

K – 12 MATHEMATICS UNIFYING STANDARDS

- 1.0 Number Sense and Operations** – Students understand ways of representing numbers, relationships among numbers, and number systems. They understand the meaning of and relationships between operations and strategies, and they can estimate appropriately.
- 2.0 Patterns, Functions, and Algebra** – Students know and understand various types of patterns and functional relationships. They use symbolic forms and models to represent and analyze mathematical structures in both real and abstract contexts.
- 3.0 Measurement** – Students know and understand attributes, units and systems of measurement. They apply a variety of techniques, tools, and formulas for determining measurements.
- 4.0 Geometry and Spatial Sense** – Students know how to analyze characteristics and properties of two- and three- dimensional objects. They select and use different representational systems, including coordinate and graph theory. They understand the usefulness of transformations and symmetry in analyzing mathematical situations. They know how to visualize and to use spatial reasoning to solve problems that cross disciplines.
- 5.0 Data Analysis, Statistics, and Probability** – Students know how to pose questions and collect, organize, represent and interpret data in order to answer those questions. They use methods of exploratory data analysis to develop and evaluate inferences, predictions, and arguments that are based on data. They understand and know how to apply the notions of chance and probability.
- 6.0 Problem Solving** – Students know that they learn basic skills and concepts in order to use them to solve problems in and out of school. They solve routine and complex problems by drawing from a variety of strategies, including technology, while demonstrating an attitude of persistence and reflection in their approaches.
- 7.0 Processes: Reasoning, Communication, and Connections** – Students use reasoning to develop, analyze, draw conclusions, and validate conjectures and arguments. As they reason, they recognize and understand multiple representations of the same concept. They see the interconnections among math ideas, as well as in other disciplines. They know how to communicate their math thinking clearly and coherently to others, orally, graphically, and in writing, using precise language and symbols.

**MATH STANDARDS
LEVEL 6**

1.0 Number Sense and Operations – Students understand ways of representing numbers, relationships among numbers, and number systems. They understand the meaning of and relationships between operations and strategies, and they can estimate appropriately.

Focus Goals

- 1.1 Compare and order rational numbers (integers, fractions, decimals, and mixed numbers).
- 1.2 Calculate and solve problems involving fractions, ratios, proportions and percentages.
- 1.3 Calculate and solve problems involving addition, subtraction, multiplication and division of rational numbers.
- 1.4 Review operations with whole numbers.

2.0 Patterns, Functions and Algebra – Students know and understand various types of patterns and functional relationships. They use symbolic forms and models to represent and analyze mathematical structures in both real and abstract contexts.

Focus Goals

- 2.1 Write and evaluate algebraic expressions for a given situation using variables.
- 2.2 Write, solve and graph one-step linear equations and interpret their results.
- 2.3 Understand that a function is an arithmetic or geometric pattern and can be expressed as a rule.
- 2.6 Investigate geometric patterns and describe them algebraically.
- 2.7 Analyze and use tables, graphs and rules to solve problems involving rates and proportions.

3.0 Measurement – Students know and understand attributes, units and systems of measurement. They apply a variety of techniques, tools and formulas for determining measurements.

Focus Goals

- 3.1 Demonstrate depth of understanding solving problems requiring measurement of plane and solid shapes.
- 3.2 Select and use appropriate measurement tools to estimate, quantify proportions and measure objects.

4.0 Geometry and Spatial Sense – Students know how to analyze characteristics and properties of two- and three- dimensional objects. They select and use different representational systems, including coordinate and graph theory. They understand the usefulness of transformation and symmetry in analyzing mathematical situations. They know how to visualize and to use spatial reasoning to solve problems that cross disciplines.

Focus Goals

- 4.1 Identify, describe, draw and classify properties of, and relationships between, plane and solid geometric figures.
- 4.2 Identify and describe the properties of two-dimensional figures.
- 4.3 Perform basic geometric constructions.
- 4.4 Use spatial organization to solve problems.

5.0 Data Analysis, Statistics, and Probability – Students know how to pose questions and collect, organize, represent and interpret data in order to answer those questions. They use methods of exploratory data analysis to develop and evaluate inferences, predictions, and arguments that are based on data. They understand and know how to apply the notions of chance and probability.

