

Tutorials are designed specifically for the Virginia Standards of Learning to prepare students for the Standards of Learning tests.

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: Logic and Constructions

• **CONDITIONAL STATEMENTS AND SYLLOGISMS**

- RLT.G.1.c: Reasoning, Lines, and Transformations The student will use deductive reasoning to construct and judge the validity of a logical argument consisting of a set of premises and a conclusion. This will include determining the validity of a logical argument.
- RLT.G.1.b: Reasoning, Lines, and Transformations The student will use deductive reasoning to construct and judge the validity of a logical argument consisting of a set of premises and a conclusion. This will include translating a short verbal argument into symbolic form; and

• **CONVERSE, INVERSE, AND CONTRAPOSITIVE STATEMENTS**

- RLT.G.1.a: Reasoning, Lines, and Transformations The student will use deductive reasoning to construct and judge the validity of a logical argument consisting of a set of premises and a conclusion. This will include identifying the converse, inverse, and contrapositive of a conditional statement;
- RLT.G.1.c: Reasoning, Lines, and Transformations The student will use deductive reasoning to construct and judge the validity of a logical argument consisting of a set of premises and a conclusion. This will include determining the validity of a logical argument.

• **CONSTRUCTIONS**

- RLT.G.3.c: Reasoning, Lines, and Transformations The student will solve problems involving symmetry and transformation. This will include investigating symmetry and determining whether a figure is symmetric with respect to a line or a point; and
- RLT.G.4.a: Reasoning, Lines, and Transformations The student will construct and justify the constructions of a line segment congruent to a given line segment;
- RLT.G.4.b: Reasoning, Lines, and Transformations The student will construct and justify the constructions of the perpendicular bisector of a line segment;
- RLT.G.4.c: Reasoning, Lines, and Transformations The student will construct and justify the constructions of a perpendicular to a given line from a point not on the line;
- RLT.G.4.d: Reasoning, Lines, and Transformations The student will construct and justify the constructions of a perpendicular to a given line at a given point on the line;
- RLT.G.4.e: Reasoning, Lines, and Transformations The student will construct and justify the constructions of the bisector of a given angle,
- RLT.G.4.f: Reasoning, Lines, and Transformations The student will construct and justify the constructions of an angle congruent to a given angle;
- RLT.G.4.h: Reasoning, Lines, and Transformations The student will construct and justify the constructions of an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Unit 2: Points, Lines, and Angles

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

- **PARALLEL LINES AND ANGLE RELATIONSHIPS**

- RLT.G.2.a: Reasoning, Lines, and Transformations The student will use the relationships between angles formed by two lines intersected by a transversal to prove two or more lines are parallel; and
- RLT.G.2.b: Reasoning, Lines, and Transformations The student will use the relationships between angles formed by two lines intersected by a transversal to solve problems, including practical problems, involving angles formed when parallel lines are intersected by a transversal.

- **PERPENDICULAR BISECTOR AND ANGLE BISECTOR THEOREMS**

- RLT.G.1.c: Reasoning, Lines, and Transformations The student will use deductive reasoning to construct and judge the validity of a logical argument consisting of a set of premises and a conclusion. This will include determining the validity of a logical argument.
- RLT.G.4.d: Reasoning, Lines, and Transformations The student will construct and justify the constructions of a perpendicular to a given line at a given point on the line;

Unit 3: Coordinate Geometry

- **LENGTH AND THE DISTANCE FORMULA**

- RLT.G.3.a: Reasoning, Lines, and Transformations The student will solve problems involving symmetry and transformation. This will include investigating and using formulas for

determining distance, midpoint, and slope;

- **MIDPOINT FORMULA ON THE COORDINATE PLANE**

- RLT.G.3.a: Reasoning, Lines, and Transformations The student will solve problems involving symmetry and transformation. This will include investigating and using formulas for determining distance, midpoint, and slope;

