

Texas Tutorials are designed specifically for the Texas Essential Knowledge and Skills (TEKS) to prepare students for the State of Texas Assessment of Academic Readiness (STAAR)® end-of-course assessments.

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Math Tutorials offer targeted instruction, practice and review designed to develop computational fluency, deepen conceptual understanding, and apply mathematical practices. They automatically identify and address learning gaps down to elementary-level content, using adaptive remediation to bring students to grade-level no matter where they start. Students engage with the content in an interactive, feedback-rich environment as they progress through standards-aligned modules. By constantly honing the ability to apply their knowledge in abstract and real world scenarios, students build the depth of knowledge and higher order skills required to demonstrate their mastery when put to the test.

In each module, the Learn It and Try It make complex ideas accessible to students through focused content, modeled logic and process, multi-modal representations, and personalized feedback as students reason through increasingly challenging problems. The Review It offers a high impact summary of key concepts and relates those concepts to students' lives. The Test It assesses students' mastery of the module's concepts, providing granular performance data to students and teachers after each attempt. To help students focus on the content most relevant to them, unit-level pretests and posttests can quickly identify where students are strong and where they're still learning.

Unit 1: Points, Lines, and Planes

- **POINTS, RAYS, LINE SEGMENTS, LINES, AND FIGURES**

- 4.A: The student uses the process skills with deductive reasoning to understand geometric relationships. distinguish between undefined terms, definitions, postulates, conjectures, and theorems;
- 1.D: The student uses mathematical processes to acquire and demonstrate mathematical understanding. communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;

- **PARALLEL LINES AND ANGLE RELATIONSHIPS**

- 6.A: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as

two-column, paragraph, and flow chart. verify theorems about angles formed by the intersection of lines and line segments, including vertical angles, and angles formed by parallel lines cut by a transversal and prove equidistance between the endpoints of a segment and points on its perpendicular bisector and apply these relationships to solve problems;

- 5.A: The student uses constructions to validate conjectures about geometric figures. investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;
- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
- 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
- 1.D: The student uses mathematical processes to acquire and demonstrate mathematical understanding. communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- **PERPENDICULAR BISECTOR AND ANGLE BISECTOR THEOREMS**
 - 5.A: The student uses constructions to validate conjectures about geometric figures. investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;
 - 6.D: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems; and
 - 5.B: The student uses constructions to validate conjectures about geometric figures. construct congruent segments, congruent angles, a segment bisector, an angle bisector, perpendicular lines, the perpendicular bisector of a line segment, and a line parallel to a given line through a point not on a line using a compass and a straightedge;
 - 5.C: The student uses constructions to validate conjectures about geometric figures. use the constructions of congruent segments, congruent angles, angle bisectors, and perpendicular bisectors to make conjectures about geometric relationships; and
 - 6.A: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. verify theorems about angles formed by the intersection of lines and line segments, including vertical angles, and angles formed by parallel lines cut by a

transversal and prove equidistance between the endpoints of a segment and points on its perpendicular bisector and apply these relationships to solve problems;

Unit 2: Slopes and Equations of Lines

• SLOPE

- 2.B: The student uses the process skills to understand the connections between algebra and geometry and uses the one- and two-dimensional coordinate systems to verify geometric conjectures. derive and use the distance, slope, and midpoint formulas to verify geometric relationships, including congruence of segments and parallelism or perpendicularity of pairs of lines; and

• PARALLEL AND PERPENDICULAR LINES

- 2.B: The student uses the process skills to understand the connections between algebra and geometry and uses the one- and two-dimensional coordinate systems to verify geometric conjectures. derive and use the distance, slope, and midpoint formulas to verify geometric relationships, including congruence of segments and parallelism or perpendicularity of pairs of lines; and
- 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

• SLOPE-INTERCEPT FORM OF A LINEAR EQUATION

- 2.C: The student uses the process skills to understand the connections between algebra and geometry and uses the one- and two-dimensional coordinate systems to verify geometric conjectures. determine an equation of a line parallel or perpendicular to a given line that passes through a given point.

