

# Model Curriculum Grade 4 Mathematics Units

## Grade 4 Overview

**Unit 1** begins with extending place value understanding of multi-digit numbers, student understanding of multiplication, and the use of all four operations to solve word problems.

The standard **4.NBT.4** “Fluently add and subtract multi-digit whole numbers using the standard algorithm” [4.NBT.4] which is repeated in unit 3 and has a benchmark expectation which asks students to use the “standard algorithm” to add and subtract whole numbers – repeated in unit 3 and unit 5 using numbers to 1,000,000.

**Unit 2** computes multi-digit whole numbers and generates equivalent fractions.

This unit also has a benchmarked standard **4.OA.3**: “Solve multi-step word problems posed with whole numbers and having whole number answers using the four operations ...” which is repeated in unit 3 and unit 4 with the expectation that students represent word problems using equations with symbols for the unknown number.

**Unit 3** asks students compare, decompose, and add and subtract fractions with like denominators (including mixed numbers). Operations with fractions are extended to multiplication problems, including word problems. Teachers need to give special attention to standard **4.NF4**.

**Unit 4** extends the understanding of fractions to solve word problems including decimal notation.

**Unit 5** asks students to compare decimals (to hundredths) and uses decimals to measure geometric figures. Students also classify 2-dimensional figures by their attributes.

# Model Curriculum

## Grade 4 Units

Major Supporting Additional (Identified by PARCC Content Frameworks)

### Unit 1: Use the four operations with whole numbers to solve problems

Generalize place value understanding for multi-digit whole numbers.	4.NBT.1	<p>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.</p> <p><i>For example, recognize that <math>700 \div 70 = 10</math> by applying concepts of place value and division.</i></p> <p><b>Footnote 2</b> Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.</p>
	4.NBT.2	<p>Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form.</p> <p>Compare two multi-digit numbers based on meanings of the digits in each place, using <math>&gt;</math>, <math>=</math>, and <math>&lt;</math> symbols to record the results of comparisons.</p> <p><b>Footnote 2</b> Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.</p>
	4.NBT.3	<p>Use place value understanding to round multi-digit whole numbers to any place.</p> <p><b>Footnote 2</b> Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.</p>
Use the four operations with whole numbers to solve problems.	4.OA.1	<p>Interpret a multiplication equation as a comparison, <b>e.g.</b>, interpret <math>35 = 5 \times 7</math> as a statement that 35 is 5 times as many as 7 and 7 times as many as 5.</p> <p>Represent verbal statements of multiplicative comparisons as multiplication equations.</p>
	4.OA.2	<p>Multiply or divide to solve word problems involving multiplicative comparison, <b>e.g.</b>, by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.<sup>1</sup></p> <p><b>Footnote 1</b> See glossary, Table 2.</p>
	4.OA.2	<p>Multiply or divide to solve word problems involving multiplicative comparison, <b>e.g.</b>, by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.<sup>1</sup></p> <p><b>Footnote 1</b> See glossary, Table 2.</p>
Use place value understanding and properties of operations to perform multi-digit arithmetic.	4.NBT.4	<p>Fluently add and subtract multi-digit whole numbers using the standard algorithm.</p> <p><b>Footnote 2</b> Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.</p>

## Unit 2: Compute with multi-digit whole numbers. Generate equivalent fractions.

Use the four operations with whole numbers to solve problems.	4.OA.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.
Use place value understanding and properties of operations to perform multi-digit arithmetic.	4.NBT.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. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.  <b>Footnote 2</b> Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.
	4.NBT.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.  <b>Footnote 2</b> Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.
Extend understanding of fraction equivalence and ordering. <sup>3</sup>	4.NF.1	Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{n \times a}{n \times b}$ 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.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 $\frac{1}{2}$ . 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, e.g., by using a visual fraction model.
Gain familiarity with factors and multiples.	4.OA.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.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.

### Unit 3: Solve problems involving addition, subtraction, and multiplication of fractions. Properties of operations with multi-digit arithmetic

Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.	4.NF.3a,b	<p>Understand a fraction <math>a/b</math> with <math>a &gt; 1</math> as the sum of <math>a</math> fractions <math>1/b</math>.</p> <p>a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.</p> <p>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.</p> <p><b>Examples:</b> <math>3/8 = 1/8 + 1/8 + 1/8</math> ; <math>3/8 = 1/8 + 2/8</math> ; <math>2 \frac{1}{8} = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8</math>.</p>
	4.NF.3c	<p>Understand a fraction <math>a/b</math> with <math>a &gt; 1</math> as the sum of <math>a</math> fractions <math>1/b</math>.</p> <p>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.</p>
	4.NF.3d	<p>Understand a fraction <math>a/b</math> with <math>a &gt; 1</math> as the sum of <math>a</math> fractions <math>1/b</math>.</p> <p>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.</p>
Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.	4.NF.4a,b	<p>Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.</p> <p>a. Understand a fraction <math>a/b</math> as a multiple of <math>1/b</math>.</p> <p><b>For example,</b> use a visual fraction model to represent <math>5/4</math> as the product <math>5 \times (1/4)</math>, recording the conclusion by the equation <math>5/4 = 5 \times (1/4)</math>.</p> <p>b. Understand a multiple of <math>a/b</math> as a multiple of <math>1/b</math>, and use this understanding to multiply a fraction by a whole number.</p> <p><b>For example,</b> use a visual fraction model to express <math>3 \times (2/5)</math> as <math>6 \times (1/5)</math>, recognizing this product as <math>6/5</math>. <b>In general,</b> <math>n \times (a/b) = (n \times a)/b</math>.</p>
	4.NF.4c	<p>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.</p> <p><b>For example,</b> if each person at a party will eat <math>3/8</math> of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?</p>

