Fairfield Public Schools

Mathematics

Grade 3

Fairfield Public Schools Mathematics Curriculum

Grade 3

Grade 3 Mathematics Overview

Grade 3 students move from additive thinking to multiplicative thinking deepening their understanding of addition and subtraction as they make connections to multiplication and division within 100. They develop an understanding of multiplication and the inverse relationship with division with whole numbers through the use of multiple representations e.g. equal-sized groups, arrays, area models, and equal jumps on a number line for multiplication and successive subtraction, partitioning, and sharing for division. Relationships can be generalized and represented through rules. Fractions are understood in terms of unit fractions and parts of a whole. Objects and geometric shapes and figures can be described and categorized based upon measurement and classification of special attributes. Multiplication concepts are developed through the use of a variety of models including the area model.

Grade 3 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 Addition & Subtraction	Unit 2 Place Value Estimation and Computation	Unit 3 Early Multiplication & Division	Unit 4 Fractions	Unit 5 Measurement and Data	Unit 6 Geometry	Unit 7 Extending Multiplication and Division

<table>
<tr><th colspan="3">Grade 3 Overview</th></tr>
<tr>
<td>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.</td>
<td>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?</td>
<td>Assessments

• Formative Assessments
• Summative Assessments
• District –Wide Screening Tools
• State Testing</td>
</tr>
<tr>
<td>Content Outline:

Unit 1 Addition & Subtraction
Unit 2 Place Value
Unit 3 Early Multiplication and Division Concepts
Unit 4 Fractions
Unit 5 Measurement and Data
Unit 6 Geometry
Unit 7 Extending Multiplication and Division</td>
<td colspan="2">Mathematics Standards
CT Common Core State Standards (CCSS)

Fairfield Public Schools Skills Matrix (Skills Matrix)

Primary Resources
• About Teaching Mathematics, Marilyn Burns
• Contexts for Learning Mathematics, Natale and Fosnot
• Scott Foresman · Addison Wesley 2004
• Teaching Student-Centered Mathematics –Van de Walle and Lovin</td>
</tr>
</table>

Grade Three 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 third 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. Third graders may 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	Third graders should 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.
3. Construct viable arguments and critique the reasoning of others	Third grade students construct arguments using concrete referents, such as objects, pictures, and drawings. They refine their 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, acting out, making a chart, list or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Third graders should evaluate their results in the context of the situation and reflect on whether the results make sense.
5. Use appropriate tools strategically	Third 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 to find all the possible rectangles that have a given perimeter. They compile the possibilities into an organized list or a table, and determine whether they have all the possible rectangles.
6. Attend to precision	As third graders develop their mathematical communication skills, they try to use clear and precise language in their 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, when figuring out the area of a rectangle they record their answers in square units.
7. Look for and make use of structure	In third grade, students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to multiply and divide (commutative and distributive properties).
8. Look for and express regularity in repeated reasoning	Students in third grade notice repetitive actions in computation and look for more shortcut methods. Students may use the distributive property as a strategy for using products they know to solve products that they don't know. For example, if students are asked to find the product of 7 x 8, they might decompose 7 into 5 and 2 and then multiply 5 x 8 and 2 x 8 to arrive at 40 + 16 or 56. In addition, third graders continually evaluate their work by asking themselves, "Does this make sense?"

Adapted from Connecticut Standards for Mathematics

Grade 3

Unit 1: Launch - Whole Number Concepts, Estimation and Computation using Addition and Subtraction

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 about previously taught material differently while the focus of the lessons is on learning how to engage one another as mathematicians using 21st century skills. Some examples include; 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.

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

• Identifying patterns in mathematics helps us to make generalizations.
• Equivalence may be shown as models and equations. (i.e. 4+8 = 7+ 5)
• Compose and decompose whole numbers using partial sums and differences, both standard and non-standard groupings, to help flexibly and efficiently compute with numbers. e.g. 17 - 9 = 17 – (7 + 2) = (17 - 7) = 10 minus 2 more = 8
• Commutative property for addition and multiplication: The order of addends or factors does not change the result, e.g., 10 + 3 = 3 + 10
• The associative property:
  ○ Numbers can be composed and decomposed to make estimation and mental computation easier.
  ○ You can flexibly combine numbers using a variety of strategies, e.g., 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
• Equivalent quantities can be represented differently, e.g., 29 + 45 = 30 + __?_.
• Use a variety of representations for creating and solving word problems using addition and subtraction.
 	
