End of Module 1 Study Guide

1. It is a Saturday morning, and Jeremy has discovered he has a leak coming from the water heater in his attic. Since plumbers charge extra to come out on weekends, Jeremy is planning to use buckets to catch the dripping water. He places a bucket under the drip and steps outside to walk the dog. In half an hour, the bucket is \( \frac{1}{5} \) of the way full.

   a. What is the rate at which the water is leaking per hour?

\[
\frac{1}{5} \div \frac{1}{2} = \frac{2}{5} \text{ buckets per hour}
\]

You could also create a table:

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>Buckets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>1/5</td>
</tr>
<tr>
<td>1</td>
<td>2/5</td>
</tr>
</tbody>
</table>

b. Write an equation that represents the relationship between the number of buckets filled, \( y \), in \( x \) hours.

\[ y = \frac{2}{5} x \]

c. What is the longest that Jeremy can be away from the house before the bucket will overflow?

Hours per one bucket: \( \frac{1}{2} \div \frac{1}{5} = \frac{5}{2} = 2.5 \text{ hours} \)

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</tr>
<tr>
<td>1 1/2</td>
<td>3/5</td>
</tr>
<tr>
<td>2</td>
<td>4/5</td>
</tr>
<tr>
<td>2 1/2</td>
<td>5/5</td>
</tr>
</tbody>
</table>

After **2.5** hours, the bucket will overflow.
2. A store is having a sale to celebrate President’s Day. Every item in the store is advertised as one-fifth off the original price. If an item is marked with a sale price of $140, what was its original price? Show your work.

Let \( x = \) original price

Sale Price = Original Price – Discount

\[
140 = x - \frac{1}{5}x
\]

\[
x = \frac{4}{5}x
\]

The original price of the item was $175.

You could also draw a tape diagram.

\[\begin{array}{cccc}
\text{Sale Price} & 1/5 x & 1/5 x & 1/5 x & 1/5 x & 1/5 x \\
\end{array}\]

Entire tape diagram represents the original price, \( x \)

\[
\frac{4}{5}x = 140
\]

3. Over the break, your uncle and aunt ask you to help them cement the foundation of their newly purchased land and give you a top-view blueprint of the area and proposed layout. A small legend on the corner states that 4 inches of the length corresponds to an actual length of 52 feet.

a. What is the scale factor of the actual foundation to the blueprint?

\[
52 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}} = 624 \text{ inches}
\]

\[
\frac{\text{Drawing}}{\text{Actual}} = \frac{4}{624} = \frac{1}{156}
\]

The scale factor is 1/156.
b. If the dimensions of the foundation on the blueprint are 11 inches by 13 inches, what are the actual dimensions in feet?

<table>
<thead>
<tr>
<th>Proportion to solve for length</th>
<th>Proportion to solve for width</th>
</tr>
</thead>
</table>
| \[
\frac{4}{52} = \frac{11}{L}
\] | \[
\frac{4}{52} = \frac{13}{W}
\] |

L = 143

W = 169

The dimensions of the actual store are ___143 ft_______ x ___169 ft_______.

*(Don’t forget to include unit of measurement)*

c. You are asked to go buy bags of dry cement and know that one bag covers 350 square feet. How many bags do you need to buy to finish this project?

The area that needs to be covered measures 143 ft x 169 ft = 24,167 sq ft

24,167/350 = 69.05 bags

You must purchase 70 bags to have enough to finish the project.

d. After 15 minutes, you have used 1/5 of the bag. Write an equation that represents the relationship between the number of bags used, y, in x hours. *(Hint: First calculate k)*

15 min = ¼ hr
1/5 divided by ¼ = 4/5 bags per hour

\[y = \frac{4}{5}x\]
e. Your uncle is able to work faster than you. He uses 5 bags for every 2 bags you use. Is the relationship proportional? Explain your reasoning using a graph on a coordinate plane. Make sure you title the axes and label your points.

<table>
<thead>
<tr>
<th>Uncle</th>
<th>You</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>6</td>
</tr>
</tbody>
</table>

Circle One: Yes / No / is / is not proportional because _________________

It is a straight line through the origin

f. What does (0,0) represent in terms of the situation being described by the graph created in part (f)?

If my uncle uses 0 bags, then I use 0 bags.

g. Using a graph, show how many bags you would use if your uncle uses 15 bags.

See graph above

I would use 6 bags if my uncle used 15.