- **CONJECTURES IN COORDINATE GEOMETRY**

- RLT.G.3.b: Reasoning, Lines, and Transformations The student will solve problems involving symmetry and transformation. This will include applying slope to verify and determine whether lines are parallel or perpendicular;
- RLT.G.3.c: Reasoning, Lines, and Transformations The student will solve problems involving symmetry and transformation. This will include investigating symmetry and determining whether a figure is symmetric with respect to a line or a point; and

Unit 4: Transformations and Congruence

- **DILATIONS, TRANSLATIONS, ROTATIONS, AND REFLECTIONS**

- TDF.G.14.d: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include solving problems, including practical problems, about similar geometric figures.
- RLT.G.3.c: Reasoning, Lines, and Transformations The student will solve problems involving symmetry and transformation. This will include investigating symmetry and determining whether a figure is symmetric with respect to a line or a point; and
- RLT.G.3.d: Reasoning, Lines, and Transformations The student will solve problems involving symmetry and transformation. This will include determining whether a figure has been translated, reflected, rotated, or dilated, using coordinate methods.

- **TRIANGLES AND CONGRUENCE TRANSFORMATIONS**

- T.G.6: Triangles The student, given information in the form of a figure or statement, will prove two triangles are congruent.

- **CONGRUENCE OF OTHER POLYGONS**

- PC.G.9: Polygons and Circles The student will verify and use properties of quadrilaterals to solve problems, including practical problems.
- RLT.G.3.c: Reasoning, Lines, and Transformations The student will solve problems involving symmetry and transformation. This will include investigating symmetry and determining whether a figure is symmetric with respect to a line or a point; and

Unit 5: Similarity

- **TRIANGLES AND SIMILARITY TRANSFORMATIONS**

- T.G.7: Triangles The student, given information in the form of a figure or statement, will prove two triangles are similar.

- TDF.G.14.d: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include solving problems, including practical problems, about similar geometric figures.

- **SIMILARITY OF OTHER POLYGONS**

- PC.G.9: Polygons and Circles The student will verify and use properties of quadrilaterals to solve problems, including practical problems.
- TDF.G.14.a: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include comparing ratios between lengths, perimeters, areas, and volumes of similar figures;
- TDF.G.14.d: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include solving problems, including practical problems, about similar geometric figures.

Unit 6: Triangles

- **CLASSIFYING TRIANGLES**

- T.G.5.a: Triangles The student, given information concerning the lengths of sides and/or measures of angles in triangles, will solve problems, including practical problems. This will include ordering the sides by length, given angle measures;
- T.G.5.b: Triangles The student, given information concerning the lengths of sides and/or measures of angles in triangles, will solve problems, including practical problems. This will include ordering the angles by degree measure, given side lengths;
- T.G.5.c: Triangles The student, given information concerning the lengths of sides and/or measures of angles in triangles, will solve problems, including practical problems. This will include determining whether a triangle exists; and
- T.G.5.d: Triangles The student, given information concerning the lengths of sides and/or measures of angles in triangles, will solve problems, including practical problems. This will include determining the range in which the length of the third side must lie.

- **TRIANGLE ANGLE THEOREMS**

- PC.G.10.b: Polygons and Circles The student will solve problems, including practical problems, involving angles of convex polygons. This will include determining the measure of an interior and/or exterior angle; and
- PC.G.10.a: Polygons and Circles The student will solve problems, including practical problems, involving angles of convex polygons. This will include determining the sum of the interior and/or exterior angles;
- T.G.6: Triangles The student, given information in the form of a figure or statement, will prove two triangles are congruent.

- **PYTHAGOREAN THEOREM**

- T.G.8.a: Triangles The student will solve problems, including practical problems, involving right triangles. This will include applying the Pythagorean Theorem and its converse;
- T.G.7: Triangles The student, given information in the form of a figure or statement, will prove two triangles are similar.

