VALWOOD

GO BEYOND

Fifth Grade Math Curriculum

5th Grade Overview

Course Description

In fifth grade instructional time should focus on three critical areas: (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume.

Topics at a Glance

- Generalize place value concepts to decimal numbers
- Multiply and divide multi-digit whole numbers and decimals to hundredths.
- Add and subtract fractions
- Multiply fractions
- Begin fraction and whole number division
- Patterns, functions, and algebraic structures
- Perimeter, area, and volume
- Flexible problem solving of multi-digit whole numbers and decimals
- Line plots and fractional amounts
- Geometric attributes and coordinate graphing
- Measurement conversions

Assessments

- Math Diagnostic Assessments
- Assessment tasks from adopted instructional materials

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Grade Level Expectations

Standard	Big Ideas for Fifth Grade
1. Number Sense, properties, and operations	1. The decimal number system describes place value patterns and relationships that are repeated in large and small numbers and forms the foundation for efficient algorithms 2. Formulate, represent, and use algorithms with multi-digit whole numbers and decimals with flexibility, accuracy, and efficiency 3. Formulate, represent, and use algorithms to add and subtract fractions with flexibility, accuracy, and efficiency 4. The concepts of multiplication and division can be applied to multiply and divide fractions
2. Patterns, Functions, & Algebraic Structures	1. Number patterns are based on operations and relationships
3. Data Analysis, Statistics, & Probability	1. Visual displays are used to interpret data
4. Shape, Dimension, & Geometric Relationships	1. Properties of multiplication and addition provide the foundation for volume an attribute of solids 2. Geometric figures can be described by their attributes and specific locations in the plane

1. Number Sense, Properties, and Operations

Number sense provides students with a firm foundation in mathematics. Students build a deep understanding of quantity, ways of representing numbers, relationships among numbers, and number systems. Students learn that numbers are governed by properties, and understanding these properties leads to fluency with operations.

Valwood Graduates

The Valwood graduate competencies are the preschool through twelfth-grade concepts and skills that all graduates will be able to demonstrate.

Valwood Graduate Competencies in the Number Sense, Properties, and Operations Standard are:

- Understand the structure and properties of our number system. At their most basic level numbers are abstract symbols that represent real-world quantities
- Understand quantity through estimation, precision, order of magnitude, and comparison. The reasonableness of answers relies on the ability to judge appropriateness, compare, estimate, and analyze error
- Are fluent with basic numerical and symbolic facts and algorithms, and are able to select and use appropriate (mental math, paper and pencil, and technology) methods based on an understanding of their efficiency, precision, and transparency
- Make both relative (multiplicative) and absolute (arithmetic) comparisons between quantities. Multiplicative thinking underlies proportional reasoning
- Understand that equivalence is a foundation of mathematics represented in numbers, shapes, measures, expressions, and equations
- Apply transformation to numbers, shapes, functional representations, and data

Content Area: Mathematics - Fifth Grade

Standard: 1. Number Sense, Properties, and Operations

Valwood Graduates:

Understand the structure and properties of our number system. At their most basic level numbers are abstract symbols that represent real-world quantities.

GRADE LEVEL EXPECTATION

Concepts and skills students master:

1. The decimal number system describes place value patterns and relationships that are repeated in large and small numbers and forms the foundation for efficient algorithms.

Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: a. Explain 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. i. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10. ii. Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. iii. Use whole-number exponents to denote powers of 10. b. Read, write, and compare decimals to thousandths. i. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form.[1] ii. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. c. Use place value understanding to round decimals to any place. d. Convert like measurement units within a given measurement system. i. Convert among different-sized standard measurement units within a given measurement system.[2] ii. Use measurement conversions in solving multi-step, real world problems.	**Inquiry Questions:** 1. What is the benefit of place value system? 2. What would it mean if we did not have a place value system? 3. What is the purpose of a place value system? 4. What is the purpose of zero in a place value system? **Relevance and Application:** 1. Place value is applied to represent a myriad of numbers using only ten symbols. **Nature of Discipline:** 1. Mathematicians use numbers like writers use letters to express ideas. 2. Mathematicians look closely and make use of structure by discerning patterns. 3. Mathematicians make sense of problems and persevere in solving them. 4. Mathematicians reason abstractly and quantitatively. 5. Mathematicians construct viable arguments and critique the reasoning of others. [1] e.g., 347.392 = 3 x 100 + 4 x 10 + 7 x 1 + 3 x 1/10 + 9 x 1/100 + 2 x 1/1000. [2] e.g., convert 5 cm to 0.05 m.

