Lesson Plan

Testing Lab Grade 5 Add, Subtract and Multiply Fractions

CCSSM: Grade 5

DOMAIN: Number and Operations—Fractions

Cluster: Use equivalent fractions as a strategy to add and subtract fractions.

Standard: 5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

Standard: 5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

Clarification: The clarification is an explanation of the indicator and objective and how these math concepts appear in the puzzle.

Materials and/or Set Up*: Gigantic Pizza Problem, Interactive Resource 1, Interactive Resource 2, Interactive Resource 3, Assessment, Soup Pot Challenge*

Relevant Vocabulary: fraction, whole number, common denominator, numerator, denominator, least common denominator, least common multiple, prime factors

Note to Teacher – Students should have attempted levels 1 and 2 of the Lab puzzle before this lesson seed is implemented. This activity does not address division of fractions, but does address multiplication of fractions with whole numbers.

Prior to this lesson you may consider using the grade 7 lesson titled "The Lab Algebraic Expressions" with level 1 of the Lab puzzle. The lesson on algebraic expressions helps students learn to manipulate the buckets using whole numbers, providing a gradual progression to level 2 of the Lab puzzle as well as this lesson.

Activities:

1. Draw a pizza divided into four equal parts on the chalkboard. Present the following problems:

   - If we want one half of the pizza to be pepperoni, how many slices would have pepperoni? *(2 slices.)* Ask the students how they arrived at the answer. Write the following equation on the board $\frac{1}{2} \times 4 = ?$ Ask the students what this means. Highlight that $\frac{1}{2}$ x 4 is the same as taking $\frac{1}{2}$ of 4. Model multiplying the **fraction** times the **whole number.** *(This can be done by multiplying first, then reducing the answer* $\frac{1}{2} \times 4 = \frac{1}{2} \times \frac{4}{1} = \frac{4}{2} = 2$ *or by dividing by the common factor, 2, (cross canceling) in the original equation, then*

multiplying $\frac{1}{2} \times 4 = \frac{1}{\cancel{2}_1} \times \frac{\cancel{4}^2}{1} = \frac{2}{1} = 2$ ***)***

- Draw a pizza with four slices on the chalkboard. This time, $\frac{3}{4}$ of the pizza will have olives. Ask students how many olive slices they will have. *(*$\frac{3}{4} \times 4 = 3$*)* Work through this problem on the board with the input of the students. Also, refer to the circle drawn on the board and demonstrate that $\frac{3}{4}$ means 3 out of 4 parts.
- Distribute ***Gigantic Pizza Problem***. Have students work with a partner to solve the problem. (*Answer:* $\frac{3}{8}$ *of* $\frac{16}{1}$ *=6 pizza slices will have mushrooms)*

2. Distribute copies of ***Interactive Resource 1***. Ask the students how many units of eyeballs are needed for the soup pot. *(19)* Discuss how the amount was determined. *(By multiplying the* **fraction** *of eyes needed,* $\frac{19}{60}$*, by the total quantity in the soup pot, 60.)*

3. As a class, determine how many units of carrots are needed for the soup pot. *(10, which is* $\frac{1}{6}$ *of 60)*

4. Have student pairs determine how many units of flowers and bugs are needed for the soup pot. *(26 and 5, respectively)*

5. Address the idea of minimizing waste. Ask the students how they would use the measuring cups labeled 30, 7 and 2 to get a quantity of 19 units of eyes. Write various solutions on the board. (*Possible solutions include:*

#1 7 + 7 + (7 – 2) Fill the 7 unit cup twice. Fill the 7 unit cup a third time. Pour 2 units into the 2 unit cup, leaving 5 in the 7 cup and dumping the 2 units into the drain.

#2 30 – 7 – 2 – 2 Fill the 30 unit cup. From the 30 unit cup, pour 2 units into the 2 unit cup and discard, twice. Then, from the remainder in the 30 unit cup, pour 7 units into the 7 unit cup and discard.)

