Just In Time Quick Check

Standards of Learning (SOL) 6.12d

Strand: Patterns, Functions, and Algebra

Standard of Learning (SOL) 6.12d

The student will make connections between and among representations of a proportional relationship between two quantities using verbal descriptions, ratio tables, and graphs.

Grade Level Skills:

- Make connections between and among multiple representations of the same proportional relationship using verbal descriptions, ratio tables, and graphs. Unit rates are limited to positive values.

Just in Time Quick Check

Just in Time Quick Check Teacher Notes

Supporting Resources:

- VDOE Mathematics Instructional Plans (MIPS)
  - 6.12cd – Identifying and Representing Proportional Relationships (Word) / PDF
- VDOE Algebra Readiness Formative Assessments
  - 6.12d (Word) / PDF
- VDOE Algebra Readiness Remediation Plans
  - Proportional Relationships (Word) / PDF
- VDOE Word Wall Cards: Grade 6 (Word) | PDF
  - Ratio Table
  - Proportional Relationship
  - Connecting Representations
- VDOE Desmos Activity
  - Marcellus the Giant
  - Walking & Wondering

Supporting and Prerequisite SOL: 6.1, 6.8b, 6.12a, 6.12b, 6.12c

SOL 6.12d - Just in Time Quick Check

1. For each of the following three scenarios, either the verbal description, the table, or the graph has been provided. Complete the three missing parts of each scenario using the information provided about the proportional relationship.

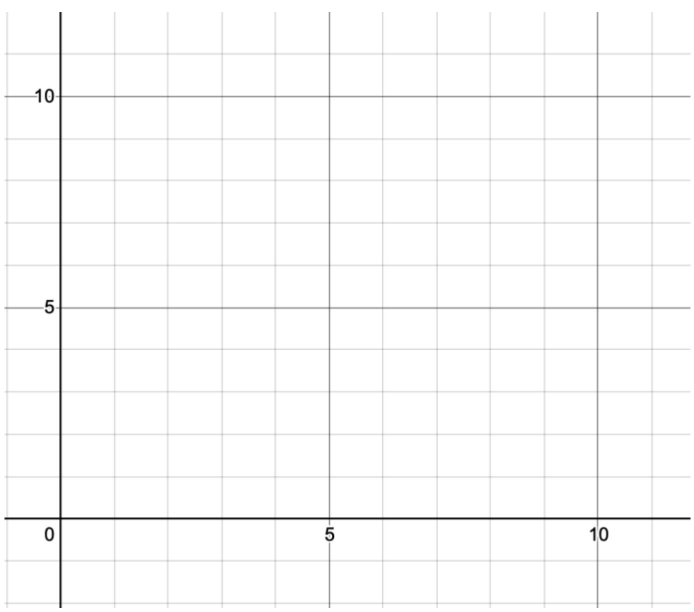
Verbal Description

I use $\frac{2}{5}$ cup of sugar per 2 cups of flour.

