

5.5 - Direct Variation

Vocabulary:

- Direct Variation

$$y = kx$$

memorize

constant of variation

$$y = 2x$$

constant

$$y = kx$$

1 EXAMPLE Is each equation a direct variation? If it is, find the constant of variation.

$$2x - 3y = 1 - 2x$$

$$-3y = 1 - 2x$$

$$y = -\frac{1}{3} + \frac{2}{3}x \quad \text{NO}$$

$$2x - 3y = 0$$

$$-3y = -2x$$

$$y = \frac{2}{3}x$$

yes

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

$$y = kx$$

Is each equation a direct variation? If it is, find the constant of variation.

1. $2y = 5x + 1$

$$y = \frac{5}{2}x + \frac{1}{2}$$

NO

3. $-12x = 6y$

$$-2x = y$$

yes

$$k = -2$$

2 EXAMPLE Write an equation for the direct variation that includes the point $(-3, 2)$.

x y

$$y = kx$$

$$\frac{-2}{3} = k \cdot \frac{-3}{3}$$

$$\frac{-2}{3} = k$$

$$y = -\frac{2}{3}x$$

$$y = kx$$

Write an equation of the direct variation that include the given point.

#11. (5,1)

x y

$$\frac{1}{5} = k \cdot \frac{5}{5}$$

$$\frac{1}{5} = k$$

$$y = \frac{1}{5}x$$

#13. (-5,-9)

x y

$$\frac{-9}{5} = k \cdot \frac{-5}{5}$$

$$\frac{9}{5} = k$$

$$y = \frac{9}{5}x$$

3 EXAMPLE The **weight an object exerts on a scale** varies directly with **the mass of the object**. If a bowling ball has a mass of 6 kg, the scale reads 59. Write an equation for the relationship between weight and mass.

weight varies w/~~mass~~ (x, y)

$$x = \text{mass}$$

$$x = 6$$

$$y = kx$$

$$y = \text{weight}$$

$$y = 59$$

$$\frac{59}{6} = \frac{k \cdot 6}{6}$$

$$\frac{59}{6} = k$$

$$y = \frac{59}{6}x$$

23. **Earnings** When you have a job that pays an hourly wage, the amount you earn varies directly with the number of hours you work. Suppose you earn \$7.10/hour working at the library.

\$ earned varies w/ # of hrs.

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

$$y = \$$$

$$y = kx$$

$$y = 7.10x$$

4 EXAMPLE For the data in each table, use the ratio $\frac{y}{x}$ to tell whether y varies directly with x . If it does, write an equation for the direct variation.

a.

x	y	$\frac{y}{x}$
-2	-1	$\frac{-1}{-2} = -0.5$
2	-1	$\frac{-1}{2} = -0.5$
4	-2	$\frac{-2}{4} = -0.5$

yes

$$y = -0.5x$$

b.

x	y	$\frac{y}{x}$
-1	2	$\frac{2}{-1} = -2$
1	2	$\frac{2}{1} = 2$
2	-4	$\frac{-4}{2} = -2$

NO

~~$$y = kx$$~~

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

25.

x	y
-2	1
3	6
8	11

xy

$$\frac{1}{2} = -0.5$$

$$\frac{6}{3} = 2$$

NO

5 EXAMPLE Suppose a windlass requires 0.75 lb of force to lift an object that weighs 48 lb. How much force would you need to lift 210 lb?

~~$$\frac{0.75 \text{ force}}{48 \text{ lb.}} = \frac{x \text{ force}}{210 \text{ lb}}$$~~


$$210 \cdot 0.75 = 48x$$

$$3.28 \text{ lbs.} =$$

of force

27. **Physics** The force you apply to a lever is proportional to the weight you can lift. Suppose you can lift a 50-lb weight by applying 20 lb of force to a certain lever.
- What is the ratio of force to weight for the lever?
 - Write ~~an equation~~ and find the force you need to lift a friend weighing 130 lb.

(a)
$$\frac{20 \text{ lb force}}{50 \text{ lb weight}} = \frac{x}{130 \text{ lb weight}}$$

$$130 \cdot 20 = 50x$$

$$\boxed{52 \text{ lb. force} = x}$$

Homework: pg. 280 #2-6even, 12-16even, 22-26even, 28, 62, 70