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	4.MD.1	<p>Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec.</p> <p>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.</p> <p><b>For example</b>, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...</p>
Use the four operations with whole numbers to solve problems.	4.OA.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.
Use place value understanding and properties of operations to perform multi-digit arithmetic.	4.NBT.4	<p>Fluently add and subtract multi-digit whole numbers using the standard algorithm.</p> <p><b>Footnote 2</b> Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.</p>

## Unit 4: Solve problems involving the 4 operations – apply fractions to measurement quantities

Generate and analyze patterns.	4.OA.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.  <i>For example, given the rule “Add 3” and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.</i>
Use the four operations with whole numbers to solve problems	4.OA.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.
Understand decimal notation for fractions, and compare decimal fractions.	4.NF.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. <sup>4</sup>  <i>For example, express <math>\frac{3}{10}</math> as <math>\frac{30}{100}</math>, and add <math>\frac{3}{10} + \frac{4}{100} = \frac{34}{100}</math>.</i>  <b>Footnote 4</b> Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.
	4.NF.6	Use decimal notation for fractions with denominators 10 or 100.  <i>For example, rewrite 0.62 as <math>\frac{62}{100}</math>; describe a length as 0.62 meters; locate 0.62 on a number line diagram.</i>
Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	4.MD.3	Apply the area and perimeter formulas for rectangles in real world and mathematical problems.  <i>For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.</i>
Represent and interpret data.	4.MD.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.  <i>For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.</i>
Understand decimal notation for fractions, and compare decimal fractions.	4.NF.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, e.g., by using a visual model.
Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	4.MD.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.

<p>Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.</p>	<p><b>4.NF.4</b></p>	<p>Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.</p> <p><b>a.</b> Understand a fraction <math>\frac{a}{b}</math> as a multiple of <math>\frac{1}{b}</math>.</p> <p><b>For example</b>, use a visual fraction model to represent <math>\frac{5}{4}</math> as the product <math>5 \times \frac{1}{4}</math>, recording the conclusion by the equation <math>\frac{5}{4} = 5 \times \frac{1}{4}</math>.</p> <p><b>b.</b> Understand a multiple of <math>\frac{a}{b}</math> as a multiple of <math>\frac{1}{b}</math>, and use this understanding to multiply a fraction by a whole number.</p> <p><b>For example</b>, use a visual fraction model to express <math>3 \times \frac{2}{5}</math> as <math>6 \times \frac{1}{5}</math>, recognizing this product as <math>\frac{6}{5}</math>.</p> <p><b>In general</b>, <math>n \times \frac{a}{b} = \frac{n \times a}{b}</math>.</p> <p><b>c.</b> Solve word problems involving multiplication of a fraction by a whole number, <b>e.g.</b>, by using visual fraction models and equations to represent the problem.</p> <p><b>For example</b>, if each person at a party will eat <math>\frac{3}{8}</math> of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?</p>
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## Unit 5: Compare decimals and measure/classify geometric figures

Geometric measurement: understand concepts of angle and measure angles.	4.MD.5a,b	<p>Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:</p> <p><b>a.</b> An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through <math>\frac{1}{360}</math> of a circle is called a “one-degree angle,” and can be used to measure angles.</p> <p><b>b.</b> An angle that turns through <math>n</math> one-degree angles is said to have an angle measure of <math>n</math> degrees.</p>
Use place value understanding and properties of operations to perform multi-digit arithmetic.	4.NBT.4	<p>Fluently add and subtract multi-digit whole numbers using the standard algorithm.</p> <p><b>Footnote 2</b> Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.</p>
Draw and identify lines and angles, and classify shapes by properties of their lines and angles.	4.G.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
	4.G.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.
Geometric measurement: understand concepts of angle and measure angles.	4.MD.6	Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
	4.MD.7	<p>Recognize angle measure as additive.</p> <p>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.</p> <p>Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, <b>e.g.</b>, by using an equation with a symbol for the unknown angle measure.</p>
Draw and identify lines and angles, and classify shapes by properties of their lines and angles.	4.G.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.