Focus Goals

- 5.1 Compute, analyze and understand statistical measurement for data sets.
- 5.2 Describe the characteristics and limitations of data samples.
- 5.3 Collect, organize, interpret, display and make predictions from data.
- 5.4 Determine probabilities and use these to make predictions about events.

6.0 Problem Solving – Students know that they learn basic skills and concepts in order to use them to solve problems in and out of school. They solve routine and complex problems by drawing from a variety of strategies, including technology, and demonstrate an attitude of persistence and reflection in their approaches.

Focus Goals

- 6.1 Make decisions about how to approach problems.
- 6.2 Apply a variety of strategies, skills and concepts in finding solutions.

7.0 Reasoning, Communication, and Connections – Students use reasoning to develop, analyze, draw conclusions, and validate conjectures and arguments. As they reason, they recognize and understand multiple representations of the same concept. They see the interconnections among math ideas, as well as in other disciplines. They know how to communicate their math thinking clearly and coherently to others, orally graphically, and in writing, using precise language and symbols.

Focus Goals

- 7.1 Use math reasoning to develop, analyze, justify, and validate thinking and arguments.
- 7.2 Express math thinking orally, graphically, and in writing.
- 7.3 Understand multiple representations of the same concept.
- 7.4 Move beyond a particular problem by generalizing to other situations.

**MATH STANDARDS
LEVEL 6**

1.0 Number Sense and Operations – Students understand ways of representing numbers, relationships among numbers, and number systems. They understand the meaning of and relationships between operations and strategies, and they can estimate appropriately.

1.1 Compare and order rational numbers (integers, fractions, decimals, and mixed numbers). (c)

- θ Compare and order positive and negative fractions, decimals, and mixed numbers and represent them on the number line (c/s/p6-7), with pictures, diagrams or manipulatives. (s)

1.2 Calculate and solve problems involving fractions, ratios, proportions and percentages. (c/p7)

- θ Interpret and use ratios in different contexts to show the relative sizes of two quantities using appropriate notations. (c)
- θ Use proportions, including the use of cross-multiplication as a method for solving problems. (c/p6-7)
- θ Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned and tips. (c)
- θ Recognize the relationship between ratio, fraction, decimal and percent. (p6-7)

1.3 Calculate and solve problems involving addition, subtraction, multiplication and division of rational numbers. (c/s)

- θ Use the least common multiple, greatest common factor or lowest and equivalent terms with fraction problems. (c/p6-7)
- θ Add, subtract, multiply and divide fractions, (c/p6-7) and explain why a particular operation was used for a given situation. (c)
- θ Add, subtract, multiply and divide problems, using positive and negative numbers and combinations of these operations. (c/s/p7)
- θ Use numerical order of operations. (c/p6-7)

1.4 Review operations using whole numbers.

- θ Apply understanding of place value, expanded notation, rounding, averaging and missing variables. (s)

2.0 Patterns, Functions, and Algebra – Students know and understand various types of patterns and functional relationships. They use symbolic forms and models to represent and analyze mathematical structures in both real and abstract contexts.

2.1 Write and evaluate algebraic expressions for a given situation using variables. (c/p7)

- θ Simplify simple algebraic expressions. (p6-7)
- θ Apply algebraic order of operations and the commutative, associative, distributive and additive identity properties to evaluate expressions. (c/p7)
- θ Recognize a solution sentence that is equivalent to a given word problem (s)

2.2 Write, solve and graph one-step simple linear equations with one variable and interpret their results. (c/p6-7)

- θ Write and solve one-step linear equations with one variable. (c/p7)
- θ Plot ordered pairs on the coordinate plane (s/p6-7)
- θ Create a table of values (t-chart) for an equation in the form $y=mx+b$ (c)
- θ Estimate unknown quantities on a graph (c/p6-7)

2.3 Understand that a function is an arithmetic or geometric pattern and can be expressed as a rule. (p6-7)

- θ Find examples of patterns that express functions. (p)
- θ Determine the output values of a given function. (s)

2.4 Investigate geometric patterns and describe them algebraically. (c/p7)

- θ Express simple relationships arising from geometry in symbolic form. (c)
- θ Describe geometric quantities using variables in expressions (p)

2.5 Analyze and use tables, graphs and rules to solve problems involving rates and proportions. (c/s)

- θ Identify rate as a measure of one quantity per unit value of another. (C)
- θ Solve problems involving rates, average speed, distance and time. (c)

3.0 Measurement – Students know and understand attributes, units and systems of measurement. They apply a variety of techniques, tools and formulas for determining measurements.