Unit 7: Quadrilaterals and Polygons 1

- **PARALLELOGRAMS AND RECTANGLES**

- PC.G.9: Polygons and Circles The student will verify and use properties of quadrilaterals to solve problems, including practical problems.

- **SQUARES AND RHOMBI**

- PC.G.9: Polygons and Circles The student will verify and use properties of quadrilaterals to solve problems, including practical problems.

- **TRAPEZOIDS**

- PC.G.9: Polygons and Circles The student will verify and use properties of quadrilaterals to solve problems, including practical problems.
- PC.G.10.c: Polygons and Circles The student will solve problems, including practical problems, involving angles of convex polygons. This will include determining the number of sides of a regular polygon.

Unit 8: Quadrilaterals and Polygons 2

- **KITES**

- PC.G.9: Polygons and Circles The student will verify and use properties of quadrilaterals to solve problems, including practical problems.

- **POLYGON BASICS**

- PC.G.10.a: Polygons and Circles The student will solve problems, including practical problems, involving angles of convex polygons. This will include determining the sum of the interior and/or exterior angles;
- PC.G.10.b: Polygons and Circles The student will solve problems, including practical problems, involving angles of convex polygons. This will include determining the measure of an interior and/or exterior angle; and
- PC.G.10.c: Polygons and Circles The student will solve problems, including practical problems, involving angles of convex polygons. This will include determining the number of sides of a regular polygon.

Unit 9: Triangles and Trigonometry

- **TRIGONOMETRIC RATIOS**

- T.G.8.c: Triangles The student will solve problems, including practical problems, involving right triangles. This will include applying trigonometric ratios.

- **PROBLEM SOLVING WITH RIGHT TRIANGLES**

- T.G.7: Triangles The student, given information in the form of a figure or statement, will prove two triangles are similar.
- T.G.8.c: Triangles The student will solve problems, including practical problems, involving right triangles. This will include applying trigonometric ratios.
- **SPECIAL RIGHT TRIANGLES**
 - T.G.8.b: Triangles The student will solve problems, including practical problems, involving right triangles. This will include applying properties of special right triangles; and
 - T.G.7: Triangles The student, given information in the form of a figure or statement, will prove two triangles are similar.
 - TDF.G.14.d: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include solving problems, including practical problems, about similar geometric figures.

Unit 10: Circles

- **CIRCLE BASICS**
 - PC.G.11.a: Polygons and Circles The student will solve problems, including practical problems, by applying properties of circles. This will include determining angle measures formed by intersecting chords, secants, and/or tangents;
- **CENTRAL ANGLES, INSCRIBED ANGLES, AND CHORDS**
 - PC.G.11.c: Polygons and Circles The student will solve problems, including practical problems, by applying properties of circles. This will include determining arc length; and
 - PC.G.11.a: Polygons and Circles The student will solve problems, including practical problems, by applying properties of circles. This will include determining angle measures formed by intersecting chords, secants, and/or tangents;
- **CONGRUENT AND SIMILAR CIRCLES**
 - TDF.G.14.a: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include comparing ratios between lengths, perimeters, areas, and volumes of similar figures;
 - TDF.G.14.d: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include solving problems, including practical problems, about similar geometric figures.
 - RLT.G.3.d: Reasoning, Lines, and Transformations The student will solve problems involving symmetry and transformation. This will include determining whether a figure has been translated, reflected, rotated, or dilated, using coordinate methods.

Unit 11: Secants and Tangents

- **SECANTS, ANGLES, AND INTERCEPTED ARCS**
 - PC.G.11.a: Polygons and Circles The student will solve problems, including practical problems, by applying properties of circles. This will include determining angle measures formed by

intersecting chords, secants, and/or tangents;

