Cooking Time – Lesson 4

Key Content Standard(s):

5.NF.A.2, 5.NF.B.7.c

Key Practice Standard(s):

4

Objective:

1. Students will use equivalent fractions as a strategy to add and subtract fractions.
2. Students will divide unit fractions by non-zero whole numbers.

Overview:

In this lesson, students will use equivalent fractions to add and subtract fractions, and will divide unit fractions by non-zero whole numbers, in the real-world context of food and cooking. The teacher will demonstrate, either through the use of models or the use of actual food, how different measurements (i.e. different fractions) of liquid can be combined, and how a fractional whole can be divided into an equal number of parts.

Lesson Plan:

1. Prior to lesson, gather materials:
   - **a.** Olive oil (at least $\frac{1}{3}$ cup)
   - **b.** Vinegar (at least $\frac{1}{6}$ cup)
   - **c.** Assorted herbs (e.g. oregano, thyme; at least a "pinch")
   - **d.** Salt (at least a "pinch")
   - **e.** Measuring tools:
     - **i.** A $\frac{1}{3}$ cup is a must; two such cups would be even better.
     - **ii.** At least one large, clear measuring cup (at least 1 cup)
     - **iii.** Teaspoon
     - **iv.** If possible, six small condiment/"prep" cups
2. Tell students that you have a wonderful recipe for salad dressing, and share it with them. Ask if students can tell us what operation we would use to calculate the total amount of dressing this recipe will make (answer: addition). Then have students model this as an equation (answer: $\frac{1}{3} + \frac{1}{6}$).
3. Ask students to demonstrate possible solutions. Solutions may include converting $\frac{1}{3}$ to $\frac{2}{6}$, so that both fractions have like denominators, or using fraction strips or another model to demonstrate that $\frac{1}{3} + \frac{1}{6} = \frac{1}{2}$.
4. Ask the students if the dash of herbs and salt will change the total volume appreciably (answer: no).

5. Add the $\frac{1}{3}$ cup of olive oil to the clear measuring cup. Tell students that the recipe calls for $\frac{1}{6}$ cup of vinegar, but you do not have a $\frac{1}{6}$ measuring cup. Ask students to brainstorm ways that we might be able to measure it out. Ideas could include looking for other equivalent measurements, and approximating half of the $\frac{1}{3}$ cup. *Teacher's Note: 8 teaspoons =* $\frac{1}{6}$ cup.
6. Once an acceptable solution for measuring $\frac{1}{6}$ cup has been agreed upon, add the vinegar to the measuring cup. Confirm that the total is approximately $\frac{1}{2}$ cup. If it is slightly more or less, discuss with students why that might be (answer: human error). Add the herbs and salt.
7. Now tell students that you want to know how much of the dressing each person will get. Remind them that there are 6 servings per batch. Have students write a number sentence demonstrating this: ($\frac{1}{2} \div 6$). For students having difficulty, ask them first what operation they will need to use when putting things into equal groups (answer: division), and ask them what the total amount that is being divided (answer: $\frac{1}{2}$ cup).
8. Ask students to predict what an answer to $\frac{1}{2} \div 6$ might be. Have students explain their predictions (note: there may be many incorrect predictions, and/or no correct predictions).
9. Ask students how we could solve $\frac{1}{2} \div 6$. To demonstrate how to solve this problem by modeling, have students graphically represent dividing $\frac{1}{2}$ cup into six equal parts. Then, have students show that 1 cup divided into parts of the same size will have 12 equal parts. Thus, one serving size is $\frac{1}{12}$ cup, and $\frac{1}{2} \div 6 = \frac{1}{12}$.
10. *Do this step if the six small condiment bowls are available.* Demonstrate that $\frac{1}{2} \div 6 = \frac{1}{12}$ by dividing the dressing into six equal groups. Ask students how much should go into each bowl, if we are putting one serving in each (answer: $\frac{1}{12}$ cup). Tell students that $\frac{1}{12}$ cup = 4 teaspoons, and divvy up the dressing into 6 equal groups.
11. Consider having students practice dividing other fractions by whole numbers, with or without physical models.

