Grade 4 Mathematics Curriculum Guide

Grade Level/Course Title: Grade 4	**Trimester 1**	**Academic Year:** 2014-2015

Grade Level Mathematics Focus:
In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

Essential Questions for this Unit:
1. How can students generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place?

Unit (Time)	Standard	Standard Description	Content	Resources
(Aug.-Sept.) **Unit 1:** **Review: Place Value, Addition and Subtraction** **(Approx. 10 days)**	4.NBT.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. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.*	• Decomposition by place value • Decomposition of whole numbers by addition • Using decomposition to add and subtract whole numbers • Using open number lines to represent multi-digit addition and subtraction • Using bar models to add and subtract multi-digit numbers • Inverse relationship between addition and subtraction • Commutative and associative properties of addition	**<u>Place Value (3 days)</u>** Lesson 1.1: Intro into Student Reference Book Lesson 2.4: Place Value with a Calculator (Optional) Lesson 2.5: Organizing and Displaying Data **<u>Addition and Subtraction (7 days)</u>** Lesson 2.7: Addition of Multi-Digit Numbers Adding and Subtracting Whole Numbers — Multiple Representations [CP] Adding Whole Numbers — Multiple Algorithms [L] Lesson 2.8: Displaying Data with a Bar Graph Lesson 2.9: Subtraction of Multi-Digit Numbers Subtracting Whole Numbers – Multiple Algorithms [L] Number Line Subtraction [L] Lesson 2.10: Assessment Parent Guide (English): Adding Whole Numbers — Multiple Methods Parent Guide (Spanish): Sumando Números Parent Guide (English): Subtracting Numbers — Multiple Methods Parent Guide (Spanish): Restando Números
	4.NBT.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.3	Use place value understanding to round multi-digit whole numbers to any place.		
	4.NBT.4	Fluently add and subtract multi-digit whole numbers using the standard algorithm		

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Essential Questions for this Unit:

1. How can students apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers?
2. How can students, depending on the numbers and the context, select and accurately apply appropriate methods to estimate or mentally calculate products?
3. How can students develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems?
4. How can students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends?
5. How can students select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context?

Unit (Time)	Standard	Standard Description	Content	Resources
(Sept.-Oct.) **Unit 2:** **Multiplication and Division** **(Approx. 20 days)**	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.	• Equal-sized groups • Repeated addition • Arrays • Area Models • Commutative Property • Associative Property • Importance of place value when multiplying • Partial Products • Distributive Property • Using open number lines to represent multiplication • Using bar models to represent multiplication • Using decomposition to multiply (any decomposition and by place value)	**Multiplication, Patterns, and Equations (6 days)** Area Model Through The Grades [CP] Lesson 2.2: Many Names for Numbers (Teach prime and composite numbers and decomposition.) Lesson 3.1: What's my Rule Lesson 3.2: Multiplication Facts Multiplication Fact Mastery Through Multiple Methods [L] Properties of multiplication [L] Lesson 3.3: Multiplication Facts Practice Lesson 3.4: More Multiplication Facts Practice Lesson 3.5: Multiplication & Division Lesson 3.8: A Guide for Solving Number Stories Lesson 3.9: True or False Number Sentences Lesson 3.10: Parentheses in Number Sentences Lesson 3.11: Open Sentences Patterns: Foundations of Functions [L] Solving Equations – Algebra Tiles [L] Solving Equations – Bar Models [L] Solving Equations – Decomposition [L]
	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. 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.		

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Essential Questions for this Unit:
1. How can students develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems?

Unit (Time)	Standard	Standard Description	Content	Resources
(Sept.-Oct.) **Unit 2:** **(Continued)** **Multiplication and Division** **(Approx. 20 days)**	4.OA.1	Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 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.	• Equal-sized groups • Repeated addition • Arrays • Area Models • Commutative Property • Associative Property • Importance of place value when multiplying • Partial Products • Distributive Property • Using open number lines to represent multiplication • Using bar models to represent multiplication • Using decomposition to multiply (any decomposition and by place value)	**Multiplication Strategies (14 days)** Lesson 5.1: Extended Multiplication Facts Lesson 5.2: Multiplication Wrestling Lesson 5.3: Estimating Sums Lesson 5.4: Estimating Products Lesson 5.5: Partial Products–Multiplication Part I Lesson 5.6: Partial Products–Multiplication Part II Multiplication Using the Distributive Property [L] Multiplication – One-Digit by Multi-Digit [L] Multiplication Selected Response Practice [L] Multiplying Whole Numbers – Generic Rectangle [L] Base-10 Multiplication and Division Part I [L] Base-10 Multiplication and Division Part II [L] Problem Solving with Multiplication and Division [L] Lesson 5.8: Big Numbers Optional: Lesson 5.9: Powers of 10 Lesson 5.10: Rounding and Reporting Large Numbers Lesson 5.11: Comparing Data Lesson 5.12: Progress Check
	4.OA.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.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.		

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Essential Questions for this Unit:
1. How can students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends?
2. How can students select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context?

