Module 1: Composing and Decomposing

TOPIC 2: POSITIVE RATIONAL NUMBERS

The focus of this topic is fraction multiplication and division. Students review creating and using physical models to represent and compare fractions, as well as to determine equivalent fractions. They use an area model for multiplication with fractions before using an algorithm. Similarly, students use visual models to represent division with fractions, and then transition to abstract thinking about fraction division with a dividing across strategy. Finally, students learn the standard algorithm for dividing fractions. They rewrite division expressions as multiplication by the reciprocal, or multiplicative inverse. Students may not achieve fluency for fraction multiplication and division in this topic, as fluency takes time and practice. They will continue to develop fluency with fraction operations throughout the course.

Where have we been?

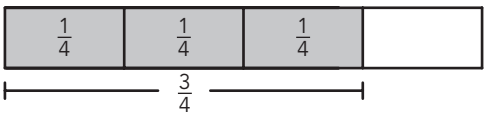
Students began their formal study of fractions in grade 3, where they understand fractions as numbers and can reason about relative sizes of fractions. By the end of grade 5, students have learned to compare and order fractions, determine equivalent fractions, as well as add and subtract fractions with like and unlike denominators. Students have also learned to multiply whole numbers by fractions, divide whole numbers by unit fractions and divide unit fractions by whole numbers.

Where are we going?

Students learn various methods to multiply and divide fractions throughout this topic. By combining this knowledge with estimation and reasoning, students can choose the most efficient strategy for a given problem. Students will solve problems involving rational numbers throughout middle and high school, as they apply their learning to work with multi-step equations, inequalities, and functions.

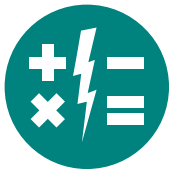
Using Bar Models to Represent Quotients with Fractions

A bar model can show the quotient of two fractions, such as $\frac{3}{4} \div \frac{1}{4}$. The division expressions asks, how many $\frac{1}{4}$s are in $\frac{3}{4}$?



There are 3 one-fourths in $\frac{3}{4}$, so $\frac{3}{4} \div \frac{1}{4} = 3$.

Myth: "If I can get the right answer, then I should not have to explain why."



Sometimes you get the right answer for the wrong reasons. Suppose a student is asked "What is 4 divided by 2?" and she confidently answers "2!" If she does not explain any further, then it might be assumed that she understands how to divide whole numbers. But, what if she used the following rule to solve that problem? "Subtract 2 from 4 one time." Even though she gave the right answer, she has an incomplete understanding of division.

However, if she is asked to explain her reasoning by drawing a picture, creating a model, or giving a different example, the teacher has a chance to remediate her flawed understanding. If teachers aren't exposed to their students' reasoning for both right and wrong answers, then they won't know about or be able to address misconceptions. This is important because mathematics is cumulative: new lessons build upon previous understandings.

Ask your student to explain his or her thinking, when possible, even if you don't know whether the explanation is correct. When children (and adults) explain something to someone else, it helps them learn. Just the process of trying to explain is helpful.

#mathmythbusted

Talking Points

You can support your student's learning of fraction multiplication and division by practicing with them. Ask your student to explain their work and verify that their solution makes sense.

Some Things to Look For

Encourage students to use visual models to represent fraction multiplication and division before moving to the algorithms. Students will have a deeper understanding of fraction operations if they take their time and make sense of the procedures.

Key Terms

benchmark fraction

Benchmark fractions are common fractions, like $\frac{1}{2}$ or $\frac{1}{4}$, that you can use to estimate the value of other fractions.

rational number

A rational number is a number that can be written in the form $\frac{a}{b}$, where a and b are both whole numbers greater than 0.

multiplicative inverse

The multiplicative inverse of a number $\frac{a}{b}$ is the number $\frac{b}{a}$, where a and b are nonzero numbers. The multiplicative inverse is also known as the *reciprocal*.