Table

Sugar (cups)	Flour (cups)
$\frac{2}{5}$	2

Graph



Connection

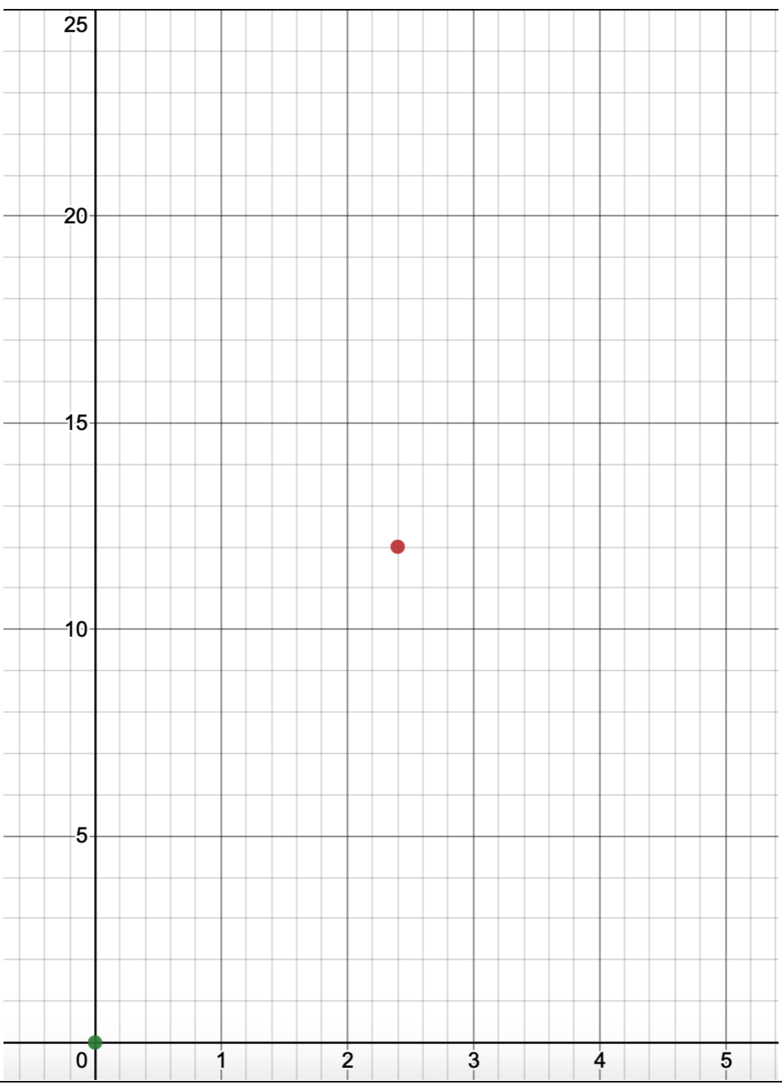
For this problem, the verbal description connects to the graph because:

Verbal Description

Table

Price	Number of Gumballs
$4.80	24
$2.40	12
$1.20	6
	5

Graph



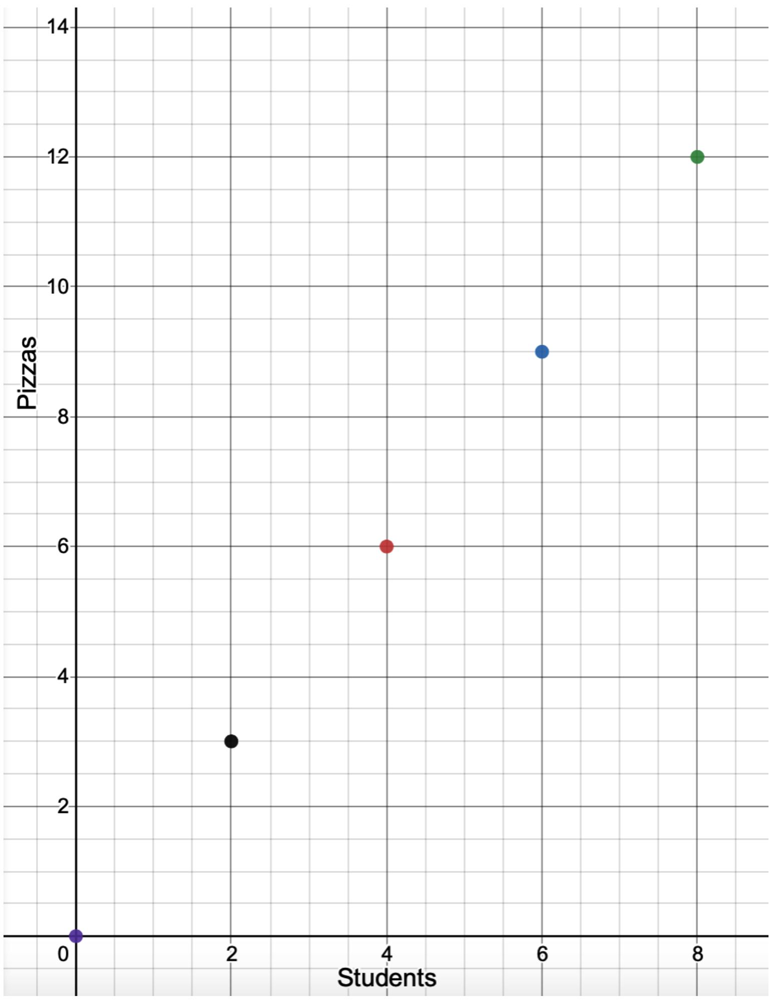
Connection

For this problem, the verbal description connects to the ratio table because:

Verbal Description	Table
2 pizzas for every ______ students	(see ratio table below)

Students	Pizzas

Graph



Connection

For this problem, the graph connects to the ratio table because:

2. Work with a partner. Read the following problem:
   - Store A sells 8 bags of chips for 10 dollars. Store B sells 10 bags of chips for 12 dollars.
   - Each partner should choose one store to represent as a verbal description, a table, and a graph.
   - Each table should include additional values that represent the same proportional relationship.
   - Each graph should include the values from the completed table.
   - Compare your results. Does Store A or Store B have the better deal on chips? How do you know?

