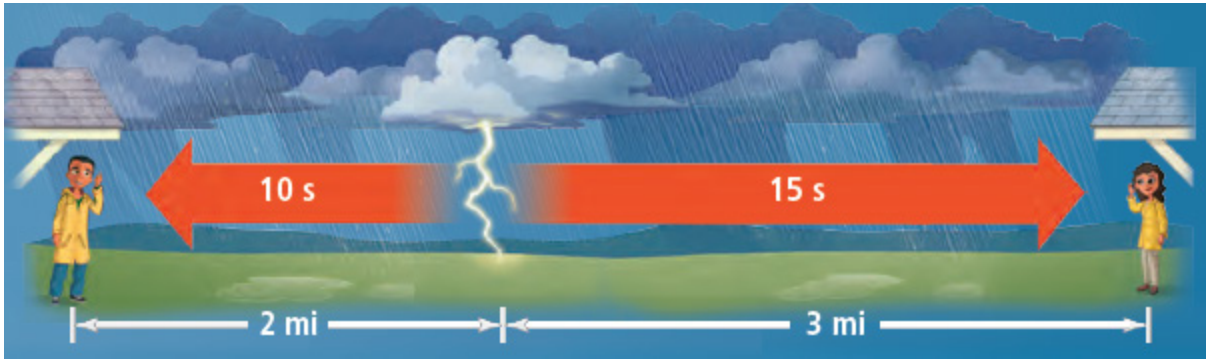
Name _____

5-2 Direct Variation

OBJECTIVE: **I can write and graph an equation of a direct variation**

Warm-Up

The diagram shows how long it takes to hear thunder after you see lightning. What general rule can you use to model this situation? Explain.



Essential Understanding

Essential Understanding If the ratio of two variables is constant, then the variables have a special relationship, known as a direct variation.

Example #1 Identifying a Direct Variation

A **direct variation** is a relationship that can be represented by a function in the form $\mathbf{y = kx}$, where $\mathbf{k \neq 0}$. The constant of variation for a direct variation k is the coefficient of x. By dividing each side of $\mathbf{y = kx}$ by **x**, you can see that the ratio of the variables is constant: $\frac{\mathbf{y}}{\mathbf{x}} = k$.

To determine whether an equation represents a direct variation, solve it for y. If you can write the equation in the form y = kx, where k 0, it represents a direct variation.

A $7y = 2x$

B $3y + 4x = 8$

Your Turn to Work it Out

1. Does $4x + 5y = 0$ represent a direct variation? If so, find the constant of variation.

Example #2 Writing a Direct Variation Equation

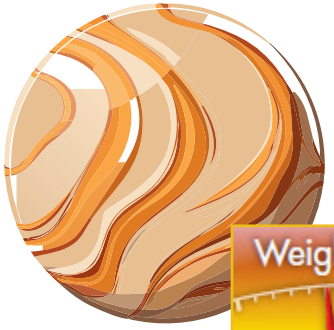
To write an equation for a direct variation, first find the constant of variation k using an ordered pair, other than (0, 0), that you know is a solution of the equation.

Suppose y varies directly with x, and y = 35 when x = 5. What direct variation equation relates x and y? What is the value of y when x = 9?

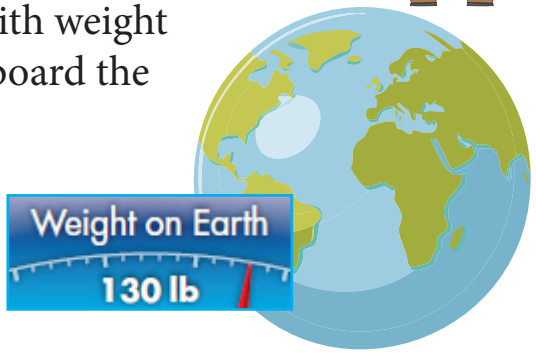
Your Turn to Work it Out

2. Suppose y varies directly with x, and $y = 10$ when $x = -2$. What direct variation equation relates x and y? What is the value of y when $x = -15$?