Unit (Time)	Standard	Standard Description	Content	Resources
(Oct.-Nov.) **Unit 3:** **Extending Multi-Digit Multiplication and Division** **(Approx. 25 days)**	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.	• Equal-sized groups • Repeated addition • Arrays • Area Models • Commutative Property • Associative Property • Importance of place value when multiplying • Partial Products • Distributive Property • Using open number lines to represent multiplication • Using bar models to represent multiplication • Using decomposition to multiply (any decomposition and by place value) • Multiple representations of division	**Multiplication and Division (25 days)** Lesson 6.1: Multiplication & Division Number Stories Division — Multiple Representations [CP] Lesson 6.2: Strategies for Division Division — Divvy Out Greater Numbers [L] Division Algorithms [L] Lesson 6.3: The Partial-Quotients Division Algorithm – Part I Lesson 6.4: Expressing and Interpreting Remainders Lesson 6.10: The Partial-Quotients Division Algorithm – Part II Lesson 6.11: Assessment Parent Guide (English): Multiplying Numbers – Multiple Methods Parent Guide (Spanish): Multiplicando Números Parent Guide (English): Dividing Numbers- Multiple Methods Parent Guide (Spanish): Dividiendo Números **BENCHMARK 1 (Units 1 through 3; no long division)**
	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.		

Grade Level/Course Title: Grade 4	**Trimester 2**	**Academic Year:** 2014-2015

Grade Level Mathematics Focus:
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Essential Questions for this Unit:

1. How can students develop understanding of fraction equivalence and operations with fractions?
2. How can students recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and develop methods for generating and recognizing equivalent fractions?
3. How can students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number?

Unit (Time)	Standard	Standard Description	Content	Resources
(Nov.-March) **Unit 4:** **Fractions** **(Approx. 50 days)**	4.NF.1	Explain why a fraction *a*/*b* is equivalent to a fraction (*n* × *a*)/(*n* × *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.	• Meaning of numerator and denominator • Equivalent fractions • Equivalent forms of 1 • Multiple representation of fractions (e.g., number line, area model)	**Fraction Concepts and Equivalent Fractions (15 days)** Lesson 7.1: Review of Basic Fraction Concepts Hundreds Chart [GMR] Prime Numbers and Factorization [CP] Click on: Sieve of Eratosthenes Prime Factorization Recognizing and Generating Equivalent Fractions [L] Simplifying Fractions [CP] Comparing and Ordering Fractions – Benchmark Fractions [CP] Comparing Fractions [L] Lesson 7.2: Fractions of Sets Lesson 7.3: Probabilities When Outcomes Are Equally Likely Lesson 7.4: Pattern-Block Fractions Lesson 7.9: Comparing Fractions Comparing Fractions Using the Complement [L]
	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 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.		

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Essential Questions for this Unit:

1. How can students develop understanding of fraction equivalence and operations with fractions?
2. How can students recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and develop methods for generating and recognizing equivalent fractions?
3. How can students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number?

Unit (Time)	Standard	Standard Description	Content	Resources
(Nov.-March) **Unit 4:** **(Continued)** **Fractions** **(Approx.** **50 days)**	4.NF.3	Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. 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. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.* 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. 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.	• Meaning of numerator and denominator • Equivalent fractions • Equivalent forms of 1 • Multiple representation of fractions (e.g., number line, area model) • Multiplication of fractions • Adding fractions	**Addition and Subtraction of Fractions (15 days)** Lesson 7.5: Fraction Addition and Subtraction Adding Fractions [CP] Lesson 7.6: Many Names for Fractions Lesson 7.7: Equivalent Fractions Fraction Bars [GMR] Number Lines, Fractions, and Bar Models [L] Converting – improper fractions and mixed numbers [L]

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Essential Questions for this Unit:

1. How can students develop understanding of fraction equivalence and operations with fractions?
2. How can students recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and develop methods for generating and recognizing equivalent fractions?
3. How can students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number?

Unit (Time)	Standard	Standard Description	Content	Resources
(Nov.-March) **Unit 4:** **(Continued)** **Fractions** **(Approx.** **50 days)**	4.NF.4	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. a. Understand a fraction *a*/*b* as a multiple of 1/*b*. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).* 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. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)* 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. *For example, if each person at a party will eat 3/8 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?*	• Meaning of numerator and denominator • Equivalent fractions • Equivalent forms of 1 • Multiple representation of fractions (e.g., number line, area model) • Multiplication of fractions • Adding fractions	**<u>Multiplication of Fractions (10 days)</u>** Lesson 7.10: The ONE for Fractions Multiplying Fractions [CP]

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Essential Questions for this Unit:
1. How can students develop understanding of fraction equivalence with decimals?

