

Solving Proportions Using Cross Products

Goal: Solve proportions using cross products.



Vocabulary

Cross products:

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

Cross Products Property

Words The cross products of a proportion are equal.

Numbers

$$\frac{5}{7} = \frac{15}{21}$$

$$5 \cdot 21 = 105$$

$$7 \cdot 15 = 105$$

Algebra If $\frac{a}{b} = \frac{c}{d}$ where b and d are nonzero numbers, then $ad = bc$.

EXAMPLE 1 Solving a Proportion Using Cross Products

Use the cross products property to solve $\frac{2}{5} = \frac{x}{7}$.

$$\frac{2}{5} = \frac{x}{7}$$

Write original proportion.

$$5x = 2 \cdot 7$$

Cross products property

$$5x = 14$$

Divide each side by 5.

$$5 = 5$$

$$x = 2.8$$

Simplify.

The phrase *cross products* comes from the "X" shape formed by the diagonal numbers in a proportion.

Ex 2.

$$\frac{2}{3} = \frac{x}{9}$$

$$18 = 3x$$

$$\frac{18}{3} = \frac{3x}{3}$$

$$6 = x$$

EXAMPLE 2 Writing and Solving a Proportion

Currency Exchange When Jake visited Canada, he exchanged 10 U.S. dollars and he received 14 Canadian dollars. Find how many U.S. dollars he exchanged when he received 35 Canadian dollars.

US DOLLARS	→	10	←	U.S. dollars
Canada Dollars	→	14	←	Canadian dollars
		u		
		35		

$\frac{14 \cdot u}{14} = \frac{10 \cdot 35}{14}$	Cross products property
$\frac{14u}{14} = \frac{350}{14}$	Divide each side by 14.
$u = 25$	Simplify.

Answer: Jake exchanged 25 U.S. dollars when he received 35 Canadian dollars.

EXAMPLE 3 Writing and Solving a Proportion

Baseball The ratio of left-handed pitchers to right-handed pitchers on a baseball team is 2 to 5. If the team has 14 pitchers, how many are left-handed?

Solution

First, determine the ratio of left-handed pitchers to total pitchers.

$\frac{\square}{\square + \square} = \frac{\square}{\square}$	For every \square pitchers, \square are left-handed.
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To find the number l of left-handed pitchers, set up a proportion and solve it.

$\frac{\square}{\square} = \frac{\square}{\square}$	← left-handed pitchers
$\frac{\square}{\square} = \frac{\square}{\square}$	← total pitchers
$\square \cdot \square = \square \cdot \square$	Cross products property
$\square = \square$	Divide each side by \square .
$\square = \square$	Simplify.

Answer: There are \square left-handed pitchers on the team.

Your turn now**Solve the following problems.**

1. In Example 2, if Jake exchanged 45 U.S. dollars, how many Canadian dollars would he receive?

2. A baseball team has a ratio of wins to losses of 5 to 3. If they played 24 games, how many games did they lose?