

Grade Four Mathematics Focus: Multiplication and Division; Fractions

Fluency with multi-digit multiplication and dividends; Fractional equivalence and operations on fractions; Developing an understanding of geometric figures and their properties

Number and Operations in Base Ten

Common Core State Standards

- 4.NBT.A.1 Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right.
- 4.NBT.A.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.
- 4.NBT.A.3 Use place value understanding to round multi-digit whole numbers to any place.
- 4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.
- 4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations.
- 4.NBT.B.6 Find whole-number quotients and remainders with up to four-digit dividends and one-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.

<p>Unit Name:</p>	<p>Enduring Understanding:</p> <ul style="list-style-type: none"> ● Every digit in a multi-digit number has a value based on its place value location ● All multi-digit numbers can be expressed in different ways ● For a given set of numbers, there are relationships that are always true called properties ● There is an inverse relationship between multiplication and division ● Place value understanding and properties of operations can be used to perform multi-digit arithmetic 	<p>Essential Questions:</p> <ul style="list-style-type: none"> ● Why is our number system called “base ten”? ● How does place value support the four operations? ● What is the relationship between multiplication and division? ● Why is it important to have number systems?
<p>Knows:</p> <ul style="list-style-type: none"> ● The relationships/magnitude of digits within the base-ten number system ● The placement of a digit dictates its value, how it is read, written, and compared 	<p>Understands:</p> <ul style="list-style-type: none"> ● Numbers are read and written using the base-ten numeration system, using standard form, word form or expanded form based on place value understanding ● Our number system is based on groups of ten ● There is more than one way to estimate a sum, difference, product, or quotient ● Representing numbers and numerical expressions in equivalent forms allow us to make calculations mentally 	<p>Does:</p> <ul style="list-style-type: none"> ● Demonstrate their knowledge of place value by using a digit in a column that is 10 times more than the digit to the right ● Read and write multi-digit numbers using a variety of explanations such as expanded notation and base ten (expanded form) ● Compare multi-digit numbers using their knowledge of place value ● Appropriately use symbols $<$, $>$, and $=$ to compare quantities

<ul style="list-style-type: none"> • Multiplication is repeated addition • Division is repeated subtraction • Multiplication and division are related operations • Strategies and methods to solve problems 	<ul style="list-style-type: none"> • The standard algorithm for addition and subtraction is based on the understanding of place value • Multiplication is the iteration of a unit taken a certain number of times • Division is the equal distribution of a total amount 	<ul style="list-style-type: none"> • Round a multi-digit number to a specific place value • Add and subtract multi-digit numbers using the standard algorithm and explain the process • Multiply multi-digit numbers using strategies based on place value and properties of operations • Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers • Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors • Explain process when performing operations • Use place value and number sense to justify reasonability of an answer
<p>Essential Vocabulary: Sum, difference, product, factor, divisor, dividend, quotient, remainder, rounding, expanded form, expanded notation, standard form, standard algorithm</p>		

Number and Operations in Base Ten Fractions

Common Core State Standards

- 4.NF.A.1 Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
- 4.NF.A.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $1/2$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols $>$, $=$, or $<$, and justify the conclusions.
- 4.NF.B.3 Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$.
 - 4.NF.B.3.A Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
 - 4.NF.B.3.B Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.
 - 4.NF.B.3.C Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
 - 4.NF.B.3.D Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
- 4.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.
 - 4.NF.B.4.A Understand a fraction a/b as a multiple of $1/b$.
 - 4.NF.B.4.B Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number.
 - 4.NF.B.4.C Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem.
- 4.NF.C.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.

- 4.NF.C.6 Use decimal notation for fractions with denominators 10 or 100.
- 4.NF.C.7 Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols $>$, $=$, or $<$, and justify the conclusions

