Fairfield Public Schools

Mathematics

Grade 4

Fairfield Public Schools Math Instructional Model

Grade 4

Grade 4 Mathematics

Students in grade 4 develop an understanding and proficiency with whole number operations and extend this understanding to multi-digit whole number multiplication and division including the use of efficient procedures. Number relationships and properties of operations provide generalizable methods for efficient computation and problem solving strategies. They comprehend fractional equivalence as a balance, and quantities can be represented differently with models and equations. Geometric figures can be analyzed and classified using properties such as having parallel sides, perpendicular sides, angle measures, and symmetry. Angle measure is understood as a measure of a rotation and is additive. Shapes and solids can be described through estimated and actual measurement. Students trust the measure for comparison without needing to physically match objects. Predictions can be made by identifying patterns and analyzing information gathered from organized data.

Grade 4 Mathematics Year-At-A-Glance

Pacing Guide									
1st Marking Period			2nd Marking Period			3rd Marking Period			
September	October	November	December	January	February	March	April	May	June
Unit 1 Basic Operations	Unit 2 Place Value Estimation and Computation	Unit 3 Extending Multiplication and Division	Unit 4 Measurement and Data	Unit 5 Fractions		Unit 6 Geometry and Measurement		Unit 7 Multi-digit Multiplication and Division	

Grade 4 Overview

Central Understandings:
Insights learned from exploring generalizations through the essential questions. (Students will understand that…)

- Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technologies.
- Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.
- Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technologies.
- Data can be analyzed to make informed decisions using a variety of strategies, tools, and technologies.

Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?
- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How can collecting, organizing and displaying data help us analyze information and make reasonable and informed decisions?

Assessments

- Formative Assessments
- Summative Assessments
- District –Wide Screening Tools
- State Testing

Content Outline:

Unit 1 Basic Operations
Unit 2 Place Value
Unit 3 Multiplication and Division
Unit 4 Measurement and Data
Unit 5 Fractions
Unit 6 Geometry and Measurement
Unit 7 Multiplication and Division

Mathematics Standards

CT Common Core State Standards (CTSDE)

Fairfield Public Schools Skills Matrix (Skills Matrix**)**

Primary Resources

- About Teaching Mathematics, Marilyn Burns
- Contexts for Learning Mathematics, Fosnot et. al.
- Scott Foresman/Addison Wesley, 2004
- Teaching Student-Centered Mathematics –Van de Walle and Lovin

Grade Four Standards for Mathematical Practice The mathematical practice standards are embedded in every unit as part of our instructional model. These standards are critical to the implementation of our balanced instructional model for developing 21st century skills. Students are expected to:	
Standards	***Explanations and Examples***
1. Make sense of problems and persevere in solving them	In fourth grade, students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. They use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They listen to the strategies of others and will try different approaches. They often will use another method to check their answers.
2. Reason abstractly and quantitatively	Fourth graders recognize that a number represents a specific quantity. They connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions that record calculations with numbers and represent or round numbers using place value concepts.
3. Construct viable arguments and critique the reasoning of others	In fourth grade, students construct arguments using concrete referents such as objects, pictures, and drawings. They explain their thinking and make connections between models and equations. They refine their mathematical communication skills as they participate in discussions involving questions like "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking.
4. Model with mathematics	Students experiment with representing problem situations in multiple ways, including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students connect the different representations and explain the connections. Fourth graders should evaluate their results in the context of the situation and reflect on whether the results make sense.
5. Use appropriate tools strategically	Fourth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper or a number line to represent and compare decimals, and protractors to measure angles. They use other measurement tools to understand the relative size of units within a system and express measurements given in larger units in terms of smaller units.
6. Attend to precision	Fourth graders develop mathematical communication skills, using clear and precise language in discussions with others and in their own reasoning. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, they use appropriate labels when creating a line plot.
7. Look for and make use of structure	In fourth grade, students look closely to discover a pattern or structure. For instance, students use properties of operations to explain calculations (partial products model). They relate representations of counting problems, such as tree diagrams and arrays, to the multiplication principal of counting. They generate number or shape patterns that follow a given rule.
8. Look for and express regularity in repeated reasoning	Fourth graders notice repetitive actions in computation to make generalizations. Students use models to explain calculations and understand how algorithms work. They also use models to examine patterns and generate their own algorithms. For example, students use visual fraction models to write equivalent fractions.

