

Kentucky Tutorials are designed specifically for the Kentucky Academic Standards to prepare students for the K-PREP, EOC exams, ACT, and ACT Plan.

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: Precision, Accuracy, and Constructions

- **MONITORING PRECISION AND ACCURACY**

- KY.HS.N.5: Define appropriate units in context for the purpose of descriptive modeling.
- KY.HS.N.6: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- KY.HS.N.4.a: Use units in context as a way to understand problems and to guide the solution of multi-step problems; Choose and interpret units consistently in formulas;
- KY.HS.N.4.b: Use units in context as a way to understand problems and to guide the solution of multi-step problems; Choose and interpret the scale and the origin in graphs and data displays.
- KY.HS.G.8.a: Create and apply geometric constructions. Make formal geometric constructions with a variety of tools and methods.

- **CONSTRUCTIONS**

- KY.HS.G.8.a: Create and apply geometric constructions. Make formal geometric constructions with a variety of tools and methods.
- KY.HS.G.8.b: Create and apply geometric constructions. Apply basic construction procedures to construct more complex figures.

Unit 2: Points and Lines

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

- KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.

- **PARALLEL AND PERPENDICULAR LINES**

- KY.HS.G.22: Justify and apply the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.
- KY.HS.G.1.b: Know and apply precise definitions of the language of Geometry: Understand properties of and differences between perpendicular and parallel lines.

Unit 3: Lines and Angles

- **PARALLEL LINES AND ANGLE RELATIONSHIPS**

- KY.HS.G.1.b: Know and apply precise definitions of the language of Geometry: Understand properties of and differences between perpendicular and parallel lines.
- KY.HS.G.7.a: Prove theorems about geometric figures. Construct formal proofs to justify theorems for lines, angles and triangles.
- KY.HS.G.6: Apply theorems for lines, angles, triangles, parallelograms.
- KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
- KY.HS.G.16.a: Identify and describe relationships among angles and segments within the context of circles involving: Recognize differences between and properties of inscribed, central and circumscribed angles.

- **PERPENDICULAR BISECTOR AND ANGLE BISECTOR THEOREMS**

- KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
- KY.HS.G.16.a: Identify and describe relationships among angles and segments within the context of circles involving: Recognize differences between and properties of inscribed, central and circumscribed angles.
- KY.HS.G.7.a: Prove theorems about geometric figures. Construct formal proofs to justify theorems for lines, angles and triangles.
- KY.HS.G.6: Apply theorems for lines, angles, triangles, parallelograms.

Unit 4: Coordinate Geometry

- **LENGTH AND THE DISTANCE FORMULA**

- KY.HS.G.23.a: Find measurements among points within the coordinate plane. Use points from the coordinate plane to find the coordinates of a midpoint of a line segment and the distance between

the endpoints of a line segment.

- KY.HS.G.23.b: Find measurements among points within the coordinate plane. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
- KY.HS.G.24.a: Use coordinates within the coordinate plane to calculate measurements of two dimensional figures. Compute the perimeters of various polygons.
- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.
- KY.HS.G.24.b: Use coordinates within the coordinate plane to calculate measurements of two dimensional figures. Compute the areas of triangles, rectangles and other quadrilaterals.
- **MIDPOINT FORMULA ON THE COORDINATE PLANE**
 - KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
 - KY.HS.G.23.a: Find measurements among points within the coordinate plane. Use points from the coordinate plane to find the coordinates of a midpoint of a line segment and the distance between the endpoints of a line segment.
 - KY.HS.G.23.b: Find measurements among points within the coordinate plane. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
 - KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.
 - KY.HS.G.24.a: Use coordinates within the coordinate plane to calculate measurements of two dimensional figures. Compute the perimeters of various polygons.
- **CONJECTURES IN COORDINATE GEOMETRY**
 - KY.HS.G.7.a: Prove theorems about geometric figures. Construct formal proofs to justify theorems for lines, angles and triangles.
 - KY.HS.G.21: Use coordinates to justify and prove simple geometric theorems algebraically.
 - KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.

Unit 5: Perimeter and Area

- **PERIMETER ON THE COORDINATE PLANE**
 - KY.HS.G.24.a: Use coordinates within the coordinate plane to calculate measurements of two dimensional figures. Compute the perimeters of various polygons.
 - KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.
 - KY.HS.G.21: Use coordinates to justify and prove simple geometric theorems algebraically.
- **AREA ON THE COORDINATE PLANE**

- KY.HS.G.24.b: Use coordinates within the coordinate plane to calculate measurements of two dimensional figures. Compute the areas of triangles, rectangles and other quadrilaterals.

