

LESSON 5

Objective

Multiply a fraction by a fraction.

Common Core State Standards

- **5.NF.4a** Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. For example, use a visual fraction model to show $(2/3) \times 4 = 8/3$, and create a story context for this equation. Do the same with $(2/3) \times (4/5) = 8/15$. (In general, $(a/b) \times (c/d) = ac/bd$.)
- **5.NF.4b** Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

Number and Operations—Fractions

Multiplying Two Fractions

Students will build upon their understanding of multiplying a fraction by a whole number to now multiply a fraction by a fraction. Using concrete models to build rectangles with fractional side lengths, students can show that the area is the same as it would be by multiplying side lengths. Visualizing fraction products as rectangular areas will increase understanding.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- Write $\frac{3}{4} \times \frac{1}{2}$ on the board. **Ask:** What fraction do the yellow pieces represent? What fraction does the pink piece represent? What fraction do the blue pieces represent? Write $\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$. **Ask:** What is the area of the park?
- **Say:** To multiply fractions without using models, use the algorithm: Multiply the numerators and multiply the denominators. Write $\frac{3}{4} \times \frac{1}{2} = \frac{3 \times 1}{4 \times 2} = \frac{3}{8}$.
- **Ask:** Do you think you could show any fraction multiplication problem picture using this method when each of the two factors is less than 1?

Solve It

Reread the problem with students. Have them draw or trace the Fraction Squares pieces on the BLM and shade the overlapping area to answer the problem and write the solution as an equation.

More Ideas

For other ways to teach about multiplying a fraction by a fraction—

- Have students use Color Tiles to represent the fractional side lengths of rectangles like denominators making sure they use the appropriate number of tiles to represent the fractional parts. Encourage them to use different colors to represent the length and the width.
- Have students trace Fraction Square pieces on Fraction Squares BLM 8 using different colored pencils, and shade the overlapping section to show the area of the fraction product.

Formative Assessment

Have students try the following problem.

Eva wants to plant pumpkins in a field that is $\frac{1}{3}$ mile by $\frac{1}{4}$ mile. What is the area of the field?

- A. $\frac{1}{16}$ square mile B. $\frac{1}{12}$ square mile C. $\frac{1}{7}$ square mile D. $\frac{1}{2}$ square mile

Try It!

20 minutes | Groups of 4

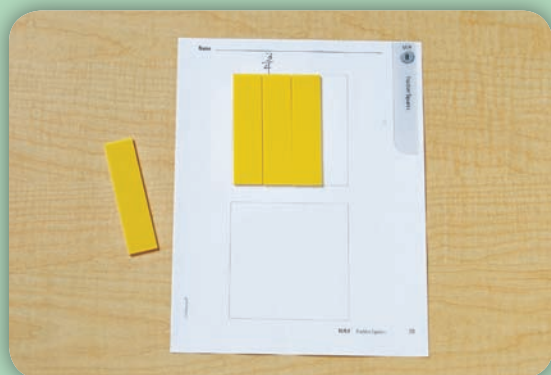
Here is a problem about multiplying a fraction by a fraction.

Zeke runs a lawn service. He needs to find the area of a rectangular park. The park measures $\frac{3}{4}$ mile by $\frac{1}{2}$ mile. What is the area of the park?

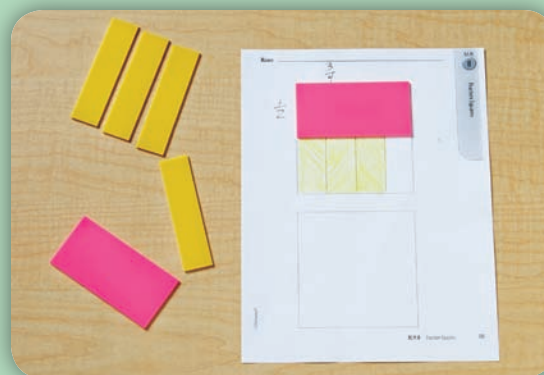
Introduce the problem. Then have students do the activity to solve the problem. Distribute Fraction Squares, Fraction Squares sheets, and pencils to students.

Materials

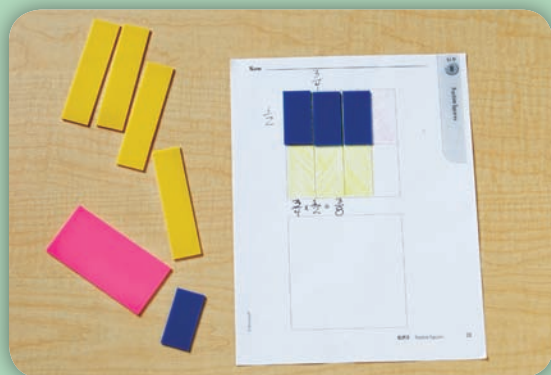
- Deluxe Rainbow Fraction® Squares (1 set per group)
- Fraction Squares (BLM 8; 1 per group)
- pencils (1 per group)



1. Say: Find the Fraction Square that represents fourths and show $\frac{3}{4}$ on your paper. Have students place three $\frac{1}{4}$ pieces vertically in the top square of the BLM. **Say:** This fraction, $\frac{3}{4}$, represents the side of the park that is $\frac{3}{4}$ of a mile. Have students mark the side as $\frac{3}{4}$.