<p>Unit Name:</p>	<p>Enduring Understanding</p> <ul style="list-style-type: none"> ● Parts of a whole can be represented by multiple equivalent fractions ● Fractions with the same denominator are multiples of each other ● Fractions are related to decimals ● Adding and subtracting fractions involves joining or removing parts of the whole 	<p>Essential Questions</p> <ul style="list-style-type: none"> ● What is equivalency? ● How are unit fractions useful in solving problems? ● How can you use fractions in real life? ● When is it helpful to break things into parts? ● How are models used to show how fractional parts are combined or separated?
<p>Knows:</p> <ul style="list-style-type: none"> ● How to find equivalent fractions ● How to multiply a fraction by a whole number ● How to compare two decimals ● How to compare two fractions 	<p>Understands</p> <ul style="list-style-type: none"> ● A whole can be divided into equal parts and each part is represented as 1 over the total number of parts (unit fraction) ● A fraction a/b as a multiple of $1/b$ ($7/8$ is a multiple of $1/8$), and use this understanding to multiply a fraction by a whole number ● Why unit fractions are important and when to use them ● Fractions can be notated as decimals 	<p>Does:</p> <ul style="list-style-type: none"> ● Find equivalent fraction with denominators with 2,3,4,6,8 ● Solve word problems involving multiplication of a fraction by a whole number ● Compare fractions with the same denominators or numerators ● Divide a number line into equal intervals using whole numbers and fractions ● Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation ● Justify decompositions ● Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction ● Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem ● Convert fractions with a denominator of 10 or 100 into decimals ● Compare two decimals

Essential Vocabulary: Fraction, unit fraction, equivalent fractions, numerator, denominator, decimal, decimal point, tenths, hundredths

Operations and Algebraic Thinking

Common Core State Standards

- 4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
- 4.OA.A.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.
- 4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
- 4.OA.B.4 Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.
- 4.OA.C.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

<p>Unit Name:</p>	<p>Enduring Understanding:</p> <ul style="list-style-type: none"> ● Real world problems can be solved using the four operations ● Rules govern mathematical patterns ● The situation determines how a remainder is interpreted 	<p>Essential Questions:</p> <ul style="list-style-type: none"> ● How do rules influence patterns? ● How can multiplicative comparisons be used to look at the world around us?
<p>Knows:</p> <ul style="list-style-type: none"> ● The parts of a multiplication and division equation ● Multiplicative comparison uses the key words, “how many times more...” ● Additive comparison uses the key words, “how many more...” ● Equal sign within an equation shows that both sides are equivalent ● Remainders are part of a division problem ● Role of variables in equations 	<p>Understands:</p> <ul style="list-style-type: none"> ● Relationships of numbers within the Commutative Property, Identity Property, and Zero Property ● Multiplication and division have an inverse relationship ● Number patterns are generated in predictable ways ● A rule can describe how numbers in a sequence are related ● How to determine which operations to use in given situations and which problems require multiple steps 	<p>Does:</p> <ul style="list-style-type: none"> ● Write and identify equations and statements for multiplicative comparisons ● Identify and verbalize which quantity is being multiplied and which number tells how many times in a given word problem ● Use drawings, equations, and symbols to solve multiplication and division problems ● Solve problems with an unknown product, unknown group size, and an unknown number of groups ● Use and discuss various strategies for solving multi-step word problems ● Use estimation strategies, including using compatible numbers (numbers that sum to 10 or 100) or rounding to assess reasonableness ● Solve multi-step story problems using all four operations ● Name all the factors and multiples for a given number 1-100 ● Classify a number as prime,

		<p>composite, or square based on its factors</p> <ul style="list-style-type: none"> ● Investigate different patterns to find rules, identify features in the patterns, and justify the reason for those features ● Represent real-world situations with multiplication equations
<p>Essential vocabulary: Multiplicative comparison, factors, products, multiples, variable, divisor, dividend, quotient, remainder, prime, composite, square number, Commutative Property, Identity Property, Zero Property, rule, patterns</p>		

Measurement and Data

Common Core State Standards

- 4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec; Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.
- 4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale
- 4.MD.A.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems
- 4.MD.B.4 Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in line plots.
- 4.MD.C.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement.
- 4.MD.C.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
- 4.MD.C.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

