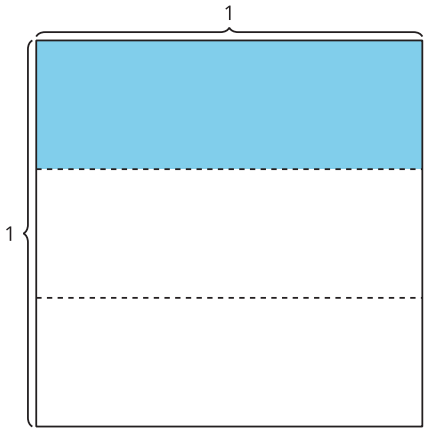
Unit 3 Family Support Materials

Multiplying and Dividing Fractions

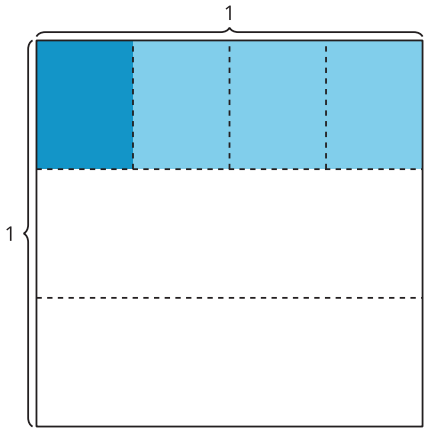
In this unit, students use area concepts to represent and solve problems involving the multiplication of two fractions, and generalize that when they multiply two fractions, they need to multiply the two numerators and the two denominators to find the product. They also reason about the relationship between multiplication and division to divide a whole number by a unit fraction and a unit fraction by a whole number.

Section A: Fraction Multiplication

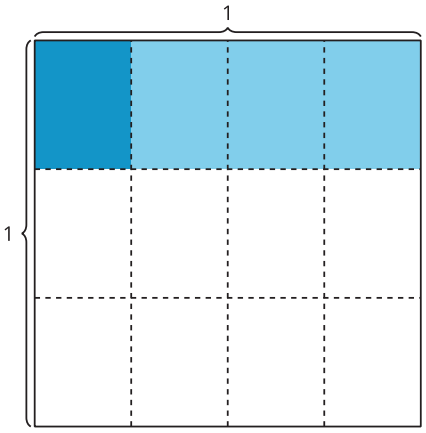
In this section, students build on their knowledge of fraction multiplication developed in the previous unit by using area concepts to understand the multiplication of a fraction by a fraction. Students draw diagrams to represent the fractional area. For example, students learn that the diagrams below can represent this situation: "Kiran eats macaroni and cheese from a pan that is $\frac{1}{3}$ full. He eats $\frac{1}{4}$ of the remaining macaroni and cheese in the pan. How much of the whole pan did Kiran eat?"



Pan with $\frac{1}{3}$ left.



Kiran eats $\frac{1}{4}$ of what's left.



$\frac{1}{4}$ of $\frac{1}{3}$ is $\frac{1}{12}$, or $\frac{1}{4} \times \frac{1}{3} = \frac{1}{4 \times 3} = \frac{1}{12}$.

Students extend this conceptual understanding to multiply all types of fractions, including fractions greater than 1 (for example, $\frac{7}{4}$). In each case, students relate this multiplication to finding the area of a rectangle with fractions as side lengths. As the lessons progress, students notice that they can multiply the two numerators and the two denominators to

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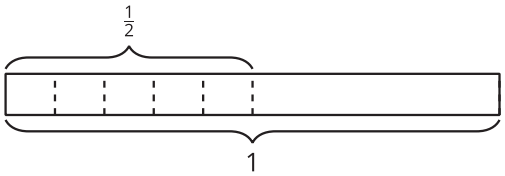
find the product. This reasoning holds true for fractions greater than 1. For example, $\frac{3}{4} \times \frac{7}{5} = \frac{3 \times 7}{4 \times 5} = \frac{21}{20}$.

Section B: Fraction Division

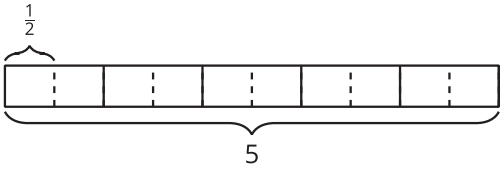
The section begins by using whole numbers to recall that the size of the quotient depends, for example, on the amount being shared and the number of people sharing. That is, each student will get more pretzels if 3 students share 45 pretzels than if 3 students share 24 pretzels. Similarly, each student will get fewer pretzels if 6 students share 24 pretzels than if 3 students share 24 pretzels. This thinking helps students understand why dividing a whole number by a unit fraction results in a quotient that is greater than the whole number. For example, $2 \div \frac{1}{3} = 6$ because there are 6 groups of $\frac{1}{3}$ in 2.

Students divide a unit fraction by a whole number and divide a whole number by a unit fraction. They interpret $\frac{1}{2} \div 5$ to mean finding the size of one part if $\frac{1}{2}$ is split into 5 equal parts, and $5 \div \frac{1}{2}$ as a way of finding how many $\frac{1}{2}$s are in 5.

$\frac{1}{2} \div 5$



$5 \div \frac{1}{2}$



To build this understanding, students reason about situations, diagrams, and expressions that represent division. Students look for patterns and assess the reasonableness of the quotients they find.

Section C: Problem Solving with Fractions

In this section, students apply what they have learned in the previous sections through problem solving. Students see how fraction multiplication and division are useful in different contexts. They use the meaning of multiplication and division to decide which operation to use to solve various problems. As students share strategies, they may realize that some problems could be solved using either division or multiplication.

Try it at home!

Near the end of the unit, ask your fifth grader to solve the following question:

A painter was painting a wall yellow. He painted $\frac{1}{3}$ of the wall yellow before being told he needed to paint the wall blue. At the end of the day, he was able to cover up $\frac{1}{5}$ of the yellow wall in blue. How much of the entire wall is blue?

Questions that may be helpful as they work:

- Can you draw a diagram to help you solve the problem?
- What equation would you use to solve the problem?
- Can you solve this using division or multiplication instead?

Solution:

$\frac{1}{15}$ of the entire wall is blue.

Sample response:

- A diagram that shows $\frac{1}{3}$ of a rectangle shaded. Then the shaded third is divided into five pieces and one of those pieces is shaded darker.
- $\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$
- Yes, I can also solve using division: $\frac{1}{3} \div 5 = \frac{1}{15}$.