Unit 6: Transformations

• TRANSFORMATIONS ON THE COORDINATE PLANE

- KY.HS.G.4.c: Understand the effects of transformations of geometric figures. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure. Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
- KY.HS.G.2.a: Representing transformations in the plane. Describe transformations as functions that take points in the plane as inputs and give other points as outputs.
- KY.HS.G.2.b: Representing transformations in the plane. Compare transformations that preserve distance and angle measures to those that do not.
- KY.HS.G.4.b: Understand the effects of transformations of geometric figures. Specify a sequence of transformations that will carry a given figure onto another.
- KY.HS.G.9.a: Understand properties of dilations. Verify the properties that result from that dilations given by a center and a scale factor.
- KY.HS.G.9.b: Understand properties of dilations. Verify that a dilation produces an image that is similar to the pre-image.

• DILATIONS, TRANSLATIONS, ROTATIONS, AND REFLECTIONS

- KY.HS.G.4.c: Understand the effects of transformations of geometric figures. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure. Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
- KY.HS.G.4.b: Understand the effects of transformations of geometric figures. Specify a sequence of transformations that will carry a given figure onto another.
- KY.HS.G.9.a: Understand properties of dilations. Verify the properties that result from that dilations given by a center and a scale factor.
- KY.HS.G.4.a: Understand the effects of transformations of geometric figures. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure.
- KY.HS.G.9.b: Understand properties of dilations. Verify that a dilation produces an image that is similar to the pre-image.
- KY.HS.G.2.b: Representing transformations in the plane. Compare transformations that preserve distance and angle measures to those that do not.

Unit 7: Congruence and Similarity

• TRIANGLES AND CONGRUENCE TRANSFORMATIONS

- KY.HS.G.4.c: Understand the effects of transformations of geometric figures. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on

a given figure. Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

- KY.HS.G.7.a: Prove theorems about geometric figures. Construct formal proofs to justify theorems for lines, angles and triangles.
- KY.HS.G.6: Apply theorems for lines, angles, triangles, parallelograms.
- KY.HS.G.5.a: Know and apply the concepts of triangle congruence: Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
- KY.HS.G.5.b: Know and apply the concepts of triangle congruence: Explain how the criteria for triangle congruence (ASA, SAS and SSS) follow from the definition of congruence in terms of rigid motions.
- **CONGRUENCE OF OTHER POLYGONS**
 - KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.
 - KY.HS.G.4.c: Understand the effects of transformations of geometric figures. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure. Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
 - KY.HS.G.4.b: Understand the effects of transformations of geometric figures. Specify a sequence of transformations that will carry a given figure onto another.
 - KY.HS.G.2.a: Representing transformations in the plane. Describe transformations as functions that take points in the plane as inputs and give other points as outputs.
 - KY.HS.G.2.b: Representing transformations in the plane. Compare transformations that preserve distance and angle measures to those that do not.
 - KY.HS.G.4.a: Understand the effects of transformations of geometric figures. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure.
 - KY.HS.G.2.c: Representing transformations in the plane. Given a rectangle, parallelogram, trapezoid, or regular polygon, formally describe the rotations and reflections that carry it onto itself, using properties of these figures.
- **TRIANGLES AND SIMILARITY TRANSFORMATIONS**
 - KY.HS.G.7.a: Prove theorems about geometric figures. Construct formal proofs to justify theorems for lines, angles and triangles.
 - KY.HS.G.6: Apply theorems for lines, angles, triangles, parallelograms.
 - KY.HS.G.11.a: Understand theorems about triangles. Apply theorems about triangles.
 - KY.HS.G.11.b: Understand theorems about triangles. Prove theorems about triangles.
 - KY.HS.G.10: Apply the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

- KY.HS.G.11.c: Understand theorems about triangles. Use similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Unit 8: Triangles

• TRIANGLE ANGLE THEOREMS

- KY.HS.G.7.a: Prove theorems about geometric figures. Construct formal proofs to justify theorems for lines, angles and triangles.
- KY.HS.G.6: Apply theorems for lines, angles, triangles, parallelograms.
- KY.HS.G.11.a: Understand theorems about triangles. Apply theorems about triangles.

• TRIANGLE BISECTORS

- KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
- KY.HS.G.16.a: Identify and describe relationships among angles and segments within the context of circles involving: Recognize differences between and properties of inscribed, central and circumscribed angles.
- KY.HS.G.7.a: Prove theorems about geometric figures. Construct formal proofs to justify theorems for lines, angles and triangles.
- KY.HS.G.6: Apply theorems for lines, angles, triangles, parallelograms.
- KY.HS.G.11.a: Understand theorems about triangles. Apply theorems about triangles.
- KY.HS.G.8.a: Create and apply geometric constructions. Make formal geometric constructions with a variety of tools and methods.
- KY.HS.G.17.a: Apply basic construction procedures within the context of a circle. Construct the inscribed and circumscribed circles of a triangle.

