Fairfield Public Schools

Mathematics

Grade 5

Board of Education Approved 4/10/2012

Fairfield Public Schools Mathematics Curriculum

Grade 5

Grade 5 Mathematics

Students in grade 5 flexibly use computation skills to reason when solving real world problems with whole numbers and compute fluently with basic operations. The algebraic properties used with whole numbers (associative, commutative, and distributive) continue to be applied to fractions and decimals. Equivalence is maintained when fractional numbers are represented in different ways. Substitutions are used to deepen the understanding of equivalence and generalizations enable students to write equations and formulas. Volume is recognized as an attribute of three-dimensional space. Students understand how the concepts of volume relate to multiplication and addition.

Grade 5 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 Whole Number Computation	Unit 2 Place Value, Estimation and Computation		Unit 3 Fractions	Unit 4 Measurement and Data		Unit 5 Geometry	Unit 6 Fraction Operations		Unit 7 Volume

Grade 5 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 Whole Number Computation
Unit 2 Place Value
Unit 3 Fractions
Unit 4 Measurement and Data
Unit 5 Geometry
Unit 6 Fractions as Operators
Unit 7 Volume

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 Five 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	Students in fifth grade solve problems by applying their understanding of operations with whole numbers, decimals, and fractions including mixed numbers. They solve problems related to volume and measurement conversions. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?".
2. Reason abstractly and quantitatively	Fifth graders recognize that a number represents a specific quantity. They connect quantities 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	Fifth grade students construct arguments using concrete referents, such as objects, pictures, and drawings. They explain calculations based upon models and properties of operations and rules that generate patterns. They demonstrate and explain the relationship between volume and multiplication. They refine their mathematical communication skills as they participate in mathematical 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. Fifth graders evaluate their results in the context of the situation and determine whether the results make sense. They also evaluate the utility of models to determine which models are most useful and efficient to solve problems.

5. Use appropriate tools strategically	Fifth 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 unit cubes to fill a rectangular prism and then use a ruler to measure the dimensions. They use graph paper to accurately create graphs and solve problems or make predictions from real world data.
6. Attend to precision	Grade 5 students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to expressions, fractions, geometric figures, and coordinate grids. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the volume of a rectangular prism they record their answers in cubic units.
7. Look for and make use of structure	In fifth grade, students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to add, subtract, multiply and divide with whole numbers, fractions, and decimals. They examine numerical patterns and relate them to a rule or a graphical representation.
8. Look for and express regularity in repeated reasoning	Fifth graders use repeated reasoning to understand algorithms and make generalizations about patterns. Students connect place value and their prior work with operations to understand algorithms to fluently multiply multi-digit numbers and perform all operations with decimals to hundredths. Students explore operations with fractions with visual models and begin to formulate generalizations.

Adapted from Connecticut Standards for Mathematics

Unit 1: Whole Number Computation **Grade 5**

The purpose of the launch is to establish classroom routines. The first unit is intended to engage students in thinking differently about previously taught material. The lessons focus on learning how to engage one another as mathematicians using 21st century skills. Class discourse is enhanced by using turn & talk, think-pair-share, justify reasoning, and constructing viable arguments for mathematical thinking. 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 of estimation and computation, including mental math and the standard algorithms, deepen understanding of the properties and operations that are used to solve problems.

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

• Benchmark numbers help to flexibly and efficiently add and subtract and multiply and divide numbers to mentally compute and estimate reasonableness of answers.
• Commutative property for addition and multiplication: The order of addends and factors can change without changing the result. For example, 1,000 + 300 = 300 + 1,000 or 1,000 x 30 = 30 x 1,000.
• The associative property:
  ○ Numbers can be composed, decomposed and regrouped to make mental computation easier.
  ○ Numbers can be flexibly combined by using a variety of strategies (i.e. regroup by using benchmark numbers or use doubles plus one or doubles plus one more group).
  ▪ 6,000 + 7,000 can be thought of as 6,000+ (4,000+3,000) or (6,000+4,000)+3,000, using multiples of 10, 100, 1000 as place value benchmarks, or
  ▪ 6,000 + 7,000 can be thought of as doubles plus one group of ten, 6,000 + (6,000+1,000) or (6,000+6,000)+1,000
• The distributive property uses partial products and partial factors to simplify multiplication and division problems, e.g., 25 x 12 = (20 + 5) x (10 + 2) or 25 x (10 + 2)
• Our number system is structured around multiples of ten.
• Multiplication and division by multiples of ten make estimation and computation easier.
• Numbers can be classified as prime or composite.
• Division can be represented different ways: $12 \div 3 = \frac{12}{3} = 3\overline{)12}$
• Division is partitive and quotative (sharing or grouping: 12 cookies shared by 3 people, or 12 cookies in bags of 3).
 	