Thinking Ahead, Linking Big Ideas among units:
 	
Unit 2: Place Value
 	
• Our number system is structured around multiples of tens, e.g., 2 can represent 2 units, 2 groups of ten, 2 groups of hundred 2 groups of a thousand.
• Benchmark numbers help us to compute mentally.
	• How do patterns in mathematics help us to make generalizations or rules that help us to solve similar problems?
	• Why do benchmark numbers help to solve problems?
	• How could we compose or decompose numbers to make them easier to add and subtract?
	• Which strategy is the most efficient for adding or subtracting given numbers and why?
	• How do you know if an equation is equivalent?
	• How do partial sums make it easier to do mental computations?

Common Core State Standards
Grade 3
Unit 1: Whole Number Concepts, Estimation and Computation using Addition and Subtraction

Operations and Algebraic Thinking

Solve problems involving the four operations, and identify and explain patterns in arithmetic.
3.OA.8- Solve two-step word problems using the four operations. 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.

3.OA.9 **-** Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.*

Number and Operations in Base Ten

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

3.NBT.2 **-** Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

Grade 3

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

The purpose of this unit is to connect the work from grade 2 of composing and decomposing numbers to extend the understanding of the structure of our place value system and base ten. The concept of multiple sets of equal-sized groups of 10s, 100s, 1,000s, and 10,000s also builds understanding for the work with multiplication and division in later units. Numbers are composed and decomposed using expanded notation, as well as regrouping numbers, to deepen understandings of equivalence. Grade 3 students develop an understanding of number relationships and generate generalized rules for using multiples of 10.

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

- Skip counting is counting equal groups and leads to repeated addition.
- Repeated addition & subtraction is a pattern that can be extended. (i.e. 120, 220, 320, 420…)
- Repeated addition leads to multiplicative thinking, e.g., 6 equal groups of 5 is 6 groups of 5 or 6 x 5 = 30.
- Commutative property for addition - The order of addends does not change the result, e.g., 10 + 3 = 3 + 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, e.g., 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
- Our number system is structured around multiples of ten.
- The place value structure shows multiples of ten, including the expanded form, e.g., 4,236 =
  - (4 thousands)+(2 hundreds)+(3 tens)+(6 units) or 4,000+200+30+6
  - (4 x 1,000) = (2 x 100) + (3 x 10) + (6 x 1), or
  - (4 x 10 x 10 x 10) + (2 x 10 x 10) + (3 x 10) + (6 x 1)
- Equivalent quantities can be represented differently.

Thinking Ahead, Linking Big Ideas among units:
Unit 3 : Early Multiplication and Division

- Associative property of multiplication
- Commutative property of multiplication
- Identity property of multiplication
- Distributive property of multiplication (over addition and subtraction)
- Division, partitive (unknown quantity to known number of groups) and quotative (known quantity to unknown number of groups)

Essential Questions

- What pattern do you see in our number system when you count by ?
- 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 different strategies could we use to add and subtract numbers?
- Which strategy is the most efficient for adding or subtracting a given set of numbers and why?
- How can you tell if a relationship is an equal?
- How does grouping numbers help to solve problems?
- How can you tell if two different representations of a quantity are equivalent?
- How does understanding the base-ten system help us to estimate and solve problems?

Common Core State Standards
Grade 3
Unit 2: Whole Number Place Value Concepts, Estimation and Computation

Number and Operations in Base Ten

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

3.NBT.1 - Use place value understanding to round whole numbers to the nearest 10 or 100.

3.NBT.2 **-** Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

Operations and Algebraic Thinking

Solve problems involving the four operations, and identify and explain patterns in arithmetic.

3.OA.9 - Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.*

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

The purpose of this unit is to develop the understanding of multiplication and division and their inverse relationship. Multiplication is a more efficient method for repeated addition. Students create and analyze patterns that involve ratio relationships (e.g. the number of wheels is 4 times the number of cars.) Students deepen their understanding of addition and subtraction and make a connection to thinking multiplicatively with whole numbers as it relates part-part-whole relationships of equal-sized groups. Third graders begin developing flexible and fluent use of all four operations for numbers 0-10.