Content Area: Mathematics - Fifth Grade

Standard: 1. Number Sense, Properties, and Operations

Valwood Graduates:

Are fluent with basic numerical and symbolic facts and algorithms, and are able to select and use appropriate (mental math, paper and pencil, and technology) methods based on an understanding of their efficiency, precision, and transparency.

GRADE LEVEL EXPECTATION

Concepts and skills students master:

2. Formulate, represent, and use algorithms with multi-digit whole numbers and decimals with flexibility, accuracy, and efficiency.

Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: a. Fluently multiply multi-digit whole numbers using standard algorithms. b. Find whole-number quotients of whole numbers.[3] i. Use strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. ii. Illustrate and explain calculations by using equations, rectangular arrays, and/or area models. c. Add, subtract, multiply, and divide decimals to hundredths i. Use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. ii. Relate strategies to a written method and explain the reasoning used. d. Write and interpret numerical expressions. i. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. ii. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.[4]	**Inquiry Questions:** 1. How are mathematical operations related? 2. What makes one strategy or algorithm better than another? **Relevance and Application:** 1. Multiplication is an essential component of mathematics. Knowledge of multiplication is the basis for understanding division, fractions, geometry, and algebra. 2. There are many models of multiplication and division such as the area model for tiling a floor and the repeated addition to group people for games. **Nature of Discipline:** 1. Mathematicians envision and test strategies for solving problems. 2. Mathematicians develop simple procedures to express complex mathematical concepts. 3. Mathematicians construct viable arguments and critique the reasoning of others. 4. Mathematicians model with mathematics.

[3] with up to four-digit dividends and two-digit divisors.

[4] 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.

Content Area: Mathematics - Fifth Grade

Standard: 1. Number Sense, Properties, and Operations

Valwood Graduates:

Are fluent with basic numerical and symbolic facts and algorithms, and are able to select and use appropriate (mental math, paper and pencil, and technology) methods based on an understanding of their efficiency, precision, and transparency.

GRADE LEVEL EXPECTATION

Concepts and skills students master:

3. Formulate, represent, and use algorithms to add and subtract fractions with flexibility, accuracy, and efficiency.

Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: a. Use equivalent fractions as a strategy to add and subtract fractions. i. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.[5] ii. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions[6] with like denominators. **iii.** Solve word problems involving addition and subtraction of fractions referring to the same whole.[7]	**Inquiry Questions:** 1. How do operations with fractions compare to operations with whole numbers? 2. Why are there more fractions than whole numbers? 3. Is there a smallest fraction? **Relevance and Application:** 1. Computational fluency with fractions is necessary for activities in daily life such as cooking and measuring for household projects and crafts. 2. Estimation with fractions enables quick and flexible decision-making in daily life. For example, determining how many batches of a recipe can be made with given ingredients, the amount of carpeting needed for a room, or fencing required for a backyard. **Nature of Discipline:** 1. Mathematicians envision and test strategies for solving problems. 2. Mathematicians make sense of problems and persevere in solving them. 3. Mathematicians reason abstractly and quantitatively. 4. Mathematicians look for and make use of structure.

[5] For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.

[6] 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.).

[7] including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem.

Content Area: Mathematics - Fifth Grade

Standard: 1. Number Sense, Properties, and Operations

Valwood Graduates:

Understand the structure and properties of our number system. At their most basic level numbers are abstract symbols that represent real-world quantities.

GRADE LEVEL EXPECTATION

Concepts and skills students master:

4. The concepts of multiplication and division can be applied to multiply and divide fractions.

Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: a. Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). b. Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers.[8] c. Interpret the product (a/b) × q as a part of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. [9] In general, (a/b) × (c/d) = ac/bd. d. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. i. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.) e. Interpret multiplication as scaling (resizing). i. Compare 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.[10] ii. Apply the principle of fraction equivalence a/b = (n × a)/(n × b) to the effect of multiplying a/b by 1. f. Solve real world problems involving multiplication of fractions and mixed numbers.[11] g. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients.[12] h. Interpret division of a whole number by a unit fraction, and compute such quotients.[13]	**Inquiry Questions:** 1. Do adding and multiplying always result in an increase? Why? 2. Do subtracting and dividing always result in a decrease? Why? 3. How do operations with fractional numbers compare to operations with whole numbers? **Relevance and Application:** 1. Rational numbers are used extensively in measurement tasks such as home remodeling, clothes alteration, graphic design, and engineering. 2. Situations from daily life can be modeled using operations with fractions, decimals, and percentages, such as determining the quantity of paint to buy or the number of pizzas to order for a large group. 3. Rational numbers are used to represent data and probability such as getting a certain color of gumball out of a machine, the probability that a batter will hit a home run, or the percent of a mountain covered in forest. **Nature of Discipline:** 1. Mathematicians explore number properties and relationships because they enjoy discovering beautiful new and unexpected aspects of number systems. They use their knowledge of number systems to create appropriate models for all kinds of real-world systems. 2. Mathematicians make sense of problems and persevere in solving them. 3. Mathematicians model with mathematics. 4. Mathematicians look for and express regularity in repeated reasoning.

i. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions.[14]	[8] 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? [9] 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. [10] Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number Explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number [11] e.g., by using visual fraction models or equations to represent the problem. [12] 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. [13] 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. [14] 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?

2. Patterns, Functions, and Algebraic Structures

Pattern sense gives students a lens with which to understand trends and commonalities. Being a student of mathematics involves recognizing and representing mathematical relationships and analyzing change. Students learn that the structures of algebra allow complex ideas to be expressed succinctly.

Valwood Graduates
The Valwood graduate competencies are the preschool through twelfth-grade concepts and skills that all graduates will be able to demonstrate.

Valwood Graduate Competencies in the 2. Patterns, Functions, and Algebraic Structures Standard are:

- Are fluent with basic numerical and symbolic facts and algorithms, and are able to select and use appropriate (mental math, paper and pencil, and technology) methods based on an understanding of their efficiency, precision, and transparency
- Understand that equivalence is a foundation of mathematics represented in numbers, shapes, measures, expressions, and equations
- Make sound predictions and generalizations based on patterns and relationships that arise from numbers, shapes, symbols, and data
- Make claims about relationships among numbers, shapes, symbols, and data and defend those claims by relying on the properties that are the structure of mathematics
- Use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions

Content Area: Mathematics - Fifth Grade

Standard: 2. Patterns, Functions, and Algebraic Structures

Valwood Graduates:

Make sound predictions and generalizations based on patterns and relationships that arise from numbers, shapes, symbols, and data.

GRADE LEVEL EXPECTATION

Concepts and skills students master:

1. Number patterns are based on operations and relationships.

Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: a. Generate two numerical patterns using given rules. b. Identify apparent relationships between corresponding terms. c. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.[1] d. Explain informally relationships between corresponding terms in the patterns. e. Use patterns to solve problems including those involving saving and checking accounts.[2] f. Explain, extend, and use patterns and relationships in solving problems, including those involving saving and checking accounts such as understanding that spending more means saving less	**Inquiry Questions:** 1. How do you know when there is a pattern? 2. How are patterns useful? **Relevance and Application:** 1. The use of a pattern of elapsed time helps to set up a schedule. For example, classes are each 50 minutes with 5 minutes between each class. 2. The ability to use patterns allows problem-solving. For example, a rancher needs to know how many shoes to buy for his horses, or a grocer needs to know how many cans will fit on a set of shelves. **Nature of Discipline:** 1. Mathematicians use creativity, invention, and ingenuity to understand and create patterns. 2. The search for patterns can produce rewarding shortcuts and mathematical insights. 3. Mathematicians construct viable arguments and critique the reasoning of others. 4. Mathematicians model with mathematics. 5. Mathematicians look for and express regularity in repeated reasoning.

[1] 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 and the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence.

[2] such as the pattern created when saving $10 a month

3. Data Analysis, Statistics, and Probability

Data and probability sense provides students with tools to understand information and uncertainty. Students ask questions and gather and use data to answer them. Students use a variety of data analysis and statistics strategies to analyze, develop and evaluate inferences based on data. Probability provides the foundation for collecting, describing, and interpreting data.

Valwood Graduates
The Valwood graduate competencies are the preschool through twelfth-grade concepts and skills that all graduates will be able to demonstrate.

Valwood Graduate Competencies in the 3. Data Analysis, Statistics, and Probability Standard are:

- Recognize and make sense of the many ways that variability, chance, and randomness appear in a variety of contexts
- Solve problems and make decisions that depend on understanding, explaining, and quantifying the variability in data
- Communicate effective logical arguments using mathematical justification and proof. Mathematical argumentation involves making and testing conjectures, drawing valid conclusions, and justifying thinking
- Use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions

Content Area: Mathematics - Fifth Grade

Standard: 3. Data Analysis, Statistics, and Probability

Valwood Graduates:

Solve problems and make decisions that depend on understanding, explaining, and quantifying the variability in data.