3.1 Demonstrate depth of understanding in solving problems requiring measurement of plane and solid shapes . (c)

- θ Apply the concept of a constant number like π . (c/p)
- θ Know the common estimates of π and use these values in formulas to estimate and calculate the circumference and the area of circles. (c/p)
- θ Identify and determine the diameter and radius of circles (s)
- θ Know and use the formulas for the volume of cylinders and rectangular or triangular prisms. (c/p6-7)
- θ Use appropriate formulas to find and compare the area and perimeter of polygons. (c/p/s)

3.2 Select and use appropriate measurement tools to estimate, quantify proportions and measure objects (p/c).

- θ Convert from one unit of measurement to another within the same system, both customary and metric. (c/s/p6-7)
- θ Make and read scale drawings, diagrams and maps (s/p6-7)
- θ Select and use appropriate units of measurement. (s/p6-8)

4.0 Geometry and Spatial Sense – Students know how to analyze characteristics and properties of two- and three-dimensional objects. They select and use different representational systems, including coordinate and graph theory. They understand the usefulness of transformations and symmetry in analyzing mathematical situations. They know how to visualize and to use spatial reasoning to solve problems that cross disciplines.

4.1 Identify, describe, draw and classify properties of, and relationships between, plane and solid geometric figures. (p/c)

- θ Use basic geometric terminology and concepts accurately including; *altitude, midpoint, bisectors, both perpendicular and angular, chords, and arcs.* (p)
- θ Identify and understand *symmetry, rotations, reflections, tessellations* (p), *translations and dilations* of congruent polygons. (s)
- θ Draw and make models of three dimensional figures. (c/p)

4.2 Identify and describe the properties of two-dimensional figures. (c/p)

- θ Identify and classify (s) angles as *vertical, adjacent, complementary* and/or *supplementary* and provide descriptions of these terms. (c/p6-7)
- θ Use the properties of complimentary and supplementary angles and the angles of a triangle to solve problems involving an unknown angle. (c)
- θ Draw quadrilaterals and triangles given information about them. (c/p)

4.3 Perform basic geometric constructions. (c/p)

- θ Bisect an angle and a line segment.
- θ Construct a congruent angle and a congruent line segment.

4.4 Use spatial organization to solve problems. (p)

- θ Make models or use geometric representations (e.g., area, perimeter, volume) to solve problems.

5.0 Data Analysis, Statistics and Probability – Students know how to pose questions and collect, organize, represent and interpret data in order to answer those questions. They use methods of exploratory data analysis to develop and evaluate inferences, predictions, and arguments that are based on data. They understand and know how to apply at the notions of chance and probability

5.1 Compute, analyze, and understand statistical measurement for data sets. (c)

- θ Compute range, mean, median and mode of data sets. (c/s/p6-7)
- θ Determine when and why a specific measure of central tendency (mean, median, mode) provides the most useful information in a given context. (c)
- θ Recognize how additional data added to data sets can effect these computations of measures of central tendency. (c)
- θ Recognize how the inclusion or exclusion of outliers affects the measures of central tendency. (c)

5.2 Describe the characteristics and limitations of data samples. (c)

- θ Compare different samples from a population with data from the entire population and identify when it makes sense to use a sample. (c)
- θ Identify different ways of selecting a sample and which makes a sample more representative for a population. (c/p6-7)

- θ Recognize and identify survey questions and data displays that might be biased and structured to influence results and conclusions. (c/p6-7)
- θ Identify data that represents sampling and explain why the sample (and the display) may be biased. (c/p8)
- θ Identify claims based on statistical data and, in simple cases, evaluate the validity of the claims. (c/p8)

