Thinking Through a Lesson Protocol (TTLP) Template

7.RP.3	**Cluster Heading:** Analyze proportional relationships and use them to solve real-world and mathematical problems.
	Content Standard # 3: Use proportional relationships to solve multi-step ratio and percent problems.
	Practice Standard: MP2 Reason abstractly and quantitatively.

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Orange Juice Jungle: Which Tastes Juicier?

If all orange concentrates are the same strength, which recipe would you expect to have the strongest orange taste?

1) Oscar's Juice: 2 cups concentrate, 3 cups water.

2) Orangeade: 5 cups concentrate, 8 cups water

3) Outrageous Orange: 3 cups concentrate, 4 cups water

4) Julius' Juice: 4 cups concentrate, 7 cups water

Work with a partner. Share reasoning and solution strategies.

Differentiation

Support
- Provide students with concentrate and juice for the four mixtures.
- Have the students compare two mixtures at a time.
- Ask students to consider how many cups total are in each mixture.

Extension
- You have two same-size containers of milk: one is chocolate milk and one is white milk. If you pour 10% of the chocolate milk into the white milk, then pour 10% of the white milk container into the chocolate milk container, is there more chocolate milk in the white milk, or more white milk in the chocolate milk? Show calculations and explain your solution.

Solution
- One way is to determine how much concentrate each recipe uses for 1 cup of water. The one that uses the most concentrate should have the strongest orange taste. Outrageous Orange has the most concentrate (0.75) for 1 cup of water. It should have the strongest orange taste.

- Another way is to find out how much water each recipe uses for 1 cup of concentrate. The recipe that uses the least water will have the strongest orange taste. Outrageous Orange has least amount of water, 1 1/3 cup, to 1 cup concentrate, so it will have the most orange flavor.

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Observation of Students
- Are students able to set up equations relating part to whole or part to part?
- Do students recognize higher concentrate has stronger taste?

Questions to Guide Student Thinking
- What factors influence the orange taste?
- How could you set up this problem?
- When you are setting up the problem would labels be important?
- Does the quantity make a difference?
- What would happen if we made juice for the class using the chosen brand? How much concentrate and water would be needed?

Vocabulary

Concentrate, Ratios, Proportions

Misconceptions
- Some students may think the juice with the most concentrate has the strongest orange taste without looking at the amount of water.
- Some students might add quantities of concentrate and water and decide the largest sum is the correct answer.
- Students correctly compute $\frac{2 \div 2}{3 \div 2} = \frac{1}{1.5}$ but incorrectly interpret the answer as 1 part water to 1.5 part concentrate instead of the correct interpretation of 1 part concentrate to 1.5 parts water.
- Students may not understand what factors contribute to strong orange taste.

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Task adapted from: http://www.figurethis.org/challenges/c25/challenge.htm