

Direct Proportion: $y = kx$

1
y is directly proportional to x. When $x = 4$, $y = 20$.
Find y when $x = 7$.

1 Statement $y \propto x$

2 Replace $\propto$ with $=$ $y = kx$

3 Substitute $20 = k \times 4$

4 Find k $k = \frac{20}{4} = 5$

5 Formula $y = 5x$

6 Use it, $x = 7$ $y = 5 \times 7 = 35$

2
y is directly proportional to x. When $x = 3$, $y = 24$.
Find y when $x = 10$.

1 Statement $y \propto x$

2 Replace $\propto$ with $=$ $y = kx$

3 Substitute $24 = k \times 3$

4 Find k $k = \frac{24}{3} = 8$

5 Formula $y = 8x$

6 Use it, $x = 10$ $y = 8 \times 10 = 80$

3
y is directly proportional to x. When $x = 5$, $y = 35$.
Find y when $x = 12$.

1 Statement $y \propto x$

2 Replace $\propto$ with $=$ $y = kx$

3 Substitute $35 = k \times 5$

4 Find k $k = \frac{35}{5} = 7$

5 Formula $y = 7x$

6 Use it, $x = 12$ $y = 7 \times 12 = 84$

4
y is directly proportional to x. When $x = 6$, $y = 18$.
Find y when $x = 14$.

1 Statement $y \propto x$

2 Replace $\propto$ with $=$ $y = kx$

3 Substitute $18 = k \times 6$

4 Find k $k = \frac{18}{6} = 3$

5 Formula $y = 3x$

6 Use it, $x = 14$ $y = 3 \times 14 = 42$

5
y is directly proportional to x. When $x = 4$, $y = 24$.
Find y when $x = 9$.

$y = kx$

Substitute $24 = k \times 4$

$k = \frac{24}{4} = 6$

Formula $y = 6x$

Answer $y = 6 \times 9 = 54$

6
y is directly proportional to x. When $x = 10$, $y = 40$.
Find y when $x = 25$.

$y = kx$

Substitute $40 = k \times 10$

$k = \frac{40}{10} = 4$

Formula $y = 4x$

Answer $y = 4 \times 25 = 100$

7
y is directly proportional to x. When $x = 8$, $y = 40$.
Find x when $y = 90$. *Notice the change!*

$y = kx$

Substitute $40 = k \times 8$

$k = \frac{40}{8} = 5$

Formula $y = 5x$

Answer $90 = 5x$, so $x = \frac{90}{5} = 18$

8
P is directly proportional to Q. When $Q = 5$, $P = 35$.
Find P when $Q = 20$.

$P = kQ$

Substitute $35 = k \times 5$

$k = \frac{35}{5} = 7$

Formula $P = 7Q$

Answer $P = 7 \times 20 = 140$

9
M is directly proportional to h. When $h = 15$,
 $M = 45$.
Find h when $M = 75$.

$M = kh$

Substitute $45 = k \times 15$

$k = \frac{45}{15} = 3$

Formula $M = 3h$

Answer $75 = 3h$, so $h = \frac{75}{3} = 25$

10
T is directly proportional to n. When $n = 4$, $T = 32$.
Find n when $T = 48$.

$T = kn$

Substitute $32 = k \times 4$

$k = \frac{32}{4} = 8$

Formula $T = 8n$

Answer $48 = 8n$, so $n = \frac{48}{8} = 6$

11
y is directly proportional to x. When $x = 4$, $y = 10$.
Find y when $x = 6$.

$y = kx$

Substitute $10 = k \times 4$

$k = \frac{10}{4} = 2.5$

Formula $y = 2.5x$

Answer $y = 2.5 \times 6 = 15$

12
y is directly proportional to x. When $x = 10$, $y = 15$.
Find y when $x = 4$.

$y = kx$

Substitute $15 = k \times 10$

$k = \frac{15}{10} = 1.5$

Formula $y = 1.5x$

Answer $y = 1.5 \times 4 = 6$

Direct Proportion: $y = kx$ *further practice*

ANSWERS 

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y is directly proportional to x .

When $x = 2.5$, $y = 9$. Find y when $x = 7$.

$$9 = 2.5k, k = 3.6, y = 3.6 \times 7$$

Answer 25.2

14



p is directly proportional to q .

When $q = 12$, $p = 8$. Find q when $p = 14$.

$$8 = 12k, k = \frac{2}{3}, 14 = \frac{2}{3}q$$

Answer 21

15



y is directly proportional to x .

Complete the table, then write a formula for y in terms of x .

x	15	4	25
y	24	6.4	40

$$24 \div 15 = 1.6$$

Formula $y = 1.6x$

16



The time, t minutes, to download a file is directly proportional to its size, s MB. A 450 MB file takes 3 minutes.

(a) Find a formula for t in terms of s .

(b) How long does a 2.1 GB file take?

(1 GB = 1000 MB)

$$3 = 450k, k = \frac{1}{150}$$

$$2.1 \text{ GB} = 2100 \text{ MB}$$

$$(a) \quad t = \frac{s}{150}$$

(b) 14 minutes

17



y is directly proportional to x^2 .

When $x = 4$, $y = 12$. Find y when $x = 10$.

$$y = kx^2, 12 = 16k, k = 0.75,$$

$$0.75 \times 10^2$$

Answer 75

18



The distance, d metres, a pebble falls is directly proportional to the square of the time, t seconds. It falls 19.6 m in 2 seconds. How long does it take to fall 122.5 m?

$$19.6 = 4k, k = 4.9, 122.5 = 4.9t^2,$$

$$t^2 = 25$$

Answer 5 seconds

19



The time, T seconds, a pendulum takes to swing there and back is directly proportional to the square root of its length, L metres. A pendulum 0.64 m long takes 1.6 seconds. Find the length of a pendulum that takes 2.4 seconds.

$$1.6 = k \times \sqrt{0.64} = 0.8k, k = 2,$$

$$2.4 = 2\sqrt{L}, \sqrt{L} = 1.2$$

Answer 1.44 m

20



y is directly proportional to x^2 .

Ria says that when x doubles, y doubles too. Is she right? Explain.

$$k(2x)^2 = 4kx^2$$

Answer No, y is multiplied by 4