



Grade 5 Multiplication and Division of Fractions – Conceptual Lessons/Unit Outline

SUGGESTED TIME FRAME: 5 Weeks

Time	Lesson Title	Knowledge Type, Claims, & Math Practices	Materials	Lesson Overview
1-2 class periods	Sharing Vanilla Wafers	KT: C, RK Claim: 1, 2, 3 MP: 1, 2, 3, 5, 6	<ul style="list-style-type: none">• Play-Doh (1 can per student or pair)• Plastic Knives (1 per student or pair)• Optional: Plates• Optional: Vanilla Wafers	In this lesson, students will build on their understanding of division as equal shares using Play-Doh to divide amounts that do not partition evenly. They will understand and describe fractions as division of whole numbers as well as explain the meaning of the numerator and denominator in context.
1 class period	Making a Zip Line	KT: C, RK Claim: 1, 2, 3 MP: 1, 2, 3, 5, 6	<ul style="list-style-type: none">• Play-Doh (1 can per student or pair)• Plastic Knives and Plates, or Strips of Paper• Optional: Rope and Scissors• Optional: Rulers	Students will cut or fold Play-Doh representing a linear measure into equal parts to understand the relationship between division of whole numbers and fractions as well as to explain the meaning of the numerator and denominator of a fraction.
1-2 class periods	Practice and Problem Solving: Using Fractions to Represent the Division of Whole Numbers	KT: P, RK Claim: 1, 2 MP:		<i>Teachers find or create</i>



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2-3 class periods	Painting a Wall— Area and Multiplication of Fractions	KT: C Claim: 1, 3 MP: 1, 2, 3, 7, 8	<ul style="list-style-type: none"> • Play-Doh (1 can per student or pair) • Plastic Knives and Plates • Colored Pencils or Highlighters 	Students will represent a fraction of a rectangle using Play-Doh and then show what a fraction of that fraction would represent. Students will connect this representation to a visual model of the area model and use this to multiply fractions. Students will study patterns to generalize a rule for multiplication of fractions.
2-3 class periods	Practice: Multiplying Fractions, Including Mixed Numbers	KT: P Claim: 1 MP:	<ul style="list-style-type: none"> • None 	<i>Teachers find or create</i>
2-3 class periods	Problem Solving: Multiplying Fractions, Including Finding Area	KT: RK Claim: 3 MP:	<ul style="list-style-type: none"> • None 	<i>Teachers find or create</i>



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Time	Lesson Title	Knowledge Type, Claims, & Math Practices	Materials	Lesson Overview
1-2 class periods	Multiplying Fractions on a Number Line	KT: C Claim: 1, 3 MP: 1, 2, 3, 7, 8	<ul style="list-style-type: none"> Optional: Number Line or Meter Stick 	<p>Students will use a number line to model the multiplication of fractions, seeing a factor as representing one distance and the other factor representing the fraction of that distance they will travel. Students will study the results to explain when the product of two fractions is greater than, equal to, or less than 1. Students will look at patterns with the factors and products to derive the fact that $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$.</p>
1 class period	Practice: Multiplying Fractions and Scaling	KT: P Claim: 1, 3 MP:	<ul style="list-style-type: none"> None 	<p><i>Teachers find or create</i> <i>Students show the product of two fractions and decide if the product is greater than 1, equal to 1, or less than 1.</i></p>
15-30 minutes (and then as needed later)	The Factor Game- Fraction by Fraction Multiplication	KT: P, RK Claim: 1, 3 MP: 2, 3, 6	<ul style="list-style-type: none"> 2-Color Counters (about 20 per student or team) Paperclips (2 per team) 	<p>Students will play a game to practice multiplication of fractions by choosing two factors and placing a counter on a square in an attempt to cover 4 squares in a row.</p>
2-3 class periods	Problem Solving: Using a Number Line to Multiply Fractions	KT: RK Claim: 2 MP:	<ul style="list-style-type: none"> None 	<p><i>Teachers find or create</i></p>



