Mathematics- Geometry
Units of Instruction
2024-2025

Mathematics - Geometry

UNIT 1: Parallel/ Perpendicular (Coordinate Geometry)	UNIT 2: Transformations	UNIT 3: Triangle Congruence	UNIT 4: Triangle Similarity	UNIT 5: Right Triangles/ Trig	UNIT 6: Quadrilaterals	UNIT 7: Circles	UNIT 8: Solids
KY.HS.G.6	**KY.HS.G.2**	**KY.HS.G.5**	**KY.HS.G.9** **KY.HS.G.11c**	**KY.HS.G.12c**	**KY.HS.G.6** **KY.HS.G.21**	**KY.HS.G.2** **KY.HS.G.16a,c** **KY.HS.G.19a**	**KY.HS.G.25b**
KY.HS.G.21 KY.HS.G.22 KY.HS.G.23 KY.HS.G.24 KY.HS.G.1 KY.HS.G.7	KY.HS.G.4 KY.HS.G.1	KY.HS.G.6 KY.HS.G.7	KY.HS.G.10	KY.HS.G.12 KY.HS.G.11 KY.HS.N.5 KY.HS.N.6	KY.HS.G.22 KY.HS.G.29 KY.HS.G.31	KY.HS.G.16 b KY.HS.G.15 KY.HS.G.8 KY.HS.G.25a	KY.HS.G.27 KY.HS.G.28 KY.HS.G.29 KY.HS.G.30 KY.HS.N.5 KY.HS.N.6
5 weeks **2.5 week**	**2 weeks** **1 week**	**6 weeks** **3 weeks**	**5 weeks** **2.5 weeks**	**5 weeks** **2.5 weeks**	**4 weeks** **2 weeks**	**5 weeks** **2.5 weeks**	**4 weeks** **2 weeks**

Mathematics - Geometry

Unit 1: Parallel and Perpendicular Lines on the Coordinate Plane

Mathematics- Geometry
Unit 1: Parallel and Perpendicular Lines on the Coordinate Plane

Duration: 5 Weeks/ 2.5 Weeks

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Prove geometric theorems. **KY.HS.G.6 Apply theorems for lines, angles, triangles, parallelograms.** MP.2, MP.3	Students use previously learned definitions, theorems, postulates and properties of lines, angles, triangles and parallelograms to draw conclusions and to make inferences. Theorems for lines and angles include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. Theorems for triangles include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.

	Theorems for parallelograms include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other and conversely, rectangles are parallelograms with congruent diagonals.
Supporting Standards	
Standards	**Clarifications**
Cluster: Experiment with transformations in the plane. **KY.HS.G.1 Know and apply precise definitions of the language of Geometry:** **a. Understand properties of line segments, angles and circle.** **b. Understand properties of and differences between perpendicular and parallel lines.** MP.3, MP.6	Students in high school start to formalize the intuitive geometric notions they developed in grades 6–8 and give specificity to geometric concepts that can serve as a good basis for developing precise definitions and arguments. a. Students understand a more formal knowledge of postulates, theorems and various properties relating to line segments, angles and circles. This knowledge is based on the undefined notions of point, line, distance along a line and distance around a circular arc. b. Students understand important properties of both parallel and perpendicular lines, prior to making the connections between these types of lines and how they relate to their calculated or given slope.
Cluster: Prove geometric theorems. **KY.HS.G.7 Prove theorems about geometric figures.** **a. Construct formal proofs to justify theorems for lines, angles and triangles** **MP.6, MP.7**	Students recall definitions, theorems, postulates and properties to construct formal proofs based on theorems established in other standards.

Cluster: Use coordinates to prove simple geometric theorems algebraically. **KY.HS.G.21 Use coordinates to justify and prove simple geometric theorems algebraically.** MP.2, MP.6	Students understand how to prove or disprove a figure defined by four given points in the coordinate plane is a rectangle, as well as prove or disprove the given point lies on the circle centered at the origin and containing an additional given point.
Cluster: Use coordinates to prove simple geometric theorems algebraically. **KY.HS.G.22 Justify and apply the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.** MP.3, MP.7	Students understand the relationship between slope and how it relates to both parallel and perpendicular lines. Within this standard, students also understand how to find the equation of a line parallel or perpendicular to a given line that passes through a given point.
Cluster: Use coordinates to prove simple geometric theorems algebraically. **KY.HS.G.23 Find measurements among points within the coordinate plane.** **a. 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.** **b. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.** MP.2, MP.8	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Cluster: Use coordinates to prove simple geometric theorems algebraically. **KY.HS.G.24 Use coordinates within the coordinate plane to calculate measurements of two dimensional figures.** **a. Compute the perimeters of various polygons.** **b. Compute the areas of triangles, rectangles and other quadrilaterals.★** MP.2, MP.4	Students utilize the distance formula to find distances between points in order to find the area and/or perimeter of various geometric figures.

