

Reteaching with Practice

For use with pages 234–239

GOAL Write linear equations that represent direct variation and use a ratio to write an equation for direct variation.

VOCABULARY

In the model for direct variation $y = kx$, the number k is the **constant of variation**.

Two quantities that vary directly are said to have **direct variation**.

EXAMPLE 1 *Writing a Direct Variation Equation*

The variables x and y vary directly. When $x = 4$, $y = 6$.

- Write an equation that relates x and y .
- Find the value of y when $x = 12$.

SOLUTION

- Because x and y vary directly, the equation is of the form $y = kx$.
You can solve for k as follows.

$$\begin{array}{ll} y = kx & \text{Write model for direct variation.} \\ 6 = k(4) & \text{Substitute 4 for } x \text{ and 6 for } y. \\ 1.5 = k & \text{Divide each side by 4.} \end{array}$$

An equation that relates x and y is $y = 1.5x$.

- $y = 1.5(12)$ Substitute 12 for x in $y = 1.5x$.
 $y = 18$ Simplify.

When $x = 12$, $y = 18$.

Exercises for Example 1

In Exercises 1–6, the variables x and y vary directly. Use the given values to write an equation that relates x and y .

- $x = 3, y = 15$
- $x = 6, y = 3$
- $x = -4, y = -4$
- $x = 10, y = -2$
- $x = 3.5, y = 7$
- $x = -12, y = 4$

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EXAMPLE 2 Using a Ratio to Write a Model

Weight varies directly with gravity. A person who weighs 150 pounds on Earth weighs 57 pounds on Mars.

- Write a model that relates a person's weight E on Earth to that person's weight M on Mars.
- A person weighs 210 pounds on Earth. Use the model to estimate that person's weight on Mars.

SOLUTION

- Rewrite the model $E = kM$ for direct variation as $k = \frac{E}{M}$.

This is the ratio form of a direct variation model. When $E = 150$ and

$$M = 57, k = \frac{150}{57}. \text{ The model for direct variation is } E = \frac{150}{57}M.$$

- Use the model $E = \frac{150}{57}M$ to estimate the person's weight on Mars.

$$210 = \frac{150}{57}M \quad \text{Substitute 210 for } E.$$

$$79.8 \approx M \quad \text{Multiply each side by } \frac{57}{150}.$$

You estimate that the person weighs about 79.8 pounds on Mars.

Exercises for Example 2

- Use the ratio model $E = \frac{150}{57}M$ to estimate a person's weight on Mars if the person weighs 120 pounds on Earth.
- Use the ratio model $E = \frac{150}{57}M$ to estimate a person's weight on Earth if the person weighs 62 pounds on Mars.
- A person who weighs 160 pounds on Earth weighs 139 pounds on Venus.
 - Write a model that relates a person's weight E on Earth to that person's weight V on Venus.
 - A person weighs 195 pounds on Earth. Use the model to estimate that person's weight on Venus.