

$$-\frac{8}{15} = \frac{x}{25} \quad -\frac{200}{15} = x \quad x = -\frac{40}{5}$$

$$200 = -15x$$

8.1 Direct and Inverse Variation

**obj: To solve problems with direct and inverse variations.**

**Direct Variation**  
 $y=kx$  or Proportions

Use the information given to first find k.  
 Next, solve the problem.

If  $y=-15$  when  $x=8$ , find  $x$  when  $y=25$ .

$$y=kx \rightarrow y = -\frac{15}{8}x$$

$$-\frac{15}{8} = \frac{k \cdot 8}{8} \rightarrow -\frac{8}{15} \cdot 25 = -\frac{15}{8}x - \frac{8}{15}$$

$$-\frac{15}{8} = k \rightarrow -200 = x$$

$$\frac{-40}{5} = x$$

\* Don't use proportions

**Inverse Variation**  
 $y=k/x$   $y = \frac{k}{x}$

Use the information given to first find k.  
 Next, solve the problem.

Given that  $y$  varies inversely as  $x$ .  
 If  $y=-15$  when  $x=8$ , find  $x$  when  $y=25$ .

$$y = \frac{k}{x} \rightarrow y = \frac{-120}{x}$$

$$8 \cdot -15 = \frac{k}{8} \cdot 8 \quad 25 = \frac{-120}{x}$$

$$-120 = k \quad 25x = -120$$

$$x = \frac{-120}{25} = -\frac{24}{5} = -4.8$$

**Inverse Variation**  
 $y=k/x$

Use the information given to first find k.  
 Next, solve the problem.

The variables  $x$  and  $y$  vary inversely and  $y=7$  when  $x=4$ . Find  $y$  when  $x=-2$ .

$$y = \frac{k}{x} \rightarrow y = \frac{28}{x}$$

$$A \cdot 7 = \frac{k}{4} \cdot 4 \quad y = \frac{28}{-2}$$

$$k = 28 \quad y = -14$$

**Example:**

A company has found that the monthly demand  $d$  for one of its products varies inversely with the price  $p$  of the product. When the price is \$12.50, the demand is 12,000 units. Find the demand if the price is reduced to \$12.00.

*[Faint handwritten notes and calculations inside the box]*

$$y = \frac{k}{x}$$

$$d = \frac{k}{p}$$

$d$  - demand  
 $p$  - price

$$(12.5) 12,000 = \frac{k}{12.50} (12.5)$$

$$150,000 = k$$

$$d = \frac{150,000}{p}$$

$$d = \frac{150,000}{12}$$

$$d = 12,500$$

$$y = 12,500 \text{ units}$$

**Example:**

Determine if each of the following are direct or inverse variations (or neither).

$y = 5x$  D  $D \rightarrow y = kx$   
 $y = 5/x$  I  $\frac{xy = 5}{x \cdot x} y = \frac{5}{x}$  I  
 $y = \frac{5}{x}$   
 $y = x/5 = \frac{1}{5}x$  D  $x + y = 5$   $y = -x + 5$  N  
 $y = 5x + 1$  N  $x/y = 5$   $\frac{x}{y} = 5$   
 $\frac{x}{5} = \frac{5y}{5}$

$y = \frac{1x}{5}$   
 $y = \frac{1}{5}x$   
D