

# Solve Percent Problems

## Vocabulary Start-Up



A **proportion** is an equation that shows that two ratios are equivalent. In a **percent proportion**, one ratio compares a part to the whole. The other ratio is the equivalent percent written as a fraction with a denominator of 100.

How do you compare part and whole?

fraction	ratio	percent
$\frac{2}{5}$ $\frac{\text{part}}{\text{whole}}$	Using the information in the first ratio, fill in the others.  $\frac{2}{5}$	$\frac{2}{5} = \frac{\square}{100}$
What do you call the part?	$\square$ to $\square$ $\square$ : $\square$	$\square$ % of 5 = 2
the whole?		

### Essential Question

WHEN is it better to use a fraction, a decimal, or a percent?

### Vocabulary

proportion  
percent proportion

### Common Core State Standards

Content Standards  
6.RP.3, 6.RP.3c

MP Mathematical Practices  
1, 2, 3, 4, 7



## Real-World Link

**Basketball** Kara is on her school basketball team. She has completed 9 out of 12 free throw shots successfully. Write the ratio as a percent and as a fraction in simplest form.



Which **MP** Mathematical Practices did you use?

Shade the circle(s) that applies.

- |  |   |
|--|---|
| <input type="checkbox"/> 1 Persevere with Problems | <input type="checkbox"/> 5 Use Math Tools         |
| <input type="checkbox"/> 2 Reason Abstractly       | <input type="checkbox"/> 6 Attend to Precision    |
| <input type="checkbox"/> 3 Construct an Argument   | <input type="checkbox"/> 7 Make Use of Structure  |
| <input type="checkbox"/> 4 Model with Mathematics  | <input type="checkbox"/> 8 Use Repeated Reasoning |

## Use Number Lines to Find the Whole

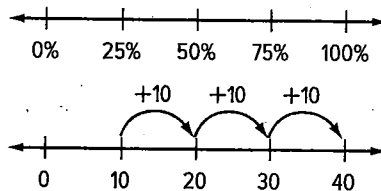
If you know the part and the percent, you can find the whole, or the total. You have used bar diagrams to solve percent problems. Double number lines are another way to illustrate percents.

### Examples

Tutor

#### 1. 10 is 25% of what number?

Use double number lines to model 25% and 10.



To model 25%, divide the number line into four parts.

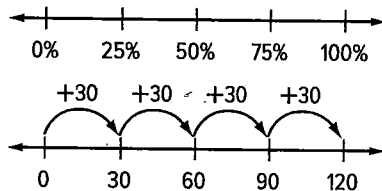
Write 10 at the 25% mark. Add 10 at each mark to find the whole.

The number 40 is at the 100% mark.

So, 10 is 25% of 40.

#### 2. Country music makes up 75% of Landon's music library. If he has downloaded 90 country music songs, how many songs does Landon have in his music library?

Use double number lines to model 75% and 90.



To model 75%, divide the number line into four parts.

$90 \div 3 = 30$ . Add 30 at each mark to find the whole.

The number 120 is at the 100% mark.

So, Landon has 120 songs in his music library.

**check** Look back at the number lines. The number 90 should line up with 75%. ✓

Show your work.

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

#### Got it? Do these problems to find out.

- a. 30 is 50% of what number?      b. 60 is 20% of what number?
- c. Peyton spent 60% of her money to buy a new television. If the television cost \$300, how much money did she have?

# Use the Percent Proportion

The diagram uses a percent proportion to show that 75% of 32 is 24.

$$\left. \begin{array}{l} \text{part} \rightarrow 24 \\ \text{whole} \rightarrow 32 \end{array} \right\} = \frac{75}{100} \text{ percent}$$

## Examples

Tutor

### 3. 15 is 30% of what number?

**Words** 15 is 30% of what number?

**Proportion**  $\frac{15}{\blacksquare} = \frac{30}{100}$  percent

$\frac{15}{\blacksquare} = \frac{30}{100}$  Write the proportion.

$\frac{15}{50} = \frac{30}{100}$  Since 15 is one half of 30, divide 100 by 2.

So, 15 is 30% of 50.

### 4. 225 is 75% of what number?

$\frac{\square}{\blacksquare} = \frac{\square}{100}$  Write the proportion.

$\frac{\square}{\square} = \frac{\square}{100}$  Since  $75 \times \square = 225$ , multiply 100 by  $\square$ .

So, 225 is 75% of \_\_\_\_\_.

### Got it? Do these problems to find out.

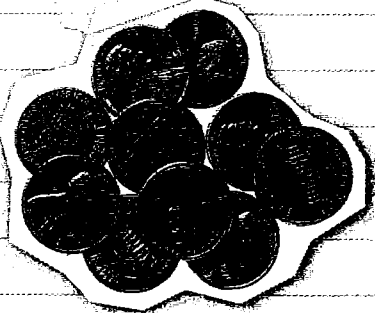
- d. 75 is 15% of what number?
- e. 9 is 36% of what number?
- f. 7 is 70% of what number?
- g. 7 is 35% of what number?

**STOP and Reflect**

Write a percent proportion below to show that 50 is 25% of 200.

Show your work.

- d. \_\_\_\_\_
- e. \_\_\_\_\_
- f. \_\_\_\_\_
- g. \_\_\_\_\_



## Example



- 5. Before 1982, pennies were 95% zinc and 5% copper. If 100 pennies minted in 1980 have an approximate mass of 15 grams of copper, what is the total mass of 100 pennies?**

The percent is 5 and the part is 15. You need to find the whole.

$$\frac{15}{\blacksquare} = \frac{5}{100}$$

Write the proportion.

$$\frac{15}{300} = \frac{5}{100}$$

Since  $5 \times 3 = 15$ , multiply 100 by 3.