2. Say: Now find the Fraction Square that represents halves. Place a $\frac{1}{2}$ piece across the top half of your $\frac{3}{4}$ pieces to mark off the other side of the rectangle. Have students place the $\frac{1}{2}$ piece horizontally across the top half of the other pieces and mark the side as $\frac{1}{2}$.



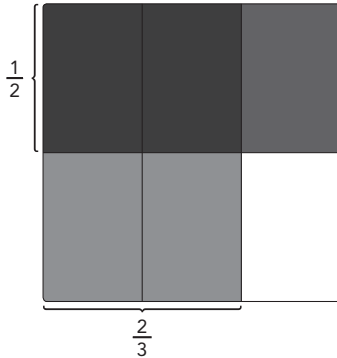
3. Say: Find out what fraction pieces you can use to fill in the overlap area. If necessary, help students determine that eighths pieces will work. **Ask:** How many eighths fit in the overlap area? Have students write the number sentence, $\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$.

Look Out!

Watch for students who want to lay the $\frac{1}{2}$ piece alongside the $\frac{3}{4}$ pieces instead of across the top of them. Watch also for students who want to lay four $\frac{1}{8}$ pieces across the top of the $\frac{1}{2}$ piece. Point out that there is no yellow piece under the last fourth of the $\frac{1}{2}$ piece.

Use Fraction Squares to model the problem. Write the solution. (Check students' work.)

1. Alex wants to cover a bulletin board with cloth. The board measures $\frac{2}{3}$ yard by $\frac{1}{2}$ yard. What is the area of the bulletin board?



$$\frac{2}{3} \times \frac{1}{2} = \frac{2}{6} \text{ or } \frac{1}{3} \text{ square yard}$$

Using Fraction Squares, model the problem. Sketch the model. Write the multiplication sentence that shows the solution.

2. A frame measures $\frac{5}{6}$ foot by $\frac{3}{4}$ foot. What is the area of the frame? (Check students' models.)

$$\frac{5}{6} \times \frac{3}{4} = \frac{15}{24} \text{ or } \frac{5}{8} \text{ square foot}$$

Find each product.

3. $\frac{1}{2} \times \frac{4}{5} = \frac{4}{10} \text{ or } \frac{2}{5}$

4. $\frac{1}{3} \times \frac{3}{4} = \frac{3}{12} \text{ or } \frac{1}{4}$

5. $\frac{2}{5} \times \frac{3}{5} = \frac{6}{25}$

6. $\frac{1}{3} \times \frac{9}{10} = \frac{9}{30} \text{ or } \frac{3}{10}$

7. $\frac{3}{10} \times \frac{5}{8} = \frac{15}{80} \text{ or } \frac{3}{16}$

8. $\frac{2}{3} \times \frac{3}{8} = \frac{6}{24} \text{ or } \frac{1}{4}$

Answer Key

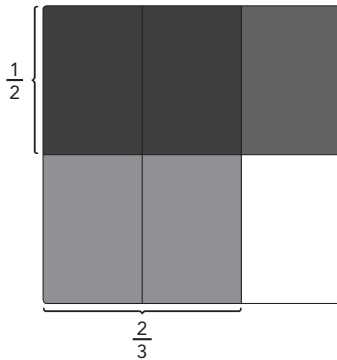
Challenge! Create a story context for the expression $\frac{2}{3} \times \frac{4}{5}$, and solve the problem.

Challenge: $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$; stories will vary.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

Use Fraction Squares to model the problem. Write the solution.

1. Alex wants to cover a bulletin board with cloth. The board measures $\frac{2}{3}$ yard by $\frac{1}{2}$ yard. What is the area of the bulletin board?



$$\frac{2}{3} \times \frac{1}{2} = \underline{\hspace{2cm}} \text{ square yard}$$

Using Fraction Squares, model the problem. Sketch the model. Write the multiplication sentence that shows the solution.

2. A frame measures $\frac{5}{6}$ foot by $\frac{3}{4}$ foot. What is the area of the frame?

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ square foot}$$

Find each product.

3. $\frac{1}{2} \times \frac{4}{5} = \underline{\hspace{2cm}}$

4. $\frac{1}{3} \times \frac{3}{4} = \underline{\hspace{2cm}}$

5. $\frac{2}{5} \times \frac{3}{5} = \underline{\hspace{2cm}}$

6. $\frac{1}{3} \times \frac{9}{10} = \underline{\hspace{2cm}}$

7. $\frac{3}{10} \times \frac{5}{8} = \underline{\hspace{2cm}}$

8. $\frac{2}{3} \times \frac{3}{8} = \underline{\hspace{2cm}}$

Name _____

Challenge! Create a story context for the expression $\frac{2}{3} \times \frac{4}{5}$, and solve the problem.

[illegible]

Name _____

BLM

8

Fraction Squares

