Review Guide

Recall:

- A linear relationship forms a straight line when graphed on the coordinate plane.
- If the linear relationship also goes through the origin, it is proportional.
- A unit rate is the value of one.
- To be a proportional linear relationship each y value divided by its corresponding x value must equal the same number. In other words, must have the same unit rate.

Let’s Explore:

*The amount of money Serena earns at her job is shown on the graph.*

What is the unit rate of the line shown? \( \frac{40}{4} = \$10 \) per hour

What is the constant of proportionality? \$10 per hour

How much does Serena earn per hour? \$10

Do you notice anything?

Does this graph represent a proportional linear relationship? How do you know?
Yes, it is a straight line that starts at the origin.

BUT...BUT...BUT....

What if you were only given the points in a table with no graph to look at?
What other method could you use to demonstrate proportionality?

Look at the following table. Is it proportional? Yes, the ratios are equal.

They all reduce to 10.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>12</td>
<td>120</td>
</tr>
<tr>
<td>16</td>
<td>160</td>
</tr>
</tbody>
</table>

\[ \frac{40}{4} = \frac{80}{8} = \frac{120}{12} = \frac{160}{16} = 10 \]
The number that you just found to prove proportionality is called the **constant of proportionality**. And to top it off, it is the same number as the slope and the unit rate and the constant rate of change.

**In other words:**

**In a proportional linear relationship, the following all have the same value.**
- constant of variation
- constant of proportionality
- unit rate

**Now let’s talk equations!**

All linear relationships that are proportional will have an equation that looks like \( y = kx \) where \( k \) is the constant of proportionality or any of those other words we used and the \( y \) and \( x \) could be any of the points given on our chart or graph.

Let’s test this equation thing using our chart.

\[
\begin{array}{c|c}
 x & y \\
 4 & 40 \\
 8 & 80 \\
 12 & 120 \\
 16 & 160 \\
\end{array}
\]

Well, does the equation work? Yup!

Guess what…this is going to totally work with all linear proportional relationships. You can easily make a linear proportional equation by finding the constant of proportionality (aka any of those other long crazy words) and writing it in the place of the \( m \) in the equation \( y = kx \).

These equations have a name. They are called **Direct Variation** equations. They are easy to identify because they go through the origin.