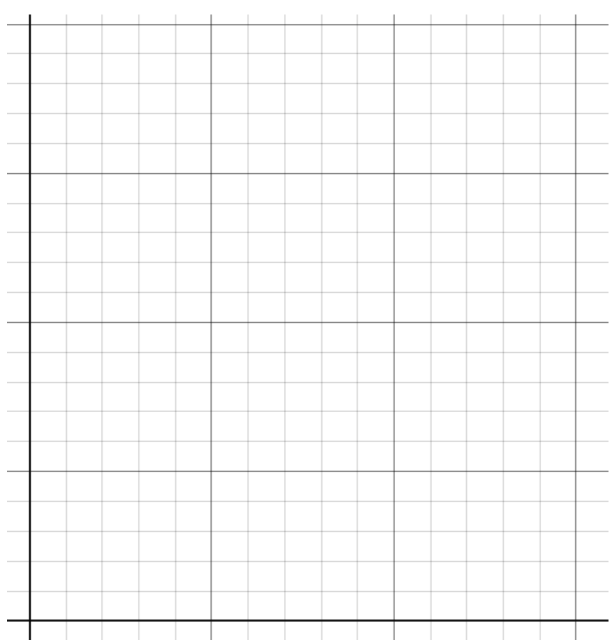
Store A: Partner name ____

Verbal Description

Table

Bags of Chips	Cost (dollars)

Graph



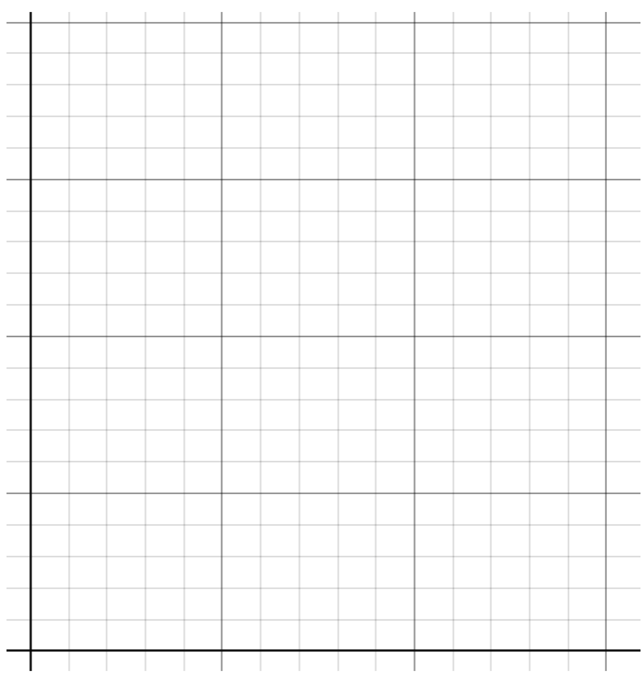
Store B: Partner name ____

Verbal Description

Table

Bags of Chips	Cost (dollars)

Graph



SOL 6.12d - Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

1. For each of the following three scenarios, either the verbal description, the table, or the graph has been provided. Complete the three missing parts of each scenario using the information provided about the proportional relationship.
   **Note: To make these problems more challenging, consider removing some of the given information to allow for students to create each of the connected representations. For example, for the third problem, try just giving the students the graph. Can they come up with the verbal description and the labels of the ratio table on their own?*

