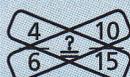


Solving Proportions

7.RP.2.a–c, 7.RP.3



A **cross product** is the product of the denominator of one fraction and the numerator of the other. If the cross products of two ratios are equal, they form a proportion.



$$6 \cdot 10 \stackrel{?}{=} 4 \cdot 15$$

$$60 = 60$$

To simplify ratios, divide the numerator and the denominator by their greatest common factor.

Variables, or letters such as n or x , are often used to represent unknown quantities in proportions.

A **proportion** shows that two ratios are equal. To see if two ratios form a proportion, simplify each ratio to see if they are equal.

Train A was on time $\frac{16}{20}$ of the time. Train B was on time $\frac{24}{30}$ of the time. Are these ratios proportional?

$$\text{Simplify } \frac{16}{20}: \frac{16 \div 4}{20 \div 4} = \frac{4}{5}$$

$$\text{Simplify } \frac{24}{30}: \frac{24 \div 6}{30 \div 6} = \frac{4}{5}$$

Both ratios simplify to $\frac{4}{5}$, so yes, they are proportional.

Proportions can be used to solve problems.

The ratios of times that trains C and D were on time are proportional. Train C was on time 15 out of 20 times this month. Train D ran 36 times this month. How many of these times was train D on time?

Write a proportion to show the two ratios are equal. Let x represent the unknown quantity.

$$\frac{15}{20} = \frac{x}{36}$$

Write the cross products.

$$20 \cdot x = 15 \cdot 36$$

Simplify and solve for x .

$$20x = 540$$

$$x = 540 \div 20 = 27$$

Train D was on time 27 times.

Read each problem. Circle the letter of the best answer.

SAMPLE The lengths and widths of two rectangles are proportional. One rectangle is 6 inches by 8 inches. What could be the dimensions of the other rectangle?

- A** 4 inches by 6 inches **C** 9 inches by 12 inches
B 6 inches by 9 inches **D** 12 inches by 18 inches



The correct answer is C. The dimensions of the given rectangle form the ratio $\frac{6}{8}$, which simplifies to $\frac{3}{4}$. Write and simplify a ratio for each answer choice to see which equals this. Choice A = $\frac{4}{6} = \frac{2}{3}$. Choice B = $\frac{6}{9} = \frac{2}{3}$. Choice C = $\frac{9}{12} = \frac{3}{4}$. Choice D = $\frac{12}{18} = \frac{2}{3}$. Only choice C simplifies to $\frac{3}{4}$.

- 1** To make a certain shade of purple paint, different parts of red paint are mixed with different parts of blue paint. The table below shows this relationship.

Parts Red	6	8	12	16
Parts Blue	15	20	30	40

What is the ratio of parts red to parts blue?

- A** 2 parts red to 3 parts blue
B 2 parts red to 5 parts blue
C 3 parts red to 5 parts blue
D 3 parts red to 10 parts blue
- 2** Randall wrote the proportion below to find n , the cost of 3 pounds of fruit.

$$\frac{6}{5} = \frac{n}{3}$$

Which equation can be used to find n ?

- A** $n = \frac{6}{5 \cdot 3}$ **C** $n = \frac{5}{6 \cdot 3}$
B $n = \frac{5 \cdot 3}{6}$ **D** $n = \frac{6 \cdot 3}{5}$

- 3** Which of the following ratios forms a proportion with $\frac{12}{16}$?

- A** $\frac{8}{12}$ **C** $\frac{18}{24}$
B $\frac{16}{20}$ **D** $\frac{24}{30}$

- 4** An elevator travels directly up 27 floors in 90 seconds. How many floors can this elevator travel directly up in 60 seconds?

- A** 18 **C** 40
B 21 **D** 200

- 5** This table shows the relationship between the cups of flour used to make muffins.

Cups of Flour	2	3	4
Number of Muffins	12	18	24

How many muffins can be made with 7 cups of flour?

- A** 13 **C** 36
B 30 **D** 42

Read each problem. Write your answer.

SAMPLE A car travels 270 miles on 15 gallons of gas. How many gallons of gas are needed for this car to travel 100 miles?

Answer _____



Set up a proportion that compares miles traveled to gallons of gas used. Let x represent the unknown number of gallons: $\frac{270}{15} = \frac{100}{x}$. Cross multiply and then solve for x : $270 \cdot x = 15 \cdot 100$, $270x = 1,500$, $x = 1,500 \div 270 = 5\frac{5}{9}$ gallons.

6 Which of the following ratios are proportional?

$$\frac{9}{12} \quad \frac{12}{15} \quad \frac{16}{20} \quad \frac{20}{24} \quad \frac{24}{35}$$

Answer _____

7 This table shows proportional relationships.

12	20	24	48
3	5	6	12

What is the ratio that is common throughout this table, written in simplest form?

Answer _____

8 Clearance items in a store are all marked down proportionally. A shirt with an original price of \$32 is on clearance for \$12. What is the clearance price of a shirt with an original price of \$40? Show your work.

Answer _____

Read each problem. Write your answer to each part.

- 9 A recipe calls for 3 parts water to 2 parts oats. Misty mixes $\frac{3}{4}$ cup of water with $\frac{1}{2}$ cup of oats.

Part A Is Misty following this recipe?

Answer _____

Part B Explain how you know your answer is correct.



Write a ratio for each pair of numbers. Are the ratios equal?

- 10 A video store charges the same fee each day a video is returned late. Craig returned a video 4 days late and paid a \$3 fee.

Part A Write a proportional equation that can be used to find the late fee for a video that is returned 7 days late.

Answer _____

Part B What is the fee for a video that is returned 7 days late? Explain how you know.