<p>Unit Name:</p>	<p>Enduring Understanding:</p> <ul style="list-style-type: none"> ● Data can be represented on a line plot ● Measurements can be converted within a system of measurement 	<p>Essential Questions:</p> <ul style="list-style-type: none"> ● What are customary and metric units for measuring length, capacity, and weight/mass, and how are they related? ● What do area and perimeter mean and how can each be found? ● How can line plots and other tools help to solve measurement problems? ● How can lines, angles, and shapes be described, analyzed, and classified? ● How are angles measured, added and subtracted?
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<p>Knows:</p> <ul style="list-style-type: none"> • Conversions can be made within the metric/standard system • The formula for area and perimeter • Unit of measurement for area is square units and unit of measurement for perimeter is units • A line plot is a visual way to display data • How to use a ruler to measure objects within an eighth of an inch • A ruler contains equivalent fractions using eighths, fourths, and halves • A circle is comprised of 360 degrees • Length can be measured using the customary units or metric units • Capacity can be measured using customary units or metric units • Weight can be measured using the customary unit. • Mass can be measured using the metric units • Angles can be classified by the fraction of the circle cut off by its rays 	<p>Understands:</p> <ul style="list-style-type: none"> • Larger units can be converted into smaller units within the same measurement system • Knowledge of units of measure can be used to solve multi-step problems • How and when to use the area and perimeter formulas and why it works • The smaller the unit used the more precise the measurement • The measurement of an angle between two rays does not measure the area • Angles can be decomposed into smaller parts • What is being measured determines the unit of measure used 	<p>Does:</p> <ul style="list-style-type: none"> • Convert measurements within a system using a two-column table • Solve multi-step word problems involving measurement • Use diagrams such as number lines to justify their solutions • Use formulas to calculate area and perimeter of rectangles and solve real world problems • Measure objects to an eighth of an inch • Use multiple strategies to add and subtract fractions • Make a line plot and interpret the data • Tell how angles can be measured within the context of a circle using degrees • Estimate an angle measure using benchmark angle measurements • Measure a given angle in degrees using a protractor • Use a protractor to draw and label an angle • Identify the type of a given angle (right, acute, obtuse, straight)
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Essential Vocabulary: Area, perimeter, protractor, angles, lines, line segments, rays, polygons, length, capacity, weight, mass, conversion, metric unit, customary unit, line plot, units of measurement (km, m, cm, kg, g, lb, oz, l, ml, hr, min, sec)

Geometry

Common Core State Standards

- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures
- 4.G.A.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles

- 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry

<p>Unit Name:</p>	<p>Enduring Understanding:</p> <ul style="list-style-type: none"> ● Points, lines, and rays are the building blocks of geometric figures ● Understanding geometry helps us solve problems having to do with design and construction ● Geometric figures can be identified by their attributes 	<p>Essential Questions:</p> <ul style="list-style-type: none"> ● How can lines, angles and shapes be described, analyzed and classified? ● How are angles measured, added and subtracted? ● How can lines of symmetry be recognized and drawn in two dimensional figures?
<p>Knows:</p> <ul style="list-style-type: none"> ● Precise geometrical vocabulary and its importance for mathematical communication ● Shapes are comprised of different geometrical components ● Attributes are used to classify shapes ● Some geometrical figures can be divided into equal parts using a line of symmetry ● The names and attributes of two-dimensional figures ● The appropriate tools to measure angles and how to use them ● Polygons can be described and classified by their sides and angles ● Line segments and rays are sets of points that describe parts of lines, shapes and solids 	<p>Understands:</p> <ul style="list-style-type: none"> ● Point, line and plane are the core attributes of space objects, and real-world situations can be used to think about these attributes ● Angles are formed by two intersecting lines or by rays with a common endpoint and are classified by size ● Two-dimensional or plane shapes have many properties that make them different from one another ● Some shapes can be reflected across one or more lines passing through the shape so the shape folds into itself; this is called the line of symmetry 	<p>Does:</p> <ul style="list-style-type: none"> ● Illustrate and identify the following in isolation and within two-dimensional figures: a point, line, line segment, ray, right angle, acute angle, obtuse angle, perpendicular lines, parallel lines ● Classify two-dimensional shapes based on specific attributes ● Identify and classify triangles by their angles and sides ● Identify line-symmetric figures and draw lines of symmetry ● Divide a regular and irregular polygon using lines of symmetry
<p>Essential Vocabulary: acute angles, obtuse angles, right angles, scalene triangles, isosceles triangles, equilateral triangles, line of symmetry, point, line, line segment, ray, parallel lines, perpendicular lines</p>		