

Variations

- ① x is directly proportional to y
- $x \propto y$ → proportionality sign
- ↳ $x = Ky$ (K is a constant)

- ② x is inversely proportional to y

$$x \propto \frac{1}{y}$$

↳ $x = \frac{k}{y}$

- ③ a is directly proportional to b^2

$$a \propto b^2$$
$$a = Kb^2$$

- ④ p is inversely proportional to square root of a

$$p \propto \frac{1}{\sqrt{a}}$$

$$p = \frac{k}{\sqrt{a}}$$

→ Direct Proportion

↑ A ↑ B

↓ A ↓ B

Price & quantity

Distance & Time (Speed is constant)

→ Inverse Proportion

↑ A ↓ B

↓ A ↑ B

Men & Time

Speed & Time (distance constant)

y is inversely proportional to the square of x

y = 2 when x = 6 find the value of y when x = 2

$$y \propto \frac{1}{x^2}$$

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

$$y = \frac{k}{x^2}$$

$$y = \frac{72}{x^2}$$

$$2 = \frac{k}{36}$$

$$y = 18$$

$$72 = k$$

y is inversely proportional to x

Given that y = 250 when x = 4 find y when x = 80

$$y \propto \frac{1}{x}$$

$$y = \frac{1000}{x}$$

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

$$y = \frac{1000}{x}$$

$$250 = \frac{k}{4}$$

$$y = 12.5$$

$$k = 1000$$

y is directly proportional to the square of x

Given that y = 50 when x = 5, find the value of y when x = 3

$$y \propto x^2$$

$$y = kx^2$$

$$50 = k \cdot 25$$

$$k = 2$$

$$y = 2x^2$$

$$y = 18$$

P is directly proportional to the square of Q .

When $P=9$, $Q=6$

a) Find the formula for P in terms of Q

$$P \propto kQ^2$$

$$9 = k \cdot 36$$

$$\frac{9}{36} = k$$

$$P = \frac{1}{4} Q^2$$

b) Find the values of Q when $P=25$

$$P = \frac{1}{4} Q^2$$

$$25 = \frac{1}{4} Q^2$$

$$100 = Q^2$$

$$Q = \pm 10$$

→ Direct Proportion

Q A car takes 3 hrs to travel 50 km, how long will it take to travel 100 km

time (hrs) Distance (km)

$$\begin{array}{cc} 3 & \swarrow \searrow & 50 \\ x & \swarrow \searrow & 100 \end{array}$$

$$x = 6 \text{ hrs}$$

Inversely Proportional

Q. 10 men take 4 days to finish a job, how long will 5 men take?

Men	time (days)
10	4
5	x

$$40 = 5x$$

$$x = 8 \text{ days}$$

y is inversely proportional to x
Given that $y = 9$ when $x = 8$, find y when $x = 6$

y	x
9	8
y	6

$$\frac{72}{6} = x$$

$$y = 12$$

y is inversely proportional to the square of x
Given that $y = 24$ when $x = 2$, find y when $x = 8$

$$\frac{y}{24} = \frac{x^2}{2^2} = \frac{1+3}{2 \times 8 \times 8} = x$$
$$y = 1.5$$

y varies directly as the square root of x
Given that $y=18$ when $x=4$ $y=?$ when $x=9$

$$\begin{array}{cc} y & x \\ 18 & 4 \\ x & 9 \end{array}$$
$$\frac{18 \times 2}{3} = x$$
$$\boxed{y=12}$$

- a) y is directly proportional to x^2
It is known that $y=6$ for a particular value of x^2
Find the value of y when this value of x is halved

$$\begin{array}{cc} y & x^2 \\ 6 & x^2 \\ y & \left(\frac{x}{2}\right)^2 \end{array}$$

$$\left(\frac{x^2}{4}\right) \times 6 = x^2 y$$

$$\frac{6}{4} = y$$

$$\boxed{y = \frac{3}{2} \text{ or } 1.5}$$