<table>
<tr><th>Big Ideas:
The central organizing ideas and underlying structures of mathematics.</th><th>Essential Questions</th></tr>
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There are multiple ways to take apart and combine any given set of numbers.
Different situations (numbers) lend themselves to using different computation strategies.
Multiplication and division are efficient methods that are related to addition and subtraction.
Multiplication and division are inverse relations.
A variety of strategies for computing can be generalized to become rules. (generalized procedures)
Distributive property of multiplication allows you to use known facts to find unknown facts, e.g., 30 ÷ 5 = (15+15) ÷ 5) = (3 + 3 = 6)
Benchmark numbers help to make numbers “friendly” and easier to estimate and mentally compute.
Place value patterns and estimation support multiplication and division.
Multiplication and division can be modeled using arrays, number lines, sets and patterns.
Apply the algebraic properties to computation, e.g., 8 x 7 = (8 x (5 +2) or (8 x 5) + (8 x 2).

Thinking Ahead, Linking Big Ideas among units:

Unit 4: Fractions

Measurement involves a ratio of the unit attribute to the whole
Estimation of measures involve personal benchmarks
Measurement involves fractional parts of a unit

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How do partial products and partial factors make it easier to do mental computations?
What different strategies could we use to add, subtract, multiply, divide?
How are multiplication and division related to addition and subtraction?
How is multiplication related to division?
How is a number line like a ruler?
How do benchmark numbers like 5 and 10 help you solve problems?
How do you know if your answer is correct?
How do you know if your strategy will work for all numbers?
How does making “friendly” numbers help you to solve the problem?
How can the number sentence be thought of in different ways?
Why is it important to consider the numbers first before you choose an efficient strategy to solve the problem?
How can you tell when a strategy is most efficient for a particular problem?
How do you know which operation to use when solving a problem?
How do algebraic properties help make estimating and solving problems easier?

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Common Core State Standards
Grade 3
Unit 3: Whole Number Concepts, Estimation, and Computation with Early Multiplication and Division

Operations and Algebraic Thinking

Represent and solve problems involving multiplication and division.
3.OA.1 - Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.*
3.OA.2 - Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.*
3.OA.3 - Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
3.OA.4 - Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = □ ÷ 3, 6 × 6 = ?.*

Understand properties of multiplication and the relationship between multiplication and division.
3.OA.5 - Apply properties of operations as strategies to multiply and divide. *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*

Solve problems involving the four operations, and identify and explain patterns in arithmetic.
3.OA.8 - Solve two-step word problems using the four operations. 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.
3.OA.9 - Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.*

Number and Operations in Base Ten

Use place value understanding and properties of operations to perform multi-digit arithmetic.
3.NBT.1 - Use place value understanding to round whole numbers to the nearest 10 or 100.
3.NBT.2 - Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

Grade 3 **Unit 4: Fractions**	
The purpose of this unit is to deepen the understanding of fractions as a whole decomposed into equal parts. Students understand the part-whole relationship as equal groups and equal shares of a whole unit. Each of these equal shares can be counted as a unit fraction. There are many ways for students to represent fractions as parts of a whole, parts of sets, area models, or units on a number line. Students compare and order fractional quantities and recognize equivalence.	
Big Ideas: The 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. • Fractional parts must be of equal size. • Equivalent fractions can represent the same quantity, e.g., 1/2 = 2/4 • A fraction with the same numerator and denominator is equal to one whole. • Fractions are relations - the size of a fractional part is relative to the size of the whole and the size of the whole (unit) is important. • Fractional parts can be represented as sets (or groups), area, or linear models. **Thinking Ahead, Linking Big Ideas among units:** **Unit 5: Measurement and Data** • The size of the unit matters when comparing and estimating • Relate area to operations of multiplication and addition • Generate measurement data using fractional units.	• What is a fraction? • How do benchmark fractions help us to estimate solutions to problems? • How can you tell when a fraction is larger/smaller when comparing fractions? • How do you know when two fractions represent the same quantity? • How can you use what you know about multiplication and division to help you think about fractions?

Common Core State Standards
Grade 3
Unit 4: Fractions

Number and Operations—Fractions

Develop understanding of fractions as numbers.

3.NF.1 - Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a*/*b* as the quantity formed by *a* parts of size 1/*b*.