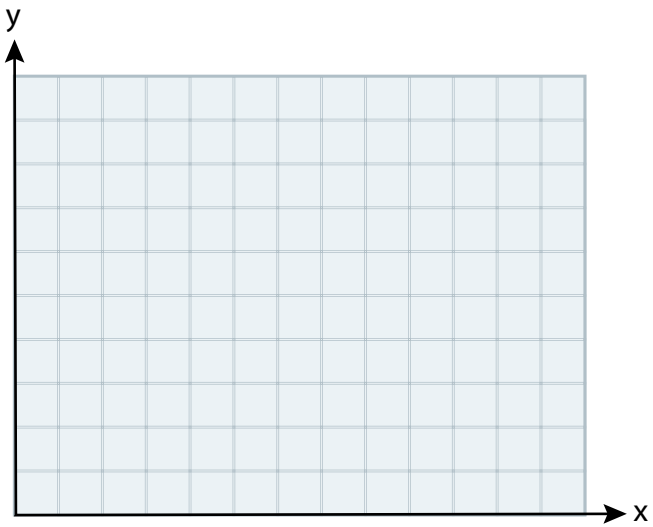
Example #3 Graphing a Direct Variation



Space Exploration Weight on Mars y varies directly with weight on Earth x. The weights of the science instruments onboard the Phoenix Mars Lander on Earth and Mars are shown.



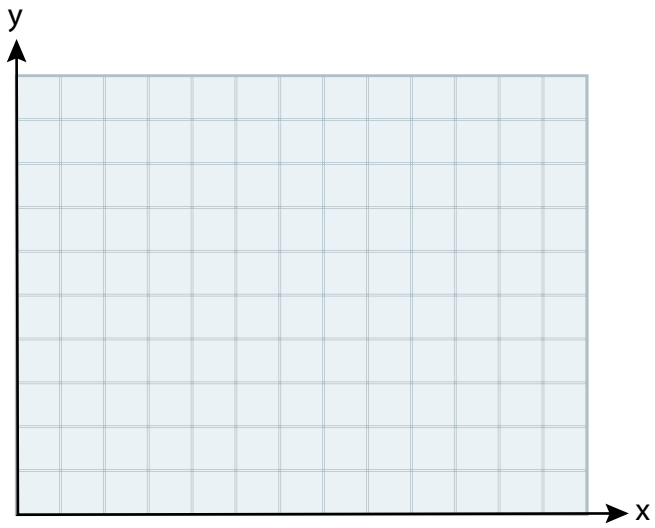
X	Y



Your Turn to Work it Out

3. Weight on the moon y varies directly with weight on Earth x. A person who weighs 100 lb on Earth weighs 16.6 lb on the moon. What is an equation that relates weight on Earth x and weight on the moon y? What is the graph of this equation?

X	Y

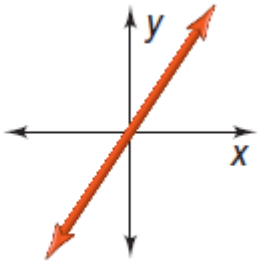


Concept Understanding

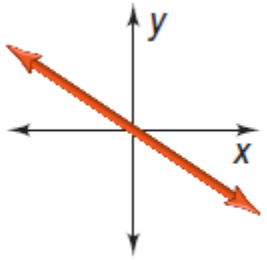
Key Concept: Graphs of Direct Variations

The graph of a direct variation equation $y = kx$ is a line with the following properties.

- The line passes through (0, 0).
- The slope of the line is k.



$k > 0$



$k < 0$

Example #4 Writing a Direct Variation From a Table

For the data in the table, does y vary directly with x? If it does, write an equation for the direct variation.

A

X	Y
4	6
8	12
10	15

B

X	Y
−2	3.2
1	2.4
4	1.6

Your Turn to Work it Out

4. For the data in the table at the right, does y vary directly with x? If it does, write an equation for the direct variation.

X	Y
−3	2.25
1	−0.75
4	−3