Sara Delano Moore • Kimberly Rimbey

MASTERING MATH MANIPULATIVES

Hands-On and Virtual Activities for Building and Connecting Mathematical Ideas

Grades K-3

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Please enjoy this complimentary excerpt from Mastering Math Manipulatives, Grades K-3, by Sara Delano Moore and Kimberly Rimbey.

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Materials

- Fraction tower pieces placed in zip-top bags (one whole, two halves, three thirds, and four fourths) for each student; you may include other-sized pieces as well, depending on your grade level and math goal
- Activity sheet for each student

Organization (physical)

- **Getting Started:** Distribute fraction tower pieces to students.
- **Winding Down:** Ask students to put the fraction towers back together prior to placing them in zip-top bags to ensure all pieces are included.

Mathematical Purpose

In this activity, students compare fractions equivalent to one whole, viewing them as equal amounts, while using fraction towers and number lines to represent contextual situations.

Activity 7.2 Resources

"One" as a Fraction Activity Sheet

Manipulative Illustrated

Fraction Towers (available from multiple sources)

Steps

> Juan and Corrina each had same-sized brownie bars. Juan's was still whole, but Corrina's was cut into four equal pieces. Who had more? How do you know?

1. Ask students to read the first problem, either together or separately. Ask guiding questions to assist students in focusing on the context such as the following:
   - *What is this math story about?*
   - *What are the quantities, relationships, and/or actions taking place?*
   - *What is the question asking?*

2. Ask students to use fraction tower pieces to represent the first problem with fraction towers, either individually or in pairs. Ask guiding questions such as these:
   - *How did you know which fraction tower pieces to use?*
   - *What did you notice about each of the whole brownie bites?*
   - *Which one had more? How do you know?*

3. Ask students to represent the situation with fractions and with number lines. Ask guiding questions such as these:
   - *How do you write the whole brownie that was cut into four pieces as a fraction?*
   - *How can you represent that on a number line?*
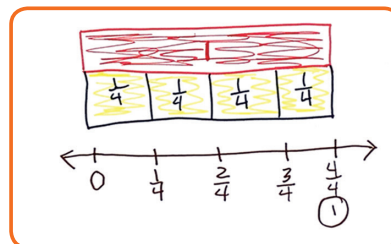
4. As students are ready, ask them to continue with the other problems, following the same sequence.

Why This Manipulative?

Fraction towers provide the opportunity for students to compare fractions using a bar model, which translates nicely into number line work. Furthermore, fraction towers establish the whole and each fractional part proportionally and precisely. This is helpful for young learners as they grapple with basic concepts of fractions such as (1) fraction pieces that name the same amount of the whole must be the same size, and (2) the number pieces that comprise the whole determine the size of those pieces.

Note that this activity may also be suitable for fraction circles, fraction squares, fraction bars, and fraction strips. You may also use pattern blocks if you restrict the denominators to numbers that work well with pattern blocks (halves, thirds, and sixths).

Developing Understanding

Provide students with the opportunity to explore the fraction towers prior to engaging in problem solving. Students should compare and contrast the function of fraction towers with that of fraction tiles and fraction circles. Furthermore, students should connect the use of fraction towers to number lines, noting that fractions can lend themselves to being viewed as a distance model, like number lines, though many students still view them as area models.

Be sure to guide students in noticing some of the fraction concepts that can be envisioned with the fraction towers, including the relationships between the fractional pieces and "one whole," the notion that same-sized pieces have the same fraction name, and the concept that the size of the pieces is related to the number of pieces it takes to make a bar that is equivalent to one whole. These ideas are typically developed in first and second grade and then formalized in third grade.

Featured Connection

This activity focuses on the Create a Diagram strategy to highlight the connection between the concrete objects and visual and symbolic representations. This connection occurs as the students use the fraction towers to represent the word problem. Then they use **open number line** representations to show their understanding by marking the whole and partitioning the whole into equal-sized pieces to show how those pieces fit together to make another whole. Finally, students use fraction symbols to indicate the parts that comprise a whole on the number line (e.g., $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}$).
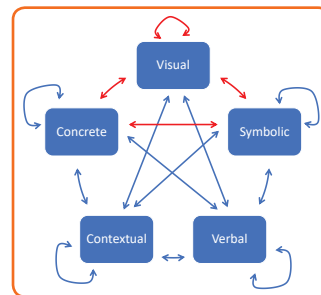
Source: Lesh, Post, & Behr (1987).

7.2 "One" as a Fraction Activity Sheet

Use fraction towers to represent each situation below. Then sketch your findings with a number line diagram.

Juan and Corrina each had same-sized brownie bars. Juan's was still whole, but Corrina's was cut into four equal pieces. Who had more? How do you know?

Jennifer and Tonisha each had same sized same-sized lengths of string. However, Jennifer's was cut into three equal pieces while Tonisha's was still in one piece. Who had more? How do you know?

Manny and Cristian each had same-sized candy bars. Manny's was cut into two equal pieces and Cristian's was all one piece. Who had more? How do you know?