Assessment:

Tell students that in your family, you really love salad dressing, and so this recipe really only is enough for 4 people. Ask students to write an equation for how much dressing each person gets (Answer: $\frac{1}{2} \div 4 = \frac{1}{8}$ cup).

Allow students to practice dividing several unit fractions by whole numbers. Have them solve pictorially and using "invert and multiply". For example:

$\frac{1}{4} \div 3$ $\frac{1}{6} \div 2$ $\frac{1}{3} \div 5$

Differentiation:

Students could be challenged to calculate the number of teaspoons in $\frac{1}{6}$ cup and in$\frac{1}{12}$ cup, given that 48 tsps = 1 cup (answer: 8 and 4 teaspoons, respectively). This form of proportional reasoning is a feature of the middle school standards, but might be appropriate for some fifth grade students.

Some students may need terms explained to them, and students may also need it explained that olive oil and vinegar are major components of many types of salad dressings. English language learners or students with limited vocabularies may benefit from a word web of common types of herbs (e.g. oregano, thyme, rosemary, basil) or salad dressing types.

Students may be taught the "invert and multiply" algorithm for dividing with fractions. That is, they could be taught that an efficient way for dividing $\frac{1}{2} \div 6$ is to "invert and multiply" the 6. Thus, $\frac{1}{2} \div 6 = \frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$. Encourage students to focus on reasoning through the division problem, rather than relying on the rote memorization of the algorithm. The algorithm will be more fully addressed in sixth grade mathematics.

Commentary:

This lesson could be extended by having the students make enough dressing for the entire class, and having the teacher bring in salad for them to eat. An additional question would be, "If this recipe makes 6 servings, how many batches do we need to have enough?" Students would also calculate how the ingredients would change (i.e. a class of 24 would increase the oil and vinegar quantities by a factor of 4, and make a judgment call on the amount of herbs and spices). Students would then carefully measure out the single serving they calculated as part of the main lesson. A classroom discussion would ensue: is $\frac{1}{12}$ c of dressing enough? Too much? How many teaspoons is that? Where do "they" come up with serving size? If we were to make the recipe again, how would we change it? This extension has the non-mathematical advantage of modeling healthy eating.

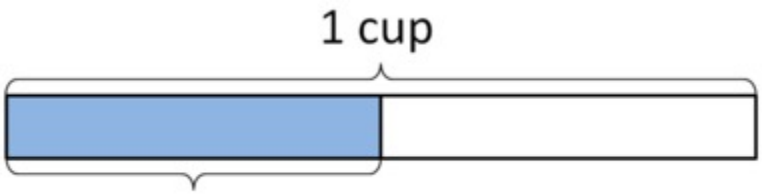
The images below may be helpful for the teacher to visualize step 8, and may also be reproduced for student use.

If applicable, include worksheets, diagrams, etc. at end

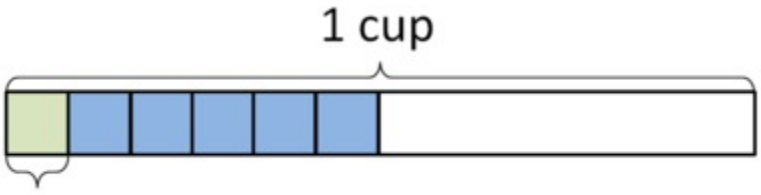
Aunt Barb's Salad Dressing Recipe

- $\frac{1}{3}$ cup olive oil
- $\frac{1}{6}$ cup balsamic vinegar
- a pinch of herbs
- a pinch of salt

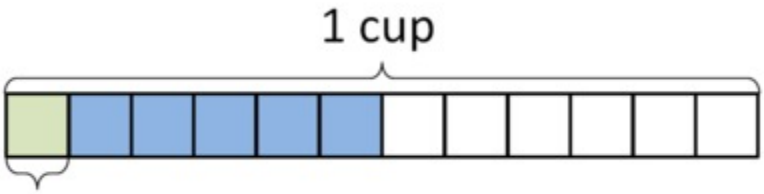
Makes 6 servings



Aunt Barb's recipe



1 serving



1 serving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