Unit 3: Triangles

• CLASSIFYING TRIANGLES

- 5.A: The student uses constructions to validate conjectures about geometric figures. investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;
- 6.D: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems; and
- 5.D: The student uses constructions to validate conjectures about geometric figures. verify the Triangle Inequality theorem using constructions and apply the theorem to solve problems.

• TRIANGLE ANGLE THEOREMS

- 5.A: The student uses constructions to validate conjectures about geometric figures. investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;
- 6.D: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems; and
- **MEDIANS AND ALTITUDES OF TRIANGLES**
 - 6.D: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems; and
- **TRIANGLE BISECTORS**
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
 - 6.D: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems; and
 - 1.C: The student uses mathematical processes to acquire and demonstrate mathematical understanding. select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

Unit 4: Polygons

- **POLYGON BASICS**
 - 5.A: The student uses constructions to validate conjectures about geometric figures. investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;
- **PARALLELOGRAMS AND RECTANGLES**
 - 6.E: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. prove a quadrilateral is a parallelogram, rectangle, square, or

rhombus using opposite sides, opposite angles, or diagonals and apply these relationships to solve problems.

- 5.A: The student uses constructions to validate conjectures about geometric figures. investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;

- **SQUARES AND RHOMBI**

- 5.A: The student uses constructions to validate conjectures about geometric figures. investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;
- 6.E: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals and apply these relationships to solve problems.

- **AREA OF POLYGONS**

- 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
- 11.A: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. apply the formula for the area of regular polygons to solve problems using appropriate units of measure;
- 11.B: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. determine the area of composite two-dimensional figures comprised of a combination of triangles, parallelograms, trapezoids, kites, regular polygons, or sectors of circles to solve problems using appropriate units of measure;

Unit 5: Congruence

- **TRIANGLE CONGRUENCE**

- 6.B: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side, and Hypotenuse-Leg congruence conditions;
- 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information,

formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

- 5.A: The student uses constructions to validate conjectures about geometric figures. investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;
- 6.C: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. apply the definition of congruence, in terms of rigid transformations, to identify congruent figures and their corresponding sides and angles;
- **DILATIONS, TRANSLATIONS, ROTATIONS, AND REFLECTIONS**
 - 3.C: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). identify the sequence of transformations that will carry a given pre-image onto an image on and off the coordinate plane; and
 - 1.E: The student uses mathematical processes to acquire and demonstrate mathematical understanding. create and use representations to organize, record, and communicate mathematical ideas;
 - 7.A: The student uses the process skills in applying similarity to solve problems. apply the definition of similarity in terms of a dilation to identify similar figures and their proportional sides and the congruent corresponding angles; and
 - 3.A: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). describe and perform transformations of figures in a plane using coordinate notation;
 - 3.B: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). determine the image or pre-image of a given two-dimensional figure under a composition of rigid transformations, a composition of non-rigid transformations, and a composition of both, including dilations where the center can be any point in the plane;
 - 6.C: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. apply the definition of congruence, in terms of rigid transformations, to identify congruent figures and their corresponding sides and angles;
- **CONGRUENCE OF OTHER POLYGONS**
 - 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information,

formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

- 3.B: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). determine the image or pre-image of a given two-dimensional figure under a composition of rigid transformations, a composition of non-rigid transformations, and a composition of both, including dilations where the center can be any point in the plane;
- 6.C: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. apply the definition of congruence, in terms of rigid transformations, to identify congruent figures and their corresponding sides and angles;
- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
- 3.A: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). describe and perform transformations of figures in a plane using coordinate notation;
- 3.C: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). identify the sequence of transformations that will carry a given pre-image onto an image on and off the coordinate plane; and
- 3.D: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). identify and distinguish between reflectional and rotational symmetry in a plane figure.

