Section 5-5: Direct Variation

Direct Variation is a special Linear Function.

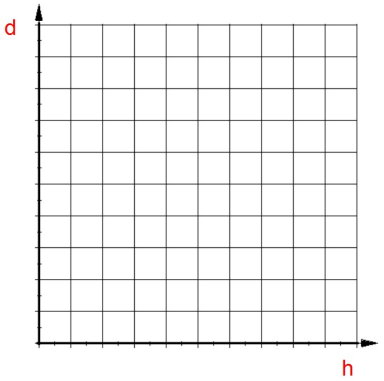
- It has a constant ratio $\frac{Y}{X} = k$

k = the Variation Constant

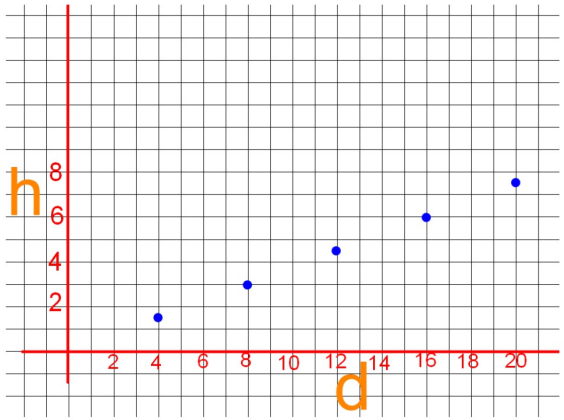
- Direct Variation Equation:

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

Make a scatter plot of the data in the table.



h	d
1.5	4
3	8
4.5	12
6	16
7.5	20



Graph of direct variation

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

Does each table of values represent a Direct Variation relationship?

1.

X	Y	$\frac{y}{x}$
6	28.5	4.75
11	52.25	4.75
19	89	4.68
26	119.6	
42	201.6	

NO

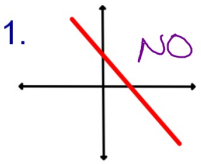
2.

X	Y	$\frac{y}{x}$
4	5.4	1.35
14	18.9	1.35
22	21.6	0.98
27	36.45	
34	45.9	

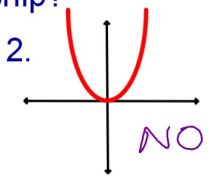
NO

Does each graph represent a Direct Variation relationship?

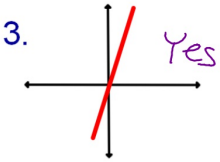
1. NO



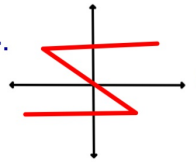
2. NO



3. Yes



4. NO



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

$2y = 10 - 4x$

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

$y = 5 - 2x$

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

$6 + 7y = 6 - 3x$

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

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

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	?

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

$\frac{9}{4} = \frac{y}{35}$

$y = 9 \cdot 35 \div 4$

$= 78.75$

$\frac{y}{x}$

$9/4 = 2.25 = k$

Use a Direct Variation Eq.

$y = 2.25x$

$y = 2.25(35)$

$y = 78.75$

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

$k = 6.1$

1. $y = 6.1x$ or 2. $\frac{y}{x} = 6.1$

2. Find the value of x when y=50

$\frac{12.2}{2} = \frac{50}{x}$ $\quad \frac{50}{6.1} = \frac{6.1x}{6.1}$ $\quad x = 8.19$

3. Find the value of y when x=20

$\frac{12.2}{2} = \frac{y}{20}$ $\quad y = 6.1(20) = 122$

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.

X Y

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

1. Model this situation with a Direct Variation equation.

$y = 2.4x$

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

$32 = 2.4x$

$13.33^{\text{min}} = x$

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

Y X

"Y varies directly with X"

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

1. What is the variation constant?

$\frac{270}{120} \frac{Y}{X} = k$

2.25 AC/worker

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

$y = 2.25x$ or $\frac{y}{x} = 2.25$

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

Use a Direct Variation Equation

$y = 2.25(140) = 315$

Or use a proportion

$\frac{270^{AC}}{120W} = \frac{x}{140W}$

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

X Y

Write an equation for this Direct Variation.

$y = kx$

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

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

$k = \frac{11}{6}$