Unit 4

Multiplication and Division of Fractions and Decimal Fractions

Grade 5
Math

Description:

In Unit 4, students use models and equations to multiply a fraction by a whole number, a whole number times a fraction, or a fraction by a fraction. They solve real world and mathematical problems involving multiplication of fractions and mixed numbers. They divide whole numbers by fractions and fractions by whole numbers. Students apply their knowledge of order of operations and writing expressions as they solve equations involving fraction operations. Students learn to express the remainder of a division problem as a fraction as they solve multi-step real-life and mathematical problems.

Standards:

Number and Operations - Fractions	
Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	
5.NF.3	Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*
5.NF.4	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product of *(m/n)* × *q* as parts of a partition of q into *n* equal parts; equivalently, as the result of a sequence of operations *m* × *q* ÷ *n*. *For example, use a visual fraction model to show understanding, and create a story context for (m/n) × q.* b. Construct a model to develop understanding of the concept of multiplying two fractions and create a story context for the equation. [in general, (*m/n*) x (*c/d*) = (*mc*)/(*n/d*).] c. 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.

	d. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.
5.NF.5	Interpret multiplication as scaling (resizing), by: a. 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. b. 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). c. Explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number. Relating the principle of fraction equivalence a/b = (n×a)/(n×b) to the effect of multiplying a/b by 1.
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.
5.NF.7	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (Students able to multiple fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade level.) a. 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) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.* b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.* c. 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?*
Measurement and Data	
Convert like measurement units within a given measurement system.	
5.MD.1	Convert among different-sized standard measurement units within a given measurement system and use these conversions in solving multi-step, real world problems. *(e.g., convert 5 cm to 0.05 m; 9 ft to 108 in).*
5.MD.2	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for

	this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*
Operations and Algebraic Thinking	
Write and interpret numerical expressions.	
5.OA.1	Use parentheses or brackets in numerical expressions, and evaluate expressions with these symbols.
5.OA.2	Write simple expressions that record calculations with whole numbers, fractions, and decimals, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 +7). Recognize that 3 × (18,932 + 9.21) is three times as large as 18,932 + 9.21, without having to calculate the indicated sum or product.*

Enduring Understandings:

- Multiplication does not always make the product larger than the factors.
- Division does not always make the quotient smaller than the factors.
- A fraction is relative to the size of the whole or unit.
- Creating visual models aids in multiplying and dividing fractions.

Essential Questions:

- How do operations with fractions compare/relate to operations with whole numbers and decimals?
- How is multiplying or dividing whole numbers similar to multiplying or dividing fractions?
- How can multiplying and dividing fractions be modeled?