Unit 6: Similarity

• TRIANGLE SIMILARITY

- 7.A: The student uses the process skills in applying similarity to solve problems. apply the definition of similarity in terms of a dilation to identify similar figures and their proportional sides and the congruent corresponding angles; and
- 7.B: The student uses the process skills in applying similarity to solve problems. apply the Angle-Angle criterion to verify similar triangles and apply the proportionality of the corresponding sides to solve problems.
- 8.A: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. prove theorems about similar triangles, including the Triangle Proportionality theorem, and apply these theorems to solve problems; and

- 8.B: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. identify and apply the relationships that exist when an altitude is drawn to the hypotenuse of a right triangle, including the geometric mean, to solve problems.
- 6.D: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems; and
- **SIMILARITY OF OTHER POLYGONS**
 - 7.A: The student uses the process skills in applying similarity to solve problems. apply the definition of similarity in terms of a dilation to identify similar figures and their proportional sides and the congruent corresponding angles; and
 - 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
 - 10.B: The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. determine and describe how changes in the linear dimensions of a shape affect its perimeter, area, surface area, or volume, including proportional and non-proportional dimensional change.

Unit 7: Right Triangles

- **PYTHAGOREAN THEOREM**
 - 1.F: The student uses mathematical processes to acquire and demonstrate mathematical understanding. analyze mathematical relationships to connect and communicate mathematical ideas; and
 - 6.D: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems; and
 - 9.B: The student uses the process skills to understand and apply relationships in right triangles. apply the relationships in special right triangles 30-60-90 and 45-45-90 and the Pythagorean theorem, including Pythagorean triples, to solve problems.
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
 - 9.B: The student uses the process skills to understand and apply relationships in right triangles. apply the relationships in special right triangles 30-60-90 and 45-45-90 and the Pythagorean theorem,

including Pythagorean triples, to solve problems.

- 8.A: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. prove theorems about similar triangles, including the Triangle Proportionality theorem, and apply these theorems to solve problems; and
- 9.B: The student uses the process skills to understand and apply relationships in right triangles. apply the relationships in special right triangles 30-60-90 and 45-45-90 and the Pythagorean theorem, including Pythagorean triples, to solve problems.
- 9.B: The student uses the process skills to understand and apply relationships in right triangles. apply the relationships in special right triangles 30-60-90 and 45-45-90 and the Pythagorean theorem, including Pythagorean triples, to solve problems.
- **PYTHAGOREAN TRIPLES**
 - 9.B: The student uses the process skills to understand and apply relationships in right triangles. apply the relationships in special right triangles 30-60-90 and 45-45-90 and the Pythagorean theorem, including Pythagorean triples, to solve problems.
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
 - 9.B: The student uses the process skills to understand and apply relationships in right triangles. apply the relationships in special right triangles 30-60-90 and 45-45-90 and the Pythagorean theorem, including Pythagorean triples, to solve problems.
 - 6.D: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems; and
 - 8.A: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. prove theorems about similar triangles, including the Triangle Proportionality theorem, and apply these theorems to solve problems; and
 - 9.B: The student uses the process skills to understand and apply relationships in right triangles. apply the relationships in special right triangles 30-60-90 and 45-45-90 and the Pythagorean theorem, including Pythagorean triples, to solve problems.
- **PROBLEM SOLVING WITH RIGHT TRIANGLES**
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
 - 1.E: The student uses mathematical processes to acquire and demonstrate mathematical understanding. create and use representations to organize, record, and communicate mathematical ideas;

