

# Algebra II

## Direct and Inverse Variation

### Homework: Worksheet

## Direct Variation

Direct variation is used to model variables that are **directly proportional**.

Examples:

- Time spent studying and your grade
- Education and Salary
- *Time practicing & Skill level*
- *Length of school day & Boredom*
- *\$ and Power*

"y varies directly with x" is modeled by

$$y=kx$$

Example:  $K$ : constant of variation

y varies directly with x. If  $y=3$  when  $x=9$  write the equation that models x and y. Then find y when  $x=6$

~~$$y=kx$$~~

$$3 = k \cdot 9$$

$$\frac{1}{3} = k$$

$$y = \frac{1}{3}x$$

$$y = \frac{1}{3} \cdot 6$$

$$y = 2$$

Given:  $y$  varies directly with  $x \rightarrow y = k \cdot x$

1. If  $x=4$  when  $y=8$ , find  $x$  when  $y=2$

$$x=1$$

$$\frac{8}{4} = \frac{k \cdot 4}{4}$$

$$2 = k$$

$$y = 2x$$

$$\frac{2}{2} = \frac{2x}{2}$$

$$1 = x$$

2.  $x=-2$  when  $y=4$ , find  $y$  when  $x=3$

$$y = -6$$

$$\frac{4}{-2} = \frac{k \cdot -2}{-2}$$

$$-2 = k$$

$$y = -2 \cdot x$$

$$y = -2 \cdot 3$$

$$y = -6$$

## Inverse Variation

Inverse variation is used to model variables that are inversely proportional.

Exmples:

- Workers and Time spent on a job
- Speed and Time to Location
- # of text messages & attention
- amount of food eaten & how hungry you are
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"y varies inversely with x" can be modeled by:  $y = \frac{k}{x}$  or  $xy = k$

Example:

y varies inversely with x. If y=3 when x=2, write the equation that models x and y. Then find y when x=6

$$xy = k$$

$$2 \cdot 3 = k$$

$$6 = k$$

$$x \cdot y = 6 \Leftrightarrow y = \frac{6}{x}$$

$$\frac{6}{6} \cdot y = \frac{6}{6}$$

$$y = 1$$

Given:  $y$  varies inversely with  $x$

$$x \cdot y = k$$

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

1.  $x=2$  when  $y=-2$ . Find  $x$  when  $y=2$

$$x = -2$$

2.  $y=6$  when  $x=\frac{1}{2}$ . Find  $y$  when  $x=3$

$$y = 1$$

$$x \cdot y = k$$

$$\frac{1}{2} \cdot 6 = k$$

$$3 = k$$

$$x \cdot y = 3$$

$$\frac{3}{3} \cdot y = \frac{3}{3} \rightarrow y = 1$$

Does the table represent direct variation, inverse variation, or neither?

x	y
1	3
2	6
3	9

\*Direct var.  
K = 3

$\frac{y}{x} = k$   
 $\frac{3}{1} = 3$   
 $\frac{6}{2} = 3$   
 $\frac{9}{3} = 3$

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

x	y
2	6
3	4
4	3

\*Inverse where k = 12

$xy = k$   
 $\frac{12}{2} = 6$   
 $\frac{12}{3} = 4$   
 $\frac{12}{4} = 3$

x	y
3	6
4	7
5	8

neither