Solving Proportions

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What You'll Learn

To solve proportions using unit rates, mental math, and cross products

Why Learn This?

You know the price of six oranges, but you want to buy eight. You can solve a proportion to find the total cost of the quantity that you want to buy.

You can use unit rates to solve a proportion. First find the unit rate. Then multiply to solve the problem.



Shopping Use the information above to find the cost in dollars of 8 oranges.

Solve the proportion $\frac{2.34 \text{ dollars}}{6 \text{ oranges}} = \frac{x \text{ dollars}}{8 \text{ oranges}}$.

Step 1 Find the unit price.

2.34 dollars 6 oranges

 $\$2.34 \div 6 \text{ oranges} \leftarrow \text{Divide to find the unit price.}$

\$.39/orange

Step 2 You know the cost of one orange. Multiply to find the cost of 8 oranges.

 $\$.39 \cdot 8 = \$3.12 \leftarrow$ Multiply the unit rate by the number of oranges.

The cost of 8 oranges is \$3.12.



Examples

- **Using Unit Rates** The cost of 4 lightbulbs is \$3. Use the information to find the cost of 10 lightbulbs.
 - Step 1 Find the unit price.

$$\frac{3 \text{ dollars}}{4 \text{ lightbulbs}} = \$3 \div 4 \text{ lightbulbs} \quad \leftarrow \text{Divide to find the unit price.}$$

$$\frac{\$.75}{\text{lightbulb}}$$

Step 2 You know the cost of one lightbulb. Multiply to find the cost of 10 lightbulbs.

\$.75 · 10	= \$7.50	\leftarrow Multiply the unit rate by the number of lightbulbs.
The cost of 10 lightbulbs is	\$7.50	

You can use mental math to solve some proportions. When a proportion involves a variable, you solve the proportion by finding the value of the variable.

Algebra Solve each proportion using mental math.

a.
$$\frac{z}{12} = \frac{21}{36}$$

$$\frac{z}{12} = \frac{21}{36} \leftarrow \text{Since } 12 \times 3 = 36, \text{ the common multiplier is } 3.$$

$$z = 7$$

b.
$$\frac{8}{10} = \frac{n}{40}$$

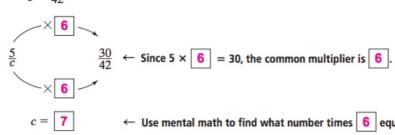
$$\frac{8}{10} = \frac{n}{40} \leftarrow \text{Since 10} \times 4 = 40, 8 \times 4 = n.$$

$$n = 32 \leftarrow \text{Use mental math.}$$

$$n = 32$$

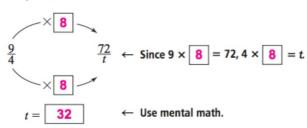
2 Solving Using Mental Math Solve each proportion using mental math.

a.
$$\frac{5}{c} = \frac{30}{42}$$



$$c = \boxed{7}$$

b.
$$\frac{9}{4} = \frac{72}{t}$$



Many proportions cannot easily be solved with mental math. In these situations, you can use cross products to solve a proportion.

EXAMPLE Solving Using Cross Products

Gridded Response Solve $\frac{25}{38} = \frac{15}{x}$ using cross products.

$$\frac{25}{38} = \frac{15}{x}$$

 $\frac{25}{38} = \frac{15}{x}$ $25x = 38(15) \quad \leftarrow \text{Write the cross products.}$

$$25x = 570 \leftarrow$$
Simplify.

$$\begin{array}{ll} 25x &=& 570 & \longleftarrow \text{Simplify.} \\ \frac{25x}{25} &=& \frac{570}{25} & \longleftarrow \text{Divide each side by 25.} \end{array}$$

$$x = 22.8 \leftarrow$$
Simplify.

Solving Using Cross Products Solve $\frac{6}{8} = \frac{9}{a}$ using cross products.

$$\frac{6}{8} = \frac{9}{a}$$

$$6a = 8(9) \leftarrow \text{Write the cross products.}$$

$$6a = \boxed{72} \leftarrow \text{Simplify}.$$

$$\frac{6a}{6} = \frac{\boxed{72}}{6} \leftarrow \text{Divide each side by } \boxed{6}.$$

$$a = \boxed{12} \leftarrow \text{Simplify}.$$

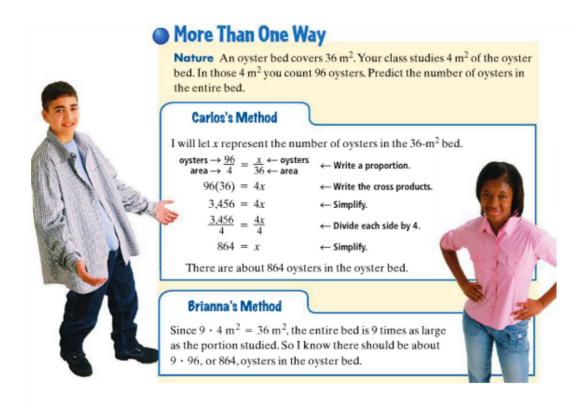


Table talk - work out both of these problems.

Quick Check

1. a. Postcards cost \$2.45 for 5 cards. How much will 13 cards cost?



b. Swimming goggles cost \$84.36 for 12. At this rate, how much will new goggles for 17 members of a swim team cost?



Table talk about each of these three problems.

- 2. Solve each proportion using mental math.
 - **a.** $\frac{3}{8} = \frac{b}{24}$



b. $\frac{m}{5} = \frac{16}{40}$



c. $\frac{15}{30} = \frac{5}{p}$



Table talk about each of these three problems.

3. Solve each proportion using cross products.

a.
$$\frac{12}{15} = \frac{x}{21}$$



b.
$$\frac{16}{30} = \frac{d}{51}$$



c.
$$\frac{20}{25} = \frac{110}{25}$$



You have an assignment worksheet and time to begin working on it now.

-	ime		Class	Date
P	ractice 4-4			Solving Proportions
U	se mental math to	solve for each value of n	ı.	
1	$\frac{n}{1} = \frac{20}{27}$		2. $\frac{9}{6} = \frac{21}{2}$	
3	$\frac{n}{14} = \frac{20}{35}$ $\frac{24}{n} = \frac{16}{10}$		2. $\frac{9}{6} = \frac{21}{n}$ 4. $\frac{3}{4} = \frac{n}{10}$	
		on using cross products.		
				8. $\frac{5}{}=\frac{m}{}$
	8 4 k =	3 5 u =	6 15 d =	8. $\frac{5}{1} = \frac{m}{4}$ $m = $
9	$\frac{36}{32} = \frac{n}{3}$	10. $\frac{5}{30} = \frac{1}{7}$	11. $\frac{t}{t} = \frac{5}{12}$	12. $\frac{9}{2} = \frac{v}{4}$
	n =	x =	t =	ν =
S	lve.			
14	A recipe require	es 3 c of flour to make 27	dinner rolls. How much	h
Se	lve using a calcula	tor, paper and pencil, or	mental math.	
15		n in 18 min. She plans to take her to complete the		
16		an go 26 miles per gallon l. How far will he be abl		asoline
17	. Eleanor can com her to complete	nplete two skirts in 15 da eight skirts?	ays. How long will it take	е
		equired to make two do to make 12 dozen muffi		
18				