- 8.B: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. identify and apply the relationships that exist when an altitude is drawn to the hypotenuse of a right triangle, including the geometric mean, to solve problems.
- 9.A: The student uses the process skills to understand and apply relationships in right triangles. determine the lengths of sides and measures of angles in a right triangle by applying the trigonometric ratios sine, cosine, and tangent to solve problems; and
- **SPECIAL RIGHT TRIANGLES**
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
 - 9.B: The student uses the process skills to understand and apply relationships in right triangles. apply the relationships in special right triangles 30-60-90 and 45-45-90 and the Pythagorean theorem, including Pythagorean triples, to solve problems.
 - 9.B: The student uses the process skills to understand and apply relationships in right triangles. apply the relationships in special right triangles 30-60-90 and 45-45-90 and the Pythagorean theorem, including Pythagorean triples, to solve problems.
 - 8.A: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. prove theorems about similar triangles, including the Triangle Proportionality theorem, and apply these theorems to solve problems; and
 - 9.B: The student uses the process skills to understand and apply relationships in right triangles. apply the relationships in special right triangles 30-60-90 and 45-45-90 and the Pythagorean theorem, including Pythagorean triples, to solve problems.

Unit 8: Trigonometry

- **TRIGONOMETRIC RATIOS**
 - 9.A: The student uses the process skills to understand and apply relationships in right triangles. determine the lengths of sides and measures of angles in a right triangle by applying the trigonometric ratios sine, cosine, and tangent to solve problems; and
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
- **RADIANS AND THE UNIT CIRCLE**
 - 12.D: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. describe radian measure of an angle as the ratio of the length of an arc intercepted by a central angle and the radius of the circle; and
 - 12.B: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. apply the proportional relationship between the measure of an arc length of a circle and the circumference of the circle to solve problems;

Unit 9: Circles**• CIRCLE BASICS**

- 6.A: The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. verify theorems about angles formed by the intersection of lines and line segments, including vertical angles, and angles formed by parallel lines cut by a transversal and prove equidistance between the endpoints of a segment and points on its perpendicular bisector and apply these relationships to solve problems;
- 12.A: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems;

• CENTRAL ANGLES, INSCRIBED ANGLES, AND CHORDS

- 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
- 1.F: The student uses mathematical processes to acquire and demonstrate mathematical understanding. analyze mathematical relationships to connect and communicate mathematical ideas; and
- 5.A: The student uses constructions to validate conjectures about geometric figures. investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;
- 12.A: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems;

• SECANTS, ANGLES, AND INSCRIBED ARCS

- 1.F: The student uses mathematical processes to acquire and demonstrate mathematical understanding. analyze mathematical relationships to connect and communicate mathematical ideas; and
- 5.A: The student uses constructions to validate conjectures about geometric figures. investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;
- 12.A: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems;

- **TANGENTS, ANGLES, AND INSCRIBED ARCS**

- 1.F: The student uses mathematical processes to acquire and demonstrate mathematical understanding. analyze mathematical relationships to connect and communicate mathematical ideas; and
- 5.A: The student uses constructions to validate conjectures about geometric figures. investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;
- 12.A: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems;

Unit 10: Working with Circles

- **CONGRUENT AND SIMILAR CIRCLES**

- 12.A: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems;
- 3.A: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). describe and perform transformations of figures in a plane using coordinate notation;
- 3.B: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). determine the image or pre-image of a given two-dimensional figure under a composition of rigid transformations, a composition of non-rigid transformations, and a composition of both, including dilations where the center can be any point in the plane;
- 7.A: The student uses the process skills in applying similarity to solve problems. apply the definition of similarity in terms of a dilation to identify similar figures and their proportional sides and the congruent corresponding angles; and

- **CIRCUMFERENCE AND ARC LENGTH**

- 12.A: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems;
- 12.B: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. apply the proportional relationship between the measure of an arc length of a circle and the circumference of the circle to solve problems;

- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
- **AREA OF CIRCLES AND SECTORS**
 - 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
 - 12.C: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. apply the proportional relationship between the measure of the area of a sector of a circle and the area of the circle to solve problems;
- **FORMULA OF A CIRCLE**
 - 10.A: The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. identify the shapes of two-dimensional cross-sections of prisms, pyramids, cylinders, cones, and spheres and identify three-dimensional objects generated by rotations of two-dimensional shapes; and
 - 12.E: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. show that the equation of a circle with center at the origin and radius is $x^2 + y^2 = r^2$ and determine the equation for the graph of a circle with radius and center (h, k) , $(x - h)^2 + (y - k)^2 = r^2$.