<table>
<tr><th>Verbal Description</th><th>Table</th></tr>
<tr><td>I use $\frac{2}{5}$ cup of sugar per 2 cups of flour.</td><td>
<table>
<tr><th>Sugar (cups)</th><th>Flour (cups)</th></tr>
<tr><td>$\frac{2}{5}$</td><td>2</td></tr>
<tr><td></td><td></td></tr>
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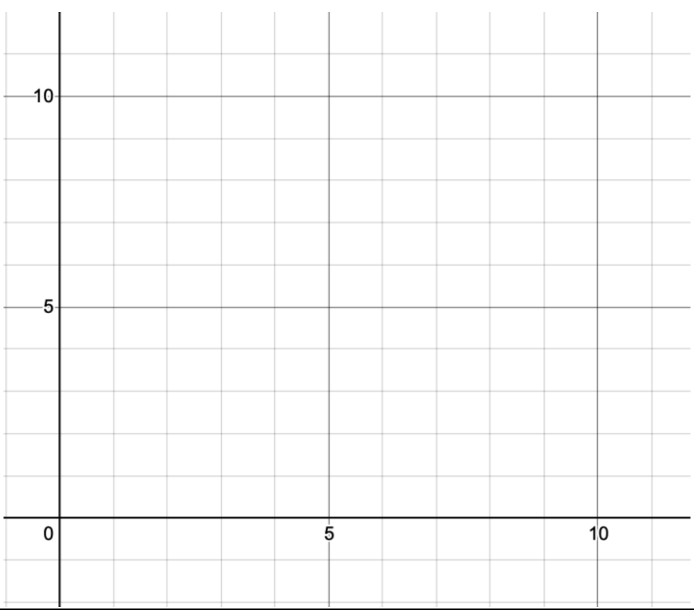
<tr><td></td><td></td></tr>
</table>
</td></tr>
<tr><th>Graph</th><th>Connection</th></tr>
<tr><td>
</td><td>For this problem, the verbal description connects to the graph because:</td></tr>
</table>

Several misconceptions can be present as students work to connect a verbal description/ratio table to a graph. A common error some students may have is omitting the ordered pair (0,0) when describing or identifying a proportional *relationship from a table or a graph. Additionally, students may struggle with choosing which variable is on the x-axis and which variable goes on the y-axis when graphing ratios. Making the connection between the ordered pairs in the table and plotting them on the graph using their labeled axes proves to be challenging when connecting the two different representations.*

It is important for students to use relevant contexts in which students analyze data and represent them in various ways, with a focus on the graph. Analyzing authentic issues can help engage students in a meaningful and exciting ways, which will help them to see how these representations connect. Some examples of authentic issues might include examining rates of global warming and how it might affect decisions about our global systems. Allow for experiences where students are provided with data and decide how to represent that data in a graph. How did you decide on the title of the x-axis? The y-axis? What would happen if you switch them? As students compare graphs that show proportional relationships ask follow up questions, such as, what do you notice about all of these graphs? What do they have in common? What is different? Students also may benefit from using a graphing manipulative tool, such as a coordinate pegboard, for a concrete experience with graphing a proportional relationship prior to moving to drawing in the coordinate points.

<table>
<tr><th>Verbal Description</th><th>Table</th></tr>
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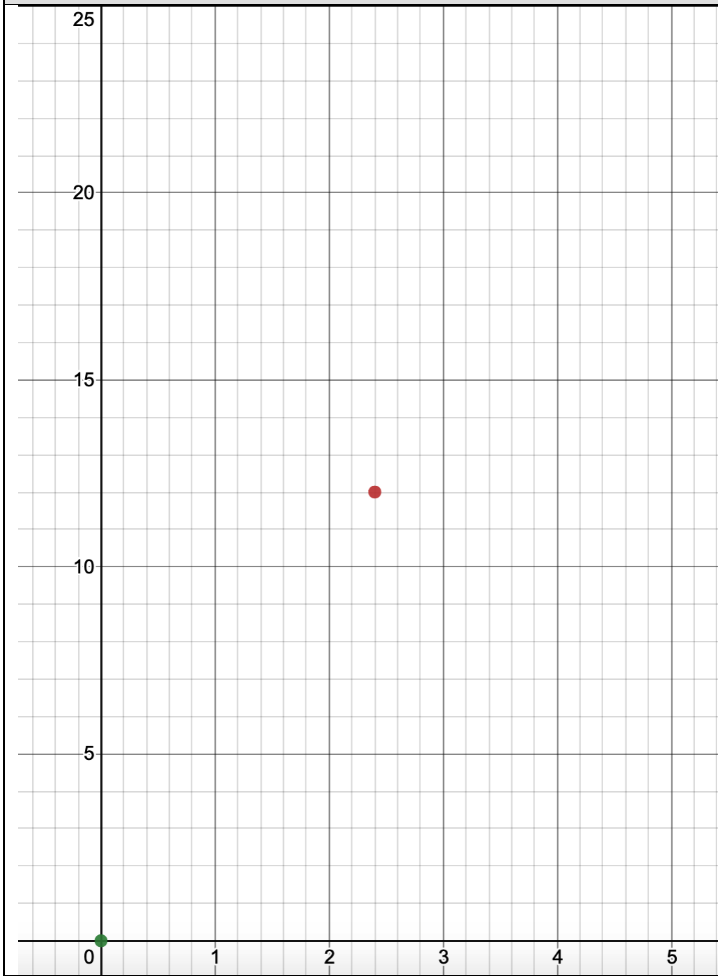
Verbal Description	Table
	