Mathematics- Geometry

Unit 2: Transformations

Mathematics - Geometry
Unit 2: Transformations

Duration: 2 Weeks/ 1 Weeks

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Experiment with transformations in the plane. **KY.HS.G.2 Representing transformations in the plane.** **a. Describe transformations as functions that take points in the plane as inputs and give other points as outputs** **b. Compare transformations that preserve distance and angle measures to those that do not.** **c. Given a rectangle, parallelogram, trapezoid, or regular polygon, formally describe the rotations and reflections that carry it onto itself, using properties of these figures.** MP.5, MP.7	Software, transparencies, etc. may be used to accurately represent congruence transformations in the plane. a. Students understand any point (a,b) can be thought of as an input and any image of point (a,b) can be thought of as the output of a specific transformation function. b. Students make connections between which transformations are a rigid motion (isometry) and which transformations do not have that characteristic. c. Students practice and understand the procedures needed to carry out multiple transformations that carry the figure onto itself, recognizing the important properties of these figures.

Supporting Standards	
Standards	**Clarifications**
Cluster: Experiment with transformations in the plane. **KY.HS.G.1 Know and apply precise definitions of the language of Geometry:** **a. Understand properties of line segments, angles and circle.** **b. Understand properties of and differences between perpendicular and parallel lines.** MP.3, MP.6	Students in high school start to formalize the intuitive geometric notions they developed in grades 6–8 and give specificity to geometric concepts that can serve as a good basis for developing precise definitions and arguments. a. Students understand a more formal knowledge of postulates, theorems and various properties relating to line segments, angles and circles. This knowledge is based on the undefined notions of point, line, distance along a line and distance around a circular arc. b. Students understand important properties of both parallel and perpendicular lines, prior to making the connections between these types of lines and how they relate to their calculated or given slope.
Cluster: Experiment with transformations in the plane. **KY.HS.G.4 Understand the effects of transformations of geometric figures.** **a. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure.** **b. Specify a sequence of transformations that will carry a given figure onto another.** **c. 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**	Students understand a figure, called a pre-image, is congruent to another figure, called the image, if that second figure can be obtained by a sequence of congruence transformations performed on the first figure. Students can draw the image of a transformed pre-image using a variety of tools, including but not limited to: · graph paper · manipulatives · tracing paper · computer programs Students perform such sequences and describe the sequence of congruence transformations necessary to transform one figure to a congruent second figure.

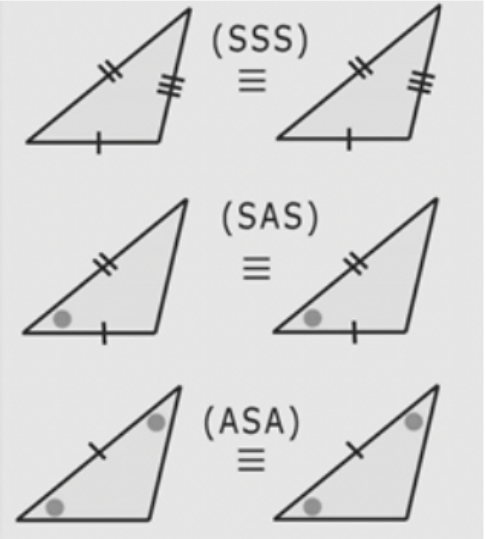
figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. MP.2, MP.8	

Mathematics- Geometry

Unit 3: Triangle Congruence

Mathematics - Geometry
Unit 3: Triangle Congruence

Duration: 6 Weeks/ 3 Weeks

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Understand congruence in terms of rigid motions. **KY.HS.G.5 Know and apply the concepts of triangle congruence:** **a. 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.** **b. Explain how the criteria for triangle congruence (ASA, SAS and SSS) follow from the definition of congruence in terms of rigid motions.**	

MP.3, MP.6	
Supporting Standards	
Standards	**Clarifications**
Cluster: Prove geometric theorems. **KY.HS.G.6 Apply theorems for lines, angles, triangles, parallelograms.** MP.2, MP.3	Students use previously learned definitions, theorems, postulates and properties of lines, angles, triangles and parallelograms to draw conclusions and to make inferences. Theorems for lines and angles include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. Theorems for triangles include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. Theorems for parallelograms include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other and conversely, rectangles are parallelograms with congruent diagonals.
Cluster: Prove geometric theorems. **KY.HS.G.7 Prove theorems about geometric figures.** **a. Construct formal proofs to justify theorems for lines, angles and triangles** **MP.6, MP.7**	Students recall definitions, theorems, postulates and properties to construct formal proofs based on theorems established in other standards.