Grade 4

Unit 1 Basic Operations: Whole Number Concepts, Estimation, and Computation with Multiplication and Division

The purpose of the launch is to establish classroom routines in a balanced math instructional model. The first unit is intended to engage students in thinking differently about previously taught material. The focus of the lesson is on learning how to engage one another, as mathematicians, emphasizing the mathematical practices and developing 21st century skills. Class discourse is enhanced by using turn & talk, think-pair-share, justify reasoning, and constructing viable arguments. Students represent their thinking using mathematical models and numbers, questioning peers for deeper understanding and clarification. The correctness of solutions lies within the logic of the mathematics. Efficient and flexible methods for estimation, mental computation, and calculating, including the standard algorithms, deepen understanding of the properties and operations that are used to solve problems.

Big Ideas: Central organizing ideas and underlying structures of mathematics.	**Essential Questions**

• Benchmark numbers help to flexibly and efficiently multiply and divide numbers.
• Commutative property for addition and multiplication - The order of addends or factors does not change the result. (i.e. 10 + 3 = 3 + 10 or 10 x 3 = 3 x 10)
• The associative property:
  o Numbers can be composed and decomposed to make estimation and mental computation easier.
  o You can flexibly combine numbers using a variety of strategies, e.g., decompose and regroup using benchmark numbers
  o e.g. 60 + 70 can be thought of as 60+ (40+30) or (60+40)+30, or
  o e.g. 60 + 70 can be thought of as doubles plus one group of ten, 60 + (60+10) or (60+60)+10
• The distributive property uses partial products to simplify multiplication problems, e.g., 5 x 12 = 5 x (10 + 2) = 50 + 10 = 60.)
• Our number system is structured around multiples of ten.
• The expanded form shows the place value structure as multiples of ten. e.g. or 1,472 = 1,000+400+70+2 or, (1 thousand) + (4 hundreds) + (7 tens) + (2 units) or,
  o 1,472= (1 x 1,000) + (4 x 100) + (7 x 10) + (2 x 1), or
  o (1 x 10 x 10 x 10) + (4 x 10 x 10) + (7 x 10) + (2 x 1)
• Addition, subtraction, multiplication, and division by multiples of ten make estimation and computation easier.
 	
Thinking Ahead, Linking Big Ideas among units:
Unit 2 Place Value
Recognize that in a multi-digit whole number, a digit in one place is ten times what it represents in the place to its right. The distributive property makes computation easier.
	• How do benchmark numbers help you solve problems?
	• What strategies could we use to multiply and divide numbers?
	• Which strategy is the most efficient for multiplying and dividing given numbers and why?
	• How do you know if two equivalent expressions are equivalent?
	• How do partial products and partial factors make it easier to do mental computations?

Common Core State Standards
Grade 4
Unit 1 Launch: Whole Number Concepts, Estimation, and Computation with Multiplication and Division

Operations and Algebraic Thinking

Use the four operations with whole numbers to solve problems.

4.0A.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.

4.0A.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.

Generate and analyze patterns.

4.0A.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.*

Measurement and Data

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.

Grade 4
Unit 2: Whole Number Place Value Concepts, Estimation and Computation

This unit extends student understanding of addition and subtraction using benchmark numbers. Students estimate and make mental computation problems simpler by identifying 'friendly' numbers and use the commutative, associative, and distributive properties as strategies. This unit also builds on foundational understandings of the multiplicative relationship using multiples of 10, 100, 1,000, & 10,000. They 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.