- PC.G.11.b: Polygons and Circles The student will solve problems, including practical problems, by applying properties of circles. This will include determining lengths of segments formed by intersecting chords, secants, and/or tangents;
- PC.G.11.c: Polygons and Circles The student will solve problems, including practical problems, by applying properties of circles. This will include determining arc length; and
- **TANGENTS, ANGLES, AND INTERCEPTED ARCS**
 - PC.G.11.a: Polygons and Circles The student will solve problems, including practical problems, by applying properties of circles. This will include determining angle measures formed by intersecting chords, secants, and/or tangents;
 - PC.G.11.b: Polygons and Circles The student will solve problems, including practical problems, by applying properties of circles. This will include determining lengths of segments formed by intersecting chords, secants, and/or tangents;
 - PC.G.11.c: Polygons and Circles The student will solve problems, including practical problems, by applying properties of circles. This will include determining arc length; and

Unit 12: Properties of Circles

- **CIRCUMFERENCE AND ARC LENGTH**

- PC.G.11.c: Polygons and Circles The student will solve problems, including practical problems, by applying properties of circles. This will include determining arc length; and

- **AREA OF CIRCLES AND SECTORS**

- PC.G.11.d: Polygons and Circles The student will solve problems, including practical problems, by applying properties of circles. This will include determining area of a sector.

- **CIRCLES**

- PC.G.12: Polygons and Circles The student will solve problems involving equations of circles.

Unit 13: Surface Area

- **SURFACE AREA OF PRISMS AND PYRAMIDS**

- TDF.G.13: Three-Dimensional Figures The student will use surface area and volume of three-dimensional objects to solve practical problems.

- **SURFACE AREA OF CYLINDERS AND CONES**

- TDF.G.13: Three-Dimensional Figures The student will use surface area and volume of three-dimensional objects to solve practical problems.

- **SURFACE AREA AND VOLUME OF SPHERES**

- TDF.G.13: Three-Dimensional Figures The student will use surface area and volume of three-dimensional objects to solve practical problems.

Unit 14: Volume

- **VOLUME OF PRISMS AND PYRAMIDS**

- TDF.G.13: Three-Dimensional Figures The student will use surface area and volume of three-dimensional objects to solve practical problems.

- **VOLUME OF CYLINDERS AND CONES**

- TDF.G.13: Three-Dimensional Figures The student will use surface area and volume of three-dimensional objects to solve practical problems.

Unit 15: Volume and Surface Area of Composite Solids

- **SURFACE AREA OF COMPOSITE SOLIDS**

- TDF.G.13: Three-Dimensional Figures The student will use surface area and volume of three-dimensional objects to solve practical problems.

- **VOLUME OF COMPOSITE SOLIDS**

- TDF.G.13: Three-Dimensional Figures The student will use surface area and volume of three-dimensional objects to solve practical problems.

Unit 16: Changing Dimensions and Similar Solids

- **SURFACE AREA OF SIMILAR SOLIDS**

- TDF.G.13: Three-Dimensional Figures The student will use surface area and volume of three-dimensional objects to solve practical problems.
- TDF.G.14.a: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include comparing ratios between lengths, perimeters, areas, and volumes of similar figures;
- TDF.G.14.d: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include solving problems, including practical problems, about similar geometric figures.

- **VOLUME OF SIMILAR SOLIDS**

- TDF.G.13: Three-Dimensional Figures The student will use surface area and volume of three-dimensional objects to solve practical problems.
- TDF.G.14.a: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include comparing ratios between lengths, perimeters, areas, and volumes of similar figures;
- TDF.G.14.d: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include solving problems, including practical problems, about similar geometric figures.

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

- TDF.G.13: Three-Dimensional Figures The student will use surface area and volume of three-dimensional objects to solve practical problems.

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- TDF.G.14.a: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include comparing ratios between lengths, perimeters, areas, and volumes of similar figures;
 - TDF.G.14.d: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include solving problems, including practical problems, about similar geometric figures.
 - TDF.G.14.b: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include determining how changes in one or more dimensions of a figure affect area and/or volume of the figure;
 - TDF.G.14.c: Three-Dimensional Figures The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include determining how changes in area and/or volume of a figure affect one or more dimensions of the figure; and