

**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.

**FOCUS GOALS  
GEOMETRY****1.0 Number Sense and Operations**

- 1.1 Understand the relationship between rational and irrational numbers in the real number system.
- 1.2 Compute real numbers, with and without calculators.

**2.0 Patterns, Functions, and Algebra**

- 2.1 Understand and recognize right triangle trigonometry functions.
- 2.2 Apply algebraic skills in geometric situations.

**3.0 Measurement**

- 3.1 Select and use appropriate scales and units of measurement.
- 3.2 Demonstrate distance using absolute value for linear graphs.
- 3.3 Derive, memorize, and apply formulas to determine area and perimeter of fundamental geometric figures (i.e., a plane, circumference, perimeter, and area).
- 3.4 Derive, memorize, and use formulas to determine surface area and volume of geometric solids in space (prisms, pyramids, cylinders).
- 3.5 Understand appropriate uses of estimated versus exact answer.

**4.0 Geometry and Spatial Sense**

- 4.1 Categorize geometric figures by characteristics and properties.
- 4.2 Know, understand and use special right triangle relationships ( $30^\circ$ ,  $60^\circ$ ,  $90^\circ$  and  $45^\circ$ ,  $45^\circ$ ,  $90^\circ$ ).
- 4.3 Know and apply definitions of simple trigonometry functions, sine, cosine, tangent.
- 4.4 Know and describe the effect of geometric transformation on figures in the coordinate plane and space, including rotations, translations, dilations, and reflections.
- 4.5 Know and apply properties of geometric figures.
- 4.6 Know and apply coordinate geometry.
- 4.7 Sketch or describe a locus of points representing a given set of conditions in a plane or space.

**5.0 Data Analysis, Statistics, and Probability**

- 5.1 Find the probability of an expected outcome in a shaded region.
- 5.2 Find the arithmetic and geometric mean.
- 5.3 Organize, produce, and analyze data in tables, graphs, and spreadsheets.
- 5.4 Demonstrate the use of appropriate computing tools.

**6.0 Problem Solving**

- 6.1 Make decisions about how to approach problems.
- 6.2 Apply a variety of strategies to solve complex mathematical problems (i.e., making a model, looking for patterns).
- 6.3 Apply math skills in new situations.

**7.0 Processes: Reasoning, Communication, and Connections**

- 7.1 Communicate math thinking and conclusions using words, graphs, and charts.
- 7.2 Prove or disprove a conjecture with a logical argument and counter examples.
- 7.3 Identify and give examples of undefined terms, axioms, theorems, and inductive and deductive reasoning.
- 7.4 Communicate how to use triangle inequality relationships.
- 7.5 Apply literacy skills when making mathematical connections.

## MATH STANDARDS GEOMETRY

**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 Understand the relationship between rational and irrational numbers in the real number system.** (p)

- Identify infinite and finite sequences and series. (s)

**1.2 Compute real numbers, with and without calculators.** (p)

- Express answers in simplified radical form, or in terms of pi (exact answer). \*

**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 Understand and recognize right triangle trigonometry functions.** (c20/p)

- Know and use elementary relationships between the angles of a right triangle.
- Analyze the graphs of trigonometric functions. (s)

**2.2 Apply algebraic skills in geometric situations.**

- Eliminate unreasonable solutions (i.e., negative length of a side of a triangle.) (p)
- Know and describe relationships between angles in polygons by using properties of complementary, supplementary, vertical, and exterior angles. (c10/p/s)
- Know and describe relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles. (c21/p)
- Demonstrate an understanding of proportionality as it relates to similarity (i.e. triangle parts). \*
- Solve and evaluate equation inequalities. (s)

**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 Select and use appropriate scales and units of measurement.** (p/s)

**3.2 Demonstrate distance using absolute value for linear graphs.** (p)

**3.3 Derive, memorize, and apply formulas to determine area and perimeter of fundamental geometric figures (i.e., a plane, circumference, perimeter, and area).**

(c8/p)

- Determine the area of an enclosed region contained within another enclosed region. (s)
- Calculate the area of a triangle, given points of the vertices. (s)

**3.4 Derive, memorize, and use formulas to determine surface area and volume of geometric solids in space (prisms, pyramids, cylinders). (c9-10/p)**

- Calculate volume. (c)
- Determine how changes in dimension affect the perimeter, area, and volume of common geometric figures and solids. (c11)

**3.5 Understand appropriate uses of estimated versus exact answer. (p)**

**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 Categorize geometric figures by characteristics and properties. (c/p)**

