about how many people out of 2000 would contact an official.



Use the percent proportion to solve each problem. Round to the nearest tenth if necessary.

33. 45 is what percent of 15?
 34. 13 is 25% of what number?
 35. What is 58% of 7?
 36. 8 is what percent of 2000?
 37. What is 0.6% of 360?
 38. 41 is $5\frac{1}{3}\%$ of what number?

39. The table shows the results of a student survey.
- What percent of the students surveyed said their favorite act was playing instruments?
 - If 10 more students vote for stand-up comedy, will the percent be greater than, less than, or equal to the current percent? Explain.

Favorite Type of Talent Show Act	
Act	Number of Students
stand-up comedy	198
singing	150
dancing	212
playing instruments	80

40. Use the Internet or another source to find the percent of states that begin with A, I, O, or U.
41. A cell phone store has 120 cell phones in stock. Of these, 45 have keyboards. The manager of the store wants to add more cell phones with keyboards so that 40% of the stock has keyboards.

- Write and solve a proportion to find the number of cell phones with keyboards that should be added to the store's inventory.
- What will be the total number of cell phones in stock?

$$\frac{50 \text{ KEYBOARDS PHONES}}{125 \text{ TOTAL PHONES}} = 40\%$$

WHAT PERCENT OF THE PHONES HAVE A KEYBOARD?

$$\frac{45}{120} = 37.5\%$$

H.O.T. Problems Higher Order Thinking

42. **CCSS Model with Mathematics** Write and solve a real-world problem involving percents.

43. **CCSS Persevere with Problems** Without calculating, arrange the following from least to greatest value. Justify your reasoning.

25% of 160, 5% of 80, 25% of 80

44. **CCSS Justify Conclusions** Sabrina spelled 82% of her spelling words correctly on her spelling tests this year. If she spells 13 out of 15 words correctly on her next test, will this help or hurt her average? Explain.

45. **CCSS Persevere with Problems** Find the value of y so that $y\% = \frac{3y+9}{600}$.

$$y\% = \frac{y}{100}$$

46. **CCSS Find the Error** Bethany is finding what percent of 32 is 18. Find her mistake and correct it.

$$\frac{18}{32} = \frac{x}{100}$$

$$x \approx 56$$

So, 32 is about 56% of 18.

$$\frac{6 \cdot y}{6 \cdot 100} = \frac{3y+9}{600}$$

47. **CCSS Make a Conjecture** Is $x\%$ of y and $y\%$ of x always, sometimes, or never equivalent? Explain your reasoning.

$$\frac{6y}{600} = \frac{3y+9}{600}$$

48. **Building on the Essential Question** Kenji states that 5.9 is 125% of 47. Is his answer reasonable? Explain your reasoning.

$$\frac{45}{120} = 37.5\%$$

CURRENTLY

$$\frac{45}{120} = \frac{Y}{100}$$

$$45(100) = 120(Y) \leftarrow \text{WDMD}$$
$$\frac{4500}{120} = \frac{120Y}{120}$$
$$37.5 = Y$$

x = EXTRA
KEYBOARD
PHONES

GOAL

$$\frac{45+x}{120+x} = \frac{40}{100}$$

$$(45+x) 100 = 40(120+x)$$
$$100(45) + 100(x) = 40(120) + 40(x)$$
$$4500 + 100x = 4800 + 40x$$
$$4500 + 60x = 4800$$
$$-4500 \quad -4500$$
$$60x = 300$$
$$\frac{60x}{60} = \frac{300}{60}$$
$$x = 5$$

$$\frac{50}{125} = 40\%$$



Standardized Test Practice

49. The table shows the results of a survey of middle school students about their favorite school mascots.

Mascot	Number of Students
Falcon	60
Stallion	123
Ram	86
Tiger	131

Based on the data, predict how many out of 2000 students would vote for the falcon.

- A 600
B 400
C 300
D 200
50. **Short Response** If 68 is 25% of a number, what is 600% of the number?
51. A place kicker expects to make 75% of his field goal attempts this season. If he attempts 36 field goals this season, which of the following statements does *not* represent the place kicker's expectation?
- F The place kicker will make 27 field goals.
G The place kicker will miss 9 field goals.
H Less than $\frac{1}{4}$ of the field goal attempts will be missed.
J The place kicker will make more than $\frac{1}{2}$ of his field goal attempts.
52. If 40% of a number is 32, what is 35% of the number?
- A 8
B 20
C 24
D 28



Common Core Review

53. In a survey, 35% of those surveyed said that they get the news from their local television station while three-fifths said that they get the news from a daily newspaper. From which source do more people get their news? **6.NS.7b**

35%

$$\frac{3}{5} = \frac{60}{100}$$

Write each percent as a fraction in simplest form. 7.EE.3

54. 45%

55. 120%

56. 0.5%

57. $83\frac{1}{3}\%$

58. In a drawing of a honeybee, the bee is 4.8 centimeters long. The actual size of the honeybee is 1.2 centimeters. What is the scale of the drawing? **7.G.1**

Find each sum or difference. Write in simplest form. 7.NS.1d

59. $\frac{17}{18} - \frac{5}{18}$

60. $\frac{3}{10} + \frac{7}{10}$

61. $\frac{1}{2} - \frac{4}{5}$

62. $\frac{7}{15} + \frac{1}{6}$

63. $\frac{3}{4} - \frac{4}{9}$

64. $\frac{1}{2} - \frac{7}{8}$

Find each product. 7.NS.2a

65. $\frac{1}{4} \times 12$

66. $\frac{3}{4} \times 24$

67. $38 \times \frac{1}{2}$

68. $15 \times \frac{1}{3}$

69. A police officer notes that a car traveled 200 feet in 2.2 seconds. What was the speed of the car in miles per hour? Round to the nearest tenth. **7.RP.3**

Express each number in scientific notation. 8.EE.1

70. 506,000

71. 10,300,000

72. 0.0208

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80%, 75%, 70%

75% AVERAGE NOW

YOU WANT AN 80% AVERAGE

$$\frac{3}{4} = \frac{x}{4} = 3$$

$$\frac{3}{100} = \frac{3(3)+9}{600}$$

$$\frac{3}{100} = \frac{18}{600}$$

45.) $y\% = \frac{3y+9}{600}$

$$\frac{y}{100} = \frac{3y+9}{600}$$

$$\frac{6y}{600} = \frac{3y+9}{600}$$

$$6y = 3y+9$$
$$-3y \quad -3y$$

$$\frac{3y}{3} = \frac{9}{3}$$

$$y = 3$$