

Warm-Up

October 2, 2015

1. What is slope of a line that passes through (-9, 5), and (7, -13)?

$$\frac{-13-5}{7-(-9)} = \frac{-18}{16} = -9/8$$

2. What is the slope of  $6x - 4y = 8$ ?

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

$m = 3/2$

$$y = mx + b$$

slope  $m$ , y-int  $b$

$$\frac{-4y = (-6x + 8)}{-4} = \frac{6x - 2}{1}$$

3. Write a function to represent the total cost if each ticket to the football game cost \$7.

$$f(x) = 7x$$

4. If a pizza with 3 toppings cost \$7.75 and a pizza with 5 toppings cost \$10.25. What is the cost of each topping?

$$\frac{10.25 - 7.75}{5 - 3} = \frac{2.50}{2} = 1.25$$

\$1.25

## Direct Variation

Direct Variation occurs in a function when  $y$  varies directly, or in the same way, as  $x$  varies. The two vary by a proportional factor,  $k$ .

Equation:  $y = kx$ , where  $k$  is the constant of variation.

### Examples: Finding the Constant of Variation

$$y = kx$$

1. Find the constant of variation if  $y = 6$  and  $x = -3$ .


$$\frac{6}{-3} = \frac{k(-3)}{-3} \quad k = -2$$

2. Find the constant of variation if  $y = 10$  and  $x = 5$ .

$$\frac{10}{5} = k(5) \quad k = 2$$

3. Find the constant of variation if  $y = 15$  and  $x = 3$ .

$$\frac{15}{3} = \frac{k(3)}{3} \quad k = 5$$

did by  
yours  
truly! 

Examples: Writing the direct variation equation.

1. Write the direct variation equation if  $y = 12$  and  $x = -6$ .

$$\frac{12}{-6} = \frac{k(-6)}{-6} \quad k = -2 \quad y = kx \Rightarrow y = -2x$$

2. Write the direct variation equation if  $y = 30$  and  $x = 2$ .

$$\frac{30}{2} = \frac{k(2)}{2} \quad k = 15 \quad y = 15x$$

3. Write the direct variation equation if  $y = 54$  and  $x = 18$ .

$$y = kx \quad \frac{54}{18} = \frac{k(18)}{18} \quad y = 3x$$

Examples: Solving direct variation equations.

1. If  $y = 8$  and  $x = 4$ , what is the value of  $y$  when

$$\frac{8}{4} = \frac{k(4)}{4} \quad k=2 \rightarrow y=2x \rightarrow y=2(6) = 12$$

2. If  $y = -16$  and  $x = -8$ , what is the value of  $x$  when  $y = -24$ ?

$$\frac{-16}{-8} = \frac{k(-8)}{-8} \quad k=2 \quad y=2x \quad x=12$$

3. If  $y = 10$ , and  $x = 5$ , what is the value of  $y$  when  $x = 4$ ?

$$\frac{10}{5} = \frac{k(5)}{5} \quad k=2 \quad y=2x \quad y=8$$
$$y=2(4)$$

## Examples: Graphing Direct Variation Equations

1. Graph  $y = 4x$

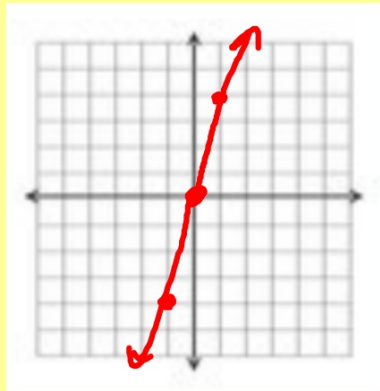
Step 1: make a point at  $(0, 0)$ .

Step 2: Find the slope:  $\frac{4}{1}$

Step 3: Count from 0, up 4, & Right 1.

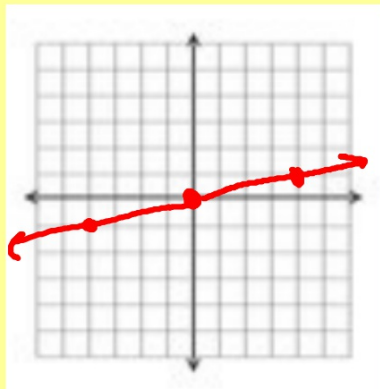
2 Graph  $y = \frac{1}{4}x$

$$m = \frac{1}{4}$$



$$\frac{-4}{-1}$$

Step 4: Connect the Dots



Determine whether the following equations represent a direct variation equation.

1.  $y = 3x$

Yes

2. 
$$\begin{array}{r} 5x + y = 0 \\ -5x \quad -5x \\ \hline y = -5x \end{array}$$

Yes

3.  $y = 2(x - 4) + 8$

$y = 2x - 8 + 8$

$y = 2x$  Yes

4. 
$$\begin{array}{r} -5 + y = 2x \\ +5 \quad +5 \\ \hline y = 2x + 5 \end{array}$$

$y = 2x + 5$   
No

### Direct Variation Word Problems:

1. The interest on a 30-year mortgage loan varies directly with the amount of the mortgage loan. The interest on an  $\$127,500$  mortgage loan is  $\$85,000$ . What is the interest on a 30-year mortgage loan of  $\$250,000$ .

$$\frac{85,000}{127,500} = k \left( \frac{127,500}{127,500} \right)$$

$$k = 0.67$$

$$y = 0.67x \rightarrow$$

$$y = 0.67(250,000)$$

$$y = \$167,500$$



2. The number of hours Jack studies and his grades on his math tests vary directly. He earned a score of 80 for studying 2 hours.
- What is the constant of variation ( $k$ )?
  - What is the direct variation equation ( $y=kx$ )?
  - How many hours will Jack have to study to earn a score of a 100?

3. The amount of money that Eddie earns varies directly with the amount of hours that he works. Last week, Eddie earned \$272 for working 32 hours.

a. Find the constant of variation ( $k$ )?

b. Write a direct variation equation ( $y=kx$ ).

c. What is his pay for 40 hours?

