Section 5-5: Direct Variation

Direct Variation is a special Linear Function.

- It has a constant ratio $\frac{Y}{X} = k$

k = the Variation Constant

- Direct Variation Equation:

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

Graph of direct variation

- The graph must be a line that passes through the origin.

The table shows a Direct Variation Relationship.

X	Y
-7	-14.7
-3	-6.3
4	8.4
5	10.5

$\frac{Y}{X}$ 2.1

1. Write a Direct Variation Equation.

$y = 2.1x$ or $\frac{y}{x} = 2.1$

2. Find X when Y = 50

$y = 23.8$ $\frac{50}{2.1} = \frac{2.1x}{2.1}$ $\frac{50}{x} = \frac{2.1}{1}$

3. Find Y when X = 11

$y = 23.1$ $y = 2.1(11)$ or $\frac{y}{11} = 2.1$

The point (6,11) is on the graph of a direct variation relationship.

Write an equation for this Direct Variation.

$\frac{y}{x} = \frac{11}{6} = 1.83$

$y = 1.83x$

Each of the ordered pairs given are for the same direct variation. Find the missing value.

1. (4,18) and (x, 45)

Use a direct variation equation or a proportion

$k = \frac{18}{4} = 4.5$

$y = 4.5x$

$\frac{45}{4.5} = \frac{4.5x}{4.5}$

$10 = x$

$\frac{y}{x} \quad \frac{18}{4} = \frac{45}{x}$

2. (18,6) and (24,y)

$\frac{6}{18} = \frac{y}{24} \quad y = 8$

Remember the phrase: "Y varies directly with X"

The amount of water in the tub varies directly with the amount of time the water has running. After 5 minutes there are 12 gallons in the tub.

1. Model this situation with a Direct Variation equation.

$y = 2.4x$

$\frac{Y}{X} = \frac{12\text{gal}}{5\text{min}} = 2.4$

2. Find the amount of time it takes to fill a 32 gallon tub.

$32 = 2.4x$

$13.33\text{min} = x$

Use a direct variation equation or a proportion.

$\frac{5\text{min}}{12\text{gal}} = \frac{x}{32\text{gal}}$

The number of air conditioners built varies directly with the number of workers in the factory.

When there are 120 workers on the job 270 air conditioners are manufactured.

1. Write a direct variation equation to model this situation.

$k = 2.25 \frac{\text{ac}}{\text{worker}}$ $\quad y = 2.25x$ or $\frac{y}{x} = 2.25$

2. Find the number of air conditioners that can be produced if there are 140 workers present

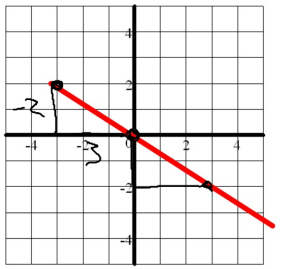
$y = 2.25x = 2.25(140) = 315$

Use a direct variation equation or a proportion.

$\frac{270\text{ac}}{120\text{w}} = \frac{y\ \text{ac}}{140\text{w}}$

Graphing Direct Variation.

1. Graph the direct variation that contains the point (-3,2)

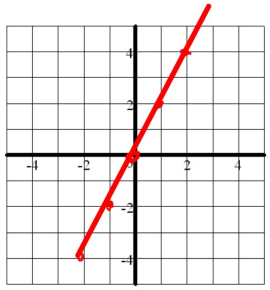


Plot (-3,2) and draw a line through this point and the origin.

Graphing Direct Variation.

2. Graph this direct variation: $y = \frac{2x}{1}$

slope = $\frac{\text{rise}}{\text{run}}$



X	Y
1	2

Graph must go through the origin which must be a point on the line. Find other points on the line by using a table or using the slope of the line.

Hwk #5:

Sec 5-5

Pages 264 to 265

Problems 12, 13, 23, 28, 37, 45

Find the slope of the line that passes through each pair of points.
Leave your answer as a fraction in reduced form.

1. (5,-8) and (-3,12)

#2

$$\frac{12-(-8)}{-3-5} = \frac{20}{-8}$$

$$= \frac{5}{-2}$$

2. (-9, 4) and (-1, 6)

$$\text{Slope} = \frac{\text{Rise}}{\text{Run}} = \frac{\text{Vertical Change}}{\text{Horizontal Change}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$