Unit 11: Coordinate Geometry

- **LENGTH AND THE DISTANCE FORMULA**
 - 2.B: The student uses the process skills to understand the connections between algebra and geometry and uses the one- and two-dimensional coordinate systems to verify geometric conjectures. derive and use the distance, slope, and midpoint formulas to verify geometric relationships, including congruence of segments and parallelism or perpendicularity of pairs of lines; and
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
- **MIDPOINT FORMULA ON THE COORDINATE PLANE**
 - 2.A: The student uses the process skills to understand the connections between algebra and geometry and uses the one- and two-dimensional coordinate systems to verify geometric conjectures. determine the coordinates of a point that is a given fractional distance less than one from one end of a line segment to the other in one- and two-dimensional coordinate systems, including finding the midpoint;
 - 2.B: The student uses the process skills to understand the connections between algebra and geometry and uses the one- and two-dimensional coordinate systems to verify geometric conjectures. derive and use the distance, slope, and midpoint formulas to verify geometric relationships, including congruence of segments and parallelism or perpendicularity of pairs of lines; and

- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
- **AREA OF COMPOSITE FIGURES**
- 1.E: The student uses mathematical processes to acquire and demonstrate mathematical understanding. create and use representations to organize, record, and communicate mathematical ideas;
- 11.B: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. determine the area of composite two-dimensional figures comprised of a combination of triangles, parallelograms, trapezoids, kites, regular polygons, or sectors of circles to solve problems using appropriate units of measure;
- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
- **TRANSFORMATIONS ON THE COORDINATE PLANE**
- 3.A: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). describe and perform transformations of figures in a plane using coordinate notation;
- 3.B: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). determine the image or pre-image of a given two-dimensional figure under a composition of rigid transformations, a composition of non-rigid transformations, and a composition of both, including dilations where the center can be any point in the plane;
- 3.C: The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). identify the sequence of transformations that will carry a given pre-image onto an image on and off the coordinate plane; and
- 7.A: The student uses the process skills in applying similarity to solve problems. apply the definition of similarity in terms of a dilation to identify similar figures and their proportional sides and the congruent corresponding angles; and

Unit 12: Surface Area

- **SURFACE AREA OF PRISMS AND PYRAMIDS**
- 11.C: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. apply the formulas for the total and lateral surface area of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure; and
- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;

- 1.E: The student uses mathematical processes to acquire and demonstrate mathematical understanding. create and use representations to organize, record, and communicate mathematical ideas;
- **SURFACE AREA OF CYLINDERS AND CONES**
 - 1.E: The student uses mathematical processes to acquire and demonstrate mathematical understanding. create and use representations to organize, record, and communicate mathematical ideas;
 - 11.C: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. apply the formulas for the total and lateral surface area of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure; and
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
- **SURFACE AREA OF COMPOSITE SOLIDS**
 - 1.E: The student uses mathematical processes to acquire and demonstrate mathematical understanding. create and use representations to organize, record, and communicate mathematical ideas;
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
 - 11.C: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. apply the formulas for the total and lateral surface area of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure; and
 - 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

Unit 13: Volume

- **VOLUME OF PRISMS AND PYRAMIDS**
 - 11.D: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. apply the formulas for the volume of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure.
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
 - 10.A: The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. identify the shapes of two-dimensional cross-sections of prisms,

pyramids, cylinders, cones, and spheres and identify three-dimensional objects generated by rotations of two-dimensional shapes; and

- **VOLUME OF CYLINDERS AND CONES**

- 1.E: The student uses mathematical processes to acquire and demonstrate mathematical understanding. create and use representations to organize, record, and communicate mathematical ideas;
- 1.F: The student uses mathematical processes to acquire and demonstrate mathematical understanding. analyze mathematical relationships to connect and communicate mathematical ideas; and
- 10.A: The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. identify the shapes of two-dimensional cross-sections of prisms, pyramids, cylinders, cones, and spheres and identify three-dimensional objects generated by rotations of two-dimensional shapes; and
- 1.C: The student uses mathematical processes to acquire and demonstrate mathematical understanding. select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

- **VOLUME OF COMPOSITE SOLIDS**

- 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
- 11.D: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. apply the formulas for the volume of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure.