- Use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems. (c12)
- Perform basic constructions with a straight edge or compass. (c16)
- Make isometric and orthographic drawings. (p)

**4.2 Know, understand and use special right triangle relationships (30°, 60°, 90° and 45°, 45°, 90°). (c20/p)**

**4.3 Know and apply definitions of simple trigonometry functions, sine, cosine, tangent. (c18/p)**

- Use trigonometric functions to solve for an unknown length or unknown angle of a right triangle. (s)
- Apply the relationships,  $\tan(x) = \sin(x) + \cos(x)$ ,  $(\sin(x))^2 + (\cos(x))^2 = 1$

**4.4 Know and describe the effect of geometric transformation on figures in the coordinate plane and space, including rotations, translations, dilations, and reflections. (c22/p/s)**

**4.5 Know and apply properties of geometric figures. (c7/s)**

- Apply triangles (i.e., altitudes, medians, and angle bisector).
- Apply quadrilaterals (i.e., diagonals)
- Apply regular polygons (i.e., apothem).
- Apply circles (i.e., central angle, tangent).

**4.6 Know and apply coordinate geometry. (c/p/s)**

- Apply the midpoint formulas. (p)
- Apply distance formulas. (c17)
- Apply parallel and perpendicular slopes. (p)
- Apply formulas with lines and circles. (c17/p)

**4.7 Sketch or describe a locus of points representing a given set of conditions in a plane or space. (p)**

**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.

**5.1 Find the probability of an expected outcome in a shaded region.** \*

**5.2 Find the arithmetic and geometric mean.** \*

**5.3 Organize, produce, and analyze data in tables, graphs, and spreadsheets.** (p)

- Estimate probabilities and predict outcomes based on data. (s)

**5.4 Demonstrate the use of appropriate computing tools.** \*

- Use mental calculation
- Use paper and pencil
- Use a scientific calculator
- Use a graphing calculator
- Use a computer

**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.

**6.1 Make decisions about how to approach problems.** (p9 – 12)

- Analyze problems by identifying relationships, identify relevant from irrelevant information, identifying missing information, sequencing and prioritizing information and observing patterns.
- Identify and utilize appropriate tools.
- Make generalizations based on prior knowledge and related examples.

**6.2 Apply a variety of strategies to solve complex mathematical problems (i.e., making a model, looking for patterns).** (p)

- Use the Pythagorean Theorem to determine distance and find missing lengths of sides of right triangles. (c15/p/s)
- Use angle of elevation and depression to solve for an unknown distances or angles of right triangles. \*
- Apply special right triangle relationships ( $30^\circ$ ,  $60^\circ$ ,  $90^\circ$  and  $45^\circ$ ,  $45^\circ$ ,  $90^\circ$ ). (c20/p)
- Apply the concept of corresponding parts of congruent triangles. (c5)
- Discern whether an answer to a problem is reasonable. (p)

**6.3 Apply math skills in new situations.** (p)

**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, and using precise language and symbols.

**7.1 Communicate math thinking and conclusions using words, graphs, and charts.** (p)

**7.2 Prove or disprove a conjecture with a logical argument and counter examples.** (c3)

- Use “Statement/Reason” or paragraph and flow formats.
- Prove properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles. (c7/p/s)
- Prove properties of complementary, supplementary, vertical, and exterior angles. (c13)
- Prove characteristics of quadrilaterals using the midpoint formula; distance formula; parallel and perpendicular slopes. (c17/s)
- Prove relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles. (c21)
- Prove basic theorems involving congruence and similarity. (c4)
- Prove that triangles are congruent or similar. (c5)
- Prove the Pythagorean theorem. (c14/p)
- Write geometric proofs, including proofs by contradiction (indirect proof). (c2/p)

**7.3 Identify and give examples of undefined terms, axioms, theorems, and inductive and deductive reasoning.** (c7)

- Use deductive reasoning to determine properties of and connections among figures, given certain assumptions. (s)

**7.4 Communicate how to use triangle inequality relationships.** (c6)

- Prove whether a triangle is acute, obtuse or right. \*
- Determine whether a triangle exists. \*

**7.5 Apply literacy skills when making mathematical connections.** (p-language arts)

- Learn and use mathematics vocabulary encountered through reading. (R1.0)
- Use strategies to comprehend, analyze, and evaluate mathematics reading materials. (R2.0)
- Employ technology to organize and record mathematics information. (R3.1)
- Write about mathematics to convey ideas logically and correctly. (W2.4)