



Grade 5 - Unit E - Multiplying and Dividing Fractions

Unit Focus

In Unit 5, students extend their understandings of multiplication and division to working with fractions. The unit begins with a review and extension of skills and concepts first introduced in Grade 4 to solidify their understandings of whole-number-by-fraction multiplication. Then, students use rectangular arrays to model and solve fraction-by-fraction multiplication problems. Students generalize their understanding of the model to be able to multiply fractions without a model and to consider how the size of the factors when multiplying with fractions impacts the size of the product relative to the factors. Students are also introduced to division of whole numbers by unit fractions, and unit fractions by whole numbers. There is a strong emphasis throughout the unit on sense-making and understanding, as students tackle material that is conceptually challenging.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer		
Standards - Common Core - Mathematics: 5 - Perform operations with multi-digit whole numbers and with decimals to hundredths. - Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. (CCSS.MATH.CONTENT.5.NBT.B.7) - Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. (CCSS.MATH.CONTENT.5.NF.B.4) - 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, $(a/b) \times (c/d) = ac/bd$.) (CCSS.MATH.CONTENT.5.NF.B.4A) - 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. (CCSS.MATH.CONTENT.5.NF.B.4B) - Interpret multiplication as scaling (resizing), by: (CCSS.MATH.CONTENT.5.NF.B.5) - 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. (CCSS.MATH.CONTENT.5.NF.B.5A)	<i>Students will be able to independently use their learning to...</i> T1 Apply models to solve problems. T2 Apply an understanding of known patterns to new problems and make connections between concepts.		
	Meaning		
	Understanding(s)	Essential Question(s)	
	<i>Students will understand that...</i> U1 Mathematicians create or use models to generalize, represent, and solve problems. U2 Mathematicians use their knowledge from patterns and structures to apply efficient strategies to solve a problem.	<i>Students will keep considering...</i> Q1 What model best represents this problem? Q2 How can a pattern be generalized to a rule? Q3 How can we apply knowledge of a pattern to similar problems? Q4 How can I decompose a number to make it easier to work with?	
	Acquisition of Knowledge and Skill		
	Knowledge	Skill(s)	
<i>Students will know...</i> K1 the difference between multiplication of fractions and division of fractions. K2 how to find the product and quotient of fractions	<i>Students will be skilled at...</i> S1 solving multiplication of fractions with the area model S2 solving multiplication of fractions using the standard algorithm		

Stage 1: Desired Results - Key Understandings

- 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 $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1. *(CCSS.MATH.CONTENT.5.NF.B.5B)*
- Apply and extend previous understandings of multiplication and division.
- Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *(CCSS.MATH.CONTENT.5.NF.B.6)*
- Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. *(CCSS.MATH.CONTENT.5.NF.B.7)*
- Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for $(1/3) \div 4$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $(1/3) \div 4 = 1/12$ because $(1/12) \times 4 = 1/3$. *(CCSS.MATH.CONTENT.5.NF.B.7A)*
- Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for $4 \div (1/5)$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $4 \div (1/5) = 20$ because $20 \times (1/5) = 4$. *(CCSS.MATH.CONTENT.5.NF.B.7B)*
- Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, how much chocolate will each person get if 3 people share $1/2$ lb of chocolate equally? How many $1/3$ -cup servings are in 2 cups of raisins? *(CCSS.MATH.CONTENT.5.NF.B.7C)*
- Mathematical Practices
- Model with mathematics. *(CCSS.MATH.MP.4)*
- Look for and express regularity in repeated reasoning. *(CCSS.MATH.MP.8)*

Madison Public Schools Profile of a Graduate

Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. *(POG.1.2)*

K3 how to model division and multiplication of fractions

K4 how the size of the fractional factor impacts the product

K5 Vocabulary: denominator, numerator, factor, fraction, improper fraction, product, quotient, equivalent fraction, area model, equation, expression, fraction model

K6 the relationship between dividing fractions and dividing with decimals

S3 determining a fractional amount of a whole number.

S4 dividing whole number by a fraction or a fraction by a whole number using a model

S5 determining the proper operation to solve fraction word problems (multiplication or division).

S6 using an area model to represent division with decimals