- **SURFACE AREA AND VOLUME OF SPHERES**

- 1.C: The student uses mathematical processes to acquire and demonstrate mathematical understanding. select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;
- 10.A: The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. identify the shapes of two-dimensional cross-sections of prisms, pyramids, cylinders, cones, and spheres and identify three-dimensional objects generated by rotations of two-dimensional shapes; and
- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;

- 11.C: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. apply the formulas for the total and lateral surface area of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure; and
- 11.D: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. apply the formulas for the volume of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure.

Unit 14: Working with Solids

- **SURFACE AREA OF SIMILAR SOLIDS**

- 10.B: The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. determine and describe how changes in the linear dimensions of a shape affect its perimeter, area, surface area, or volume, including proportional and non-proportional dimensional change.
- 11.C: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. apply the formulas for the total and lateral surface area of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure; and
- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
- 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

- **VOLUME OF SIMILAR SOLIDS**

- 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
- 10.B: The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. determine and describe how changes in the linear dimensions of a shape affect its perimeter, area, surface area, or volume, including proportional and non-proportional dimensional change.
- 11.D: The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. apply the formulas for the volume of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure.
- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;

- **EFFECTS OF CHANGING DIMENSIONS ON PERIMETER, AREA, AND VOLUME**

- 1.C: The student uses mathematical processes to acquire and demonstrate mathematical understanding. select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;
- 10.B: The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. determine and describe how changes in the linear dimensions of a shape affect its perimeter, area, surface area, or volume, including proportional and non-proportional dimensional change.
- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;

- **CONVERTING BETWEEN TWO-DIMENSIONAL FIGURES AND THREE-DIMENSIONAL SOLIDS**

- 1.F: The student uses mathematical processes to acquire and demonstrate mathematical understanding. analyze mathematical relationships to connect and communicate mathematical ideas; and
- 10.A: The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. identify the shapes of two-dimensional cross-sections of prisms, pyramids, cylinders, cones, and spheres and identify three-dimensional objects generated by rotations of two-dimensional shapes; and

Unit 15: Logic

- **LANGUAGE OF LOGIC**

- 1.D: The student uses mathematical processes to acquire and demonstrate mathematical understanding. communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- 4.A: The student uses the process skills with deductive reasoning to understand geometric relationships. distinguish between undefined terms, definitions, postulates, conjectures, and theorems;

- **CONDITIONAL STATEMENTS AND SYLLOGISMS**

- 1.D: The student uses mathematical processes to acquire and demonstrate mathematical understanding. communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- 1.G: The student uses mathematical processes to acquire and demonstrate mathematical understanding. display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.
- 4.B: The student uses the process skills with deductive reasoning to understand geometric relationships. identify and determine the validity of the converse, inverse, and contrapositive of a conditional statement and recognize the connection between a biconditional statement and a true conditional statement with a true converse;

- **CONVERSE, INVERSE, AND CONTRAPOSITIVE STATEMENTS**

- 4.B: The student uses the process skills with deductive reasoning to understand geometric relationships. identify and determine the validity of the converse, inverse, and contrapositive of a conditional statement and recognize the connection between a biconditional statement and a true conditional statement with a true converse;
- 1.D: The student uses mathematical processes to acquire and demonstrate mathematical understanding. communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- 1.G: The student uses mathematical processes to acquire and demonstrate mathematical understanding. display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Unit 16: Proofs

