



## Topic F

# Multiplication with Fractions and Decimals as Scaling and Word Problems

## 5.NF.5, 5.NF.6

<b>Focus Standard:</b>	5.NF.5	Interpret multiplication as scaling (resizing), by: <ol style="list-style-type: none"> <li>Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.</li> <li>Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence <math>a/b = (n \times a)/(n \times b)</math> to the effect of multiplying <math>a/b</math> by 1.</li> </ol>
	5.NF.6	Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
<b>Instructional Days:</b>	4	
<b>Coherence -Links from:</b>	G4–M3	Multi-Digit Multiplication and Division
	G5–M2	Multi-Digit Whole Number and Decimal Fraction Operations
	<b>-Links to:</b>	G6–M2 Arithmetic Operations Including Division of Fractions
		G6–M4 Expressions and Equations

Students interpret multiplication in Grade 3 as equal groups, and in Grade 4, students begin understanding multiplication as comparison. Here, in Topic F, students once again extend their understanding of multiplication to include scaling (**5.NF.5**). Students compare the product to the size of one factor, given the size of the other factor (**5.NF.5a**) without calculation (e.g.,  $486 \times 1,327.45$  is twice as large as  $243 \times 1,327.45$  because  $486 = 2 \times 243$ ). This reasoning, along with the other work of this module, sets the stage for students to reason about the size of products when quantities are multiplied by 1, by numbers larger than 1, and numbers smaller than 1. Students relate their previous work with equivalent fractions to interpreting multiplication by  $\frac{n}{n}$  as multiplication by 1 (**5.NF.5b**).

Students build on their new understanding of fraction equivalence as multiplication by  $\frac{n}{n}$  to convert fractions to decimals and decimals to fractions. For example,  $\frac{3}{25}$  is easily renamed in hundredths as  $\frac{12}{100}$  using multiplication of  $\frac{4}{4}$ . The word form of *twelve hundredths* will then be used to notate this quantity as a decimal. Conversions between fractional forms will be limited to fractions whose denominators are factors of 10, 100, or 1,000. Students will apply the concepts of the topic to real world, multi-step problems (5.NF.6).

#### A Teaching Sequence Toward Mastery of Multiplication with Fractions and Decimals as Scaling and Word Problems

**Objective 1:** Explain the size of the product, and relate fraction and decimal equivalence to multiplying a fraction by 1.  
(Lesson 21)

**Objective 2:** Compare the size of the product to the size of the factors.  
(Lessons 22–23)

**Objective 3:** Solve word problems using fraction and decimal multiplication.  
(Lesson 24)