Unit 9: Quadrilaterals

• PARALLELOGRAMS AND RECTANGLES

- KY.HS.G.6: Apply theorems for lines, angles, triangles, parallelograms.
- KY.HS.G.7.b: Prove theorems about geometric figures. Construct formal proofs to justify theorems for parallelograms.
- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.

• SQUARES AND RHOMBI

- KY.HS.G.6: Apply theorems for lines, angles, triangles, parallelograms.
- KY.HS.G.7.b: Prove theorems about geometric figures. Construct formal proofs to justify theorems for parallelograms.
- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.

Unit 10: Right Triangles and Trigonometric Ratios**• PYTHAGOREAN THEOREM**

- KY.HS.G.6: Apply theorems for lines, angles, triangles, parallelograms.
- KY.HS.G.12.c: Understand properties of right triangles. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.
- KY.HS.G.12.a: Understand properties of right triangles. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles (sine, cosine and tangent).
- KY.HS.G.11.a: Understand theorems about triangles. Apply theorems about triangles.
- KY.HS.G.11.b: Understand theorems about triangles. Prove theorems about triangles.
- KY.HS.G.11.c: Understand theorems about triangles. Use similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
- KY.HS.G.7.a: Prove theorems about geometric figures. Construct formal proofs to justify theorems for lines, angles and triangles.

• TRIGONOMETRIC RATIOS

- KY.HS.F.16.b: Understand and use the unit circle. Use special triangles to determine geometrically the values of sine, cosine, tangent for $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{6}$ and use the unit circle to express the values of sine, cosine and tangent for θ , $\theta + \pi$ and $2\pi - \theta$ in terms of their values for θ , where θ is any real number.
- KY.HS.G.12.c: Understand properties of right triangles. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
- KY.HS.G.12.a: Understand properties of right triangles. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles (sine, cosine and tangent).
- KY.HS.F.16.b: Understand and use the unit circle. Use special triangles to determine geometrically the values of sine, cosine, tangent for $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{6}$ and use the unit circle to express the values of sine, cosine and tangent for θ , $\theta + \pi$ and $2\pi - \theta$ in terms of their values for θ , where θ is any real number.
- KY.HS.F.16.b: Understand and use the unit circle. Use special triangles to determine geometrically the values of sine, cosine, tangent for $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{6}$ and use the unit circle to express the values of sine, cosine and tangent for θ , $\theta + \pi$ and $2\pi - \theta$ in terms of their values for θ , where θ is any real number.
- KY.HS.G.12.b: Understand properties of right triangles. Explain and use the relationship between the sine and cosine of complementary angles.
- KY.HS.G.11.c: Understand theorems about triangles. Use similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.

Unit 11: Circles

- **CIRCLE BASICS**

- KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
- KY.HS.G.16.a: Identify and describe relationships among angles and segments within the context of circles involving: Recognize differences between and properties of inscribed, central and circumscribed angles.

- **CENTRAL ANGLES, INSCRIBED ANGLES, AND CHORDS**

- KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
- KY.HS.G.16.a: Identify and describe relationships among angles and segments within the context of circles involving: Recognize differences between and properties of inscribed, central and circumscribed angles.
- KY.HS.G.6: Apply theorems for lines, angles, triangles, parallelograms.
- KY.HS.G.16.b: Identify and describe relationships among angles and segments within the context of circles involving: Understand relationships between inscribed angles and the diameter of a circle.
- KY.HS.G.18.a: Understand the relationship between an intercepted arc length within a circle and the radius of the circle. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius. Derive the formula for the area of a sector.

- **TANGENTS, ANGLES, AND INTERCEPTED ARCS**

- KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
- KY.HS.G.16.c: Identify and describe relationships among angles and segments within the context of circles involving: Understand the relationship between the radius of a circle and the line drawn through the point of tangency on that radius.
- KY.HS.G.16.a: Identify and describe relationships among angles and segments within the context of circles involving: Recognize differences between and properties of inscribed, central and circumscribed angles.
- KY.HS.G.7.a: Prove theorems about geometric figures. Construct formal proofs to justify theorems for lines, angles and triangles.
- KY.HS.G.6: Apply theorems for lines, angles, triangles, parallelograms.

