3.6 Solve Proportions Using Cross Products

Goal • Solve proportions using cross products.

VOCABULARY

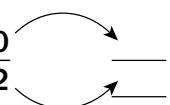Cross product

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Scale drawing

Scale model

Scale

CROSS PRODUCTS PROPERTY

Words The cross products of a proportion are _____ .

Example $\dfrac{5}{6} = \dfrac{10}{12}$ _____ $\cdot$ 10 = 60
 _____ $\cdot$ 12 = 60

Algebra If $\dfrac{a}{b} = \dfrac{c}{d}$ where $b \neq 0$ and $d \neq 0$, then $ad = $____ .

Example 1 *Solve a proportion using cross products*

Solve the proportion $\frac{5}{y} = \frac{15}{75}$.

Solution

$$\frac{5}{y} = \frac{15}{75}$$ Write original proportion.

$\underline{\quad} \cdot 75 = \underline{\quad} \cdot 15$ Cross products property

$\underline{\quad\quad} = \underline{\quad\quad}$ Simplify.

$\underline{\quad\quad} = y$ Divide each side by $\underline{\quad}$.

The solution is $\underline{\quad}$.

Example 2 *Write and solve a proportion*

Plant Food To feed your plants, you need to mix 3 tablespoons of plant food with 16 ounces of water. If it takes 80 ounces of water to feed all of your plants, how many tablespoons of plant food are needed?

Solution

Step 1 Write a proportion involving two ratios that compare the amount of plant food with the amount of water.

$\frac{3}{16} = \frac{x}{\boxed{}}$ ← amount of plant food
← amount of water

Step 2 Solve the proportion.

$\frac{3}{16} = \dfrac{x}{\boxed{}}$ Write proportion.

$3 \cdot \underline{\quad} = \underline{\quad} \cdot x$ Cross product property

$\underline{\quad\quad} = \underline{\quad\quad}$ Simplify.

$\underline{\quad} = x$ Divide each side by $\underline{\quad}$.

You need $\underline{\quad}$ tablespoons of plant food for 80 ounces of water.

✅ *Checkpoint* **Solve the proportion. Check your solution.**

1. $\dfrac{5}{n} = \dfrac{25}{45}$ **2.** $\dfrac{6}{b} = \dfrac{3}{b-2}$

3. In Example 2, suppose it takes 120 ounces to feed all of the plants. How many tablespoons of plant food are needed?

Example 3   *Use a scale model*

Scale Model An architect creates a scale model of a school. The school is 50 feet high. The ratio of the model to the actual school is 1 foot to 75 feet. Estimate the height of the model.

Solution

Write and solve a proportion to find the height h of the scale model.

$$\dfrac{1}{\boxed{}} = \dfrac{h}{\boxed{}} \quad \leftarrow \text{ height of model (feet)}$$
$$\leftarrow \text{ actual height (feet)}$$

$1 \cdot \underline{} = \underline{} \cdot h$ **Cross products property**

$\underline{} = h$ **Simplify.**

The height of the scale model is $\underline{}$ foot, or $\underline{}$ inches.

✅ *Checkpoint* **Complete the following exercise.**

4. In Example 3, suppose the ratio of the model to the actual school is 1 foot to 100 feet. Estimate the height of the model.