Big Ideas: Central organizing ideas and underlying structures of mathematics.	**Essential Questions**

• Benchmark numbers help to flexibly and efficiently add & subtract numbers.
• Commutative property for addition and multiplication - The order of addends or factors does not change the result. (i.e. 10 + 3 = 3 + 10 or 10 x 3 = 3 x 10)
• The associative property:
  ○ Numbers can be composed and decomposed to estimation and make mental computation easier.
  ○ You can flexibly combine numbers using a variety of strategies. (i.e. Decompose and regroup by using benchmark numbers)
  ▪ e.g. 60 + 70 can be thought of as 60+ (40+30) or (60+40)+30, or
  ▪ e.g. 60 + 70 can be thought of as doubles plus one group of ten, 60 + (60+10) or (60+60)+10
• The distributive property uses partial products to simplify multiplication problems. (e.g. 5 x 12 = 5 x (10 + 2) = 50 + 10 = 60.)
• Our number system is structured around multiples of ten.
• The expanded form shows the place value structure as multiples of ten. e.g. 4,236 = (4 thousands)+(2 hundreds)+(3 tens)+(6 units) or 1,472 = 1,000+400+70+2
• Equivalent quantities can be represented differently. e.g. 1,472=
  ○ (1 x 1,000) = (4 x 100) + (7 x 10) + (2 x 1), or
  ○ (1 x 10 x 10 x 10) + (4 x 10 x 10) + (7 x 10) + (2 x 1)
• Addition, subtraction, multiplication, and division by multiples of ten make estimation and mental computation easier.
Thinking Ahead, Linking Big Ideas among units:
Unit 3 Multiplication & Division
• Place value patterns are linked to multiplication and division using benchmark numbers (multiples of 10)
	• What pattern do you notice in our number system when you multiply and divide by multiples of ten, 10, 100, 1,000, 10,000…?
	• How do benchmark numbers help you solve problems?
	• What strategies could we use to add and subtract large numbers?
	• Which strategy is the most efficient for adding or subtracting given numbers and why?
	• How does what you know about multiplication and division help you to solve the problem?
	• How do factors and products show the relationship between multiplication and division?
	• How do you know if equivalent expressions are equivalent?
	• How do partial products and partial factors make it easier to do mental computations with multiplication and division?

Common Core State Standards
Grade 4
Unit 2: Whole Number Place Value Concepts, Estimation and Computation

Number and Operations in Base Ten

Generalize place value understanding for multi-digit whole numbers.

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.*

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.

Use place value understanding and properties of operations to perform multi-digit arithmetic.

4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.

Grade 4

Unit 3: Whole Number Concepts, Estimation, and Computation with Multiplication and Division

The purpose of this unit is to deepen understanding of the basic operations with multiplication and division by applying algebraic properties. The goal by the end of grade 4 is for students to have flexible and fluent use of a repertoire of strategies to estimate and compute with multi-digit whole numbers, including, the standard algorithms, and other efficient procedures. Students use mathematical models, construct viable arguments and justify reasoning as to why a strategy yields the solution to a problem or why an algorithm will work. Understanding of the inverse relationship of multiplication and division are developed through problem solving as students analyze different problem structures. Number sense is deepened while students focus on the numbers rather than the manipulation of digits.

