

Section 11.3 Direct and Inverse Variation

Assignment:

direct variation

$y = \text{dep.}$
 $x = \text{indep.}$

inverse variation

constant of variation

Handwritten notes and equations:

- $x=3, y=12$
- $y=kx$
- $12=k(3)$
- $\frac{12}{3} = \frac{k}{1}$
- $k=4$
- $y=4x$
- $\frac{y}{x} = k$
- linear model
- $y = k \cdot x$ (circled in yellow)
- $y = \frac{k}{x}$
- $k = \text{will not change}$

Examples

1. The variables x and y vary directly. When $x=3, y=-30$.

Step 1

a. Find k .

$$\frac{-30}{-3} = k \left(\frac{-3}{-3} \right) \quad k=10$$

b. Write an equation that relates x and y .

$$y = 10x$$

c. Find the value of y when $x=8$.

$$y = 10(8)$$

$$y = 80$$

2. The length that a spring will stretch S varies directly with the weight w attached to the spring. If a spring stretches 1.4 inches when a 20 pound weight is attached, how far will it stretch when a 10 pound weight is attached?

Handwritten calculations for Example 2:

- $10(.07) = S \quad w k = S$
- $.07 = \frac{S}{w}$ (circled)
- $\frac{20k}{20} = \frac{1.4 \text{ in}}{20 \text{ lb}}$
- $k = 0.07 \text{ in/lb}$
- $\frac{1.4}{20} = \frac{S}{10}$ (crossed out)
- $20x = 14$
- $\frac{14}{20} = \frac{S}{10}$ (circled)

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

3. The variables x and y vary inversely. When x is 3, y is 12.

a. Find k .

$$3 \cdot 12 = \frac{k}{3} \cdot 3 \quad k = 36$$

b. Write an equation that relates x and y .

$$y = \frac{36}{x}$$

c. Find y when $x = 18$.

$$y = \frac{36}{18} \quad y = 2$$

4. The area covered by a truckload of mulch and the depth of the mulch are inverse related. A load covers an area of 324 ft^2 six inches deep.

a. Write a model relating the area A and the mulch depth d .

$$6 \cdot 324 = \frac{k}{6} \cdot 6 \quad k = 1944 \quad A = \frac{k}{d}$$

b. Use the model to find the area covered by mulch 4 inches deep.

$$A = \frac{1944}{d}$$

$$A = \frac{1944}{4}$$

$$A = 486 \text{ ft}^2$$