MIDLAND ISD
ADVANCED PLACEMENT CURRICULUM STANDARDS

	GEOMETRY	
TEKS	**COLLEGE BOARD**	**COLLEGE AND CAREER READINESS STDS**
(1) Geometric structure. The student understands the structure of, and relationships within, an axiomatic system. The student is expected to: **(A)** develop an awareness of the structure of a mathematical system, connecting definitions, postulates, logical reasoning, and theorems; **(B)** recognize the historical development of geometric systems and know mathematics is developed for a variety of purposes; and **(C)** compare and contrast the structures and implications of Euclidean and non-Euclidean geometries. **(2) Geometric structure. The student analyzes geometric relationships in order to make and verify conjectures. The student is expected to:** **(A)** use constructions to explore attributes of geometric figures and to make conjectures about geometric relationships; and **(B)** make conjectures about angles, lines, polygons, circles, and three-dimensional figures and determine the validity of the conjectures, choosing from a variety of approaches such as coordinate, transformational, or axiomatic.	**Standard G.1: Geometric Reasoning, Proof, and Representations** **G.1.1** Student uses a variety of representations to describe geometric objects and to analyze relationships among them. Student examines elementary models of non-Euclidean geometries and finite geometries to understand the nature of axiomatic systems and the role the parallel postulate plays in shaping Euclidean geometry. **G.1.2** Student describes and applies inductive and deductive reasoning to form conjectures and attempts to verify or reject them through developing short sequences of geometric theorems within a local axiomatic system or developing counterexamples. **G.1.3** Student applies mathematical methods of proof to develop justifications for basic theorems of Euclidean geometry. **Standard G.2: Similarity and Transformations** **G.2.1** Student identifies and applies transformations of figures in the coordinate plane and discusses the results of these transformations. **G.2.2** Student identifies congruent figures and justifies these congruences by establishing sufficient conditions and by	**I. Numeric Reasoning** **A. Number representation** **1.** Compare real numbers. **2**. Define and give examples of complex numbers. **B. Number operations** **1.** Perform computations with real and complex numbers. **C. Number sense and number concepts** **1.** Use estimation to check for errors and reasonableness of solutions. **II. Algebraic Reasoning** **A. Expressions and equations** **1.** Explain and differentiate between expressions and equations using words such as “solve,” “evaluate,” and “simplify.” **B. Manipulating expressions** **1.** Recognize and use algebraic (field) properties concepts, procedures, and algorithms to combine, transform, and evaluate expressions (e.g., polynomials, radicals, rational expressions). **C. Solving equations, inequalities, and systems of equations** **1.** Recognize and use algebraic (field) properties concepts, procedures, and algorithms to solve equations, inequalities, and systems of linear equations. **2.** Explain the difference between the solution

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(3) Geometric structure. The student applies logical reasoning to justify and prove mathematical statements. The student is expected to: **(A)** determine the validity of a conditional statement, its converse, inverse, and contrapositive; **(B)** construct and justify statements about geometric figures and their properties; **(C)** use logical reasoning to prove statements are true and find counter examples to disprove statements that are false; **(D)** use inductive reasoning to formulate a conjecture; and **(E)** use deductive reasoning to prove a statement. **(4) Geometric structure. The student uses a variety of representations to describe geometric relationships and solve problems. The student is expected to select an appropriate representation (concrete, pictorial, graphical, verbal, or symbolic) in order to solve problems.** **(5) Geometric patterns. The student uses a variety of representations to describe geometric relationships and solve problems. The student is expected to:** **(A)** use numeric and geometric patterns to	finding a congruence-preserving rigid transformation between the figures. Student solves problems involving congruence in a variety of contexts. **G.2.3** Student identifies similar figures and justifies these similarities by establishing sufficient conditions and by finding a similarity-preserving rigid transformation or origin-centered dilation between the figures. Student solves problems involving similarity in a variety of contexts. **Standard G.3: Direct and Indirect Measurements** **G.3.1** Student justifies two- and three-dimensional measurement formulas for perimeter/circumference, area, and volume and applies these formulas and other geometric properties relating angle and arc measures to solving problems involving measures of simple and composite one-, two-, and three-dimensional geometric objects. **G.3.2** Student proves and applies the Pythagorean theorem and its converse, and student develops and applies the distance formula, properties of special right triangles, properties of proportions, and the basic trigonometric ratios.	set of an equation and the solution set of an inequality. **D. Representations** **1.** Interpret multiple representations of equations and relationships. **2.** Translate among multiple representations of equations and relationships. **III. Geometric Reasoning** **A. Figures and their properties** **1.** Identify and represent the features of plane and space figures. **2.** Make, test, and use conjectures about one-,two-,and three-dimensional figures and their properties. **3.** Recognize and apply right triangle relationships including basic trigonometry. **B. Transformations and symmetry** **1**. Identify and apply transformations to figures. **2.** Identify the symmetries of a plane figure. **3**. Use congruence transformations and dilations to investigate congruence, similarity, and symmetries of plane figures. **C. Connections between geometry and other mathematical content strands** **1.** Make connections between geometry and algebra. **2**. Make connections between geometry, statistics, and probability.