Big Ideas: Central organizing ideas and underlying structures of mathematics.	**Essential Questions**

• Factors and products show the relationship between multiplication and division.
• Commutative property for addition and multiplication : The order of addends or factors does not change the result, e.g. 10 + 23 = 23 + 10 or, 7 x 5 = 5 x 7
• The associative property 32 + (18 + 27) = (32 + 18) + 27, or, (4 x 5) x 5 = 4 x (5 x 5)
• The distributive property uses partial products and can simplify multiplication problems. e.g. 5 x 12 = 5 x (10 + 2) = 50 + 10 = 60
• Our number system is structured around multiples of ten.
• The expanded form shows the place value structure, e.g. 4,236 = (4 thousands)+(2 hundreds)+(3 tens)+(6 units) or 1,472 = 1,000+400+70+2
• Equivalent quantities can be represented differently. e.g. 1,472=
  ○ (1 x 1,000) = (4 x 100) + (7 x 10) + (2 x 1), or
  ○ (1 x 10 x 10 x 10) + (4 x 10 x 10) + (7 x 10) + (2 x 1)
• Addition, subtraction, multiplication, and division by multiples of ten make estimation and computation easier.
 	
Thinking Ahead, Linking Big Ideas among units:
 	
Unit 4 Measurement
Measurement involves a ratio of the unit attribute to the whole attribute
• Estimation of measures involve personal benchmarks
• Relative size of units within a measurement system is important
	• What is the relationship between factors and products?
	• How can you break a number into parts to make it a "friendlier" number to calculate mentally?
	• What pattern do you see in our number system when you multiply/divide by (10, 100, 1,000, 10,000…)?
	• How do benchmark numbers help you solve problems?
	• What strategies could we use to multiply and divide numbers?
	• Which strategy is the most efficient for multiplying or dividing and why?
	• How do you know if two expressions are equivalent?
	• How do partial products and partial factors make it easier to do mental computations?
	• How do partial products and partial factors make it easier to estimate?
	• How do partial products and partial factors make it easier for you to solve a problem?
	• What are the different ways symbols are used to show division?

Common Core State Standards
Grade 4
Unit 3: Whole Number Place Value Concepts, Estimation and Computation

Operations and Algebraic Thinking

Use the four operations with whole numbers to solve problems.

4.OA.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.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.

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.

Number and Operations in Base Ten
Generalize place value understanding for multi-digit whole numbers.

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.

Grade 4

Unit 4: Measurement and Data

The purpose of this unit is to understand the relative size of measurement units. Within a single system of measurement, measurements in a larger unit can be expressed in terms of a smaller unit. There are agreed upon units of measure (customary and metric), as well as non-standard units of measure that can be used to measure objects. It is important to choose a uniform unit of measure when measuring an object. Fractional concepts are deepened through experiences and situations involving measurement. The ratio relationship of units of measure promotes multiplicative reasoning. Students trust the quantified measure for comparison. They do not need to physically match to compare. Estimating measure uses benchmarks of the uniform units.

Big Ideas: Central organizing ideas and underlying structures of mathematics.	**Essential Questions**
• A measurement does not change as a result of the placement of the units, e.g. the difference on a number line between 0 and 4 is the same difference between 8 and 12. • A unit measure of length represents a uniform distance that is repeatedly counted. • Linear measurement involves a ratio of the uniform unit to the length of the entire object or distance. • When measuring a larger area it is covered with a uniform smaller area unit. • To find the area of squares and rectangles you can use a multiplication array. • Perimeter is a length measurement. • It is helpful to use benchmark measures when estimating. • The smaller the uniform unit the more units are needed for a given measure. **Thinking Ahead, Linking Big Ideas among units:** **Unit 5 Fractions** • Comparing fractions • Composing and decomposing fractions • Understanding operations when applied to fractions	• What do you notice when measuring an object with two different units of measure? • What benchmark units help you to estimate a measure? • What happens when you measure the same object with different units of measure? • Which measurement tool would you use for a particular situation? • How do fractional numbers help when measuring? • Which numbers do you use to mentally calculate a solution and why? • How would you break apart a number to make it easier to compute? • What is capacity?

Common Core State Standards
Grade 4
Unit 4: Measurement and Data

Measurement and Data

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

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), ...*

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.

Represent and interpret data.

