

# Algebra 1

Chapter 5

Section 5-2

## Direct Variation

Direct variation is a type of <sup>linear</sup> function that can be put in the form:

$$y = kx$$

where  $x$  is the independent variable,  $y$  is the dependent variable and  $k$  is the constant of variation.

## Identifying Direct Variation by Equation

Do the following equations show direct variations

$$2x + 3y = 10$$

$$\begin{array}{r} -2x \\ \hline 3y = -2x + 10 \end{array}$$

$$y = -\frac{2}{3}x + \frac{10}{3}$$

No

$$11x + 2y = 0$$

$$\begin{array}{r} -11x \\ \hline 2y = -11x \end{array}$$

$$y = -\frac{11}{2}x$$

Yes,  $k = -\frac{11}{2}$

$$5y = 4x$$

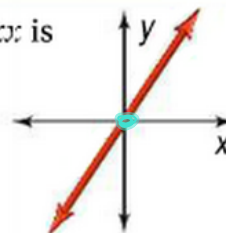
$$y = \frac{4}{5}x$$

Yes  
 $k = \frac{4}{5}$

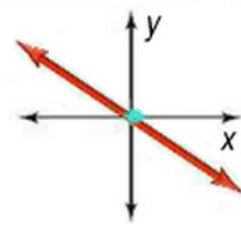
### Concept Summary Graphs of Direct Variations

The graph of a direct variation equation  $y = kx$  is a line with the following properties.

- \* The line passes through  $(0, 0)$ .
- \* The slope of the line is  $k$ .



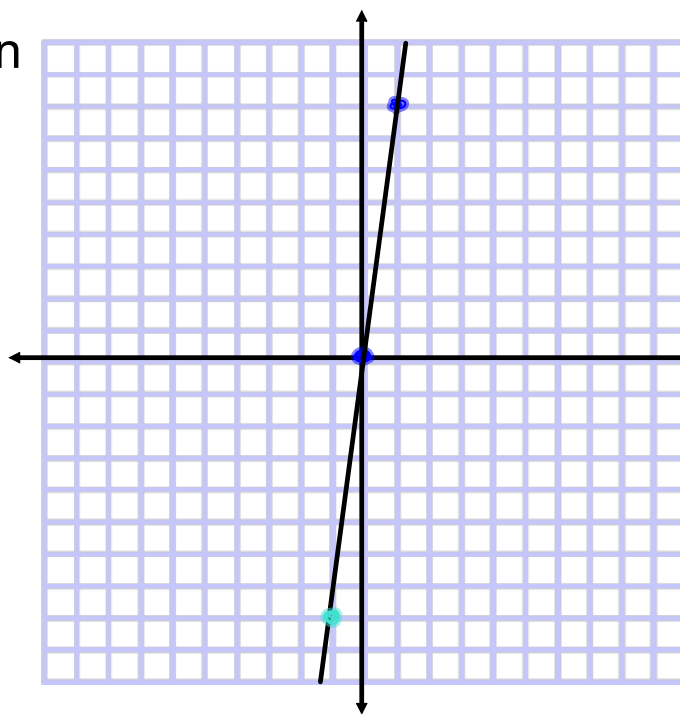
$k > 0$



$k < 0$

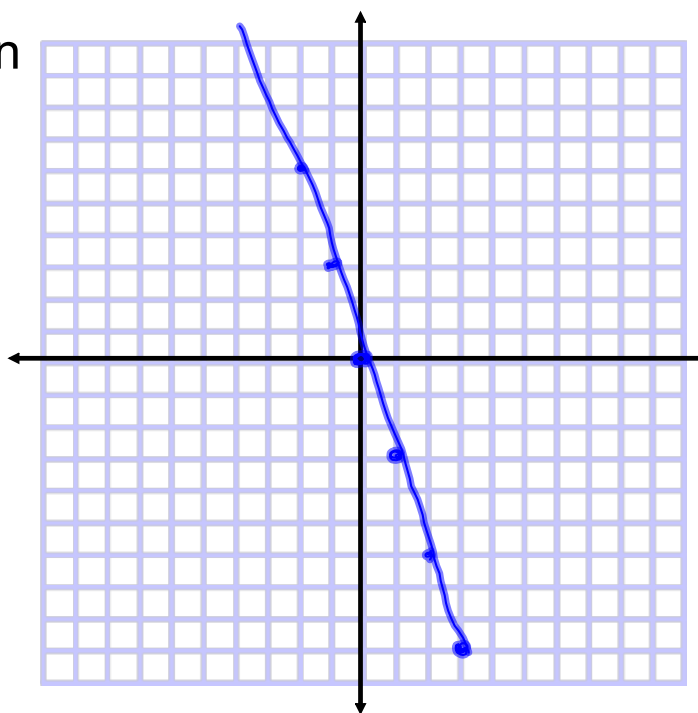
Graph the direct variation

$$y = 8x$$



Graph the direct variation

$$y = -3x$$



Finding k. (Solve for k).

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

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

Finding k.

$$y = kx$$

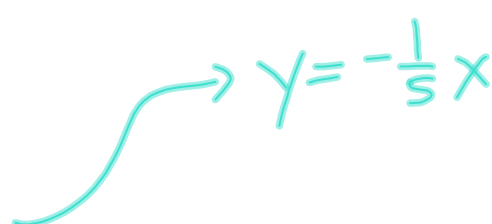
Suppose y varies directly with x. When  $y = 12$ ,  
 $x = 14$ . What is the value of k?

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

$$k = \frac{12}{14} = \frac{6}{7}$$

Writing an equation.

Suppose  $y$  varies directly with  $x$ . When  $y = -2$ ,  $x = 10$ . What is the direct variation equation?

$$k = \frac{-2}{10}$$
$$k = -\frac{1}{5}$$

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

Writing an equation.

Suppose  $y$  varies directly with  $x$ . When  $y = 1$ ,  $x = 2$ . What is the direct variation equation?

$$k = \frac{1}{2}$$
$$y = \frac{1}{2}x$$

Is each relationship a direct variation?

x	-2	1	4
y	4	-2	-8

$$\frac{4}{-2} \stackrel{?}{=} \frac{-2}{1} \stackrel{?}{=} \frac{-8}{4}$$

$$-2 = -2 = -2$$

Yes

x	4	8	10
y	6	12	15

$$\frac{6}{4} \stackrel{?}{=} \frac{12}{8} \stackrel{?}{=} \frac{15}{10}$$

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

Yes

Is each relationship a direct variation?

x	3	5	8	9
y	4.8	8	12.8	14.4

$$\frac{4.8}{3} \stackrel{?}{=} \frac{8}{5} \stackrel{?}{=} \frac{12.8}{8} \stackrel{?}{=} \frac{14.4}{9}$$

$$\frac{1.6}{1} = \frac{1.6}{1} = \frac{1.6}{1}$$

Yes

Yes

x	10	9	8	7
y	11	10	9	8

$$\frac{11}{10} \neq \frac{10}{9} \neq \frac{9}{8} \neq \frac{8}{7}$$

NO

At Ernie's Filling Station, 6 gallons of gas costs \$18.60, 4.5 gallons costs \$13.95, and 3.1 gallons costs \$9.61. Is the relationship a direct variation?

$$\frac{18.60}{6} = \frac{13.95}{4.5} = \frac{9.61}{3.1}$$

$$\frac{3.1}{1} = \frac{3.1}{1} = \frac{3.1}{1}$$

Yes