Thinking Ahead, Linking Big Ideas among units:
 	
Unit 2 Place Value
• Understand the ten structure of our place value number system 10, 100, 1,000, 10,000, …1,000,000, and that the power of ten relationship continues with decimal numbers, 1.0 0.1, 0.01, 0.001
• Use the distributive property for computing with large and small numbers.
• Generalize the pattern of multiples of 10 to flexibly compute.
	• How do benchmark numbers help to estimate and justify reasonableness of answers to computation problems?
	• What different strategies could we use to estimate and compute?
	• Which strategy is the most efficient in a specific situation for computing and why?
	• How do you know if an equation has two equivalent expressions?
	• How does place value make mental computation easier?
	• What is a prime number?
	• How can using all the prime number factors and the associative property help you find all the other factors of a number?
	• What is a composite number?
	• Why is it helpful to know the factors of a number?
	• Why is it important to consider the numbers before selecting a strategy to solve a problem?

Common Core State Standards
Grade 5
Unit 1: Whole Numbers Concepts, Estimation, and Computation

Operations and Algebraic Thinking

Write and interpret numerical expressions.

5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7).Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921,without having to calculate the indicated sum or product.*

Number and Operations in Base Ten

Perform operations with multi-digit whole numbers and with decimals to hundredths.

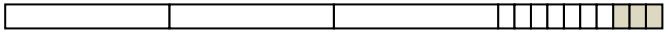
5.NBT.5 Fluently multiply multi-digit whole numbers using the standard algorithm.

5.NBT.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Unit 2: Place Value Concepts, Estimation and Computation Grade 5

The purpose of this unit is to deepen the understanding of place value by recognizing that the base-ten system extends infinitely in two directions. The understanding of multiples of 10 with whole numbers is extended to numbers less than one. Students use patterns in our number system for numbers between 1,000,000 and 0.001. Students use algebraic properties and their knowledge of the structure of our place value system to flexibly estimate and compute with large and small numbers. Open number lines, area models, time measurement, and the use of benchmark numbers as referent are applied when working with numbers.

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

• Our place value system is based on powers of ten.
• Place value patterns extend infinitely in both directions.
• Equivalent quantities can be represented differently (expanded form), e.g., 1,472=
  ○ 1,000 + 400 + 70 + 2 = (1 thousand)+(4 hundreds)+(7 tens)+(2 units)
  ○ (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), or
  ○ (1 x 10^3) + (4 x 10^2) + (7 x 10) + (2 x 1)
• These equivalent forms may be used to generalize rules for efficient computing.
• Expanded form allows us to represent and substitute numbers, e.g., 4232 = (4 x 1,000) + (2 x 100) + (3 x 10) + 2, or 42.32 = (4 x 10) + (2 x 1) + (3 x 0.1) + (2 x 0.01)
• The algebraic properties (associative, commutative, and distributive) with whole numbers continue to be applied and help to estimate and mentally compute.
• Addition, subtraction, multiplication, and division by multiples of ten make estimation and computation easier.
• The distributive property uses partial products and partial factors to simplify multiplication and division problems, e.g., 25 x 12 = 25 x (10 + 2) = 250 + 50 = 300
• The distributive property can be represented using an array model.
• Concrete models or drawings are used to add, subtract, multiply and divide decimals to hundredths, e.g., 3 tenths subtracted from 4 wholes. The wholes must be divided into tenths. The answer is 3 and 7/10 or 3.7. 
Strategies based on place value and properties of operations are used to add, subtract, multiply and divide decimals to hundredths.
 	