6. Examine the various solutions given and ask the students to determine which would require the least amount of dumping. (*In the examples above solution #1 requires dumping 2 units while solution #2 requires dumping 11 units.)*

7. Ask the students to add the four **fractions** for the recipe. Have students rewrite the addition problem using **common denominators**

$$\frac{19}{60} + \frac{1}{6} + \frac{13}{30} + \frac{1}{12} = \frac{19}{60} + \frac{10}{60} + \frac{26}{60} + \frac{5}{60} = \frac{60}{60} = 1$$

8. Ask students if they notice anything about the quantities needed of each item and

the **numerators** of the **fractions** with **common denominators**. Emphasize that $\frac{60}{60} = 1$ represents the entire soup pot. Ask the students to explain why this must be true.

9. Pair students and check for understanding by having students complete the following:

A. Add: $\frac{1}{8} + \frac{1}{8} + \frac{2}{3} + \frac{5}{6}$ $(\frac{21}{12})$

B. Could the fraction in Part A represent all the ingredients for a pot of monster soup? Explain. (*No, because the sum represents more than one whole.)*

10. Distribute copies of ***Interactive Resource 2*.** Have student pairs determine how many units of each ingredient are needed. *(12 eyes, 12 carrots, 3 flowers and 9 bugs)* Ask students how the puzzle differed from the previous one. *(In this puzzle the **common denominator** of the ingredients (12) did NOT equal the quantity on the soup pot (36), which requires working with **common denominators**.)*

11. Distribute copies of ***Interactive Resource 3***. Individually, have the students determine the number of units required for each ingredient. *(eyes= 11, carrots = 3, flowers = 20, bugs = 14)* Have the students prove the sum of the fractional parts equals one.

Differentiation Suggestions:

- If needed, provide students with small group instruction for simplifying fractions and finding equivalent fractions. For students who continue to have difficulty multiplying a fraction and a whole number, have students work with objects, such as colored cubes. For example, give students 8 colored cubes and begin by asking them what is $\frac{1}{4}$ of 8. Have students first divide 8 cubes into four groups, then set aside one of the groups. The students will have placed 2 cubes aside. At the same time, have the students work through the multiplication problem $\frac{1}{4}$ x 8 .
- Distribute ***Soup Box Challenge*** *(Possible solution: 36, 12, 3. This solution would require 5 pours and no spills.)*
- If students have mastered level 1 and level 2 of the Lab puzzle, give them fractions with different **denominators**. Challenge them to find equivalent fractions that have **common denominators**. Proportions will be used to achieve the objective. If the soup contains 60 liters, the student must find the total amount of each ingredient by identifying the **numerator** of the equivalent fraction.

First have the students do some practice.

$\frac{1}{7} = \frac{\_\_}{21}$, $\frac{3}{8} = \frac{\_\_}{56}$, $\frac{5}{6} = \frac{\_\_}{36}$, $\frac{2}{15} = \frac{\_\_}{75}$, $\frac{\_\_}{12} = \frac{10}{60}$

(*Fractions can be completed through cross-products or multiplying the **numerator** and **denominator** by the same number. Answers are* $\frac{3}{21}, \frac{21}{56}, \frac{30}{36}, \frac{10}{75}, \frac{2}{12}$)

- Provide students with the following problem:
  The soup vat calls for 60 liters.
  Eyeballs fraction is $\frac{4}{15}$
  Carrots fraction is $\frac{3}{10}$
  Flowers fraction is $\frac{7}{20}$
  Bugs fraction is $\frac{1}{12}$

*(Students will likely think of 60 as the **Least Common Denominator** (LCD) or **Least Common Multiple** (LCM) of 15, 10, 20, and 12. Eyeballs will, therefore, require 16 liters, carrots 18 liters, flowers 21 liters, and bugs will be 5 liters.)*

- To verify that 60 is the required **denominator**, or to assist students in finding common multiples in the above example, or in more challenging examples, such as for 3, 4, 5, and 24, have students find the **prime factors** of the **denominators**. Then study the **prime factors** to discover how the **prime factors** would indicate that 60 is the **Least Common Multiple** (LCM) for 10, 12, 15, and 20. (*10 = 5 × 2 12 = 3 × 2 × 2 15 = 5 × 3 20 = 5 × 2 × 2 HINT: The words "Common" and "Multiple" suggest which of the prime factors will result in a product of 60: 5 × 3 × 2 × 2)*