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develop algebraic expressions representing geometric properties; **(B)** use numeric and geometric patterns to make generalizations about geometric properties, including properties of polygons, ratios in similar figures and solids, and angle relationships in polygons and circles; **(C)** use properties of transformations and their compositions to make connections between mathematics and the real world, such as tessellations; and **(D)** identify and apply patterns from right triangles to solve meaningful problems, including special right triangles (45-45-90 and 30-60-90) and triangles whose sides are Pythagorean triples. **(6) Dimensionality and the geometry of location. The student analyzes the relationship between three-dimensional geometric figures and related two-dimensional representations and uses these representations to solve problems. The student is expected to:** **(A)** describe and draw the intersection of a given plane with various three-dimensional geometric figures; **(B)** use nets to represent and construct three-dimensional geometric figures; and **(C)** use orthographic and isometric views of three-dimensional geometric figures to	**Standard G.4: Two-Stage Experiments, Conditional Probability, and Independence** **G.4.1** Student determines the sample space for two-stage experiments, and employs the multiplication rule for counting. Student distinguishes between independent and dependent compound events and computes their probabilities using representations for such events and using the multiplication rule for probability. **G.4.2** Student develops, uses, and interprets simulations to estimate probabilities for events where theoretical values are difficult or impossible to compute.	**3.** Make connections between geometry and measurement. **D. Logic and reasoning in geometry** **1.** Make and validate geometric conjectures. **2.** Understand that Euclidean geometry is an axiomatic system. **IV. Measurement Reasoning** **A. Measurement involving physical and natural attributes** **1**. Select or use the appropriate type of unit for the attribute being measured. **B. Systems of measurement** **1.** Convert from one measurement system to another. **2.** Convert within a single measurement system. **C. Measurement involving geometry and algebra** **1.** Find the perimeter and area of two-dimensional figures. **2.** Determine the surface area and volume of three-dimensional figures. 3. Determine indirect measurements of figures using scale drawings, similar figures, the Pythagorean Theorem, and basic trigonometry. **D. Measurement involving statistics and probability** **1**. Compute and use measures of center and spread to describe data. **2.** Apply probabilistic measures to practical

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represent and construct three-dimensional geometric figures and solve problems. **(7) Dimensionality and the geometry of location. The student understands that coordinate systems provide convenient and efficient ways of representing geometric figures and uses them accordingly. The student is expected to:** **(A)** use one- and two-dimensional coordinate systems to represent points, lines, rays, line segments, and figures; **(B)** use slopes and equations of lines to investigate geometric relationships, including parallel lines, perpendicular lines, and special segments of triangles and other polygons; and **(C)** derive and use formulas involving length, slope, and midpoint. **(8) Congruence and the geometry of size. The student uses tools to determine measurements of geometric figures and extends measurement concepts to find perimeter, area, and volume in problem situations. The student is expected to:** **(A)** find areas of regular polygons, circles, and composite figures; **(B)** find areas of sectors and arc lengths of circles using proportional reasoning; **(C)** derive, extend, and use the Pythagorean		situations to make an informed decision. **V. Probabilistic Reasoning** **A. Counting principles** **1.** Determine the nature and the number of elements in a finite sample space. **B. Computation and interpretation of probabilities** **1.** Compute and interpret the probability of an event and its complement. **2.** Compute and interpret the probability of conditional and compound events. **VI. Statistical Reasoning** **A. Data collection** **1**. Plan a study. **B. Describe data** **1**. Determine types of data. **2.** Select and apply appropriate visual representations of data. **3.** Compute and describe summary statistics of data. **4.** Describe patterns and departure from patterns in a set of data. **C. Read, analyze, interpret, and draw conclusions from data** **1.** Make predictions and draw inferences using summary statistics. **2.** Analyze data sets using graphs and summary