Unit (Time)	Standard	Standard Description	Content	Resources
(Nov.-March) **Unit 4:** **(Continued)** **Fractions** **(Approx.** **50 days)**	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. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.*	• Meaning of numerator and denominator • Equivalent fractions • Equivalent forms of 1 • Multiple representation of fractions (e.g., number line, area model) • Multiplication of fractions • Adding fractions • Equivalence between fractions and decimals	**<u>Fractions and Decimals (10 days)</u>** Lesson 7.8: Fractions and Decimals Equivalent Decimals and Fractions [L] Lesson 7.13: Progress Check Lesson 9.1: Fractions, Decimals, and Percents (De-emphasize percents in these lessons – not a Grade 4 CCSS) Fractions, Decimals, and Percents [L] Ordering Fractions, Decimals, and Percents [L] Lesson 9.2: Converting "Easy" Fractions to Decimals and Percents Lesson 9.6: Comparing the Results of a Survey Lesson 9.7: Comparing Population Data Lesson 9.10: Progress Check Lesson 4.1: Decimal Place Value Lesson 4.2: Review of Basic Decimal Concepts Lesson 4.3: Comparing and Ordering Decimals Lesson 4.4: Estimating with Decimals Lesson 4.5: Decimal Addition and Subtraction Lesson 4.6: Decimals in Money Lesson 4.8: Metric Units of Length Lesson 4.10: Measuring in Millimeters **BENCHMARK 2 (Unit 4)**
	4.NF.6	Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*		
	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 the number line or another visual model. CA		

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Grade Level/Course Title: Grade 4	**Trimester 3**	**Academic Year:** 2014-2015

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Essential Questions for this Unit:
1. How can students solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit?
2. How can students represent and interpret data?
3. How can students, through geometric measurement, understand concepts of angles and measure angles?

Unit (Time)	Standard	Standard Description	Content	Resources
(April-June) **Unit 5:** **Geometric Measurement, Lines, Angles, and Shapes** **(Approx. 45 days)**	4.MD.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. *For example, 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), ...*	• Conversion of measurement units • Data representation • Classification of shapes • Symmetry • Relationships among shapes based on attributes • Measurement of angles	**Geometric Measurement (25 days)** Measurement [L] Lesson 8.1: Kitchen Layouts and Perimeter (Optional) Lesson 8.2: Scale Drawings (Optional) Lesson 8.3: Area Area and Perimeter — Decomposition [L] Discovering Area and Perimeter [L] Same Perimeter – Different Area [L] Same Area – Different Perimeter [L] Area of Rectangles and Squares Applet Lesson 8.4: What Is the Area of My Skin? Lesson 8.5: Formula for the Area of a Rectangle Lesson 8.8: Geographical Area Measurements
	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.		
	4.MD.3	Apply the area and perimeter formulas for rectangles in real world and mathematical problems. 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.		

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Essential Questions for this Unit:
1. How can students solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit?
2. How can students represent and interpret data?
3. How can students, through geometric measurement, understand concepts of angles and measure angles?

Unit (Time)	Standard	Standard Description	Content	Resources
(April-June) **Unit 5: (Continued)** **Geometric Measurement, Lines, Angles, and Shapes** **(Approx. 45 days)**	4.MD.4	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*	• Conversion of measurement units • Data representation • Measurement of angles • Classification of shapes • Symmetry • Relation-ships among shapes based on attributes	**Line Plots (5 days)** Line Plots [L] **Angles (7 days)** Lesson 6.5: Rotations and Angles Lesson 6.6: Using a Full-Circle Protractor Lesson 6.7: The Half-Circle Protractor Lesson 8.9: Progress Check Lesson 11.7: Capacity and Weight (Lessons 12.1-12.7 left out, not aligned to Grade 4 CCSS)
	4.MD.5	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. 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 1/360 of a circle is called a "one-degree angle," and can be used to measure angles. b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.		
	4.MD.6	Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.		
	4.MD.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.		

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Essential Questions for this Unit:
1. How can students describe, analyze, compare, and classify two-dimensional shapes?
2. How can students, through building, drawing, and analyzing two-dimensional shapes, deepen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry?

Unit (Time)	Standard	Standard Description	Content	Resources
(April-June) **Unit 5: (Continued)** **Geometric Measurement, Lines, Angles, and Shapes** **(Approx. 45 days)**	4.G.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	• Classification of shapes • Symmetry • Relationships among shapes based on attributes • Conversion of measurement units • Data representation • Measurement of angles	**Lines, Angles, and Shapes (8 days)** Lesson 1.2: Points, Line Segments, Lines and Rays Lines, rays, and segments [L] Lesson 1.3: Angles, Triangles, and Quadrangles Classifying Triangles [CP] Lesson 1.4: Parallelograms Quadrilaterals [CP] Lesson 1.5: Polygons Lesson 10.1: Explorations with a Transparent Mirror Lesson 10.2: Finding Lines of Reflections Lesson 10.3: Properties of Reflections Lesson 10.4: Line Symmetry **BENCHMARK 3 (Unit 5)**
	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. (Two dimensional shapes should include special triangles, e.g., equilateral, isosceles, scalene, and special quadrilaterals, e.g., rhombus, square, rectangle, parallelogram, trapezoid.) CA		
	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.		