Solving Proportions

Warm Up

Problem of the Day

Lesson Presentation

Lesson Quizzes

Solving Proportions

Warm Up

Determine whether the ratios are proportional.

1. $\frac{5}{8}, \frac{15}{24}$ **yes**
2. $\frac{12}{15}, \frac{16}{25}$ **no**
3. $\frac{15}{10}, \frac{20}{16}$ **no**
4. $\frac{14}{18}, \frac{42}{54}$ **yes**

Solving Proportions

Problem of the Day

If $A = 1$, $B = 2$, $C = 3$, $D = 4$, and so on, all the way to $Z = 26$, then what is $A + B + C + D + \ldots + Z = ?$ (*Hint:* $A + Z = B + Y$.)

351

Solving Proportions

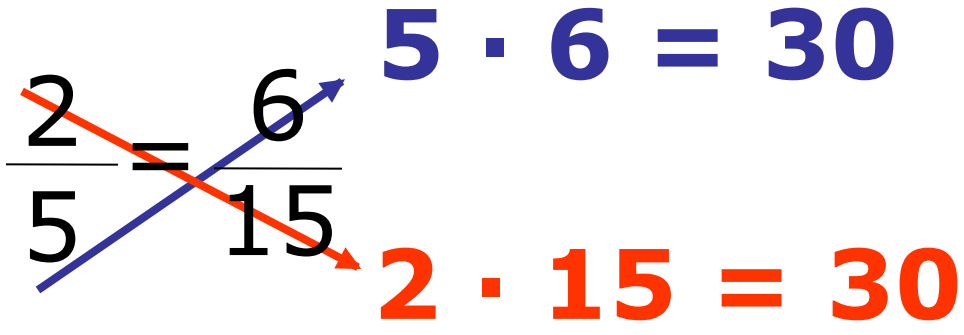
Learn to solve proportions by using cross products.

Vocabulary

cross product

Solving Proportions

For two ratios, the product of the numerator in one ratio and the denominator in the other is a **cross product**. If the cross products of the ratios are equal, then the ratios form a proportion.



Solving Proportions

CROSS PRODUCTS

In the proportion $\frac{a}{b} = \frac{c}{d}$, where $b \neq 0$ and $d \neq 0$, the cross products, $a \cdot d$ and $b \cdot c$, are equal.

You can use the cross product rule to solve proportions with variables.

Solving Proportions

Additional Example 1: Solving Proportions Using Cross Products

Use cross products to solve the proportion.

$$\frac{9}{15} = \frac{m}{5}$$

$15 \cdot m = 9 \cdot 5$ *The cross products are equal.*

$15m = 45$ *Multiply.*

$\frac{15m}{15} = \frac{45}{15}$ *Divide each side by 15 to isolate the variable.*

$m = 3$

Solving Proportions

Check It Out: Example 1

Use cross products to solve the proportion.

$$\frac{6}{7} = \frac{m}{14}$$

$7 \cdot m = 6 \cdot 14$ *The cross products are equal.*

$7m = 84$ *Multiply.*

$\frac{7m}{7} = \frac{84}{7}$ *Divide each side by 7 to isolate the variable.*

$m = 12$

Solving Proportions

It is important to set up proportions correctly. Each ratio must compare corresponding quantities in the same order.

Suppose a boat travels 16 miles in 4 hours and 8 miles in x hours at the same speed. Either of these proportions could represent this situation.

$$\frac{16 \text{ mi}}{4 \text{ hr}} = \frac{8 \text{ mi}}{x \text{ hr}} \qquad \frac{16 \text{ mi}}{8 \text{ mi}} = \frac{4 \text{ hr}}{x \text{ hr}}$$

Solving Proportions

Additional Example 2: *Problem Solving Application*

If 3 volumes of Jennifer's encyclopedia takes up 4 inches of space on her shelf, how much space will she need for all 26 volumes?

Understand the Problem

Rewrite the question as a statement.

- Find the space needed for 26 volumes of the encyclopedia.

List the **important information:**

- 3 volumes of the encyclopedia take up 4 inches of space.

Solving Proportions

Additional Example 2 Continued

2 Make a Plan

Set up a proportion using the given information. Let x represent the inches of space needed.

$$\frac{3 \text{ volumes}}{4 \text{ inches}} = \frac{26 \text{ volumes}}{x} \quad \begin{matrix} \leftarrow \textit{volumes} \\ \leftarrow \textit{inches} \end{matrix}$$

Solving Proportions

Additional Example 2 Continued

3 **Solve**

$\frac{3}{4} = \frac{26}{x}$ *Write the proportion.*

$3 \cdot x = 4 \cdot 26$ *The cross products are equal.*

$3x = 104$ *Multiply.*

$\frac{3x}{3} = \frac{104}{3}$ *Divide each side by 3 to isolate the variable.*

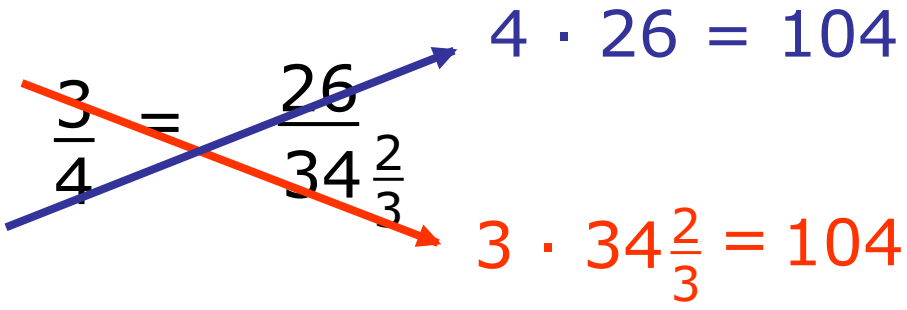
$x = 34\frac{2}{3}$

She needs $34\frac{2}{3}$ inches for all 26 volumes.