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Theorem; **(D)** find surface areas and volumes of prisms, pyramids, spheres, cones, cylinders, and composites of these figures in problem situations; **(E)** use area models to connect geometry to probability and statistics; and **(F)** use conversions between measurement systems to solve problems in real-world situations. **(9) Congruence and the geometry of size. The student analyzes properties and describes relationships in geometric figures. The student is expected to:** **(A)** formulate and test conjectures about the properties of parallel and perpendicular lines based on explorations and concrete models; **(B)** formulate and test conjectures about the properties and attributes of polygons and their component parts based on explorations and concrete models; **(C)** formulate and test conjectures about the properties and attributes of circles and the lines that intersect them based on explorations and concrete models; and **(D)** analyze the characteristics of polyhedra and other three-dimensional figures and their component parts based on explorations and concrete models.		statistics. **3.** Analyze relationships between paired data using spreadsheets, graphing calculators, or statistical software. **4.** Recognize reliability of statistical results. **VII. Functions** **A. Recognition and representation of functions** **1.** Recognize whether a relation is a function. **2.** Recognize and distinguish between different types of functions. **B. Analysis of functions** **1.** Understand and analyze features of a function. **2.** Algebraically construct and analyze new functions. **C. Model real world situations with functions** **1.** Apply known function models. **2.** Develop a function to model a situation. **VIII. Problem Solving and Reasoning** **A. Mathematical problem solving** **1**. Analyze given information. **2**. Formulate a plan or strategy. **3.** Determine a solution. **4**. Justify the solution. **5.** Evaluate the problem-solving process. **B. Logical reasoning** **1.** Develop and evaluate convincing arguments.

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(10) Congruence and the geometry of size. The student applies the concept of congruence to justify properties of figures and solve problems. The student is expected to: **(A)** use congruence transformations to make conjectures and justify properties of geometric figures including figures represented on a coordinate plane; and **(B)** justify and apply triangle congruence relationships. **(11) Similarity and the geometry of shape. The student applies the concepts of similarity to justify properties of figures and solve problems. The student is expected to:** **(A)** use and extend similarity properties and transformations to explore and justify conjectures about geometric figures; **(B)** use ratios to solve problems involving similar figures; **(C)** develop, apply, and justify triangle similarity relationships, such as right triangle ratios, trigonometric ratios, and Pythagorean triples using a variety of methods; and **(D)** describe the effect on perimeter, area, and volume when one or more dimensions of a figure are changed and apply this idea in solving problems.		**2**. Use various types of reasoning. **C. Real world problem solving** **1.** Formulate a solution to a real world situation based on the solution to a mathematical problem. **2.** Use a function to model a real world situation. **3.** Evaluate the problem-solving process. **IX. Communication and Representation** **A. Language, terms, and symbols of mathematics** **1.** Use mathematical symbols, terminology, and notation to represent given and unknown information in a problem. **2.** Use mathematical language to represent and communicate the mathematical concepts in a problem. **3**. Use mathematics as a language for reasoning, problem solving, making connections, and generalizing. **B. Interpretation of mathematical work** **1.** Model and interpret mathematical ideas and concepts using multiple representations. **2.** Summarize and interpret mathematical information provided orally, visually, or in written form within the given context. **C. Presentation and representation of mathematical work** **1.** Communicate mathematical ideas, reasoning,

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		and their implications using symbols, diagrams, graphs, and words. **2.** Create and use representations to organize, record, and communicate mathematical ideas. **3.** Explain, display or justify mathematical ideas and arguments using precise mathematical language in written or oral communication. **X. Connections** **A. Connections among the strands of mathematics** **1.** Connect and use multiple strands of mathematics in situations and problems. **2.** Connect mathematics to the study of other disciplines. **B. Connections of mathematics to nature, real world situations, and everyday life** **1.** Use multiple representations to demonstrate links between mathematical and real world situations. **2.** Understand and use appropriate mathematical models in the natural, physical, and social sciences. **3.** Know and understand the use of mathematics in a variety of careers and professions.