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1-2 class periods	Dividing Fractions I	KT: C Claim: 1 MP: 1, 2, 3, 7	<ul style="list-style-type: none"> • Play-Doh (1 small tub per student) • Plastic Knives (1 per student) • Paper Plates (1 per student) • Optional: Colored Pencils 	Students will use quotative division to rewrite division of fraction problems as “How many ____ are in ____”, and use this definition with an area model to divide a whole number by a fraction. Students will first understand this by seeing how many of a smaller pattern block fit into a larger one and then relating the context to the math behind it.
1-2 class periods	Dividing Fractions II	KT: C Claim: 1 MP: 1, 2, 3, 7	<ul style="list-style-type: none"> • Optional: Colored Pencils or Highlighters 	Students will use partitive division and an area model to divide fractions by whole numbers. Students will explain the relationship between the division and corresponding multiplication problem.
1 class period	Dividing Fractions: Noticing Patterns	KT: C Claim: 1, 3 MP: 3, 6, 7, 8	<ul style="list-style-type: none"> • Optional: Play-doh, plastics knives 	Students will study patterns for each type each type of division problem from the previous lessons (whole number divided by a unit fraction and a unit fraction divided by a whole number) to draw conclusions about what is happening with the size and number of pieces and explain what happens with the resulting quotient.
2 class periods	Practice: Dividing Whole Numbers by Fractions and Fractions by Whole Numbers	KT: P Claim: 1 MP:	<ul style="list-style-type: none"> • None 	<i>Teachers find or create</i>



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1-2 class periods	Dividing Fractions on a Number Line	KT: C Claim: 1, 3 MP: 1, 2, 3, 5, 7, 8	<ul style="list-style-type: none"> Meter Sticks (2) Chalk number lines drawn from 0-4 in thirds (1 per pair) 	Students will use a number line to model the division of fractions, using quotative (measurement) division. Students will study the models to relate division to finding a missing factor in multiplication and then describe the relationship between the size of the dividend and divisor with the size of the quotient.
1 class period	Fraction Multiplication and Division Problem Solving	KT: RK Claim: 2, 3, 4 MP: 1, 3, 4	<ul style="list-style-type: none"> None 	Students will use context to determine whether a given problem is better interpreted as multiplication or division of fractions. Students can use bar models or other strategies to solve real world problems involving multiplication or division of fractions.
2-3 class periods	Problem Solving: Dividing Fractions	KT: RK Claim: 2 MP:	<ul style="list-style-type: none"> None 	<i>Teachers find or create</i>
1 class period	How Far Can You Jump?	KT: RK Claim: 2, 3 MP: 1, 5	<ul style="list-style-type: none"> Place for students to run and jump Starting Line for each group Tool to mark landing distance for each group Meter Sticks (1 per group) 	Students will measure the distance (in fractions of meters) each student can jump and represent this data on a line plot. Students will answer questions comparing distances with multiplicative comparisons, representing each question with a math sentence and solution applying the four operations with fractions.



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1-2 class periods	Problem Solving with Line Plots	KT: RK Claim: 2 MP:		<i>Teachers find or create</i>

CODES:

Types of Knowledge:

RK- Relational Knowledge

SBAC Claims:

Claim 1: Concepts/Procedures



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C-Conceptual Knowledge

P-Procedural Fluency

M-Memorization

Claim 2: Problem Solving

Claim 3: Communication & Reasoning

Claim 4: Model and Data Analysis

Math Practices Embedded:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

STANDARDS:

Number and Operations–Fractions (NF)

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



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3. Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). 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?*
4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
 - a. 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, $(a/b) \times (c/d) = ac/bd$.)*
 - b. 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.
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); 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.
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.



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7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.¹
 - a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for $(1/3) \div 4$, 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 $(1/12) \times 4 = 1/3$.*
 - b. 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 $20 \times (1/5) = 4$.*
 - 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 (MD)

Represent and Interpret Data.

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.*

1. Students able to multiply 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.