Some common misconceptions some students may have is interpreting language, such as, "per", "for each", or "for every" from verbal descriptions. This problem also requires students to apply their knowledge of proportional relationships to determine the ratio table and graphing the coordinate "5" that does not following the halving/doubling pattern in the table. They might solve this by determining the unit rate and multiplying by the factor rate. As students engage in a variety of contextual problems connecting representations, make it common practice for students to use the verbal description. Ask questions, such as, what is the meaning of "per" in the situation? In what ways can we write the relationship between these two variables?

There are also children's literature books that can help students connect ratio tables and graphs to verbal descriptions of proportional rates. Two examples are:

- *Each Orange Had 8 Slices (*Giganti, 1999)- *Giganti use the word each to show how a context grows proportionally. Each context shows two proportional relationships (i.e. each plate has oranges, each oranges has seeds). Students can rewrite the language of "each" using other proportional phrases and can represent the story in a table and a graph.*
- *If You Hopped Like a Frog (*Schwartz, 1999)- *Schwartz compares human features and abilities to those of different animals. Students can take the proportional language, rewrite it and connect to tables and graphs.*

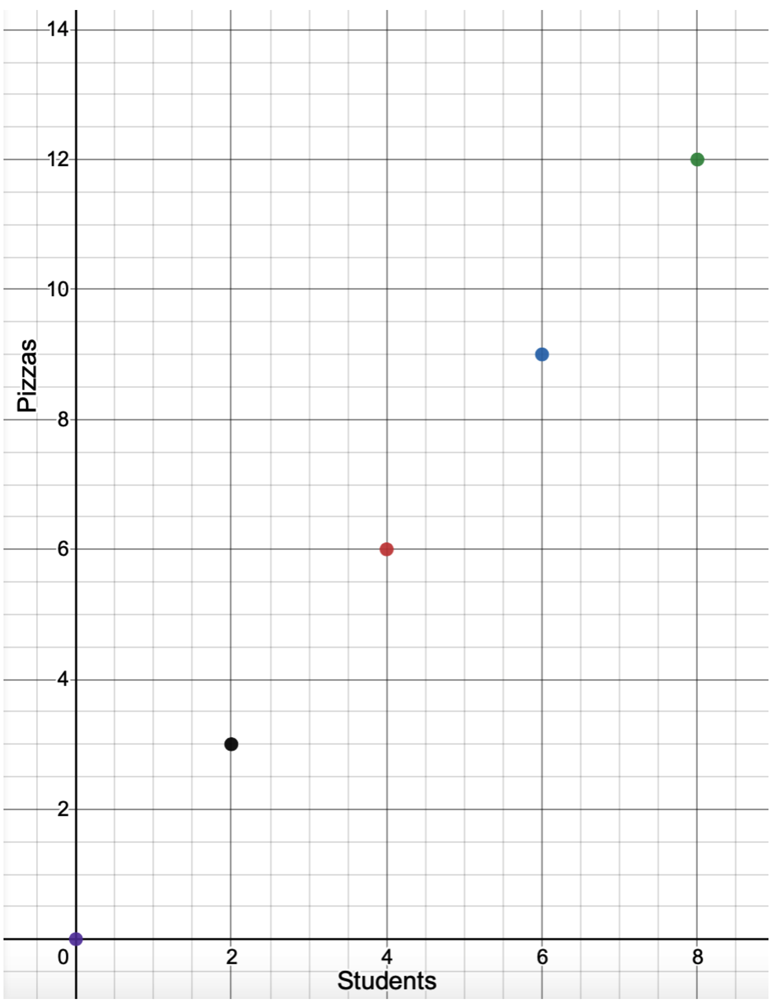
Verbal Description

2 pizzas for every ______ students

Table

Students	Pizzas

Graph



Connection

For this problem, the graph connects to the ratio table because:

