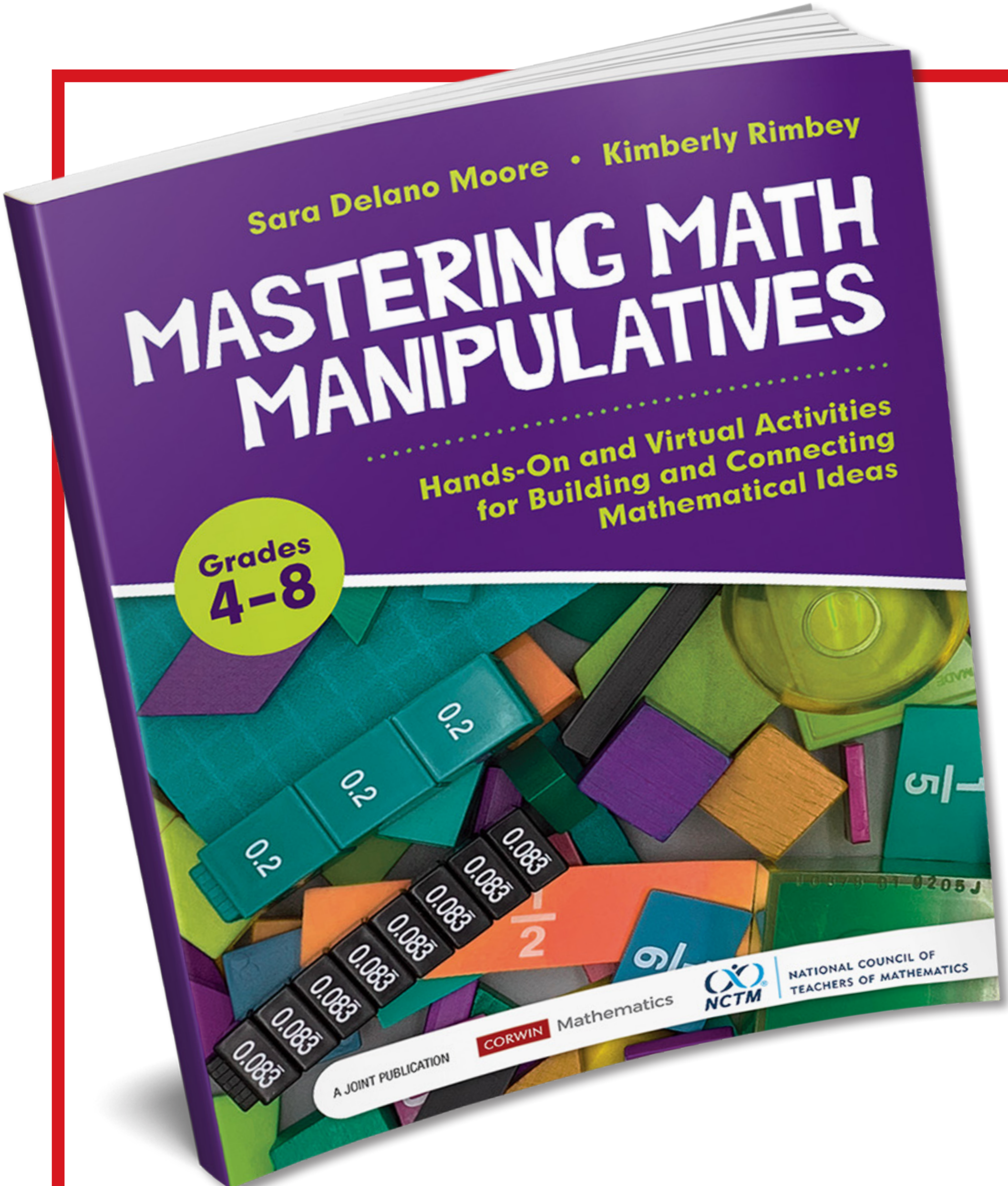


Thank you

FOR YOUR INTEREST IN CORWIN

Please enjoy this complimentary excerpt from Mastering Math Manipulatives, Grades 4-8, by Sara Delano Moore and Kimberly Rimbey.

LEARN MORE about this title!

ACTIVITY

2.6 MULTIPLYING A FRACTION BY A FRACTION

3 4 5 6 7 8+

Materials

- Fraction squares, one set per pair
- Two colors of pen or pencil for tracing
- Plain paper for tracing

Organization (physical)

- **Getting Started:** Have students check that all the fraction square pieces are complete by counting or assembling the squares.
- **Winding Down:** Count or assemble the squares as they are returned to the bag.

Mathematical Purpose

In this activity, students will use an area model to understand fraction-by-fraction multiplication.