3.NF.2 - Understand a fraction as a number on the number line; represent fractions on a number line diagram.

a. Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line.

b. Represent a fraction *a*/*b* on a number line diagram by marking off *a* lengths 1/*b* from 0. Recognize that the resulting interval has size *a*/*b* and that its endpoint locates the number *a*/*b* on the number line.

3.NF.3 - Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.
a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.

b. Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3. Explain why the fractions are equivalent, e.g., by using a visual fraction model.

c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.*

d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

Grade 3 **Unit 5: Measurement and Data**	
The purpose of this unit is for students to deepen their understanding of measurement concepts through analyzing attributes and properties of two-dimensional objects. They use their understanding of equal-sized groups to develop an understanding of standard and non-standard (equal) units of measure. There are agreed upon units of measure (customary and metric) as well as non-standard (student generated) units of measure that can be used to measure objects. Measurement is relational and the count of actual units gives an indication of size. It enables two things to be compared without actually matching them. The size (weight, volume, capacity) of an object is equivalent to the number of units used to measure it. Connections are made between area and array models used to represent multiplication. The use of estimation with benchmark units of measure promotes multiplicative reasoning. Students will use different problem structures to solve problems involving intervals of time. Within this unit students will also gather, organize and analyze data using charts, tables and graphs. Data can be organized in various graphical forms to visually convey information. This unit also integrates and reinforces calculating skills of all operations with whole numbers while solving problems.	
Big Ideas: The central organizing ideas and underlying structures of mathematics.	**Essential Questions**
• Measurement involves a ratio of the constant unit to the whole • Estimation of measures involve personal benchmarks • Measurement involves fractional parts of a unit, e.g., ½ inch, ¼ inch • A unit measure represents a uniform amount • The size of the unit matters when comparing and estimating measures • Different units are used to measure length (inches, feet, yard, mile centimeters, meters, kilometers) and the choice of a unit is influenced by the context. • Area is measured by units of smaller areas such as square inches, square centimeters, square feet, etc. • Data can be organized and presented in different ways to provide different information • Inferences can be made from a sampling of data • Predictions can be made by analyzing information gathered from organized data • Change can be measured over time. **Thinking Ahead, Linking Big Ideas among units:** **Unit 6: Geometry** • Equal units of measure can be used to quantify geometric properties • Shapes can be composed and decomposed • Equal parts of a shape can be expressed as unit fractions	• Why is it important to keep the unit of measure uniform when making measurements? • What is a benchmark measure and how does it help you estimate length, distance, weight, and volume? • What does the unit measure mean? • When measuring a given object, how is the size of the unit related to the number of units needed? • When is an exact measure important and when is it practical to estimate? • How is a number line like a ruler? • Which an appropriate tool and unit of measure to measure a given attribute and why? • What would happen if you changed your unit of measure? • How can data be presented in different ways? • How does the data support your conjecture? • What do the compared sets of data tell you? • What is a way to describe a typical element of data in a set of data? • What generalizations can be made from a set of data?

Common Core State Standards
Grade 3
Unit 5: Measurement and Data

Measurement and Data

Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
3.MD.1 - Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.
3.MD.2 - Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

Represent and interpret data.
3.MD.3 - Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*
3.MD.4 - Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
3.MD.5 - Recognize area as an attribute of plane figures and understand concepts of area measurement.
a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.
b. A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.
3.MD.6 - Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).
3.MD.7 - Relate area to the operations of multiplication and addition.
a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.
d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.
3.MD.8 - Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

Grade 3

Unit 6: Geometry

The purpose of this unit is to develop spatial reasoning through identifying and visualizing spatial relationships. Objects and shapes can be described and categorized based upon measurement and classification of their specific attributes. Students begin to move beyond the appearance of shape as descriptors to using attributes to describe them and make generalizations, e.g., a square with four sides, opposite sides are parallel and four right angles, begin to fit into a class of shapes, rectangles, and even into a larger category of quadrilaterals.

