

**Lesson 1.9 Notes (Direct Variation)**

- **Direct Variation** – relationship in which 2 quantities have a constant ratio
  - In a direct variation equation, the slope is assigned a special variable:  $k$

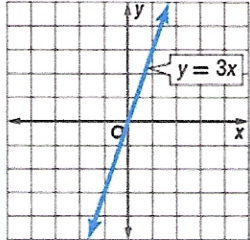
**Key Concept** **Direct Variation**

**Words** A direct variation is a relationship in which the ratio of  $y$  to  $x$  is a constant,  $k$ . We say  $y$  varies directly with  $x$ .

**Symbols**  $\frac{y}{x} = k$  or  $y = kx$ ,  
where  $k \neq 0$

**Example**  $y = 3x$

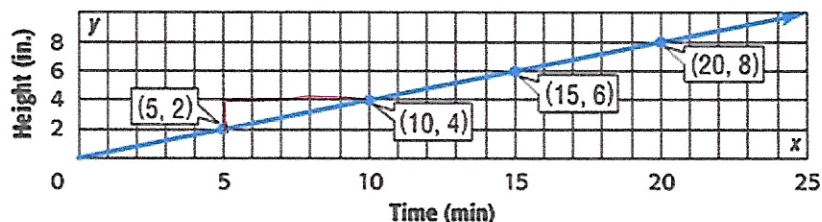
**Model**



- In a direct variation:
  - The graph will always be a straight line through the origin!!
  - There will be a constant ratio.
- Constant of Proportionality = slope ( $k$ ) = constant rate of change

**Practice:**

1. The height of the water as a pool is being filled is shown in the graph.



- a. Is there a direct variation?  
Why or why not?

*Yes (straight line through origin)*

b. Determine the rate in inches per minute.

*Constant Rate = Slope =  $\frac{\text{rise}}{\text{run}} = \frac{2 \text{ inches}}{5 \text{ min}} = 0.4 \text{ in./min}$*

c. Identify the constant of proportionality.

*constant of proportionality = constant rate =  $0.4 \text{ in./min}$*

2. Is the linear relationship shown a direct variation? If so, state the constant of proportionality.

<b>Time, <math>x</math></b>	1	2	3	4
<b>Wages (\$), <math>y</math></b>	12	24	36	48

*$\frac{12}{1} = \frac{24}{2} = \frac{36}{3} = \frac{48}{4} = 4 \leftarrow \text{constant ratio}$*

*Yes, this is direct variation.  
(constant of proportionality = 4)*

3. The equation  $y = 10x$  represents the amount of money  $y$  Julio earns for  $x$  hours of work.

a. Identify the constant of proportionality.

$$y = kx \Rightarrow \boxed{k = 10}$$

b. Explain what it represents in this situation.

$$\text{constant of proportionality} = \text{constant rate of change} \Rightarrow$$

$\boxed{\$10 \text{ per 1 hour of work}}$

4. Dustin's car can travel about 30 miles on one gallon of gas. Make a table and a graph to show the distance travelled after 1, 2, 3, and 4 gallons of gas. Is there a direct variation? Why or why not?

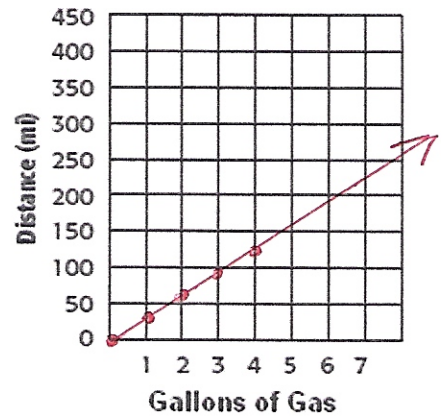
Gallons of gas	1	2	3	4
Distance (mi)	30	60	90	120

$$\frac{30}{1} = \frac{60}{2} = \frac{90}{3} = \frac{120}{4} = 30$$

Yes, there is a direct variation.

- constant ratio = 30

- graph is straight line through origin



5. Pizzas cost \$8 each plus a \$3 delivery charge. Show the cost of 1, 2, 3, and 4 pizzas. Is there a direct variation? Why or why not?

Number of Pizzas	1	2	3	4
Cost (\$)	11	19	27	35

$$\frac{11}{1} = 11 \quad \frac{19}{2} = 9.5 \quad \frac{27}{3} = 9 \quad \frac{35}{4} = 8.75$$

No, there is not a direct variation.

(No constant ratio)