Thinking Ahead, Linking Big Ideas among units:
Unit 3 Fractions
• The algebraic properties (associative, commutative, and distributive) that apply to whole numbers continue to be applied and help to estimate and mentally compute with fractional numbers.
• Knowing the factors of composite numbers helps to compute with fractions.
• Fractions indicate division.
	• What pattern do you notice in our base-ten system when using powers of 10?
	• How are these patterns helpful when composing and decomposing numbers?
	• How do benchmark numbers help to estimate, mentally compute, and solve problems?
	• What different strategies could we use to compute with large numbers?
	• Which strategy is the most efficient for a specific situation to estimate and compute?
	• How do you know if two equivalent expressions are equivalent?
	• How do partial products and partial quotients (factors) make it easier to estimate and perform mental computations?
	• How does substituting using the expanded form make it easier to estimate, compute and judge the reasonableness of answers?
	• How are pictorial representations used to add, subtract, multiply and divide decimals?

Common Core State Standards
Grade 5
Unit 2: Place Value Concepts, Estimations and Computation

Number and Operations in Base Ten

Understand the place value system

5.NBT.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

5.NBT.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

5.NBT.3 Read, write, and compare decimals to thousandths.

a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.

b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

5.NBT.4 Use place value understanding to round decimals to any place.

Perform operations with multi-digit whole numbers and with decimals to hundredths.

5NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Measurement and Data

Convert like measurement units within a given measurement system.

5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Unit 3: Fractions	**Grade 5**
The purpose of this unit is to deepen the understanding of fractions. Students understand the larger the denominator, the smaller the equal unit parts and the numerator is the count of these unit parts. Students understand the connection between fractions and division and can explain why the fraction symbol indicates division. Benchmark fractions are used to help estimate solutions to problems. Equivalence is different representations of the same quantity, and equivalent forms can be substituted for each other. The commutative, associative, and distributive properties help to compute with fractions.	
Big Ideas: The central organizing ideas and underlying structures of mathematics.	**Essential Questions**
• Benchmark fractions are helpful for estimating, comparing and computing. • When comparing fractions, the size of the whole matters. • The algebraic properties with whole numbers continue to be applied to fractions. • Fractions indicate division and the denominator is the divisor. • The more the whole is divided into equal parts, the smaller the parts (12^{ths} are smaller than 4^{ths}). • Equivalent fractions are different representations of the same quantity. • Equivalent fractions can be thought of as a ratio relationship (1 out of 2, 2 out of 4). • Knowing the factors of composite numbers helps us to identify common factors. This allows us to compare and find equivalent fractions. • Equivalent fractions can be substituted for each other. • Addition and subtraction of fractions must have like denominators. • Strategies are developed to divide fractions in general, by reasoning about the relationship between multiplication and division. • Interpret division of a whole number by a unit fraction or a unit fraction by a non-zero whole number and compute, e.g., $\frac{1}{3} \div 4$ (Four students were sharing $\frac{1}{3}$ of a pan of brownies. How much of the pan will each student get if they share the brownies equally?)	• What is a fraction? • What is a mixed number? • What is an improper fraction? • What do fractions (mixed numbers, improper fractions) represent on the number line or ruler? • How do you know when a fraction represents the same quantity? • How do you know if two fractions are equivalent? • Why can equivalent fractional forms be substituted for each other? • How do benchmark fractions help you to estimate, compare, compute, and judge reasonableness of answers? • What does the numerator mean? • What does the denominator mean? • How does a fraction indicate division? • What different strategies could be used to add and subtract fractions? • Which strategy is the most efficient for estimating and computing with fractions for a given situation and why? • Which model best illustrates equivalent fractions and why? • How can the distributive property help you estimate and multiply fractions and mixed numbers? • Which fraction represents a larger or smaller quantity and how do you know? • When can ½ be a smaller quantity than ¼? • How do you interpret division of a unit fraction by a non-zero whole number or a whole number by a unit fraction and compute?

Thinking Ahead, Linking Big Ideas among units: **Unit 4 Measurement and Data** • Conversion of units of measure. • Units of measure are fractional parts in relation to the whole.	

Common Core State Standards
Grade 5
Unit 3: Fractions

Number and Operations—Fractions

Use equivalent fractions as a strategy to add and subtract fractions.

5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

5.NF.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators ,e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that3/7 < 1/2.*

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

5.NF.3 Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*

5.NF.5 Interpret multiplication as scaling (resizing), by:

a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.

5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.*

b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.*

c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb. of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?*

Operations and Algebraic Thinking

Write and interpret numerical expressions.