5.3 Collect, organize, interpret, display and make predictions from data. (c/p8)

- θ Identify an objective and choose an appropriate method of collection.
- θ Choose appropriate types of questions to gather meaningful data.
- θ Collect data from a variety of sources.
- θ Determine appropriate measures of central tendency and dispersion of data collected.
- θ Create, and draw conclusions from frequency tables, line plots, bar, circle and pictographs and tally charts. (c/s/p)

5.4 Determine probabilities and use these to make predictions about events. (c/p)

- θ Model situations, devise simulations and carry out experiments to generate data. (p7)
- θ Represent all possible outcomes for compound events in an organized way (e.g. tables, grid, tree diagrams) and express the theoretical probability of each outcome. (c/s/p)
- θ Use data to estimate the probability of future events. (c)
- θ Represent probabilities as ratios, proportions and decimals between 0 and 1, and percents between 0 and 100 and check that probabilities computed are reasonable; know how this is related to the probability of an event not occurring. (c/p)
- θ Find the probability of two disjoint events occurring. (c)
- θ Find the probability of one event following another, in independent trials, using the product of the two probabilities. (c)
- θ Recognize the difference between independent and dependent events and how this affects the results for specific probability situations. (c/s)

6.0 Problem Solving – Students know that they learn basic math skills and concepts in order to use them to solve problems in and out of school. They solve routine and complex problems by drawing from a variety of strategies, including technology, and demonstrate an attitude of persistence and reflection in their approaches.

6.1 Make decisions about how to approach problems. (c)

- θ Consider approaches after identifying relationships, discriminating relevant from irrelevant information, identifying missing information, sequencing and prioritizing information and observing patterns. (c/s/p)
- θ Formulate and justify mathematical conjectures based upon a general description of the mathematical question or problem posed. (c)
- θ Determine when and how to break a problem into smaller parts. (p)

6.2 Apply a variety of strategies, skills and concepts in finding solutions. (p/c)

- θ Select and apply one or more mathematical relations to solve problems. (p6-7)
- θ Estimate and verify the reasonableness and/or the range of possible solutions (c/s)

- θ Use results from simpler problems to solve more complex problems. (c/p6-7)
- θ Determine when the use of a calculator or other technology is effective and efficient. (p)
- θ Determine a focus: solve related problems, divide into smaller parts, work backwards, model by acting out, use manipulatives, guess and check. (p)

7.0 Reasoning, Communication, and Connections – Students use reasoning to develop, analyze, draw conclusions, and validate conjectures and arguments. As they reason, they recognize and understand multiple representations of the same concept. They see the interconnections among math ideas as well as in other disciplines. They know how to communicate their math thinking clearly and coherently to others, orally, graphically, and in writing, using precise language and symbols.

7.1 Use math reasoning to develop, analyze, justify, and validate thinking and arguments. (p)

- θ Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy. (c)
- θ Make precise calculations (c) and interpret (p) the validity of the results from the context of the problem. (c)
- θ Identify, evaluate (c) and present (p) reasonable conclusions and justify the solution processes (p) in the context of the original situation. (c)
- θ Locate a flaw in a math argument. (p)
- θ Find counter examples. (p)

7.2 Express math thinking orally, graphically, and in writing. (p)

- θ Restate or summarize the problem. (p)
- θ Ask clarifying and extending questions. (p)
- θ Use a variety of methods such as words, numbers, symbols, charts, graphs, tables, diagrams, and models to explain math reasoning and use of processes. (c/p)
- θ Express solutions clearly and logically using appropriate mathematical notation and terms, and support solutions with evidence, in both verbal and symbolic work. (c/p)

7.3 Understand multiple representations of the same concept. (p)

- θ Read and understand math in written form.
- θ Recognize the relationship between concrete models, math symbols, and written English.
- θ Translate written problems into math symbols, and math symbols into written English.
- θ Translate data from one representation to another (i.e., table to graph).

7.4 Move beyond a particular problem by generalizing to other situations. (p/c)

- θ Develop generalizations of patterns and results and extend them to new problem situations. (c/p)
- θ Use specific and related examples to make generalizations. (p)
- θ Note method of deriving the solution and demonstrate conceptual understanding of the derivation by solving similar problems. (c)
- θ Know how to use math in new situations and in other curriculum areas. (p)