Unit 12: Properties of Circles 1

- **CONGRUENT AND SIMILAR CIRCLES**

- KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
- KY.HS.G.15: Verify using dilations that all circles are similar.
- KY.HS.G.4.c: Understand the effects of transformations of geometric figures. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure. Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
- KY.HS.G.9.a: Understand properties of dilations. Verify the properties that result from that dilations given by a center and a scale factor.
- KY.HS.G.9.b: Understand properties of dilations. Verify that a dilation produces an image that is similar to the pre-image.
- KY.HS.G.3: Develop formal definitions of rotations, reflections and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments.
- **CIRCUMFERENCE AND ARC LENGTH**
 - KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
 - KY.HS.G.25.a: Analyze and determine the validity of arguments for the formulas for the various figures and shapes. Finding the circumference and area of a circle.
 - KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.

Unit 13: Properties of Circles 2

- **AREA OF CIRCLES AND SECTORS**
 - KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
 - KY.HS.G.25.a: Analyze and determine the validity of arguments for the formulas for the various figures and shapes. Finding the circumference and area of a circle.
 - KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.
- **CIRCLES**
 - KY.HS.G.1.a: Know and apply precise definitions of the language of Geometry: Understand properties of line segments, angles and circle.
 - KY.HS.G.25.a: Analyze and determine the validity of arguments for the formulas for the various figures and shapes. Finding the circumference and area of a circle.
 - KY.HS.G.19.c: Understand the relationship between the algebraic form and the geometric representation of a circle. Complete the square to find the center and radius of a circle given by an equation.

- KY.HS.G.19.a: Understand the relationship between the algebraic form and the geometric representation of a circle. Write the equation of a circle of given center and radius using the Pythagorean Theorem.

Unit 14: Surface Area

- **SURFACE AREA AND VOLUME OF SPHERES**

- KY.HS.G.26: Give an informal argument using Cavalieris principle for the formulas for the volume of a sphere and other solid figures.
- KY.HS.G.25.b: Analyze and determine the validity of arguments for the formulas for the various figures and shapes. Finding the volume of a sphere, prism, cylinder, pyramid and cone.
- KY.HS.G.27: Use volume formulas to solve problems for cylinders, pyramids, cones, spheres, prisms.
- KY.HS.G.28: Identify the shapes of two-dimensional cross-sections of three-dimensional objects and identify three-dimensional objects generated by rotations of two-dimensional objects.
- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.

- **SURFACE AREA OF COMPOSITE SOLIDS**

- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.
- KY.HS.G.8.b: Create and apply geometric constructions. Apply basic construction procedures to construct more complex figures.

- **SURFACE AREA OF SIMILAR SOLIDS**

- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.

Unit 15: Volume

- **RELATING TWO-DIMENSIONAL FIGURES TO THREE-DIMENSIONAL SOLIDS**

- KY.HS.G.28: Identify the shapes of two-dimensional cross-sections of three-dimensional objects and identify three-dimensional objects generated by rotations of two-dimensional objects.

- **VOLUME OF PRISMS AND PYRAMIDS**

- KY.HS.G.26: Give an informal argument using Cavalieris principle for the formulas for the volume of a sphere and other solid figures.
- KY.HS.G.25.b: Analyze and determine the validity of arguments for the formulas for the various figures and shapes. Finding the volume of a sphere, prism, cylinder, pyramid and cone.
- KY.HS.G.27: Use volume formulas to solve problems for cylinders, pyramids, cones, spheres, prisms.
- KY.HS.G.26: Give an informal argument using Cavalieris principle for the formulas for the volume of a sphere and other solid figures.

- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.
- KY.HS.G.26: Give an informal argument using Cavalieris principle for the formulas for the volume of a sphere and other solid figures.
- **VOLUME OF CYLINDERS AND CONES**
- KY.HS.G.26: Give an informal argument using Cavalieris principle for the formulas for the volume of a sphere and other solid figures.
- KY.HS.G.25.b: Analyze and determine the validity of arguments for the formulas for the various figures and shapes. Finding the volume of a sphere, prism, cylinder, pyramid and cone.
- KY.HS.G.27: Use volume formulas to solve problems for cylinders, pyramids, cones, spheres, prisms.
- KY.HS.G.26: Give an informal argument using Cavalieris principle for the formulas for the volume of a sphere and other solid figures.
- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.
- KY.HS.G.26: Give an informal argument using Cavalieris principle for the formulas for the volume of a sphere and other solid figures.

Unit 16: Applications of Volume

- **MODELING SITUATIONS WITH GEOMETRY**
- KY.HS.G.31: Apply geometric methods to solve design problems.
- KY.HS.G.30: Apply concepts of density based on area and volume in modeling situations, using appropriate units of measurement.
- **VOLUME OF COMPOSITE SOLIDS**
- KY.HS.G.29: Use geometric shapes, their measures and their properties to describe objects in real world settings.
- KY.HS.G.26: Give an informal argument using Cavalieris principle for the formulas for the volume of a sphere and other solid figures.