

9-1 Variation

- **Direct Variation:** $y = kx$, $k \neq 0$
 k is constant of variation

y varies directly as x
 y is directly proportional to x

- **Inverse Variation:** $y = \frac{k}{x}$, $k \neq 0$, $x \neq 0$

$$xy = k$$

" y varies inversely as x "
" y is inversely proportional to x "

- **Joint Variation:** $y = kxz$, $k \neq 0$

" y varies directly (jointly) with x and z "
" y is jointly proportional with x and z "

1

What type of variation is shown by the data?

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

$$xy = k$$

$$RT = k$$

R	10	20	30	40
T	30	15	10	7.5

$$T = \frac{k}{R}$$

$$30 = \frac{k}{10} \quad k = 300$$

$$T = \frac{k}{R}$$

$$\frac{T}{R} = k$$

$$15 = \frac{300}{20} \quad \checkmark$$

2

Write an equation relating the variables. Then solve the problem.

If z varies directly with x and y and inversely as w^3 , and $z = 3$ when $x = 4$, $y = 3$, and $w = 2$, find w when $z = 5$, $x = 10$, and $y = 16$. $w = 4$

$$z = \frac{kxy}{w^3}$$

$$3 = \frac{k \cdot 4 \cdot 3}{8}$$

$$2 = k$$

$$5 = \frac{2 \cdot 10 \cdot 16}{w^3}$$

$$5w^3 = 320$$

$$w^3 = 64$$

3

Write an equation relating the variables. Then solve the problem.

The volume (V) of a geometric solid varies jointly with the square of a base edge (e) and its height (h). If $V = 60 \text{ in}^3$ when $e = 6 \text{ in}$ and $h = 5 \text{ in}$, find

h when $V = 100 \text{ in}^3$ and $e = 5 \text{ in}$.

$$V = Ke^2h$$
$$60 = K(36)(5)$$
$$\frac{1}{3} = K$$

$$V = \frac{1}{3}e^2h$$
$$100 = \frac{1}{3}(25)h$$
$$\boxed{12 \text{ in} = h}$$