Modeling Fractions

Strand: Number and Number Sense

Topic: Modeling Fractions

Primary SOL: 3.2 The student will

b) represent fractions and mixed numbers, with models and symbols.

Related SOL: 3.2a, 3.2c

Materials

- Box of graham crackers
- Loaf of bread
- Chocolate bars (no nuts)
- English muffins
- Fraction bars
- Fraction circles

Vocabulary

denominator, equivalent, improper fraction, mixed number, numerator, proper fraction, whole number

Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Inform students that many foods we eat can be portioned using fractions. For example, a bag of dinner rolls can be portioned into 12ths, and we would count the parts as $\frac{1}{12}, \frac{2}{12}, \frac{3}{12}, \frac{4}{12} \ldots \frac{12}{12}$. Ask, *"What other foods are often shared in equal-size pieces?"* Have students talk with a neighbor and create a list of foods we often eat that are only a fraction of the whole (or a piece of the whole). Have students share ideas and generate a list on the board.
2. Using some of the food items the students' list, demonstrate how to model fractions, and write the fractions' names.
3. Give each student one whole graham cracker and have them model a particular fraction. For example, you may have them model $\frac{2}{4}$. Students would then break their graham cracker into four equal pieces and group two of the pieces together out of the four to model $\frac{2}{4}$. Ask students how they could count the pieces to prove they built $\frac{2}{4}$. (They would count $\frac{1}{4}, \frac{2}{4}$.) Write these fractions on the board so they learn how we write fractions. This would also be a good time to discuss what the numerator and denominator in each fraction represents. (We have four total pieces, so that is the denominator. The 2 is the numerator, and that represents how many pieces I have out of the whole. The numerator is what we count.)

4. Have students model a few other fractions with the graham cracker before moving on to a fraction that is more than a whole (mixed number). Make sure to have students build $\frac{4}{4}$ and discuss how that is equivalent or equal to 1, (e.g., $\frac{4}{4}$ = 1).
5. Next, give each student another graham cracker so that they have two whole graham crackers. Now that students understand $\frac{4}{4}$ is equal to a whole, ask them how they could use their graham crackers to build $\frac{5}{4}$. Allow students to share their modeled fractions with the class. Ask, *"How would you write the fraction for $\frac{5}{4}$?"* "*Is there another way to write this fraction?"* ($1\frac{1}{4}$) Introduce the concept of $1\frac{1}{4}$ being a mixed number or a fraction that has a whole(s) and a little bit more.
6. See whether students can build another mixed number with the graham cracker pieces they have. Allow students to share their modeled mixed numbers with the class before eating their graham crackers.
7. To extend, the teacher can show the students five graham crackers. Ask, *"How much will each student get if we share these five graham crackers among two students?"* ($2\frac{1}{2}$ or $2\frac{2}{4}$)
8. Continue to practice modeling fractions, or put students into groups and have them model fractions using slices of bread, chocolate bars, and English muffins so that students understand the size of the whole can change. Make sure to have students model fractions and mixed numbers. You can also have students model fractions and mixed numbers with fraction circles, fraction bars, or Cuisenaire rods.

Assessment

- **Questions**
  - What does the denominator mean?
  - What does the numerator mean?
  - If you used more than one type of food, ask "How are the models different? What did they have in common?"
  - How would you model $\frac{1}{8}$, using a graham cracker? Draw a picture of this model.
  - How many whole graham crackers would you need to model $2\frac{1}{2}$? What improper fraction would be equivalent to $2\frac{1}{2}$?
- **Journal/writing prompts**
  - Identify some other food items that you could use to model fractions and mixed numbers. Describe why these food items would be helpful in modeling.
  - Explain why sometimes you have a whole number with a fraction, but other times you have just a fraction.
  - Draw a picture of what $3\frac{1}{3}$ pizzas would look like.

  - The zoo uses 8 bananas to feed their 6 monkeys. They want to use up all the bananas and give the same amount to each monkey. How much should they give each monkey?

- **Other Assessments**
  - Monitor students as they work on solving their problems. Assist when needed. When students are sharing their thinking, listen for correct vocabulary and understanding of the concept.
  - Have students match given fractions and mixed numbers with corresponding fraction bars or fraction circles.
  - Have students draw models for given fractions and mixed numbers.

Extensions and Connections (for all students)

- Have students count by fractions instead of whole numbers. If we count by fifths, we would say $\frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \frac{5}{5}, \frac{6}{5}, \frac{7}{5}$, etc. See whether they identify patterns and can figure out when they count to two wholes, three wholes, etc.
- Read a story about fractional concepts. Have students use manipulatives to model the fractions represented in the story.
- Have students use measuring devices to model fractions in relation to such units of measure as cups, inches, and pounds.

Strategies for Differentiation

- Have students use grid paper to assist them in drawing fraction models.
- Provide blank fraction bars or fraction circles for students to use to practice modeling fractions and mixed numbers before using food items.

Note: The following pages are intended for classroom use for students as a visual aid to learning.