5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7).Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921,without having to calculate the indicated sum or product.*

Unit 4: Measurement and Data	**Grade 5**
The purpose of this unit is to collect data involving measurement in order to convert and compare quantities within a given measurement system. Students recognize customary and metric units of measure and benchmarks for measurement. Students will understand that different unit measures and ratios are involved in converting units of measure (hours and minutes, feet and inches, centimeters and meters). This continues to build on the concept that substitutions may be made with equivalent values.	
Big Ideas: The central organizing ideas and underlying structures of mathematics.	**Essential Questions**
• Data can be organized and presented in different ways to provide different information. • The reasonableness of an answer may be affected by the size of the sampling of data. • Predictions can be made by analyzing information gathered from organized data. • Interpreting data can influence a decision or choice. • A unit measure represents the distance between marks on a scale. • Measurement involves a ratio of the unit size to the size of the whole. • The same unit must be used to measure and compare two objects. • The smaller the unit of measure the more units are needed to measure the same object. • There are specific ratios used to convert measures. • Different tools and units are appropriate for measuring specific objects in different contexts. **Thinking Ahead, Linking Big Ideas among units:** **Unit 5 Geometry** • Classify two-dimensional figures in a hierarchy based on properties • Real world and mathematical problems can be represented by graphing points on a coordinate plane and interpreting the values of the points in the context of the situation.	• What is the best way to organize a particular set of data and why? • How does organizing data help us understand information? • What conjectures can be made based on the data? If you were to continue collecting data what do you think would happen? • How can you compare different sets of data? • How does the analysis of data influence a decision or choice? • How does the size of a sampling affect the reasonableness of a prediction? • Can trends be identified from a set of data? • What do you notice about measuring the same object with two different units of measure? • Why does the size of the unit matter? • What benchmarks are helpful when estimating a measure and why? • How do you convert between measures? • What ratios can you use to change from one unit of measure to another?

Common Core State Standards
Grade 5
Unit 4: Measurement and Data

Measurement and Data

Convert like measurement units within a given measurement system.

5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Represent and interpret data.

5.MD.2. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

Unit 5: Geometry	**Grade 5**
The purpose of this unit is to use points on a coordinate plane to represent and then interpret real world and mathematical problems. Two dimensional figures can be categorized in a hierarchy based on their properties. Students use attributes to compare polygons and solids and identify commonalities and subsets. Students understand that the relationship among attributes helps to define polygons and solids.	
Big Ideas: The central organizing ideas and underlying structures of mathematics.	**Essential Questions**
• The first number indicates how far to travel from the origin in the direction of one axis. • The second number indicates how far to travel from the origin in the direction of the second axis. • The names of the two axes and the coordinates correspond. • Attributes of polygons and solids enable us to categorize and classify them. • Polygons and solids can be described through estimates and measures of their parts. • Polygons can be moved along a plane or space. • Looked at from different perspectives, the relationship of polygons and solids may be seen.	• How can estimations and actual measurement of parts help to classify polygons and solids? • What attribute can you use to classify polygons and solids? • How do you draw a coordinate grid? • How can an ordered pair represent a point on a coordinate grid? • How do you know where to plot the first and second numbers on a coordinate grid?
Thinking Ahead, Linking Big Ideas among units: **Unit 6 Fractions with Operations** • Operations with fractions have the same meaning as operations with whole numbers. • Algebraic properties used with whole numbers continue to be applied to fractional numbers.	

Grade 5
Common Core State Standards
Unit 5: Geometry

Graph points on the coordinate plane to solve real-world and mathematical problems.

5.G.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).

5.G.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Classify two-dimensional figures into categories based on their properties.

5.G.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.
For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.

5.G.4 Classify two-dimensional figures in a hierarchy based on properties

Operations and Algebraic Thinking

Analyze patterns and relationships.

