**Direct Variation**

**Essential Question(s):** What are the characteristics of a direct variation equation? What does the graph of a direct variation equation look like? How can you tell if data in a table represents direct variation?

**Direct Variation:** ______________________________

We read this “y varies directly as x” or “y varies directly with x”
“k” is called the constant of variation. (It is the constant rate of change)
“k” is NEVER ZERO.

When “k” is positive:  
As x increases, y increases.  OR  As x decreases, y decreases.

**Examples:**

y = 3x is an example of direct variation. The constant of variation is _______.

y = 3x + 4 is NOT an example of direct variation.

**Graph of Direct Variation:** ______________________________________

____________________________________

When k is positive:  
Example:  y = 2x

When k is negative:

Example:  y = \(-\frac{1}{3}\)x
Identifying Direct Variation Equations

Try to rewrite the equation in the form “y = kx” (solve for y).
If it CAN be rewritten in “y = kx”, then it IS a direct variation equation.
If it CANNOT be rewritten in “y = kx”, then it is NOT a direct variation equation.

Practise: Identify whether the equation represents direct variation.
If so, identify the constant of variation.

1) y = 7x 2) y = 2x - 5 3) 4x + 5y = 0

Write and Use a Direct Variation Equation:

Example 1:

a) Given that y varies directly with x, write the direct variation equation if y = 6 when x = 3.

b) Find the value of y when x = 8.5.

Example 2:

An object that weighs 100 pounds on Earth would weigh just 6 pounds on Pluto. Assume that weight P on Pluto varies directly with weight E on Earth.

a) Write a direct variation that relates P and E.

b) What would a rock weighing 750 pounds on Earth weigh on Pluto?
How to Identify Direct Variation from a Table

A table shows direct variation if \( \frac{y}{x} \) gives the same answer for each \((x, y)\).

**Example:**

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>16</td>
</tr>
</tbody>
</table>

**Practice:** Determine if the table represents direct variation or not. If it does, write the direct variation equation.

1)

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>1</td>
<td>12</td>
</tr>
</tbody>
</table>

2)

<table>
<thead>
<tr>
<th>x</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>6</td>
<td>12</td>
<td>18</td>
<td>24</td>
</tr>
</tbody>
</table>

3) Select three points below that will create a relation that is a direct variation.

(11, 55) (5, 8) (5, 9) (12, 60) (1, 5) (11, 13)

Summary:
Extra Practice Problems:

Identify whether the equation represents direct variation. If so, identify the constant of variation.

1) \( y = \frac{2}{3}x \)  
2) \( 2x + 6y = 0 \)  
3) \( 2x - y = 3 \)  

4) \( y = \frac{x}{3} \)  
5) \( y = \frac{4}{x} \)  
6) \( y = 5x \)  

Given that \( y \) varies directly with \( x \), use the specified values to write a direct variation equation that relates \( x \) and \( y \).

7) \( x = 3, y = 18 \)  
8) \( x = \frac{1}{4}, y = 1 \)  

9) \( x = -6, y = 15 \)  
10) \( x = -\frac{1}{3}, y = 12 \)  

11) Given that \( y \) varies directly as \( x \) and \( y = -6 \) when \( x = 2 \); find the value of \( y \) when \( x = 14 \).

12) Given that \( y \) varies directly as \( x \) and \( y = 4 \) when \( x = 16 \); find the value of \( y \) when \( x = 20 \).