GRADE LEVEL EXPECTATION

Concepts and skills students master:

1. Visual displays are used to interpret data.

Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: a. Represent and interpret data. i. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). ii. Use operations on fractions for this grade to solve problems involving information presented in line plots.[1]	**Inquiry Questions:** 1. How can you make sense of the data you collect? **Relevance and Application:** 1. The collection and analysis of data provides understanding of how things work. For example, measuring the temperature every day for a year helps to better understand weather. **Nature of Discipline:** 1. Mathematics helps people collect and use information to make good decisions. 2. Mathematicians model with mathematics. 3. Mathematicians use appropriate tools strategically. 4. Mathematicians attend to precision. [1] 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.

4. Shape, Dimension, and Geometric Relationships

Geometric sense allows students to comprehend space and shape. Students analyze the characteristics and relationships of shapes and structures, engage in logical reasoning, and use tools and techniques to determine measurement. Students learn that geometry and measurement are useful in representing and solving problems in the real world as well as in mathematics.

Valwood Graduates
The Valwood graduate competencies are the preschool through twelfth-grade concepts and skills that all graduates will be able to demonstrate.

Valwood Graduate Competencies in the 4. Shape, Dimension, and Geometric Relationships standard are:

- Understand quantity through estimation, precision, order of magnitude, and comparison. The reasonableness of answers relies on the ability to judge appropriateness, compare, estimate, and analyze error
- Make sound predictions and generalizations based on patterns and relationships that arise from numbers, shapes, symbols, and data
- Apply transformation to numbers, shapes, functional representations, and data
- Make claims about relationships among numbers, shapes, symbols, and data and defend those claims by relying on the properties that are the structure of mathematics
- Use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions

Content Area: Mathematics - Fifth Grade

Standard: 4. Shape, Dimension, and Geometric Relationships

Valwood Graduates:

Understand quantity through estimation, precision, order of magnitude, and comparison. The reasonableness of answers relies on the ability to judge appropriateness, compare, estimate, and analyze error.

GRADE LEVEL EXPECTATION

Concepts and skills students master:

1. Properties of multiplication and addition provide the foundation for volume, an attribute of solids.

Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: a. Model and justify the formula for volume of rectangular prisms. i. Model the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes.[1] ii. 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. iii. Represent threefold whole-number products as volumes to represent the associative property of multiplication. b. Find volume of rectangular prisms using a variety of methods and use these techniques to solve real world and mathematical problems. i. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. ii. Apply the formulas V = l × w × h and V = b × h for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths. iii. Use the additive nature of volume to find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts.	**Inquiry Questions:** 1. Why do you think a unit cube is used to measure volume? **Relevance and Application:** 1. The ability to find volume helps to answer important questions such as which container holds more. **Nature of Discipline:** 1. Mathematicians create visual and physical representations of problems and ideas that reveal relationships and meaning. 2. Mathematicians make sense of problems and persevere in solving them. 3. Mathematicians model with mathematics. [1] 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. 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.

Content Area: Mathematics - Fifth Grade

Standard: 4. Shape, Dimension, and Geometric Relationships

Valwood Graduates:

Make claims about relationships among numbers, shapes, symbols, and data and defend those claims by relying on the properties that are the structure of mathematics

GRADE LEVEL EXPECTATION

Concepts and skills students master:

2. Geometric figures can be described by their attributes and specific locations in the plane.

Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: a. Graph points on the coordinate plane[2] to solve real-world and mathematical problems. b. 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. c. Classify two-dimensional figures into categories based on their properties i. Explain that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.[3] ii. Classify two-dimensional figures in a hierarchy based on properties.	**Inquiry Questions:** 1. How does using a coordinate grid help us solve real world problems? 2. What are the ways to compare and classify geometric figures? 3. Why do we classify shapes? **Relevance and Application:** 1. The coordinate grid is a basic example of a system for mapping relative locations of objects. It provides a basis for understanding latitude and longitude, GPS coordinates, and all kinds of geographic maps. 2. Symmetry is used to analyze features of complex systems and to create worlds of art. For example, symmetry is found in living organisms, the art of MC Escher, and the design of tile patterns, and wallpaper. **Nature of Discipline:** 1. Geometry's attributes give the mind the right tools to consider the world around us. 2. Mathematicians model with mathematics. 3. Mathematicians look for and make use of structure.

[2] 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).

[3] For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.