5.OA.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*

Unit 6: Fraction Operations	**Grade 5**
The purpose of this unit is to connect the understanding that algebraic properties (associative, commutative, and distributive) used with whole numbers continue to be applied to fractional numbers. Estimation is important for judging the reasonableness of comparisons and computation with fractions and decimals. Students extend the use of addition and subtraction with fractions and use the distributive property to multiply fractions and mixed numbers. They use equivalence to work with mixed numbers and improper fractions. Students write expressions, equations, and use formulas with fractions and mixed numbers to estimate and solve problems. Students are provided opportunities to use proportional reasoning to justify solutions to problems.	
Big Ideas: The central organizing ideas and underlying structures of mathematics.	**Essential Questions**
• Equivalent fractions and/or decimals can be substituted when operating on them. • Benchmark fractions help to estimate, compare, compute numbers mentally, and judge the reasonableness of answers. • The distributive property and arrays may be used as models for multiplying fractions and mixed numbers. • When multiplying two rational numbers the product may be equal to, greater than, or less than the factors, e.g., 4/5 x 2/2 =8/10, 1 ½ x 3 = 4 ½ , ¼ x ½ = 1/8 • The algebraic properties with whole numbers continue to be applied to fractions. • Equivalent fractions are different representations of the same quantity. • Equivalent fractions can be thought of as a ratio relationship (1 out of 2, 2 out of 4) • Knowing the factors of composite numbers helps us to identify common factors in the denominator. This allows us to compare and find equivalent fractions. • Equivalent fractions can be substituted for each other. **Thinking Ahead, Linking Big Ideas among units:** **Unit 7 Volume** • Volume is an attribute of three-dimensional space. • Volume is related to area.	• What different strategies could you use to compute with fractions? • Which strategy is the most efficient for estimating and computing fractions for a given situation and why? • How do benchmark fractions help you to estimate a solution? • How do benchmark fractions help you to mentally compute? • How would you break apart a number to make it easier to compute? • How does the distributive property help you to estimate and multiply fractions and mixed numbers?

Common Core State Standards
Grade 5
Unit 6: Fraction Operations

Number and Operations—Fractions
Use equivalent fractions as a strategy to add and subtract fractions.

5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

5.NF.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
a. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. *For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*

5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

Operations and Algebraic Thinking
Write and interpret numerical expressions.

5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7).Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921,without having to calculate the indicated sum or product.*

Measurement and Data
Represent and interpret data.
5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

Unit 7: Volume **Grade 5**

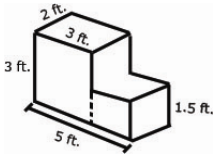
The purpose of this unit is to extend understanding of two-dimensional space to recognize volume as an attribute of three-dimensional space. Volume can be measured by counting unit cubes of the same size and by applying a formula. There is a relationship between area and volume. A variety of rectangular prisms can be constructed given one volume. Volumes of non-overlapping rectangular prisms can be determined by adding the volume of each. Students connect the written notation of a cubic unit to their understanding of powers of 10 in our place value system.

Big Ideas:
The central organizing ideas and underlying structures of mathematics.

- Recognize volume as an attribute of solid figures.
- Understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume.
- The cubic unit is written with an exponent of 3.
- Same sized cubic units are used to measure volume.
- Volume is related to the operations of multiplication and addition.
- Volume is related to area.
- The associative property of multiplication and decomposition of numbers can be used to determine equivalent volumes of rectangular prisms; e.g., When given 24 cubes, how many rectangular prisms can be made with a volume of 24 cubic units?

Length	Width	Height
1	2	12
2	2	6
4	2	3
8	3	1

- Volume is additive; e.g., Calculate the volumes of each of the rectangular prisms and add to determine the volume of the solid figure.



Thinking Ahead, Linking big ideas:

Essential Questions

- How can volume be measured?
- What is the relationship between the total volume and the area of the base?
- What is the volume formula if you know the area of the base?
- What is the volume formula if you know the length, width and height of a rectangular prism?
- How can you build as many prisms as possible given a particular volume?
- How can you find the volume of an irregular rectangular prism?

Grade 6	
• Connect ratio and rate to whole number multiplication and division and use concepts of ratio and rate to solve problems. • Apply division of fractions and extend the notion of number to the system of rational numbers. • Write, interpret, and use expressions and equations. • Develop understanding of statistical thinking.	

Common Core State Standards
Grade 5
Unit 7: Volume

Measurement and Data

Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

5.MD.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.
b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.

5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft., and improvised units.

5.MD.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.
a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.
b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems.
c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

Operations and Algebraic Thinking

Write and interpret numerical expressions.
5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7).Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921,without having to calculate the indicated sum or product.*