

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
HONORS 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 Use algebraic skills in geometric situations.
- 2.3 Understand and use inequalities.
- 2.4 Understand and apply factoring.
- 2.5 Understand and apply exponents.
- 2.6 Understand and apply rationals.
- 2.7 Understand and use graphing.

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 use formulas to determine area and perimeter of fundamental geometric figures (i.e., a plane, 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° , 60° , 90° and 45° , 45° , 90°).
- 4.3 Know definitions of simple trigonometry functions, single, cosine, tangent.
- 4.4 Know 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 Prove theorems using coordinate geometry.
- 4.7 Sketch or describe a locus of points representing a given set of conditions in a plane or space.
- 4.8 Perform basic constructions with a straightedge and compass.
- 4.9 Draw isometric and orthographic representations of 3-D objects.

5.0 Data Analysis, Statistics, and Probability

- 5.1 Determine the probability of an expected outcome in a shaded region.
- 5.2 Determine the arithmetic and geometric mean.
- 5.3 Organize, analyze, and produce data in tables, graphs, and spreadsheets.
- 5.4 Demonstrate use of the 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 counterexamples.
- 7.3 Identify and give examples of undefined terms, axioms, theorems, and inductive and deductive reasoning.
- 7.4 Demonstrate ability to use triangle inequality relationships.
- 7.5 Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.
- 7.6 Apply literacy skills when making mathematical connections.

MATH STANDARDS HONORS 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)

θ Solve problems by applying infinite sequences and series. (c/aII22/s)

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

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

θ Know when an estimate or an exact answer is appropriate.

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. (c18,20/p)

2.2 Use algebraic skills in geometric situations. (c/p)

θ Eliminate unreasonable solutions (i.e., negative length of a side of a triangle.) (p)

θ Know and describe relationships between angles in polygons by using properties of complementary, supplementary, vertical, and exterior angles. (c16/p)

θ Know and describe relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles. (c21/p)

θ Demonstrate an understanding of proportionality as it relates to similarity (i.e., triangle parts). *

2.3 Understand and use inequalities.

θ Explain the use of a compound. (c/aII6)*

θ Explain the use of an absolute Value (with equations). (c/aII1)

2.2 Understand and apply factoring. (c/aII4)

θ Explain $A = 1$.

θ Explain $A \neq 1$.

θ Explain differences of squares.

θ Explain binomial squared.

θ Explain double factoring.

θ Explain factoring equations.

2.3 Understand and apply exponents.

θ Explain use of exponential functions.

θ Explain use of scientific notation.

2.4 Understand and apply rationals. (c/aII7,15)

- θ Explain use of rational equations.
- θ Explain use of rational expressions.

2.5 Understand and use graphing. (c/p)

- θ Graph and analyze exponential functions.
- θ Graph and analyze rational functions.
- θ Graph and analyze systems of equations and inequalities.

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 use formulas to determine area and perimeter of fundamental geometric figures (i.e., a plane, perimeter and area).** (c8/p)**3.4 Derive, memorize, and use formulas to determine surface area and volume of geometric solids in space (prisms, pyramids, cylinders).** (c9)**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. (c12)

- θ Use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems.

4.2 Know, understand and use special right triangle relationships (30°, 60°, 90° and 45°, 45°, 90°). (c20/p)**4.3 Know definitions of simple trigonometry functions, sine, cosine, tangent.** (c18/p)

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

- 4.4 Know the effect of geometric transformation on figures in the coordinate plane and space, including rotations, translations, dilations and reflections.** (c22/p)
- 4.5 Know and apply properties of geometric figures:** * (c7)
- θ Apply triangles (i.e., altitudes, medians, and angle bisector).
 - θ Apply quadrilaterals (i.e., diagonals).
 - θ Apply regular polygons (i.e., apothem).
 - θ Apply circles (i.e., central angle, tangent).
- 4.6 Prove theorems using coordinate geometry.** (c17)
- θ Apply the midpoint formulas. (c17)
 - θ Apply distance formulas. (c17)
 - θ Apply parallel and perpendicular slopes.
 - θ 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.** *
- 4.8 Perform basic constructions with a straightedge and compass.** (c16)
- 4.9 Draw isometric and orthographic representations of 3-D objects.** (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 Determine the probability of an expected outcome in a shaded region.** *
- 5.2 Determine the arithmetic and geometric mean.** *
- 5.3 Organize, analyze, and produce data in tables, graphs, and spreadsheets.** (p)
- θ Estimate probabilities and predict outcomes based on data. (s)
- 5.4 Demonstrate use of the appropriate computing tools.** *
- θ Use mental calculation.
 - θ Use paper and pencil.
 - θ Use a scientific calculator.
 - θ Use a graphing calculator.
 - θ 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)

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

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

- θ Use the Pythagorean Theorem to determine distance and find missing lengths of sides of right triangles. (c15/p)
- θ Use angle of elevation and depression to solve for an unknown distance or angles of right triangles. *
- θ Apply special right triangle relationships (30° , 60° , 90° and 45° , 45° , 90°). (c/p)
- θ Use the concept of corresponding parts of congruent triangles (CPCT). (c)

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.

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 counterexamples. (c3.0)

- θ Use “Statement/Reason” or paragraph and flow formats.
- θ Prove properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles. (c7/p)
- θ Prove properties of complementary, supplementary, vertical, and exterior angles. (c13)
- θ Prove characteristics of quadrilaterals using the midpoint formula; distance formula; parallel and perpendicular slopes. (c27)
- θ Prove relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles. (c21)
- θ Prove basic theorems involving congruence and similarity. (c4)
- θ Prove that triangles are congruent or similar. (c5)
- θ Prove the Pythagorean theorem. (c14/p)
- θ 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)

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

7.4 Demonstrate ability to use triangle inequality relationships. (c6)

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

7.5 Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids. (c/11)

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

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