- **TWO-COLUMN PROOFS**

- 1.D: The student uses mathematical processes to acquire and demonstrate mathematical understanding. communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- 1.G: The student uses mathematical processes to acquire and demonstrate mathematical understanding. display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

- **PARAGRAPH PROOFS AND PROOFS BY CONTRADICTION**

- 1.D: The student uses mathematical processes to acquire and demonstrate mathematical understanding. communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- 1.G: The student uses mathematical processes to acquire and demonstrate mathematical understanding. display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

- **INDUCTIVE REASONING AND MAKING CONJECTURES**

- 1.D: The student uses mathematical processes to acquire and demonstrate mathematical understanding. communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- 1.G: The student uses mathematical processes to acquire and demonstrate mathematical understanding. display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.
- 4.C: The student uses the process skills with deductive reasoning to understand geometric relationships. verify that a conjecture is false using a counterexample; and

Unit 17: Topics in Geometry

- **CONSTRUCTIONS**

- 1.C: The student uses mathematical processes to acquire and demonstrate mathematical understanding. select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;
- 1.E: The student uses mathematical processes to acquire and demonstrate mathematical understanding. create and use representations to organize, record, and communicate mathematical ideas;
- 5.C: The student uses constructions to validate conjectures about geometric figures. use the constructions of congruent segments, congruent angles, angle bisectors, and perpendicular bisectors to make conjectures about geometric relationships; and
- 5.B: The student uses constructions to validate conjectures about geometric figures. construct congruent segments, congruent angles, a segment bisector, an angle bisector, perpendicular lines, the perpendicular bisector of a line segment, and a line parallel to a given line through a point not on a line using a compass and a straightedge;
- **EUCLIDEAN VERSUS NON-EUCLIDEAN GEOMETRY**
 - 4.D: The student uses the process skills with deductive reasoning to understand geometric relationships. compare geometric relationships between Euclidean and spherical geometries, including parallel lines and the sum of the angles in a triangle.
 - 1.F: The student uses mathematical processes to acquire and demonstrate mathematical understanding. analyze mathematical relationships to connect and communicate mathematical ideas; and

Unit 18: Probability

- **COMBINATIONS AND PERMUTATIONS**
 - 13.A: The student uses the process skills to understand probability in real-world situations and how to apply independence and dependence of events. develop strategies to use permutations and combinations to solve contextual problems;
- **INTRODUCTION TO PROBABILITY**
 - 13.C: The student uses the process skills to understand probability in real-world situations and how to apply independence and dependence of events. identify whether two events are independent and compute the probability of the two events occurring together with or without replacement;
 - 13.E: The student uses the process skills to understand probability in real-world situations and how to apply independence and dependence of events. apply independence in contextual problems.

Unit 19: Advanced Concepts in Probability

- **ANALYZING DECISIONS IN PROBABILITY**
 - 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;

- 13.E: The student uses the process skills to understand probability in real-world situations and how to apply independence and dependence of events. apply independence in contextual problems.
- **CONDITIONAL PROBABILITY**
- 13.D: The student uses the process skills to understand probability in real-world situations and how to apply independence and dependence of events. apply conditional probability in contextual problems; and
- 13.C: The student uses the process skills to understand probability in real-world situations and how to apply independence and dependence of events. identify whether two events are independent and compute the probability of the two events occurring together with or without replacement;
- 13.E: The student uses the process skills to understand probability in real-world situations and how to apply independence and dependence of events. apply independence in contextual problems.
- **GEOMETRIC PROBABILITIES**
- 1.A: The student uses mathematical processes to acquire and demonstrate mathematical understanding. apply mathematics to problems arising in everyday life, society, and the workplace;
- 13.B: The student uses the process skills to understand probability in real-world situations and how to apply independence and dependence of events. determine probabilities based on area to solve contextual problems;
- 12.C: The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. apply the proportional relationship between the measure of the area of a sector of a circle and the area of the circle to solve problems;
- 1.B: The student uses mathematical processes to acquire and demonstrate mathematical understanding. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;