

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.

1. POINTS, LINES, AND PLANES

• POINTS, RAYS, LINE SEGMENTS, LINES, AND FIGURES

- **4.A** distinguish between undefined terms, definitions, postulates, conjectures, and theorems;
- **1.D** communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- **1.A** apply mathematics to problems arising in everyday life, society, and the workplace;

• PARALLEL LINES AND ANGLE RELATIONSHIPS

- **6.A** 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** 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** apply mathematics to problems arising in everyday life, society, and the workplace;
- **1.B** 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** 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** 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** 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** 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** use the constructions of congruent segments, congruent angles, angle bisectors, and perpendicular bisectors to make conjectures about geometric relationships; and
- **6.A** 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;

2. SLOPES AND EQUATIONS OF LINES

• SLOPE

- **2.B** 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** 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** 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** determine an equation of a line parallel or perpendicular to a given line that passes through a given point.

3. TRIANGLES

• CLASSIFYING TRIANGLES

- **5.A** 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** 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** verify the Triangle Inequality theorem using constructions and apply the theorem to solve problems.

• TRIANGLE ANGLE THEOREMS

- **5.A** 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** 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** 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** apply mathematics to problems arising in everyday life, society, and the workplace;
- **6.D** 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** 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;

4. POLYGONS

• POLYGON BASICS

- **5.A** 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** 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** 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** 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** 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** 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** apply the formula for the area of regular polygons to solve problems using appropriate units of measure;
- **11.B** 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;

5. CONGRUENCE

• TRIANGLE CONGRUENCE

- **6.B** 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** 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** 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** 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** identify the sequence of transformations that will carry a given pre-image onto an image on and off the coordinate plane; and
- **1.E** create and use representations to organize, record, and communicate mathematical ideas;
- **7.A** 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** describe and perform transformations of figures in a plane using coordinate notation;
- **3.B** 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** 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** 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** 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** apply the definition of congruence, in terms of rigid transformations, to identify congruent figures and their corresponding sides and angles;
- **1.A** apply mathematics to problems arising in everyday life, society, and the workplace;
- **3.A** describe and perform transformations of figures in a plane using coordinate notation;
- **3.C** identify the sequence of transformations that will carry a given pre-image onto an image on and off the coordinate plane; and
- **3.D** identify and distinguish between reflectional and rotational symmetry in a plane figure.

6. SIMILARITY

• TRIANGLE SIMILARITY

- **7.A** 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** apply the Angle-Angle criterion to verify similar triangles and apply the proportionality of the corresponding sides to solve problems.
- **8.A** prove theorems about similar triangles, including the Triangle Proportionality theorem, and apply these theorems to solve problems; and
- **8.B** 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** 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** 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** 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** 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.

7. RIGHT TRIANGLES

• PYTHAGOREAN THEOREM

- **1.F** analyze mathematical relationships to connect and communicate mathematical ideas; and
- **6.D** 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** 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** apply mathematics to problems arising in everyday life, society, and the workplace;
- **8.A** prove theorems about similar triangles, including the Triangle Proportionality theorem, and apply these theorems to solve problems; and

- **PYTHAGOREAN TRIPLES**

- **9.B** 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** apply mathematics to problems arising in everyday life, society, and the workplace;
- **6.D** 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** prove theorems about similar triangles, including the Triangle Proportionality theorem, and apply these theorems to solve problems; and

- **PROBLEM SOLVING WITH RIGHT TRIANGLES**

- **1.A** apply mathematics to problems arising in everyday life, society, and the workplace;
- **1.E** create and use representations to organize, record, and communicate mathematical ideas;
- **8.B** 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** 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** apply mathematics to problems arising in everyday life, society, and the workplace;
- **9.B** 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** prove theorems about similar triangles, including the Triangle Proportionality theorem, and apply these theorems to solve problems; and

8. TRIGONOMETRY

- **TRIGONOMETRIC RATIOS**

- **9.A** 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** apply mathematics to problems arising in everyday life, society, and the workplace;

- **RADIANS AND THE UNIT CIRCLE**

- **12.D** 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** apply the proportional relationship between the measure of an arc length of a circle and the circumference of the circle to solve problems;

9. CIRCLES

- **CIRCLE BASICS**

- **6.A** 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** 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** 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** analyze mathematical relationships to connect and communicate mathematical ideas; and
- **5.A** 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** 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** analyze mathematical relationships to connect and communicate mathematical ideas; and
- **5.A** 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** 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** analyze mathematical relationships to connect and communicate mathematical ideas; and
- **5.A** 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** apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems;

10. WORKING WITH CIRCLES

- **CONGRUENT AND SIMILAR CIRCLES**

- **12.A** apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems;
- **3.A** describe and perform transformations of figures in a plane using coordinate notation;
- **3.B** 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** 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** apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems;
- **12.B** 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** apply mathematics to problems arising in everyday life, society, and the workplace;

- **AREA OF CIRCLES AND SECTORS**

- **1.B** 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** apply mathematics to problems arising in everyday life, society, and the workplace;
- **12.C** 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** 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** show that the equation of a circle with center at the origin and radius r is $x^2 + y^2 = r^2$ and determine the equation for the graph of a circle with radius r and center (h, k) , $(x - h)^2 + (y - k)^2 = r^2$.

