Facilitator Guide: Estimation with Fractions

Lesson Overview:

Big Idea: Estimation tasks help build students conceptual understanding of fractions. In this lesson, they begin developing strategies for visualizing fractions of a whole and benchmarking fractions to 0, 1/2, and 1.

Lesson Flow: Have students play the *Beaker Game* to estimate filling a beaker based on a given fraction, then play a few puzzles together as a class. Students then solve a set of problems independently in their problem sheet, trade papers with a partner and discuss the problems as a whole class using prompts on the teacher's screen. Teacher then poses a multiple choice problem and leads a discussion about which fraction best matches the visual model. Wrap up the lesson by having students match fractions to visual models on a problem sheet and discuss solutions as a class.

Warm Up: Beaker Game

Students estimate filling a beaker given a fraction prompt. The feedback models the meaning of fraction notation in the context of filling up a beaker (7 min)

- This estimation activity is meant to build students' visual intuition about the relative size of fractions, they do not need to be exact
- *Monitor* for understanding:
  - "How do you decide where to fill the beaker to?"
  - "What helps you figure out about how far up/down to fill the beaker?"
  - "What patterns do you notice?"
- Encourage benchmarking to 0, 1/2, 1 to estimate
  - "Do you have to have the exact amount?"
  - "Since we are estimating, what fraction seems reasonable? Is this close to 0, 1/2, 1 whole?"

Activity One: Beaker Game as a Class

Solve and discuss puzzles as a class. Students raise their hands when the beaker shows the fractional amount filled close to the prompt (7 min)
- *Focus Discussion* on reasoning behind the estimate

Activity Two: Beaker Game Problem Set

Part 1: Students solve **Beaker Problem Sheet** independently (7 min)

- Estimate the fraction that names the part filled. (Problems 1-3)
- Fill the beaker based on fraction given: 8/9, 1/10, 6/11 (Problems 4-6)
- Create your own. (Problems 7-9)

Activity Two: Beaker Game Problem Set (continued)

Part 2: Students trade **Beaker Problem Sheet** with neighbor and discuss prompts on the teacher's slide as a class (5 min)

- The larger the denominator the smaller the part 1/8 is smaller than 1/2
- There is more than one correct answer: estimation includes numbers that are close. A beaker with only a small part could be filled 1/6, 1/7, or even 1/8 full
- Encourage benchmarking to 1/2 or 1 whole
    - 8/9 is close to a whole because 9/9 is a whole
    - 6/11 is a little more than half: one-half of 11 is more than 5 but less than 6.

Activity Three: Beaker Game Multiple Choice

Discuss and answer Beaker Game Multiple Choice puzzles as a class (10 min)

- Give students time to consider which fraction best describes the beaker
- Poll students which fraction best matches visual (use fingers to show 1-4)
- Students discuss with a partner then justify their thinking as a whole class
- Reason about the relative size of the fractions and benchmark to 0, 1/2, and 1

Activity Four: Beaker Pairs Worksheet

Students solve **Beaker Pairs Worksheet** individually, then compare and discuss with partner (10 min)

- Give students 5 minutes to work on their own matching fractions to visual models
- Focus discussion on which pairs of visuals-fractions are likely matches and which are unlikely and why
    - If time is limited discuss problems #1, 3, and 5