Exploration: Milkshakes & Ratios

☒ USE RATIOS TO DESCRIBE PROPORTIONAL SITUATIONS ☒ REPRESENT RATIOS WITH CONCRETE MODELS & FRACTIONS
☒ USE RATIOS TO MAKE PREDICTIONS IN PROPORTIONAL SITUATIONS
☒ USE TABLES AND SYMBOLS TO REPRESENT & DESCRIBE PROPORTIONAL RELATIONSHIPS & TO GENERATE FORMULAS
☒ COMMUNICATE MATHEMATICAL IDEAS USING LANGUAGE& GRAPHICAL, NUMERIC, PHYSICAL, OR ALGEBRAIC MODELS
☒ EVALUATE THE EFFECTIVENESS OF DIFFERENT REPRESENTATIONS TO COMMUNICATE IDEAS

Prerequisites	Preparation
Some experience with the Function Game Activity: Relationship Studies, Graphs & Unit Rates	Worksheet #1 & #2 for each student Overhead #1 Bags of dark & light beans

Milkshake Recipe Chart

Pass out bags of dark and white beans. Direct students to Overhead #1 and begin by saying **"The Sweet Shop has a formula for its milkshakes. They start with vanilla ice cream and milk and add 3 teaspoons of a secret ingredient for every 5 teaspoons of chocolate syrup. The more teaspoons of the secret ingredient and chocolate the richer the flavor. I've given you dark and white beans to represent the teaspoons of secret ingredient and chocolate syrup. Please display on your desk at least 3 different combinations of teaspoons of secret ingredient and teaspoons of chocolate that would work."**

Allow students time to work. As a class discuss the possible combinations they came up with and record them on the board. Your list may look like this:

15 teaspoons secret ingredient : 20 teaspoons chocolate

9 teaspoons secret ingredient : 15 teaspoons chocolate

6 teaspoons secret ingredient : 10 teaspoons chocolate

12 teaspoons secret ingredient : 15 teaspoons chocolate

Next introduce the concept of scale factor by demonstrating with the first combination. **"This combination has a scale factor of 5."** Record this on the board:

15 teaspoons secret ingredient : 20 teaspoons chocolate   **(scale factor = 5)**

9 teaspoons secret ingredient : 15 teaspoons chocolate

6 teaspoons secret ingredient : 10 teaspoons chocolate

12 teaspoons secret ingredient : 15 teaspoons chocolate

"What do you think scale factor means?" Discuss as a class and then have students figure out the scale factors for the other combinations written on the board.

"When ordering a milkshake at the Sweet Shop you have four choices: light, original, rich, and extra rich."
Record on the board:

Light: scale factor 1

Original: scale factor of 3

Rich: scale factor of 7

Extra Rich: scale factor of 10

"Work with the beans to complete this recipe chart." Pass out Worksheet #1. Observe as students work. Afterward discuss as a class how students thought about the problems. Were there different way students approached the recipe chart or different ways they organized their thinking?

Milkshake Relationship Study

Pass out Worksheet #2. **"Here is a Relationship Study for the milkshake recipe. The verbal representation has already been done for you. The figuring you've done on the recipe chart should help you in creating the table representation. It may be helpful to think of the table like a round of the function game to try and figure out the process column and the equation. My suggestion is to start with which ever representation seems easiest to you, and see if that representation helps you create any others."**

I've found it is best to allow students to work through the relationship study in the order they chose and using strategies that make sense to them. As students work you may want to ask:

- **Which representation did you start with? Did that help you create any other representations?**
- **Which representation is the easiest for you to figure out? What makes it easy?**
- **Which representation is the most difficult for you to figure out? What make it so difficult?**
- **Have you developed any strategies that help you with any part of relationship studies?**
- **How did you decide how to number your graph?**
- **What does this point on your graph mean?**
- **Which representation did you think would be most helpful in deciding on a recipe for the semi-rich milkshake? Use that representation to determine what you think would be a good recipe for the semi-rich milkshake. Were you correct? … was it the most helpful representation to use or would you change your selection? What made that the most helpful representation for this situation?**
- **What does the graph tell you? How is that different from what the equation (or table or unit rates or the verbal representation) tells you?**
- **In what situation would the equation (or table or graph or unit rates or verbal representation) be most helpful?**

Encouraging Mathematical Reasoning: www.MathLessonBank.com

Sweet Shop Milkshake Formula:

3 teaspoons of secret ingredient

for every

5 teaspoons of chocolate syrup

. . . added to vanilla ice cream and milk.

The more teaspoons of secret ingredient and chocolate surup the richer the flavor.

Name: _____   Date: _____

Relationship Study: Sweet Shop Milkshakes

Table Representation

S	Process	C

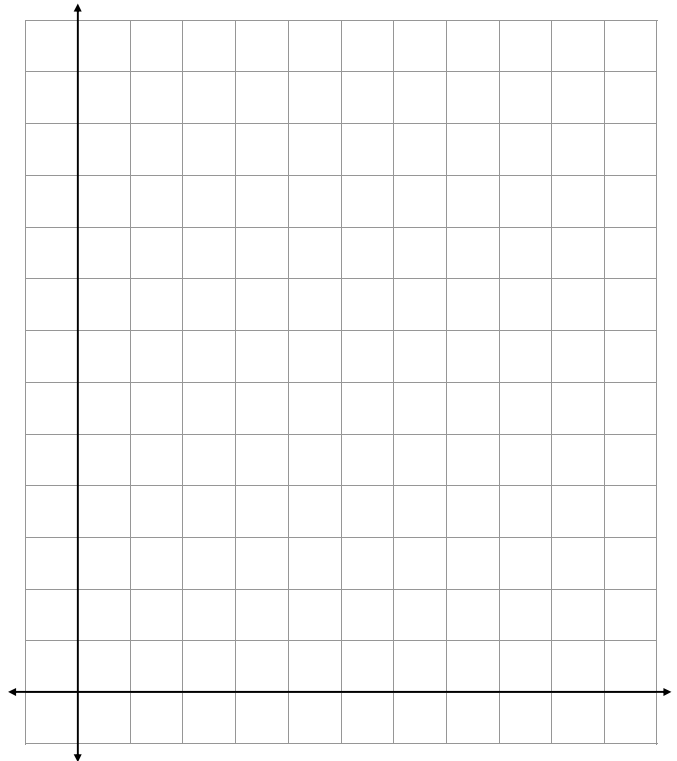### Verbal Representation

(Do not forget to define your variables)

S stands for teaspoons of secret ingredient and C
stands for the number of teaspoons of chocolate
syrup. There are 3 teaspoons of secret ingredient for
every 5 teaspoons of chocolate syrup.

_____

Graph Representation

Equation Representation

Unit Rate Representation

_____ tsp secret ingredient : 1 tsp chocolate

1 tsp secret ingredient : _____ tsp chocolate

Decision

The Sweet Shop has decided to add an "semi-rich" milkshake to their menu which is falls somewhere between the original milkshake and the rich milkshake. Which representation would be most helpful in deciding how many teaspoons of secret ingredient and teaspoons of chocolate syrup to use?   Why?