Some students may have misconceptions when provided a graph and asked to make connections and represent that information using multiple representations. This may indicate that students are having difficulty interpreting a graph that requires understanding of the relationship between the coordinate pairs in relation to the context of this situation. If students are having trouble interpreting the graph to complete the ratio table and description, consider first having students describe graphs qualitatively. Instead of giving exact values of a graph, allow students to examine how the two *variables are working together. For example, they might do a quick sketch of a graph (without labels) for a story such as below:*

- *The temperature of an ice cube 10 minutes before it is taken out of the freezer and allowed to melt in a glass*
- *The level of water in a bathtub from the moment you begin to fill it to when it is full*

As students are completing these quick sketches, have them describe the relationships between the variables and how that is influencing the representation, they are drawing. How does one variable change as the other changes? Similarly, have students use the same process for graphs that are already created by removing the numbers on the axes. What is this graph telling us? What is the relationship between the labels on the x- and y- axes? How do you know? Allowing students to look at graphs without numbers or labels helps them to focus on relationships and supports them in reading a completed graph.

2. Work with a partner. Read the following problem:

- Store A sells 8 bags of chips for 10 dollars. Store B sells 10 bags of chips for 12 dollars.
- Each partner should choose one store to represent as a verbal description, a table, and a graph.
- Each table should include additional values that represent the same proportional relationship.
- Each graph should include the values from the completed table.
- Compare your results. Does Store A or Store B have the better deal on chips? How do you know?

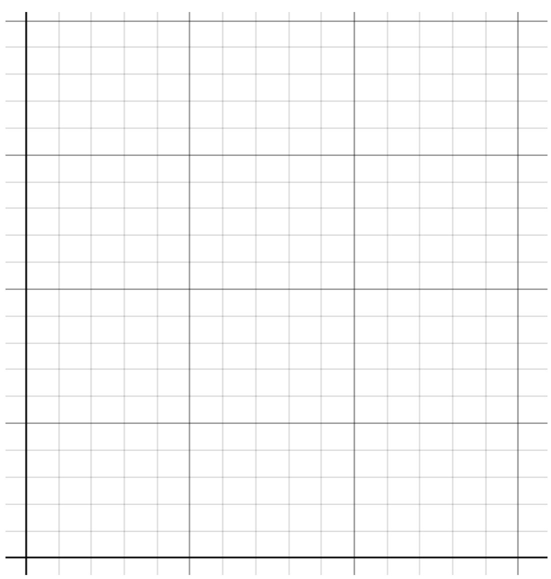
Store A: Partner name ____

Verbal Description

Table

Bags of Chips	Cost (dollars)

Graph



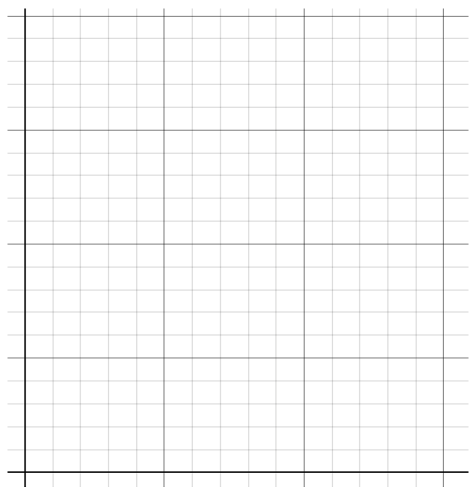
Store B: Partner name ____

Verbal Description

Table

Bags of Chips	Cost (dollars)

Graph



This problem is designed to have students demonstrate the use of multiple representations of proportional relationships in a context. Some students may have difficulty deciding how to represent the relationships across representations and how they are making connecting between the representations. Some students may have misconceptions that each store is the same because they think additively and believe that the two situations are the same because the cost of the chips to the number of bags of chips differs by 2. If students think it is an additive relationship, it might be beneficial to considering looking at suggestions across 6.12a, b, c in order to build their understanding of what a proportional relationship is and why it is multiplicative.

A teacher may find it beneficial to ask questions, such as, where do we see the unit rate across the representations? How does that help us make our decision? Where do we see that in the table, the graph? How does it connect to the verbal description written?