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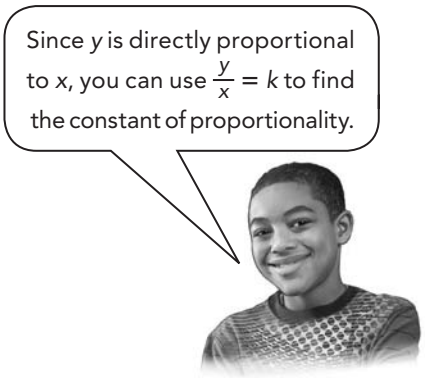
Lesson 5.3 Solving Direct Proportion Problems

Write a direct variation equation and find the indicated value.

Example

y varies directly as x, and $y = 6$ when $x = 2$.



a) Write an equation that relates y and x.

Constant of proportionality: $\frac{y}{x} = \frac{6}{2} =$ 3

The direct proportion equation is $y = 3x$.

b) Find y when $x = 6$.

Method 1
Use a proportion.

$$\frac{6}{2} = \frac{y}{6}$$
$$2 \cdot y = 6 \cdot 6$$
$$2y = 36$$
$$\frac{2y}{2} = \frac{36}{2}$$
$$y = 18$$

Method 2
Use a direction proportion equation.

When $x =$ 6 and $y =$ $3x$,

$$y = 3 \cdot 6$$
$$y = 18$$

c) Find x when $y = 24$.

Method 1
Use a proportion.

$$\frac{6}{2} = \frac{24}{x}$$
$$6 \cdot x = 24 \cdot 2$$
$$6x = 48$$
$$\frac{6x}{6} = \frac{48}{6}$$
$$x = 8$$

Method 2
Use a direction proportion equation.

When $y =$ 24 and $y =$ $3x$,

$$24 = 3x$$
$$\frac{24}{3} = \frac{3x}{3}$$
$$8 = x$$

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Complete.

1. p varies directly as r, and $p = 12$ when $r = 3$.

a) Write an equation that relates p and r.

Constant of proportionality: $\frac{p}{r} =$ _____ = _____

The direct proportion equation is $p =$ _____ r.

b) Find p when $r = 4$.

Method 1
Use a proportion.

$\frac{12}{3} = \frac{p}{\square}$

$p \cdot 3 = 12 \cdot$ _____

$3p =$ _____

$\frac{3p}{\square} =$ _____

$p =$ _____

Method 2
Use a direction proportion equation.

When $r = 4$ and $p =$ _____ r,

$p =$ _____ $\cdot$ _____

$p =$ _____

c) Find r when $p = 40$.

Method 1
Use a proportion.

$\frac{12}{3} = \frac{\square}{r}$

$12 \cdot r =$ _____ $\cdot$ _____

$12r =$ _____

$\frac{12r}{\square} =$ _____

$r =$ _____

Method 2
Use a direction proportion equation.

When $p =$ _____ and $p =$ _____ r,

_____ = _____

_____ = _____

_____ = _____

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Write a direct variation equation and find the indicated value.

2. m varies directly as n, and $m = 18$ when $n = 6$.

a) Write an equation that relates m and n.

b) Find m when $n = 3$.

c) Find n when $m = 36$.

3. y varies directly as x, and $y = 5$ when $x = 10$

a) Write an equation that relates y and x.

b) Find y when $x = 8$.

c) Find x when $y = 25$.

4. s varies directly as q, and $s = 2$ when $q = 5$.

a) Write an equation that relates s and q.

b) Find s when $q = 25$.

c) Find q when $s = 8$.

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In each table, *y* is directly proportional to *x*. Complete the table.

Example

x	2	**a)** _____	5
y	10	15	**b)** _____

a)
$$\frac{2}{10} = \frac{x}{15}$$
$$2 \cdot 15 = x \cdot 10$$
$$30 = 10x$$
$$\frac{30}{10} = \frac{10x}{10}$$
$$3 = x$$

b)
$$\frac{2}{10} = \frac{5}{y}$$
$$2y = 50$$
$$\frac{2y}{2} = \frac{50}{2}$$
$$y = 25$$

Since *y* is directly proportional to *x*, you can use proportional reasoning to solve for the unknown values.

Complete.

5.

x	4	**a)** _____	10
y	12	18	**b)** _____

a) $\frac{4}{12} = \frac{x}{\square}$

$x \cdot 12 = 4 \cdot$ _____

$12x =$ _____

$\frac{12x}{\square} =$ _____

$x =$ _____

b) $\frac{4}{12} = \frac{10}{\square}$

_____ · _____ = _____ · _____

_____ = _____

_____ = _____

_____ = _____

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In each table, *y* is directly proportional to *x*. Complete the table.

6.

x	2	**a)** _____	5
y	14	28	**b)** _____

7.

x	4	**a)** _____	16
y	1	3	**b)** _____

8.

x	3	**a)** _____	7
y	42	70	**b)** _____

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Solve. Show your work.

Example

The mass of a collection of copper coins, y grams, is directly proportional to the number of coins in the collection, c. The mass of 12 coins is 36 grams.

a) Find the constant of proportionality.

Constant of proportionality: $\frac{y}{c} = \frac{36}{12} =$ 3

The constant of proportionality is 3.

b) Write an equation that relates y and c.

The direct proportion equation is $y = 3c$.

c) Find the mass of a collection of 30 coins.

When $c =$ 30 and $y =$ $3c$, $y = 3 \cdot 30$

$y =$ 90

The mass of a collection of 30 coins is 90 grams.

Complete.

9. The number of tourists, n, in a tour group, is directly proportional to the number of buses, c, a travel agent needs to reserve. A travel agent reserves 6 buses for 360 tourists.

a) Find the constant of proportionality.

Constant of proportionality: $\frac{n}{c} =$ _____ = _____

The constant of proportionality is _____.

b) Write an equation that relates c to n.

The direct proportion equation is _____.

c) Find the value of c when $n = 240$.

When $n =$ _____ and $n =$ _____c, _____ = _____ $\cdot c$

_____ = _____

_____ = _____

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Solve. Show your work.

10. The number of cell phones produced by a manufacturer, s, is directly proportional to the number of hours, h, that the production line is operational. The production line is capable of producing 72 cell phones in 48 hours.

a) Find the constant of proportionality.

b) Write an equation that relates s and h.

c) Find the value of s when $h = 40$.

11. The number of loaves of bread, N, produced at a local bakery is directly proportional to the time it takes to bake the bread, T. It takes 4 hours to bake 220 loaves of bread.

a) Find the number of loaves of bread baked in 1 hour.

b) Write an equation that relates N and T.

c) How long does it take to bake 330 loaves of bread?

12. The distance traveled by an aircraft, d miles, is directly proportional to the duration of the flight, t hours. It takes 3 hours to travel 1,350 miles.

a) Find the distance the aircraft travels in 1 hour.

b) Write an equation that relates d and t.

c) How long does it take to travel 2,250 miles?