- Ask students: If 120 is the LCM for 3, 4, 5, and 24, what is the rule, or pattern, that might be formulated for using the prime factors to get a **Least Common Multiple?** (3 = 3 × 1 4 = 2 × 2 5 = 5 × 1 24 = 3 × 2 × 2 × 2
  Answer: 120 = 5 × 3 × 2 × 2 × 2. The pattern is to use each prime factor the <u>most</u> number of times it appears.)

- Pair students and have them come up with their own combination of challenging denominators for each ingredient in the puzzle, then exchange with their partner to solve for the amounts.

Assessment:

- Distribute **Assessment** resource sheet.

Answers: 1. 12, Part A: 16, Part B: 12, ($\frac{5}{8}$ of 32 = $\frac{5}{8} \times \frac{32}{1}$ = 20 laps completed, so she still needs to run 32 – 20 = 12 laps.)

Follow Up:

- Have students return to the puzzle to apply what they learned in the lesson. Ask: Did the lesson help you to clarify the math in the puzzle? How so? What other strategies could you have used to help you solve the puzzle? Additionally, check teacher stats in the game to determine students' level of understanding.
- Provide students with the following scenario

  You need to make the special family recipe lemonade for your upcoming family reunion. The recipe calls for $\frac{3}{4}$ cups of sugar and $\frac{1}{3}$ cup lemon juice. If you want to triple the recipe, how much of each ingredient is needed? *($2\frac{1}{4}$ and 1)*

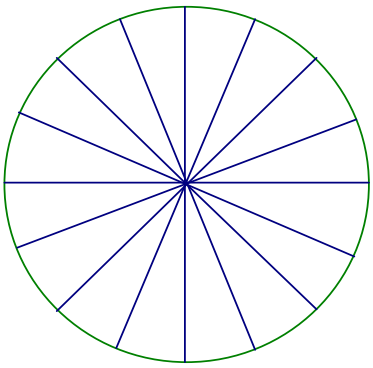
Real World Connection:

- Ask students to find a recipe from a family member or friend, a cookbook or magazine. Have students copy down the original recipe. Ask the students to imagine that they need to prepare their selected recipe for the entire school. Have the students write the new recipe that has been adjusted in quantity for the entire school.

Gigantic Pizza Problem

Directions: Write an ***equation*** to solve the following problem.

You are having a party and plan to order a gigantic pizza cut into 16 slices. 3/8 of the pizza needs to have mushrooms. How many pizza slices will have mushrooms?



Interactive Resource 1

Interactive Resource 2

Interactive Resource 3

Soup Pot Challenge

You have the following monster soup recipe:

$\frac{3}{66}$ 

$\frac{5}{22}$ 

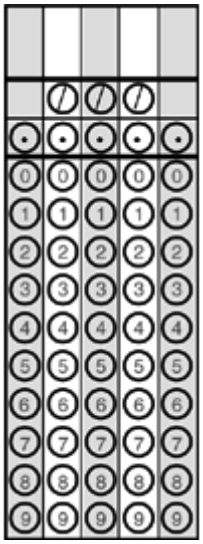
$\frac{6}{33}$ 

$\frac{6}{11}$ 

Use this recipe to fill a pot of capacity ***66 units****. Determine the sizes of the 3 cups you would like to use to fill the soup pot. Try to find three cups that fill the soup pot the* ***most efficiently*** *without needing to dump any extra ingredients. Using words, pictures and/or numbers, explain how you determined your answer. Is your answer the only possible answer? Why or why not?*

Assessment

1. **Multiply:** $\frac{3}{4} \times 16$



2.

Part A

Tory has a goal of running 64 laps around the school track each week. If she can only run four days a week, how many laps must she run each day?

Part B

Tory's sister tries to run 32 laps at an indoor gym each week. If she has already completed 5/8 of her laps for this week, how many more laps must she run to meet her goal?