Big Ideas: The central organizing ideas and underlying structures of mathematics.	**Essential Questions**
• Equal units of measure can be used to quantify geometric properties • The orientation (transformations) of the shape does not change the shape, e.g., a square rotated 45° is still a square. • Shapes and solids can be composed and decomposed (part-whole relations) • Geometric shapes can be described through estimated and actual measurements. • Area is measured in square units. • Parts of shapes can be described in fractional terms • Area is an attribute of two-dimensional regions • Shapes are alike and different based on their geometric attributes • Shapes in different categories may share attributes • Shapes can be moved in a plane or space • A unit measure represents an amount between demarcations rather than a mark on a scale itself. **Thinking Ahead, Linking Big Ideas among units:** **Unit 7: Extending Multiplication & Division with Whole Numbers** • Array model supports multiplicative thinking as students make connections between area and arrays. • Algebraic properties help to make estimation and mental computation easier.	• What shapes make up larger shapes? • How does breaking a larger shape into smaller shapes help you to think about the attributes of the shape? • How well do your estimated measures compare to the actual measures of shapes and why? • In what ways are shapes the same, similar or different when they are moved in space? • What attributes can you use to sort and classify Two-dimensional shapes?

Common Core State Standards
Grade 3
Unit 6: Geometry

Geometry

Reason with shapes and their attributes.
3.G.1 - Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.
3.G.2 - Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

Measurement and Data

Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
3.MD.5 - Recognize area as an attribute of plane figures and understand concepts of area measurement.
a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area. b. A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.
3.MD.6 - Measure areas by counting unit squares (square cm, square m, square in, square ft., and improvised units).
3.MD.7 - Relate area to the operations of multiplication and addition.
a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.
d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.
3.MD.8 - Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

Grade 3

Unit 7: Whole Number Concepts, Estimation and Computation using Addition and Subtraction with Multiplication & Division

The purpose of this unit is to deepen the development of multiplication and division concepts and their inverse relationship. Greater facility with mental computation strategies and estimation become more significant as students evaluate the efficiencies of alternative strategies including the standard algorithm. Algebraic properties are applied to whole numbers when students compute using partial products and partial quotients. Although greater numbers are explored, automaticity with basic facts is the goal with all four operations 0-10 by the end of grade 3.

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

- There are multiple ways to compose and decompose any given set of numbers.
- Different situations lend themselves to using different computation strategies.
- Multiplication and division are efficient methods that are related to addition and subtraction.
- Multiplication and division are inverse relations.
- A variety of strategies for computing can be generalized to become rules.
- Distributive property of multiplication allows you to use known facts to find unknown facts, e.g., $48 \div 6 = (24+24) \div 6) = (4 + 4 = 8)$
- Benchmark numbers help to make numbers "friendly" and easier to mentally compute and make estimations
- Place value patterns and estimation support multiplication and division.
- Multiplication and division can be modeled sets, arrays, patterns, and number lines.

Essential Questions

- How do partial products and partial quotients (factors) make it easier to do mental computations?
- What different strategies could we use to add, subtract, multiply, divide?
- How are multiplication and division related to addition and subtraction?
- How is multiplication related to division?
- How is a number line like a ruler?
  How do benchmark numbers like 5 and 10 help you solve problems?
- How do you know if your answer is correct?
- How do you know if your strategy will work for other numbers?
- How can decomposing numbers make it easier to mentally compute?
- How can the number sentence be thought of in different ways?
- Why is it important to consider the numbers first before you choose an efficient strategy to solve the problem?
- How can you tell when a strategy is most efficient for a particular problem?
- How do you know which operation to use when solving a problem?

Thinking Ahead, Linking Big Ideas:

Grade 4

- Students will extend their understanding of the four basic operations to multi-digit computation in contextual situations.
- Students will flexibly and fluently apply algebraic properties when computing.

Common Core State Standards
Grade 3
Unit 7: Extending Multiplication and Division Concepts, Estimation and Computation with Whole Numbers

Operations and Algebraic Thinking

Represent and solve problems involving multiplication and division.
3.OA.1 - Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.*
3.OA.2 - Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.*
3.OA.3 - Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
3.OA.4 - Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = □ ÷ 3, 6 × 6 = ?.*

Understand properties of multiplication and the relationship between multiplication and division.
3.OA.5 - Apply properties of operations as strategies to multiply and divide. *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*
3.OA.6 - Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.*

Multiply and divide within 100.
3.OA.7 - Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

Solve problems involving the four operations, and identify and explain patterns in arithmetic.
3.OA.8 - Solve two-step word problems using the four operations. 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.
3.OA.9 - Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.*

Number and Operations in Base Ten
3.NBT.3 - Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.