The total mass of 100 pennies is 300 grams.

## Guided Practice

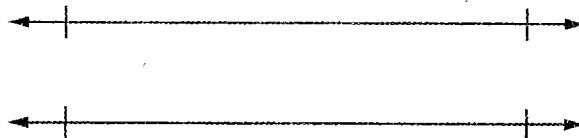
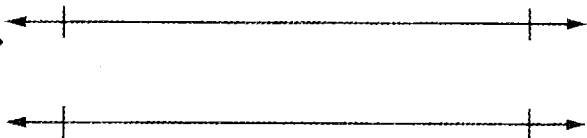


Use double number lines to find the whole. (Example 1)

1. 40 is 20% of what number? \_\_\_\_\_

2. 90 is 25% of what number? \_\_\_\_\_

Show your work.



Write a percent proportion and solve each problem. (Examples 3 and 4)

3. 120 is 30% of what number?

4. 60 is 15% of what number?

\_\_\_\_\_

5. In the first year of ownership, a new car can lose 20% of its value. If a car lost \$4,200 of value in the first year, how much did the car originally cost? (Examples 2 and 5)

\_\_\_\_\_  
\_\_\_\_\_

6.  **Building on the Essential Question** How can you use proportions to solve percent problems?

\_\_\_\_\_  
\_\_\_\_\_

### Rate Yourself!

How well do you understand percent problems? Circle the image that applies.



Clear



Somewhat Clear



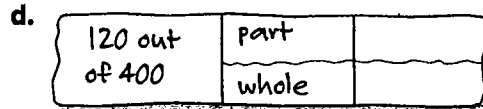
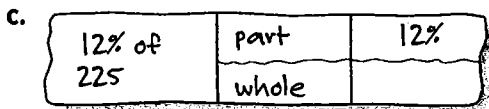
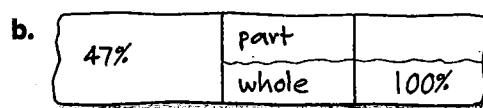
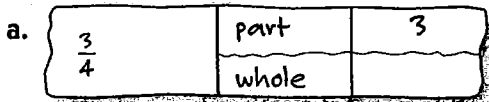
Not So Clear

For more help, go online to access a Personal Tutor.



**FOLDABLES** Time to update your Foldable!

10. **MP Identify Structure** Complete the following graphic organizers. Identify the missing information.



- e. How does identifying the part and the whole help you to write the percent proportion? \_\_\_\_\_



**H.O.T. Problems** Higher Order Thinking

11. **MP Reason Abstractly** Write a percent proportion where the part and the whole are known. Solve the problem to find the percent. \_\_\_\_\_

12. **MP Persevere with Problems** Using what you know about percents, explain why a commercial that says "80% of dentists use this toothpaste" might be misleading. \_\_\_\_\_

13. **MP Reason Inductively** The purity of gold is listed in karats. Refer to the table. If a necklace is 75% gold, what karat is it? Explain your reasoning. \_\_\_\_\_

Karats	Pure Gold (%)
24	100
12	50

14. **MP Construct an Argument** Omar scored an 82% on his first test of the quarter. Will a score of 38 out of 50 on the second test help or hurt his grade? Explain your reasoning. \_\_\_\_\_

15. **MP Persevere with Problems** At a zoo, an Asian elephant is about 3 tons and eats about 300 pounds of food a day. What percentage of its body weight does the elephant eat each day? \_\_\_\_\_

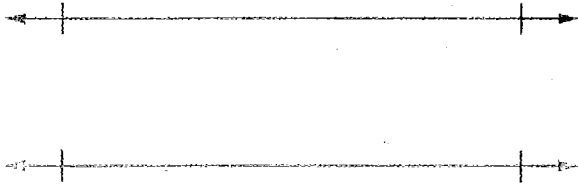
# Independent Practice

Go online for Step-by-Step Solutions

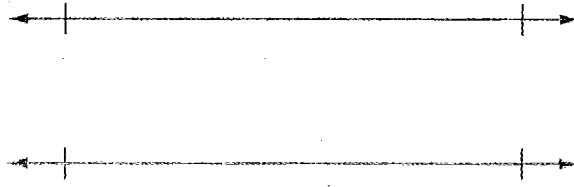


**Use double number lines to find the missing number.** (Example 1)

1. 63 is 90% of what number? \_\_\_\_\_



2. 80 is 25% of what number? \_\_\_\_\_



**Write a percent proportion and solve each problem.** (Examples 3 and 4)

**3** 22 is 44% of what number?

\_\_\_\_\_

4. 450 is 75% of what number?

\_\_\_\_\_

**5** A store is having a sale where winter clothes are 60% of the original price. A sweater is on sale for \$30. What was the original price of the sweater? (Examples 2 and 5)

\_\_\_\_\_  
\_\_\_\_\_

6. Kai calculates that he spends 15% of a school day in science class. If he spends 75 minutes in science class, how many minutes does Kai spend in school?

(Examples 2 and 5) \_\_\_\_\_  
\_\_\_\_\_

**For Exercises 7–9, use the table.**

7. If you have 3 cups of pineapple juice, how many total cups of punch can you make? \_\_\_\_\_

\_\_\_\_\_

8. How many cups of sorbet are used in 8 cups of punch?

\_\_\_\_\_  
\_\_\_\_\_

9. Elise does not like sorbet, so she omits that ingredient and adds 5 percent of each of the other ingredients. How many cups of punch will she have if she uses

6 cups of orange juice? \_\_\_\_\_

\_\_\_\_\_

Punch Recipe	
Ginger Ale	40%
Orange Juice	25%
Pineapple Juice	20%
Sorbet	15%