Activity 2.6 Resources

- *Multiplying a Fraction by a Fraction* Activity Video

Manipulative Illustrated

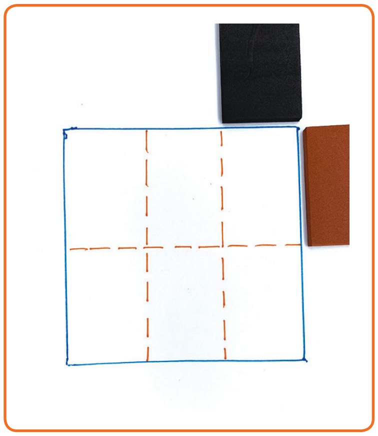
- Fraction squares

Steps

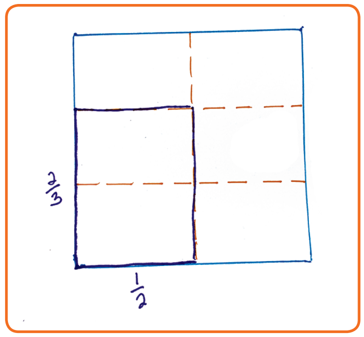
$\frac{1}{2} \times \frac{2}{3} =$

1. Have students trace the square "whole" on their paper.
2. Review the idea of area as the space covered by a shape. In this problem, we're making a rectangle that is $\frac{1}{2}$ unit on one side and $\frac{2}{3}$ unit on the other side.

   Use the fraction square pieces to partition the two sides of the unit square into halves on one dimension and thirds on the other dimension. Draw dotted lines between the marks so you can see halves and thirds in the figure.



3. Mark the dimensions of the rectangle in the problem on the diagram. Outline the full diagram.
4. Discuss the area of the smaller rectangle you've drawn, guiding students' thinking with questions like these:
   - *What do you notice about the area of the small rectangle?*
   - *What are the dimensions of the small rectangle? Is each small rectangle the same dimensions and area?*
   - *How many of the small rectangles represent the product of $\frac{1}{2}$ and $\frac{2}{3}$? How do you know?*
5. Based on the previous discussion, guide students to see that each small rectangle has an area of $\frac{1}{6}$; the unit whole square is partitioned into six equal pieces.
6. If each small rectangle has an area of $\frac{1}{6}$, the area of the rectangle under discussion is $\frac{2}{6}$.



7. Record the equation as $\frac{1}{2} \times \frac{2}{3} = \frac{2}{6}$.

Why This Manipulative?

Fraction squares make it easy to draw the unit square and partition it into fractional pieces. Because they are an area model themselves, students can overlay the pieces on the diagram to see that the area of the solution is the area where the pieces representing the factors overlap. This is evident in the video.

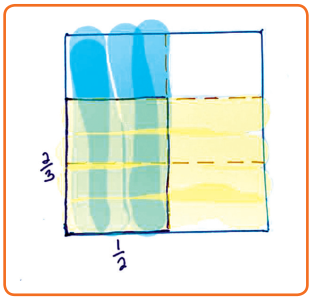
The model also works with a factor (or factors) greater than one. There will be multiple whole unit squares, so each side length is appropriate. For example, multiplying $1\frac{1}{2} \times \frac{2}{3}$ would require two stacked unit squares, so the vertical side length (following the pattern of the images in this lesson) is $1\frac{1}{2}$ and the horizontal length remains $\frac{2}{3}$. It may help students to write the problem as $\frac{3}{2} \times \frac{2}{3}$, and they will find $\frac{6}{6}$ as the area.

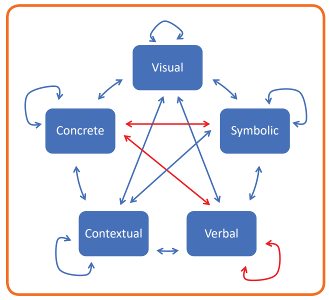
Developing Understanding

This representation helps students reinforce the connection between multiplication and area. The area model also helps students understand that the unit of the product, in an area problem, is different from the units of the factors. When we find a "part of a part" in this context, we have a new unit of measure. In this case, each factor represents a length of the side of the unit whole square. In the product, the area is expressed in sixths of the square. It is important *not* to simplify the product so that students can see the relationship.

Students should have multiple experiences with multiplying fractions using fraction squares as described here so they come to understand the pattern of what happens, especially with the denominator of the product. If students are ready, this work can move to grid paper without the fraction squares, allowing a wider range of denominators.

Featured Connection





Source: Lesh, Post, & Behr (1987).

Use the Name Your Model strategy to connect the pictorial and abstract representations.

$$\frac{1}{2} \times \frac{2}{3} = \frac{1 \times 2}{2 \times 3} = \frac{2}{6}$$

Guide students to identify each element of the equation in the diagram pictured. The two factors appear as the dimensions of the green rectangle, the area with double-shading.

When the numerators are multiplied, we are counting the number of pieces in the resulting area. For this problem, $1 \times 2 = 2$ pieces in the final area.

When the denominators are multiplied, we see the number of unit area pieces into which the larger unit whole is partitioned. In this problem, 2 (halves in a whole) $\times$ 3 (thirds in a whole) means the unit whole square is partitioned into sixths, six smaller rectangles.

The product in this problem is the area of the green rectangle and includes two of those $\frac{1}{6}$ square unit rectangles.