Salsa Task

7th Grade

David went to the store to buy salsa for a party. He noticed they were sold in three different size jars. He recorded those observations in the following table:

Price	**$1.20**	**$1.56**	**$1.76**
Ounces of Salsa	**8**	**12**	**16**

a) Find the unit rates associated with each size jar of salsa.
b) Is there a proportional relationship between the ounces of salsa and the price? Why or why not?
c) Explain in writing what the unit rate means in the context of this problem.
d) David wants to buy 60 ounces of salsa for dip recipe. What combination of jars of salsa does he need to buy to spend the least amount of money? Explain your reasoning.

Teacher Notes:

- This is an instructional task where the teacher should be looking for multiple solution paths from the students and expecting to hear rate language as the students are ask to explain their thinking and/or reasoning.
- Care should be taken to focus on unit rate, and a good discussion could be built around the do they know how to determine it from a table, graph or equation.

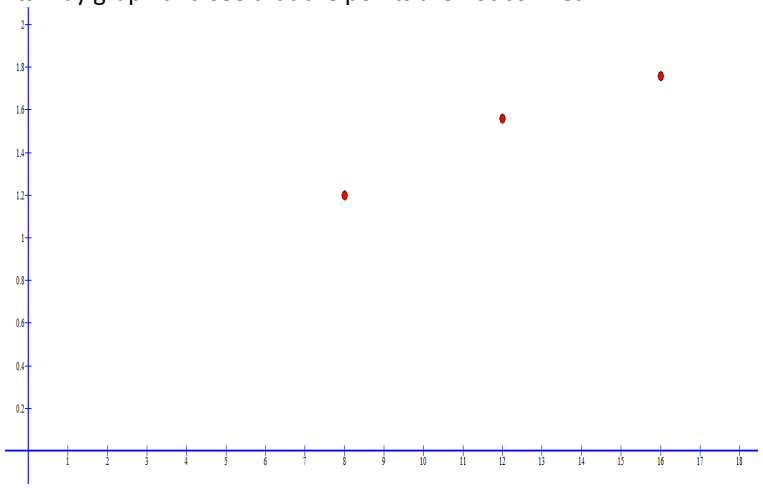
Common Core State Standards for Mathematical Content	**Common Core State Standards for Mathematical Practice**
7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.* **7.RP.2** Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn*. **7.EE.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.* **7.EE.4a** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Essential Understandings

- Reasoning with ratios involves attending to and coordinating two quantities
- A ratio is a multiplicative comparison of two quantities, or it is a joining of two quantities in a composed unit.
- Forming a ratio as a measure of a real world attribute involves isolating that attribute from other attributes and understanding the effect of changing each quantity on the attribute of interest.
- Ratios can be meaningfully reinterpreted as quotients.
- Proportional reasoning is complex and involves understanding that:
  - Equivalent ratios can be created by iterating and/or partitioning a composed unit;
  - If one quantity in a ratio is multiplied or divided by a particular factor, then the other quantity must be multiplied or divided by the same factor to maintain the proportional relationship.

Explore Phase

Possible Solution Paths	Assessing and Advancing Questions
A. The unit rates for each size of salsa are, in cost per ounce: 1.20 ÷8 = 0.15 1.56 ÷12 = 0.13 1.76 ÷16 = 0.11 OR The unit rates for each size of salsa are, in ounce per cost: 8 ÷ 1.20 = 6.67 12 ÷1.65 = 7.69 16 ÷1.76 = 9.09	<u>Assessing</u> • Tell us about your work • Why are you dividing the price by the ounces? • How do you know that dividing the price by the ounces will give you the unit rate? <u>Advancing</u> • Is there another way to show the relationship between the amount of salsa and price?

B. There is not a proportional relationship between the ounces of salsa and price in dollars because when you divide the price by the number of ounces you get a different quantity or unit rate. Or To see if the rates are proportional, cross multiply to determine that the rates are not proportional $$\frac{1.20}{8} \neq \frac{1.56}{12} \neq \frac{1.76}{16}$$ Students may graph and see that the points are not collinear: 	<u>Assessing</u> • Tell us about your work • What does 0.15 , 0.13, and 0.11 tell us? What do we call it? • How are you going to use the unit rates to tell if there is a proportional relationship? • Is there a proportional relationship? • How can you compare the ratios? Are they the same or equivalent? <u>Advancing</u> • How does knowing the unit price benefit you? • How can you represent the quantities from the table in a ratio? Can you represent the ratio in fraction notation?
C. 8 ounce jar: For every ounce of salsa the price is 15¢. 12 ounce jar: For every ounce of salsa the price is 13¢. 16 ounce jar: For every ounce of salsa the price is 11¢. OR 8 ounce jar: For every dollar 6.67 ounces of salsa can be bought 12 ounce jar: For every dollar 7.69 ounces of salsa can be bought 16 ounce jar: For every dollar 9.09 ounces of salsa can be bought	<u>Assessing</u> • Why did you express the unit rate this way? <u>Advancing</u> • Is there another way to express the unit rate? • How does knowing the unit rate help determine which jar of salsa to buy?

D.

8 ounces	12 ounces	16 ounces	Total Ounces	Total Price
0	0	4	64	7.04
0	1	3	60	6.84
1	2	2	64	7.84
1	3	1	60	7.64
0	5	0	60	7.80

Since the 16 ounce jar has the lowest unit rate, I want to start with that one to buy as many as I can to get to 60 ounces. This would be 4 jars for a total of $7.04. But, it would leave me with 4 ounces that I do not need, so if I buy 3 jars of the 16 ounce and 1 jar of the 12 ounce which has the next lowest unit rate then I will have 60 ounces exactly for $6.84. This combination would use the least amount of salsa without extra and utilize the lowest two unit rates

Assessing

- Tell us about your work
- Why did you start with the lowest unit rate?
- Why did you not need any other combinations

Advancing

- How does knowing the unit rate help determine how much salsa to buy?

Possible Student Misconceptions

Students may ignore the decimal point in the $1.20, $1.80 and $2.40.
Some students may think that using the least expensive unit rate by itself is the best combination.

Assessing

- What is being compared?
- Where did you get the 120, 180, and 240 from? Or possibly, is that REALLY 240 dollars?
- How is it the same as the quantities in the table?

Advancing

- What are the quantities being compared in this problem?
- How are you going to use ratios

Entry/Extensions

If a group is unable to start: Focus students on the table.
What does the task ask us to figure out?
What is being compared?
What are the items on the table being compared?
We are comparing ounces of salsa to price in dollars.

Assessing and Advancing Questions

Assessing

- What are we trying to figure out in this problem?
- What can you tell me about the ounces of salsa and the price in dollars?

If students finish early:
What would be the best combination of jars to buy if you are given $10 to spend? All of the money must be spent on salsa.

Assessing

- Tell us about your work
- Why did you choose the combination that you did?

Advancing

- What are some things you had to consider when you can up with your combinations?

Discuss/Analyze

Whole Group Questions

- How do you decide whether two quantities form a proportional relationship?
- How would you identify the constant of proportionality in a table of values?
- When something is changing proportionally, what information can we get from the ratio to describe the change?