Solving Proportions

Additional Example 2 Continued

4 Look Back



The cross products are equal, so $34\frac{2}{3}$ is the answer

Solving Proportions

Check It Out: Example 2

John filled his new radiator with 6 pints of coolant, which is the 10 inch mark. How many pints of coolant would be needed to fill the radiator to the 25 inch level?

Understand the Problem

Rewrite the question as a statement.

- Find the number of pints of coolant required to raise the level to the 25 inch level.

List the **important information:**

- 6 pints is the 10 inch mark.

Solving Proportions

Check It Out: Example 2 Continued

2 Make a Plan

Set up a proportion using the given information. Let p represent the pints of coolant.

$$\frac{6 \text{ pints}}{10 \text{ inches}} = \frac{p}{25 \text{ inches}}$$

← *pints*

← *inches*

Solving Proportions

Check It Out: Example 2 Continued

3 **Solve**

$\frac{6}{10} = \frac{p}{25}$ *Write the proportion.*

$10 \cdot p = 6 \cdot 25$ *The cross products are equal.*

$10p = 150$ *Multiply.*

$\frac{10p}{10} = \frac{150}{10}$ *Divide each side by 10 to isolate the variable.*

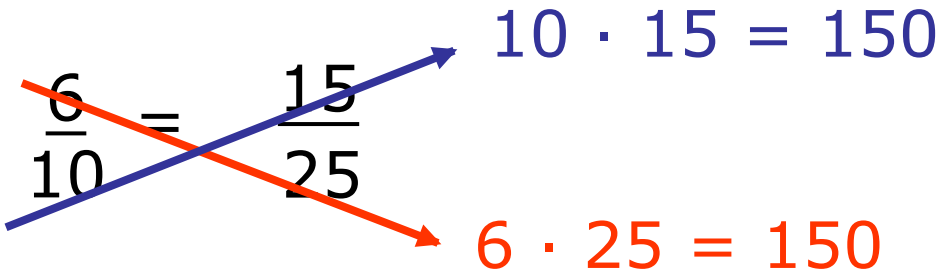
$p = 15$

15 pints of coolant will fill the radiator to the 25 inch level.

Solving Proportions

Check It Out: Example 2 Continued

4 Look Back



The cross products are equal, so 15 is the answer.

Lesson Quizzes

Standard Lesson Quiz

Lesson Quiz for Student Response Systems

Solving Proportions

Lesson Quiz: Part I

Use cross products to solve the proportion.

1. $\frac{25}{20} = \frac{45}{t}$ $t = 36$

2. $\frac{x}{9} = \frac{19}{57}$ $x = 3$

3. $\frac{2}{3} = \frac{r}{36}$ $r = 24$

4. $\frac{n}{10} = \frac{28}{8}$ $n = 35$

Solving Proportions

Lesson Quiz: Part II

5. Carmen bought 3 pounds of bananas for $1.08. June paid $ 1.80 for her purchase of bananas. If they paid the same price per pound, how many pounds did June buy?

5 pounds

Solving Proportions

Lesson Quiz for Student Response Systems

1. Use cross products to solve the proportion.

$$= \frac{24}{16} \quad \frac{48}{t}$$

A. $t = 16$

B. $t = 24$

C. $t = 32$

D. $t = 36$

Solving Proportions

Lesson Quiz for Student Response Systems

2. Use cross products to solve the proportion.

$$= \frac{y}{16} \quad \frac{21}{84}$$

A. $y = 2$

B. $y = 4$

C. $y = 8$

D. $y = 16$

Solving Proportions

Lesson Quiz for Student Response Systems

3. Use cross products to solve the proportion.

$$= \frac{4}{5} \qquad \frac{r}{25}$$

A. $r = 20$

B. $r = 15$

C. $r = 10$

D. $r = 5$

Solving Proportions

Lesson Quiz for Student Response Systems

4. Use cross products to solve the proportion.

$$= \frac{n}{16} \quad \frac{21}{12}$$

A. $n = 21$

B. $n = 28$

C. $n = 32$

D. $n = 36$

Solving Proportions

Lesson Quiz for Student Response Systems

5. If you put an object that has a mass of 25 grams on one side of the balance scale, you would have to put 55 paper clips on the other side to balance the weight. How many paper clips would balance the weight of a 30-gram object?

A. 55 paper clips

B. 58 paper clips

C. 60 paper clips

D. 66 paper clips