

Grade Five Mathematics Focus: Fractions, Division and Decimals

**Operations on fractions; unit fractions; operations with decimals to the hundredths;
 Volume**

Numbers and Operations in Base 10

Common Core State Standards

- 5.NBT.A.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
- 5.NBT.A.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.
- 5.NBT.A.3 Read, write, and compare decimals to thousandths.
 - 5.NBT.A.3.A Read and write decimals to thousandths using base-ten numerals, number names, and expanded form.
 - 5.NBT.A.3.B Compare two decimals to thousandths based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.
- 5.NBT.A.4 Use place value understanding to round decimals to any place.
- 5.NBT.B.5 Fluently multiply multi-digit whole numbers using the standard algorithm.
- 5.NBT.B.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
- 5.NBT.B.7 Add, subtract, multiply, and divide decimals to hundredths

Unit Name:

Enduring Understanding

- Every numerical operation has an inverse.
- Computational fluency requires efficient, accurate and flexible methods for computing.
- Multiplying by a power of 10 shifts the digits of a whole number or decimal that many places to the left.
- The exponent not only indicates how many places the digits of a whole number or decimal is shifting, but also that you are multiplying or making the number 10 times greater by a factor of

Essential Questions

- How does understanding the structure of the number system help you solve problems?
- How can you use the inverse of a numerical operation to help you compute an answer?
- What occurs when whole numbers and/or decimals are multiplied, divided, or ordered by powers of 10?

	the exponent.	
<p>Knows:</p> <ul style="list-style-type: none"> • How to regroup numbers based on the base ten system • Place-value understanding is needed to round decimals to any place • How to round numbers, including decimals • Multi-digit computation is just an extension of single digit computations 	<p>Understands:</p> <ul style="list-style-type: none"> • In a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left • How to round decimals using base ten understanding • When to use the relationship between multiplication and division • How to use various models to explain how an algorithm works • How to use the four operations with decimals 	<p>Does:</p> <ul style="list-style-type: none"> • Read and write decimals to thousandths using base-ten numerals, number names, and expanded form • Compare two decimals to thousandths • Use $>$, $=$, and $<$ symbols to record the results of comparisons • Fluently multiply multi-digit whole numbers using the standard algorithm • Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors • Illustrate and explain calculations by using equations, rectangular arrays, and/or area models. • Add, subtract, multiply, and divide decimals to hundredths
<p>Essential Vocabulary: base ten, tenth, hundredth, thousandth, decimal, place value, exponent, power of ten, inverse operation</p>		

Common Core State Standards

- 5.NF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.
- 5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.
- 5.NF.B.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.
- 5.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
 - 5.NF.B.4.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 $a \times q \div b$.
 - 5.NF.B.4.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.NF.B.5 Interpret multiplication as scaling (resizing)
 - 5.NF.B.5.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.
 - 5.NF.B.5.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.
- 5.NF.B.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.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.
 - 5.NF.B.7.A Interpret division of a unit fraction by a non-zero whole number, and compute such quotients.
 - 5.NF.B.7.B Interpret division of a whole number by a unit fraction, and compute such quotients.
 - 5.NF.B.7.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.

Unit Name:

Enduring Understanding

- An understanding of numbers is developed by recognizing fractions and decimals as different representations of numbers on a number line
- Fractions and decimals represent a relationship between two numbers
- Fractions can be used to explain real world problems
- Benchmark fractions can be used to estimate the reasonableness of results with operations of fractions
- Equivalent fractions are critical when adding and subtracting fractions with unlike denominators

Essential Questions

- How can parts of a whole be expressed?
- Why is it important to round and estimate whole numbers and fractions/decimals?
- How do you use previous understandings of multiplication and division to multiply or divide fractions?
- How does multiplication and division of fractions help to solve real world problems?
- What does it mean to multiply a number by a fraction?

	<ul style="list-style-type: none"> Fractions are division models 	
<p>Knows:</p> <ul style="list-style-type: none"> How to find a common denominator How to add fractions Sums and differences of mixed numbers can be estimated by rounding Fractions and mixed numbers can be multiplied Fractions and mixed numbers can be divided Products and quotients can be estimated by rounding and by using an understanding of relationships 	<p>Understands:</p> <ul style="list-style-type: none"> Fractions must have common denominators in order to be added or subtracted Fractions with unlike denominators can be added or subtracted by renaming fractions with equivalent fractions with like denominators A fraction is a division of the numerator by the denominator ($a/b = a \div b$) When multiplying by a fraction less than one, the product will be smaller than the first factor When multiplying by a fraction greater than one, the product will be larger than the first factor Parts of a whole can be expressed as fractions and/or decimals Fraction sums and differences can be estimated by replacing fractions with the closest half or whole Different strategies can be used to add, subtract, multiply, and divide fractions 	<p>Does:</p> <ul style="list-style-type: none"> Find common denominators in order to add and subtract fractions with unlike denominators Solve addition and subtraction word problems containing fractions with either common or unlike denominators Use equivalent fractions, models, decomposition/composition, number lines, and regrouping as strategies to add and subtract fractions Use equivalent fractions as benchmarks, show benchmarks on a number line and decompose benchmark fractions Use area models, fraction strips, geoboards, pattern blocks and number lines as strategies to model sums and differences Use strategies (unit, benchmark, number line) to determine if the answer is reasonable Understand and explain in models that fractions are division of whole numbers Use measurement models for division of fractions Multiply a fraction or whole number by a fraction Represent multiplication of a fraction by a fraction or whole number with drawings and story problems Find the area of a rectangle Interpret multiplication as scaling to solve real world problems involving multiplication of fractions and mixed numbers Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions

Essential Vocabulary: Common denominator, benchmark fraction, equivalent fractions, mixed number, improper fraction, unit fraction

Common Core State Standards

- 5.OA.A.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
- 5.OA.A.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.
- 5.OA.B.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.

Unit Name:	Enduring Understanding <ul style="list-style-type: none">● Expressions can be used to record calculations	Essential Questions <ul style="list-style-type: none">● How can patterns help us solve problems?● How are the values of an algebraic expression and numerical expression found?● How can you write a variety of expressions that have the same value?● How are the coordinate points related to patterns?
Knows: <ul style="list-style-type: none">● An algebraic expression or equation can be represented in a variety of ways that have the same value● How to plot points on a coordinate plane	Understand <ul style="list-style-type: none">● The order in which you solve multi-operational equations affects the value of the answer● Expressions can be written to describe mathematical operations● Patterns can be put together to generate new patterns● To determine if there is a pattern present in a set of numbers, one can look for constant change between the variables	Does: <ul style="list-style-type: none">● Use the order of operations to find answers to expressions that are multi-operational● Write simple expressions that record calculations with numbers● Interpret numerical expressions without evaluating them● Generate patterns from other patterns● Graph ordered pairs generated by the pattern on a coordinate plane

Essential Vocabulary: Evaluate, parentheses, ordered pairs, corresponding terms, coordinate plane

Common Core State Standards

- 5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.
- 5.MD.B.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.
- **5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.**
 - 5.MD.C.3.A A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.
 - 5.MD.C.3.B A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.
- **5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.**
- **5.MD.C.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.**
 - 5.MD.C.5.A Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.
 - 5.MD.C.5.B Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.
 - 5.MD.C.5.C Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

Unit Name: Measurement and Data

Enduring Understanding

- Relationships exist that enable you to convert between units of measure by multiplying and dividing
- A line plot organizes data on a number line and is useful for showing visually how a set of data is distributed
- Line plots can be analyzed to recognize outliers, generate median, and answer questions

Essential Questions

- Why would one need to convert measurements from one unit to another?
- Why is volume measured in cubic units?
- Why is volume additive?

Knows:

- Measurement units can vary between the customary system and the metric system
- Data entries do not have to be only whole numbers
- The scale on a line plot must be evenly spaced
- Volume is an attribute of solid figures
- The concept of

Understands:

- A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume
- A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units
- Place value helps one to understand the metric system
- How to interpret a line plot
- How to represent measurement data using a line plot

Does:

- Convert among different-sized standard measurement units within a given measurement
- Use measurements to solve multi-step, real world problems
- Plot fractional data on a line plot and solve fractional word problems using the data
- Identify volume as an attribute of solid figures and understand concepts of volume measurement
- Measure volumes by counting unit cubes with various measurements
- Apply the operations of multiplication and addition to find the volume of solid figures

<p>volume measurement involves filling up space</p> <ul style="list-style-type: none"> • Volume is related to the operations of multiplication and addition • Volume is additive 		
<p>Essential Vocabulary: Line plot, attribute, capacity, convert, cubic unit, customary system, metric system, volume, formula</p>		

Geometry

Common Core State Standards

- 5.G.A.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates.
- 5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.
- 5.G.B.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.
- 5.G.B.4 Classify two-dimensional figures in a hierarchy based on properties.

<p>Unit Name: Geometry</p>	<p>Enduring Understanding</p> <ul style="list-style-type: none"> • Relationships can be described and generalizations made for mathematical situations that have numbers or objects that repeat in predictable ways 	<p>Essential Questions</p> <ul style="list-style-type: none"> • How are points graphed? • How can we show the relationship between patterns with given rules using a coordinate plane?
<p>Knows:</p> <ul style="list-style-type: none"> • How to identify and define a coordinate system • An ordered pair of numbers defines a point within a coordinate plane • A point has a value on a coordinate plane • How to classify and 	<p>Understands:</p> <ul style="list-style-type: none"> • Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis • The convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate) • Relationship and patterns within geometric 	<p>Does:</p> <ul style="list-style-type: none"> • Form ordered pairs and graph them on a coordinate plane • Classify two-dimensional figures into categories based on their properties

understand the attributes of two-dimensional figures	figures	
Essential Vocabulary: coordinate plane, ordered pair, x-axis, y-axis, origin, x-coordinate, y-coordinate, hierarchy, concave polygon , convex polygon		