Mid Module 4 Study Guide Answer Key

1. In New York, state sales tax rates vary by county. In Allegany County, the sales tax rate is 8 1/2%.
   a. A book costs $12.99 and a video game costs $39.99. Rounded to the nearest cent, how much more is the tax on the video game than the tax on the book?
   
   Part = Percent * Whole
   
   $12.99 (8.5%) = 12.99(0.085) = 1.10415
   $39.99 (8.5%) = 39.99(0.085) = 3.39915
   $3.39915 - 1.10415 = 2.295
   Answer: $2.30
   
   b. Using b to represent the cost of an item in dollars before tax and t to represent the amount of sales tax in dollars for that item, write an equation to show the relationship between n and t.
   
   \[ t = 0.085b \]
   
   c. Using your equation, create a table that includes five possible pairs of solutions to the equation. Label each column appropriately.

<table>
<thead>
<tr>
<th>Cost of Item (b)</th>
<th>Amount of Sales Tax (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>1.00</td>
<td>0.085</td>
</tr>
<tr>
<td>2.00</td>
<td>0.17</td>
</tr>
<tr>
<td>3.00</td>
<td>0.255</td>
</tr>
<tr>
<td>4.00</td>
<td>0.34</td>
</tr>
<tr>
<td>5.00</td>
<td>0.425</td>
</tr>
</tbody>
</table>

   You may pick any values for b, (0, 1, 2, 3, 4 or 0, 10, 20, 30, 40 etc.)
d. Graph the relationship from parts (b) and (c) in the coordinate plane. Include a title and appropriate scales and labels for both axes.

![Graph showing the relationship between sales tax and cost of item before tax.](image)

(e) Is the relationship proportional? Why or why not? If so, what is the constant of proportionality? Explain.

Yes, the relationship is proportional because the graph of the equation is a straight line that touches the origin. Also, the table shows that the ratio of the amount of sales tax to the cost of an item is constant.

\[
\frac{0.085}{1} = \frac{0.17}{2} = \frac{0.255}{3} = \frac{0.34}{4} = \frac{0.425}{5}
\]

The constant of proportionality is 0.085 because that is the sales tax amount for $1.00, which is the unit rate.
A customer returns an item to a toy store in Wyoming County. The toy store has another location in Allegany County, and the customer shops at both locations. The customer's receipt shows $2.12 tax was charged on a $24.99 item. Was the item purchased at the Wyoming County store or the Allegany County store? Explain and justify your answer by showing your math work.

The item was purchased in Allegany County.

\[
\frac{2.12}{24.99} \text{ is about } \frac{2.12 \times 4}{25 \times 4} = \frac{8.48}{100},
\]

which is 8.48%, or about 8.5%. 
2. Amy is baking her famous pies to sell at the Town Fall Festival. She uses $32\frac{1}{2}$ cups of flour for every 10 cups of sugar in order to make a dozen pies. Answer the following questions below and show your work.

a. Write an equation, in terms of \( f \), representing the relationship between the number of cups of flour used and the number of cups of sugar used to make the pies.

\[
32\frac{1}{2} \text{ cups flour} = \frac{32.5}{10} = 3.25 = 3 \frac{1}{4} = 13\frac{1}{4}
\]

b. Write the constant of proportionality as a percent. Explain what it means in the context of this situation.

\[
3.25 = \frac{325}{100} = 325\%.
\]

A constant of proportionality of 325\% means that the amount of flour used to make the pies is 325\% the amount of sugar used.

c. To help sell more pies at the festival, Amy set the price for one pie at 40% less than what it would cost at her bakery. At the festival, she posts a sign that reads, “Amy’s Famous Pies—Only $9.00/Pie!” Using this information, what is the price of one pie at the bakery?

\[
x - 0.4x = 9
\]

\[
0.6x = 9
\]

\[
x = 15
\]

The price of one pie at the bakery is $15.

Can also use the formula, Selling Price = (1 – m)whole

\[
9 = (1 - 0.4)w
\]

\[
9 = 0.6w
\]

Remember, “whole” represents the original price

\[
$15 = w
\]
3. Imani wanted to raise her math grade from an 80 to a 93 in order to make High Honor Roll. She says that this represents a percent increase of approximately 16%. Do you agree with her? Why or why not?

\[
\text{Percent Increase} = \frac{\text{New} - \text{Original}}{\text{Original}} \times 100 = \frac{93 - 80}{80} \times 100 = 0.1625 \approx 16\%
\]

Yes, I agree with her because an increase of 13 points corresponds to a 16.3% increase and that is approximately 16%.