

Inverse Proportion: $y = k/x$

1
y is inversely proportional to x. When $x = 4$, $y = 6$.
Find y when $x = 8$.

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

2 Replace $\propto$ with k $y = \frac{k}{x}$

3 Substitute $6 = \frac{k}{4}$

4 Find k $k = 6 \times 4 = 24$

5 Formula $y = \frac{24}{x}$

6 Use it, $x = 8$ $y = \frac{24}{8} = 3$

2
y is inversely proportional to x. When $x = 2$, $y = 10$.
Find y when $x = 5$.

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

2 Replace $\propto$ with k $y = \frac{k}{x}$

3 Substitute $10 = \frac{k}{2}$

4 Find k $k = 10 \times 2 = 20$

5 Formula $y = \frac{20}{x}$

6 Use it, $x = 5$ $y = \frac{20}{5} = 4$

3
y is inversely proportional to x. When $x = 3$, $y = 8$.
Find y when $x = 12$.

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

2 Replace $\propto$ with k $y = \frac{k}{x}$

3 Substitute $8 = \frac{k}{3}$

4 Find k $k = 8 \times 3 = 24$

5 Formula $y = \frac{24}{x}$

6 Use it, $x = 12$ $y = \frac{24}{12} = 2$

4
y is inversely proportional to x. When $x = 5$, $y = 4$.
Find y when $x = 2$.

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

2 Replace $\propto$ with k $y = \frac{k}{x}$

3 Substitute $4 = \frac{k}{5}$

4 Find k $k = 4 \times 5 = 20$

5 Formula $y = \frac{20}{x}$

6 Use it, $x = 2$ $y = \frac{20}{2} = 10$

5
y is inversely proportional to x. When $x = 6$, $y = 2$.
Find y when $x = 4$.

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

Substitute $2 = \frac{k}{6}$

k = $2 \times 6 = 12$

Formula $y = \frac{12}{x}$

Answer $y = \frac{12}{4} = 3$

6
y is inversely proportional to x. When $x = 2$, $y = 9$.
Find x when $y = 3$. *Notice the change!*

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

Substitute $9 = \frac{k}{2}$

k = $9 \times 2 = 18$

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

Answer $3 = \frac{18}{x}$, so $x = \frac{18}{3} = 6$

7
P is inversely proportional to Q. When $Q = 4$,
 $P = 15$.
Find P when $Q = 10$.

$P = \frac{k}{Q}$

Substitute $15 = \frac{k}{4}$

k = $15 \times 4 = 60$

Formula $P = \frac{60}{Q}$

Answer $P = \frac{60}{10} = 6$

8
M is inversely proportional to h. When $h = 3$, $M = 8$.
Find h when $M = 4$.

$M = \frac{k}{h}$

Substitute $8 = \frac{k}{3}$

k = $8 \times 3 = 24$

Formula $M = \frac{24}{h}$

Answer $4 = \frac{24}{h}$, so $h = \frac{24}{4} = 6$

9
T is inversely proportional to n. When $n = 6$, $T = 10$.
Find n when $T = 15$.

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

Substitute $10 = \frac{k}{6}$

k = $10 \times 6 = 60$

Formula $T = \frac{60}{n}$

Answer $15 = \frac{60}{n}$, so $n = \frac{60}{15} = 4$

10
The time, T hours, to finish a job is inversely
proportional to the number of workers, n.
6 workers take 10 hours.
(a) Find a formula for T in terms of n.
(b) How long would 15 workers take?

Start with $T \propto \frac{1}{n}$

$T = \frac{k}{n}$, $10 = \frac{k}{6}$, $k = 60$

(a) $T = \frac{60}{n}$

(b) $T = \frac{60}{15} = 4 \text{ hours}$

11
The pressure, P, of a gas is inversely proportional
to its volume, V. When $V = 4$, $P = 30$.
(a) Find a formula for P in terms of V.
(b) Find V when $P = 40$.

Start with $P \propto \frac{1}{V}$

$P = \frac{k}{V}$, $30 = \frac{k}{4}$, $k = 120$

(a) $P = \frac{120}{V}$

(b) $40 = \frac{120}{V}$, $V = \frac{120}{40} = 3$

12
The number of days, d, a bag of dog food lasts is
inversely proportional to the number of dogs, n.
It lasts 12 days for 5 dogs.
(a) Find a formula for d in terms of n.
(b) How many dogs would finish it in 4 days?

Start with $d \propto \frac{1}{n}$

$d = \frac{k}{n}$, $12 = \frac{k}{5}$, $k = 60$

(a) $d = \frac{60}{n}$

(b) $4 = \frac{60}{n}$, $n = \frac{60}{4} = 15 \text{ dogs}$

Inverse Proportion: $y = k/x$ *further practice*

ANSWERS 

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y is inversely proportional to x .
When $x = 0.4$, $y = 15$. Find y when
 $x = 2.5$.

$$k = 0.4 \times 15 = 6, y = \frac{6}{2.5}$$

Answer 2.4

14



y is inversely proportional to x .
Complete the table.

x	2	5	15	12
y	30	12	4	5

$$k = 2 \times 30 = 60, y = \frac{60}{x}$$

15



The time, t hours, for a journey is
inversely proportional to the average
speed, s km/h. At 72 km/h the journey
takes 2 hours 30 minutes.

- (a) Find a formula for t in terms of s .
(b) What average speed makes the
journey take 2 hours 15 minutes?

$$k = 72 \times 2.5 = 180,$$

$$2 \text{ hours } 15 \text{ minutes} = 2.25 \text{ hours}$$

(a) $t = \frac{180}{s}$

(b) 80 km/h

16



y is inversely proportional to x^2 .
When $x = 2$, $y = 45$. Find y when $x = 3$.

$$y = \frac{k}{x^2}, k = 45 \times 4 = 180, \frac{180}{3^2}$$

Answer 20

17



The brightness, B lux, of the light from
a lamp is inversely proportional to the
square of the distance, d metres, from
the lamp. At 2 m the brightness is
150 lux. How far from the lamp is the
brightness 24 lux?

$$k = 150 \times 2^2 = 600, 24 = \frac{600}{d^2},$$

$$d^2 = 25$$

Answer 5 m

18



y is inversely proportional to x .
 x is increased by 25%.
By what percentage does y decrease?

$$x \times 1.25, \text{ so } y \div 1.25,$$

$$1 \div 1.25 = 0.8$$

Answer 20%

19



A team of pickers takes 12 hours to
pick a field of strawberries.
With 3 more pickers, it takes 8 hours.
The time is inversely proportional to
the number of pickers.
How many pickers were in the
first team?

$$n \text{ pickers: } 12n = 8(n + 3), 4n = 24$$

Answer 6 pickers

20



Here are some values of x and y .
Is y inversely proportional
to x ? Explain.

x	2	4	5	8
y	20	10	8	6

$$2 \times 20 = 4 \times 10 = 5 \times 8 = 40,$$

$$\text{but } 8 \times 6 = 48$$

Answer No, $8 \times 6 = 48$, not 40