Proportion with Squares, Cubes and Roots

ANSWERS

1

y is directly proportional to the square of x. When $x = 2, y = 20$. Find y when $x = 3$.

x	2	3
x^2	4	9
y	20	45

× 5

Statement $y \propto x^2$

Replace $\propto$ with $= k$ $y = k x^2$

Substitute $20 = k \times 2^2$

Find k $k = 5$

Formula $y = 5x^2$

Use it $y = 5 \times 3^2$

45

$y =$ _____

2

y is directly proportional to the square of x. When $x = 3, y = 18$. Find y when $x = 5$.

x	3	5
x^2	9	25
y	18	50

× 2

Statement $y \propto x^2$

Replace $\propto$ with $= k$ $y = k x^2$

Substitute $18 = k \times 3^2$

Find k $k = 2$

Formula $y = 2x^2$

Use it $y = 2 \times 5^2$

50

$y =$ _____

3

y is directly proportional to the square of x. When $x = 4, y = 112$. Find y when $x = 1.5$.

x	4	1.5
x^2	16	2.25
y	112	15.75

× 7

Statement $y \propto x^2$

Replace $\propto$ with $= k$ $y = k x^2$

Substitute $112 = k \times 4^2$

Find k $k = 7$

Formula $y = 7x^2$

Use it $y = 7 \times 1.5^2$

15.75

$y =$ _____

4

y is directly proportional to the cube of x. When $x = 2, y = 40$. Find y when $x = 3$.

x	2	3
x^3	8	27
y	40	135

× 5

Statement $y \propto x^3$

Replace $\propto$ with $= k$ $y = k x^3$

Substitute $40 = k \times 2^3$

Find k $k = 5$

Formula $y = 5x^3$

Use it $y = 5 \times 3^3$

135

$y =$ _____

5

y is directly proportional to the square root of x. When $x = 49, y = 21$. Find y when $x = 16$.

Statement $y \propto \sqrt{x}$

Replace $\propto$ with $= k$ $y = k\sqrt{x}$

Substitute $21 = k \times \sqrt{49} = 7k$

Find k $k = 3$

Formula $y = 3\sqrt{x}$

Use it $y = 3 \times \sqrt{16}$

12

$y =$ _____

6

y is inversely proportional to the square of x. When $x = 4, y = 3$. Find y when $x = 2$.

$y = \frac{k}{x^2}, 3 = \frac{k}{16}, k = 48$

$y = \frac{48}{2^2} = \frac{48}{4}$

12

$y =$ _____

7

y is directly proportional to x^2. When $x = 5$, $y = 50$. Find the positive value of x when $y = 98$.

$50 = 25k, k = 2, y = 2x^2$

$98 = 2x^2, x^2 = 49$

7

$x =$ _____

8

y is directly proportional to x^2. When $x = 3$, $y = 36$. Ben writes $36 = 3k$, so $k = 12$, and when $x = 4, y = 48$. Explain Ben's mistake, then find the right value of y.

He forgot to square: $36 = k \times 3^2 = 9k$

$k = 4, y = 4 \times 4^2$

64

$y =$ _____

Proportion with Squares, Cubes and Roots *further practice*

ANSWERS

9

y is directly proportional to x^2.
When $x = 3$, $y = 4.5$. Find y when $x = 8$.

$4.5 = 9k,\ k = 0.5$

$y = 0.5 \times 8^2$

$y =$ 32

10

The cost, C pounds, of a round rug is directly proportional to the square of its diameter, d metres. A rug 1.2 m across costs £72. Find the cost of a rug 1.5 m across.

$72 = k \times 1.2^2 = 1.44k,\ k = 50$

$C = 50 \times 1.5^2$

Answer £112.50

11

The distance you can see to the horizon, d km, is directly proportional to the square root of your height above the sea, h m. From 25 m you can see 18 km. (a) How far can you see from 64 m? (b) How high must you be to see 27 km?

$18 = k\sqrt{25} = 5k,\ k = 3.6$

(a) 3.6×8 (b) $\sqrt{h} = 7.5$

Answer (a) 28.8 km (b) 56.25 m

12

The brightness, B, of a lamp is inversely proportional to the square of the distance from it, d metres. At 2 m the brightness is 45.
Find the brightness at 3 m.

$45 = \frac{k}{2^2},\ k = 180$

$B = \frac{180}{3^2}$

$B =$ 20

13

y is directly proportional to x^3.
Complete the table.

x	2	4	6
y	4	32	108

$4 = 8k,\ k = 0.5$

$108 = 0.5x^3,\ x^3 = 216$

Answer 32 and 6

14

y is directly proportional to x^2.
When $x = 4$, $y = p$. When $x = 6$, $y = p + 30$. Find p.

$36k - 16k = 30$

$k = 1.5,\ p = 1.5 \times 16$

$p =$ 24

15

y is inversely proportional to x^2.
When $x = 6$, $y = 2.5$. Find the positive value of x when $y = 10$.

$k = 2.5 \times 36 = 90$

$10 = \frac{90}{x^2},\ x^2 = 9$

$x =$ 3

16

y is directly proportional to x^3.
Lily says, "If x doubles, y doubles too."
Is she right? Explain.

$y = kx^3;\ (2x)^3 = 8x^3$

so y is multiplied by 8

Answer No, y is multiplied by 8