Section 5-5: Direct Variation

Constant Ratio

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.

Does each table represent Direct Variation?

1.

X	Y	$\frac{Y}{X}$
−8	36.8	−4.6
−6	27.6	−4.6
5	−23	−4.6
9	−41.4	−4.6
14	−64.4	−4.6

Yes

$\frac{Y}{X} = -4.6$

2.

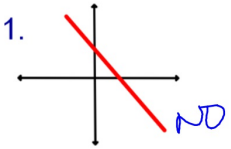
X	Y	
2	5	2.5
4	7	1.75
6	9	
8	11	
10	13	

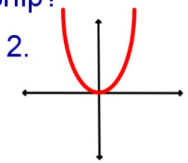
NO

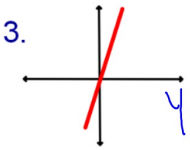
3.

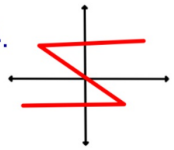
X	Y	$\frac{Y}{X}$
−6	−9	+
−2	−3	+
4	−6	−
8	12	
12	18	

Does each graph represent a Direct Variation relationship?

1. 

2. 

3. 

4. 

Direct Variation Equations:

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

Is each equation direct variation?
If yes, find the variation constant.

1. $4x + 2y = 10$

NO

$-4x \quad -4x$

$\frac{2y}{2} = \frac{10 - 4x}{2}$

$y = 5 - 2x$

This Equation has a constant which means it CAN'T be written as y = kx

2. $6 + 7y = 5 - 3x + 1$

Yes

$6 + 7y = 6 - 3x$

$-6 \quad -6$

$\frac{7y}{7} = \frac{-3x}{7}$

$y = -\frac{3}{7}x$

This Equation DOESN'T have a constant so it CAN be written in y = kx form.

Given the table shows a direct variation relationship, find the value of ?.

To solve Direct Variation situations you can use either equation or you can use a Proportion

X	Y
4	9
10	22.5
24	54
35	?

write & use a Direct Variation Equation

$\frac{y}{x}$

$9/4 = 2.25 = k$

$y = 2.25x$

$y = 2.25(35)$

$y = 78.75$

or use a proportion

$\frac{y}{x}$

$\frac{5y}{2y} = \frac{y}{35}$

$y = 78.75$

1. Use this table to write a Direct Variation equation.

X	Y
2	12.2
9	54.9
15	91.5
18	109.8
23	140.3

$\frac{y}{x}$

6.1

$y = 6.1x$

or

$\frac{y}{x} = 6.1$

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.

Y X X Y

$K = 2.4$ gal/min

1. Model this situation with a Direct Variation equation.

$\frac{Y}{X} = 2.4$ or $y = 2.4x$

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

32 y

$\frac{32}{2.4} = \frac{2.4x}{2.4}$ or use a proportion

$\frac{32}{2.4} = \frac{2.4x}{2.4}$

$x = 13\frac{1}{3}$ min

$x = 13\frac{1}{3}$ min

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.

Y X X

1. What is the variation constant?

$K = \frac{Y}{X} = \frac{270 \text{ AC.}}{120 \text{ work}}$

2.25 AC/WK

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

$y = 2.25x$

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

Use a Direct Variation Equation: $y = 2.25(140) = 315$ AC's

Or use a proportion $\frac{120w}{270 \text{ AC}} = \frac{140w}{y \text{ AC}}$

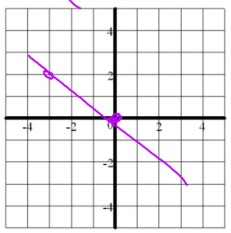
The point (6,11) is on the graph of a direct variation relationship.

Write an equation for this Direct Variation.

$K = \frac{Y}{X} = \frac{11}{6} \rightarrow$ $\frac{Y}{X} = \frac{11}{6}$ or $y = \frac{11}{6}x$

Graphing Direct Variation.

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



Plot the point (-3,2) and (0,0) then connect them to create the line representing Direct Variation.
If more than two points are needed you can use these two to find the slope then find more points using the slope.