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.*

Grade 4

Unit 5: Fractions

The purpose of this unit is to develop an understanding of fraction equivalence and operations with fractions. Students develop the understanding that properties of operations with whole numbers also applies to operations with fractions. They build a foundational understanding of fractions and how they relate to decimals. Students make the connection between fractions and division. When making comparisons, the size of the whole matters. Estimation strategies using benchmark numbers deepens the understanding of fractions and decimals.

Big Ideas: Central organizing ideas and underlying structures of mathematics.	**Essential Questions**
• Benchmark fractions are helpful for estimating and computing. • The more the whole is divided into equal parts, the smaller the parts, e.g. 8^{ths} are smaller than 4^{ths} • The denominator is the number of equal parts and the numerator is the number of equal parts being considered. • Equivalent fractions are different representations of the same quantity. • A fraction with the same numerator and denominator is equal to one whole. • Fractions are relations - the size of the whole (unit) is important. • Fractional parts can be represented using different models, e.g., as set model (or groups), area model, or linear model • When comparing fractions the size of the whole matters. • Benchmark numbers like ½ or ¼ help to flexibly and efficiently estimate sums and differences with fractions. • Algebraic properties that apply to whole numbers also apply to fractional numbers. • The symbol 1/10 and 0.1 mean the same thing, one part out of ten equal parts. 1/100 is the same as 0.01 or one part out of one hundred equal parts. • A fraction is a division problem and the denominator is the divisor. $1 \div 2 = \frac{1}{2} = 2\overline{)1}$ • Benchmark decimals like 0.25, or 0.5 are helpful for estimating and computing. • Decimals are base-ten fractions, and there are many ways to represent an equivalent quantity, e.g., ½, 5/10, 0.5, 0.50. • The more fractional parts to make a whole, the smaller the parts. • Fractions can be applied to a multiplicative context. **Thinking Ahead, Linking Big Ideas among units:** Unit 6 Geometry and Measurement • Angles are the measure of a rotation. • Angles can be measured and unit angles are additive	• How is a fraction like division? • How do benchmark fractions help you to estimate and solve problems? • What strategies could we use to add and subtract fractions? • How do you know if two fractions are equivalent? • What does "remainder" mean in the context of the division problem?, e.g., an integer, a left over, or a fractional part, or do you need to adjust your answer? Example: There are 36 people for 10 person vans, how many vans do you need? • How do you know when a fraction is larger or smaller than another? • When can ½ be a smaller quantity than ¼? • What is a mixed number? • What are fractions on a number line or ruler? • How are fractions and decimals similar? • What are benchmark decimals and how do they relate to benchmark fractions? • How do you know which fraction or decimal is larger or smaller?

Common Core State Standards
Grade 4
Unit 5: Fractions

Operations and Algebraic Thinking

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. *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.*

Number and Operations—Fractions

Extend understanding of fraction equivalence and ordering.

4.NF.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.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.

Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

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.

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?*

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. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.*

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 a visual model.

Measurement and Data

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.

Represent and interpret data.
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.*

Generalize place value understanding for multi-digit whole numbers.

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.*

Grade 4

Unit 6: Geometry and Measurement

The purpose of this unit is to develop the understanding that an angle measure is a measure of rotation and that angle measure is additive. Spatial reasoning using geometrical models to identify polygons and visualize spatial relationships is developed. Students describe, analyze, compare, and classify two-dimensional shapes. Students classify shapes by properties of their lines and angles.

Big Ideas: Central organizing ideas and underlying structures of mathematics.	**Essential Questions**
• The orientation (transformations: flips, slides, rotations) of the shape does not change the shape, e.g., a square rotated 45° is still a square. • Polygons can be composed and decomposed into other shapes. • Attributes of polygons enable us to categorize and classify them. • Polygons are two-dimensional figures • Some polygons have more than more than one line of symmetry. • Two-dimensional figures can be classified by the presence/absence of parallel or perpendicular line or angles. • Right angles can be classified in their own category. **Thinking Ahead, Linking Big Ideas among units:** **Unit 7 Multiplication and Division with Multi-digit Whole Numbers** • Division and its inverse relation to multiplication • Division with multi-digit numbers • Distributive property of multiplication over addition and subtraction with whole numbers	• What is a polygon? • How does knowing properties of polygons help you to compose and decompose them? • What attributes can you use to sort and classify the polygons? • How do you know if two polygons are congruent or similar? • How do you know if a polygon is symmetrical? • What is a transformation? • What are lines, rays, and angles?

