## Arithmetic Operations Including Division of Fractions

In this 19-lesson module, students complete their understanding of the four operations as they study division of whole numbers, division by a fraction, division of decimals and operations on multi-digit decimals. This expanded understanding serves to complete their study of the four operations with positive rational numbers, preparing students for understanding, locating, and ordering negative rational numbers and working with algebraic expressions.

Below is an example of how a fraction bar model can be used to represent the quotient in a division problem.

$$\frac{3}{4} \div \frac{1}{12}$$

Draw a model to represent the quotient.
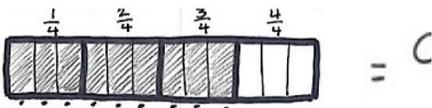
The chart below shows the relationships between various fractions and may be a great tool for your child throughout this module.

What Came Before this Module:

Students added, subtracted, and multiplied fractions and decimals (to the hundredths place). They divided a unit fraction by a non-zero whole number as well as divided a whole number by a unit fraction.

What Comes After this Module:

Students will extend the number line (both horizontally and vertically) to include the opposites of whole numbers and will use the number line as a model to relate integers and other rational numbers to statements of order in real-world contexts.

Key Words

Greatest Common Factor
The greatest common factor of two whole numbers (not both zero) is the greatest whole number that is a factor of each number. For example, the GCF of 24 and 36 is 12 because when all of the factors of 24 and 36 are listed, the largest factor they share is 12.

Least Common Multiple
The least common multiple of two whole numbers is the least whole number greater than zero that is a multiple of each number. For example, the LCM of 4 and 6 is 12 because when the multiples of 4 and 6 are listed, the smallest or first multiple they share is 12.

Multiplicative Inverses
Two numbers whose product is 1 are multiplicative inverses of one another. In the example below, three-fourths and four-thirds are multiplicative inverses of one another because their product is 1.

$$\frac{3}{4} \times \frac{4}{3} = \frac{4}{3} \times \frac{3}{4} = 1.$$

How can you help at home?

- ✓ Ask your child what they learned in school today and ask them to show you an example.
- ✓ Reinforce fast recall of multiplication and division facts by playing math games using flashcards. See how many facts your child can answer in 25 seconds. Then, see if they can answer more questions the next time by playing again!
- ✓ Challenge your child to create three different examples of multiplicative inverses using the example given in the *Key Words* section of this newsletter.

Key Common Core Standards:

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

- Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

Compute fluently with multi-digit numbers and find common factors and multiples.

- Fluently divide multi-digit numbers using the standard algorithm.
- Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1 − 100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

Our model in the spotlight is the **area model**. This model helps break a problem into smaller parts, making the problem easier to understand and solve. The key feature of the area model used in this module is that it represents the quotient of two numbers as a rectangular region comprised of unit squares. Below is a problem that can be solved using an area model. The solution is also shown below.
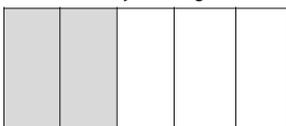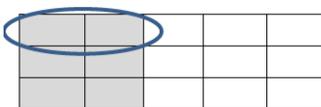
Problem:

Imagine that you have $\frac{2}{5}$ of a cup of frosting that you need to share equally

$$\frac{2}{5} \div 3$$

We can start by drawing a model of two-fifths.

How can we show that we are dividing two-fifths into three equal parts?

What does this part represent?

From the visual model, we can determine that $\frac{2}{5} \div 3 = \frac{2}{15}$.

A positive attitude towards math is very important in helping your child succeed in school. In the ever-changing world we live in, a strong foundation in math, paired with excellent problem solving skills may open many doors for your child in the years to come!
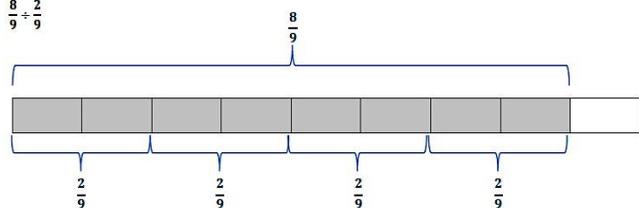
Spotlight on a model frequently used in this module:

Area Model

Below are examples of how to use a *fraction bar*, a *number line*, and an *area model* to solve problems seen in this module.

Fraction bar:
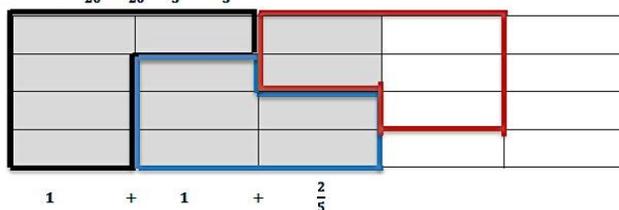
$$\frac{8}{9} \div \frac{2}{9}$$

$$\frac{8}{9}$$

$$\frac{2}{9} \qquad \frac{2}{9} \qquad \frac{2}{9} \qquad \frac{2}{9}$$

Here we have 4 groups of $\frac{2}{9}$. Therefore, the answer is 4.

Area Model:
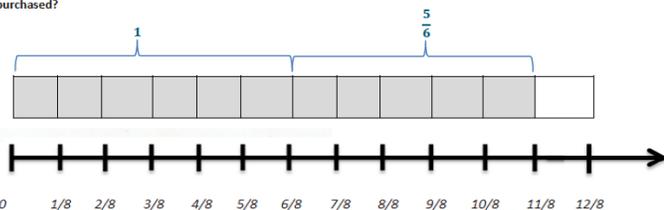
$$\frac{3}{5} \div \frac{1}{4}$$

This can be rewritten as $\frac{12}{20} \div \frac{5}{20} = \frac{12}{5} = 2\frac{2}{5}$.

$$1 \quad + \quad 1 \quad + \quad \frac{2}{5}$$

Number Line:

Molly's friend Xavier purchased $\frac{11}{8}$ cups of strawberries, and he eats $\frac{3}{4}$ cup servings. How many servings has he purchased?

$$1 \qquad \qquad \frac{5}{6}$$

| 0 | 1/8 | 2/8 | 3/8 | 4/8 | 5/8 | 6/8 | 7/8 | 8/8 | 9/8 | 10/8 | 11/8 | 12/8 |

There are 1 and $\frac{5}{6}$ servings.