


## 5.6 - Inverse Variation

### Vocabulary:

- Inverse (Indirect) Variation  $y = k/x$

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


$$xy = k$$

direct:  $y = kx$

**1 EXAMPLE** Suppose  $y$  varies inversely with  $x$ , and a point on the graph of the equation is  $(8, 9)$ . Write an equation for the inverse variation.

$$\begin{aligned}xy &= k \\8 \cdot 9 &= k \\72 &= k\end{aligned}$$

$$xy = 72$$

or

$$y = \frac{72}{x}$$

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

$$xy = k$$

Suppose  $y$  varies inversely with  $x$ . Write an equation for the inverse variation.

1.  $y = 6$  when  $x = 3$

3.  $y = 7$  when  $x = 8$

$$6 \cdot 3 = k$$

$$18 = k$$

$$xy = 18$$

or

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

$$xy = 56$$

or

$$y = \frac{56}{x}$$

**2 EXAMPLE**

The points  $(5, 6)$  and  $(3, y)$  are two points on the graph of an inverse variation. Find the missing value.

$$xy = k$$

$$5 \cdot 6 = 3y$$

$$\frac{30}{3} = \frac{3y}{3}$$

$$10 = y$$

Each pair of points is on the graph of an inverse variation. Find the missing value.

10. (6, 12) and (9, y)

$$6 \cdot 12 = 9 \cdot y$$

$$\frac{72}{9} = \frac{9y}{9}$$

$$8 = y$$

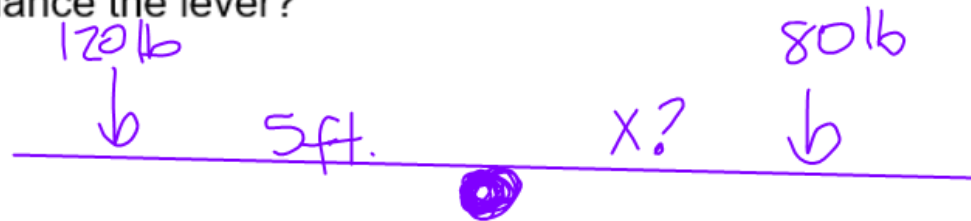
11. (3, 5) and (1, n)

$$3 \cdot 5 = 1 \cdot n$$

$$15 = 1n$$

$$15 = n$$

**3 EXAMPLE** A 120-lb weight is placed 5 ft from a fulcrum. How far from the fulcrum should an 80-lb weight be placed to balance the lever?



$$120 \cdot 5 = 80 \cdot x$$

$$\frac{600}{80} = \frac{80 \cdot x}{80}$$

$$7.5 \text{ ft} = x$$

$$x \cdot y = k$$

23. **Bicycling** Suppose a camper took 2 h to ride around a reservoir at 10 mi/h at the beginning of the summer. By the end of the summer, she can ride around the reservoir in  $1\frac{1}{2}$  h. What is her rate at the end of the summer?

$$2 \cdot 10 = 1.5x$$

$$\frac{20}{1.5} = \frac{1.5x}{1.5}$$

$$13.\overline{3} = x$$

mph

**4 EXAMPLE** Decide if each data set represents a direct variation or an inverse variation. Then write an equation to model the data.

a.

x	y
3	10
5	6
10	3

30  
30  
30

inverse  
 $xy = 30$

b.

x	y
2	3
4	6
8	12

direct  
 $y = 1.5x$

direct:  $\frac{y}{x}$

inverse:  $xy$

$$\frac{3}{2} = 1.5$$

$$\frac{6}{4} = \frac{3}{2}$$



25.

x		y
4	•	15
6	•	10
10	•	6

inverse

$$xy = 60$$

**5 EXAMPLE**

Explain whether each situation represents a direct variation or an inverse variation.  $y = \frac{k}{x}$

$$y = kx$$

- a. You buy several souvenirs for \$10 each.

$$y = 10x \quad \text{direct}$$

multiply 10 by the # of items

- b. The cost of a \$25 birthday present is split among several friends.

$$\frac{25}{x} = y$$

inverse b/c you split \$25 among  
x friends

Homework: pg. 288 #2-6even, 12, 14, 18, 24, 26, 28, 40, 58, 68