11. COORDINATE GEOMETRY

• LENGTH AND THE DISTANCE FORMULA

- **2.B** 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** apply mathematics to problems arising in everyday life, society, and the workplace;

• MIDPOINT FORMULA ON THE COORDINATE PLANE

- **2.A** 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** 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** apply mathematics to problems arising in everyday life, society, and the workplace;

• AREA OF COMPOSITE FIGURES

- **1.E** create and use representations to organize, record, and communicate mathematical ideas;
- **11.B** 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** apply mathematics to problems arising in everyday life, society, and the workplace;

• TRANSFORMATIONS ON THE COORDINATE PLANE

- **3.A** describe and perform transformations of figures in a plane using coordinate notation;
- **3.B** 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** identify the sequence of transformations that will carry a given pre-image onto an image on and off the coordinate plane; and
- **7.A** apply the definition of similarity in terms of a dilation to identify similar figures and their proportional sides and the congruent corresponding angles; and

12. SURFACE AREA

• SURFACE AREA OF PRISMS AND PYRAMIDS

- **11.C** 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** apply mathematics to problems arising in everyday life, society, and the workplace;
- **1.E** create and use representations to organize, record, and communicate mathematical ideas;

• SURFACE AREA OF CYLINDERS AND CONES

- **1.E** create and use representations to organize, record, and communicate mathematical ideas;
- **11.C** 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** apply mathematics to problems arising in everyday life, society, and the workplace;

• SURFACE AREA OF COMPOSITE SOLIDS

- **1.E** create and use representations to organize, record, and communicate mathematical ideas;
- **1.A** apply mathematics to problems arising in everyday life, society, and the workplace;
- **11.C** 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** 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;

13. VOLUME

• VOLUME OF PRISMS AND PYRAMIDS

- **11.D** 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** apply mathematics to problems arising in everyday life, society, and the workplace;
- **10.A** 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** create and use representations to organize, record, and communicate mathematical ideas;
- **1.F** analyze mathematical relationships to connect and communicate mathematical ideas; and
- **10.A** 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** 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** 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** apply mathematics to problems arising in everyday life, society, and the workplace;
- **11.D** 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** 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** 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** apply mathematics to problems arising in everyday life, society, and the workplace;
- **11.C** 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** 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.

14. WORKING WITH SOLIDS

• SURFACE AREA OF SIMILAR SOLIDS

- **10.B** 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** 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** apply mathematics to problems arising in everyday life, society, and the workplace;
- **1.B** 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** 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** 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** 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** apply mathematics to problems arising in everyday life, society, and the workplace;

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

- **1.C** 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** 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** apply mathematics to problems arising in everyday life, society, and the workplace;

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

- **1.F** analyze mathematical relationships to connect and communicate mathematical ideas; and
- **10.A** 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

15. LOGIC

- **LANGUAGE OF LOGIC**

- **1.D** communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- **4.A** distinguish between undefined terms, definitions, postulates, conjectures, and theorems;

- **CONDITIONAL STATEMENTS AND SYLLOGISMS**

- **1.D** communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- **1.G** display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.
- **4.B** 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** 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** communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- **1.G** display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

16. PROOFS

- **TWO-COLUMN PROOFS**

- **1.D** communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- **1.G** 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** communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- **1.G** display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

- **INDUCTIVE REASONING AND MAKING CONJECTURES**

- **1.D** communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- **1.G** display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.
- **4.C** verify that a conjecture is false using a counterexample; and

17. TOPICS IN GEOMETRY

- **CONSTRUCTIONS**

- **1.C** 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** create and use representations to organize, record, and communicate mathematical ideas;
- **5.C** use the constructions of congruent segments, congruent angles, angle bisectors, and perpendicular bisectors to make conjectures about geometric relationships; and
- **5.B** 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** compare geometric relationships between Euclidean and spherical geometries, including parallel lines and the sum of the angles in a triangle.
- **1.F** analyze mathematical relationships to connect and communicate mathematical ideas; and

18. PROBABILITY

- **COMBINATIONS AND PERMUTATIONS**

- **13.A** develop strategies to use permutations and combinations to solve contextual problems;

- **INTRODUCTION TO PROBABILITY**

- **13.C** identify whether two events are independent and compute the probability of the two events occurring together with or without replacement;
- **13.E** apply independence in contextual problems.

19. ADVANCED CONCEPTS IN PROBABILITY

- **ANALYZING DECISIONS IN PROBABILITY**

- **1.A** apply mathematics to problems arising in everyday life, society, and the workplace;

- **13.E** apply independence in contextual problems.

- **CONDITIONAL PROBABILITY**

- **13.D** apply conditional probability in contextual problems; and
- **13.C** identify whether two events are independent and compute the probability of the two events occurring together with or without replacement;
- **13.E** apply independence in contextual problems.

- **GEOMETRIC PROBABILITIES**

- **1.A** apply mathematics to problems arising in everyday life, society, and the workplace;
- **13.B** determine probabilities based on area to solve contextual problems;
- **12.C** 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** 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;