Common Core State Standards
Grade 4
Unit 6: Geometry and Measurement

Measurement and Data

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. *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.*

Geometric measurement: understand concepts of angle and measure angles.

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.

Geometry

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.

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.

Grade 4
Unit 7: Whole Number Concepts, Estimation, and Computation, Extending Multiplication and Division

The purpose of this unit is to build on the understanding of basic operations with whole numbers and to develop fluency with efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Students flexibly select and use efficient procedures from a repertoire of strategies, including the standard algorithms to solve problems. This includes breaking apart numbers and using the associative and distributive property to make it easier to mentally compute solutions to problems involving whole numbers. Understandings of place value, properties of operation, and the relationship of multiplication and division using generalizable procedures are used to compute to find factors, products and multi-digit dividends. Estimation is an integral and integrated part of the problem solving process. Connections to fractional parts of a whole are reinforced involving division problems with remainders.

Big Ideas: Central organizing ideas and underlying structures of mathematics.	**Essential Questions**
• The distributive property provides a front-end strategy to estimate the answer to a multiplication and division problem. • The distributive property using 2- and 3-digit numbers may be represented using the array model. • Factors and products show the relationship between multiplication and division. • Commutative property • Associative property • Distributive property • Partial sums, partial products and partial factors help to simplify problems when mentally computing. • Our number system is structured around multiples of ten. • The expanded form shows the place value structure as multiples of ten. • Equivalent quantities can be represented differently • Addition, subtraction, multiplication, and division by multiples of ten make estimation and computation easier. • Division representations, e.g. $12 \div 3 = \frac{12}{3} = 3\overline{)12}$ • Division is sharing or grouping, e.g., 12 cookies shared by 3 people, or 12 cookies in bags of 3. • Multiplication and division are inverse relations. • A composite number has more than one and itself as factors.	• How can you break a number into parts to make it a "friendlier" number to calculate? • What pattern do you notice in our number system when you multiply and divide by multiples of ten, 10, 100, 1,000, 10,000…? • Why do benchmark numbers help you to estimate and solve problems? • What strategies could we use to multiply and divide numbers? • Which strategy is the most efficient for adding or subtracting given numbers and why? • How do you know if two expressions are equivalent? • How do partial products and partial factors make it easier to do mental computations? • How do partial products and partial factors make it easier to estimate? • How do you interpret the "remainder" in the context of a division problem? (i.e. is it an integer or 6 left over, a fractional part 3 3/5, or do you need to adjust your answer? (There are 54 people for 10 person vans. How many vans do you need?) • How does expanded form show the connection between place value and multiplication and division with the distributive property?

Thinking Ahead, Linking Big Ideas: **Grade 5** • Students will use their understanding of the four basic operations to problem solve with multi-digit computation problems in contextual situations. • Students flexibly and fluently apply algebraic properties to with whole numbers. • Students understand that the algebraic properties that apply to whole numbers, also apply to fractional numbers.	• How can you use the distributive property to estimate the answers to multiplication and division problems?

Common Core State Standards
Grade 4
Unit 7: Whole Number Concepts, Estimation, and Computation, Extending Multiplication and Division

Operations and Algebraic Thinking

Use the four operations with whole numbers to solve problems.

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.

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.

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.

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. *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*

Generalize place value understanding for multi-digit whole numbers.

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.*

4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.

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.

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.