Mathematics - Geometry

Unit 4: Triangle Similarity

Mathematics - Geometry

Unit 4: Triangle Similarity

Duration: 5 Weeks/ 2.5 Weeks

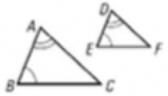
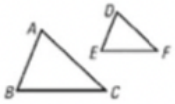
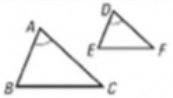
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Understand similarity in terms of similarity transformations. **KY.HS.G.9 Understand properties of dilations.** **a. Verify the properties that result from that dilations given by a center and a scale factor.** **b. Verify that a dilation produces an image that is similar to the pre-image.** MP.5, MP.7	• Methods to verify properties could include, but not limited to: scale models, moving an object closer to a light source and examining changes, changing the scale factor on a copier. • Students explain the effect of dilations on objects that pass through the center verses those that do not pass through the center of a figure. • Students understand within this standard, the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides is a result that occurs because two objects are similar.

Cluster: Prove theorems involving similarity.

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

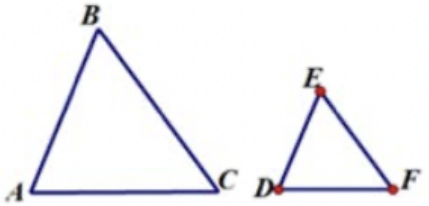
MP.1, MP.3

Theorems include the Pythagorean Theorem and "a line parallel to one side of a triangle divides the other two proportionally and
conversely."
Students demonstrate the ability to copy a segment, copy an angle, bisect a segment, bisect an angle, construct perpendicular lines, which includes the perpendicular bisector of a line segment and construct a line parallel to a given line through a point not on the line.
Triangle Similarity Postulate and Theorems:

AA Similarity Postulate	SSS Similarity Theorem	SAS Similarity Theorem
		
Two triangles are similar if they have two pairs of congruent angles.	Two triangles are similar if they have three pairs of proportional sides.	Two triangles are similar if they have two pairs of proportional sides with a congruent included angle.

Supporting Standards

Standards	Clarifications

Cluster: Understand similarity in terms of similarity transformations. **KY.HS.G.10 Apply the properties of similarity transformations to establish the AA criterion for two triangles to be similar.** MP.3, MP.6	The AA Similarity Theorem  If $\angle A \cong \angle D, and\ \angle B \cong \angle E,$ Then $\Delta ABC \sim \Delta DEF.$

Mathematics - Geometry

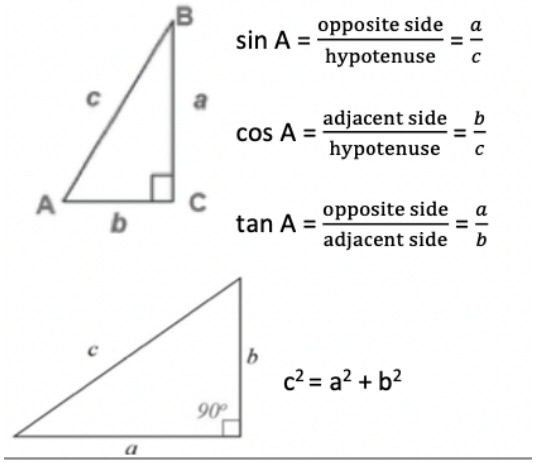
Unit 5: Right Triangles and Trigonometry

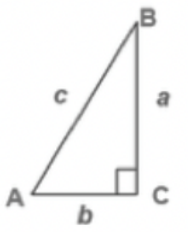
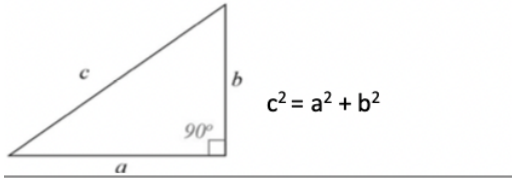
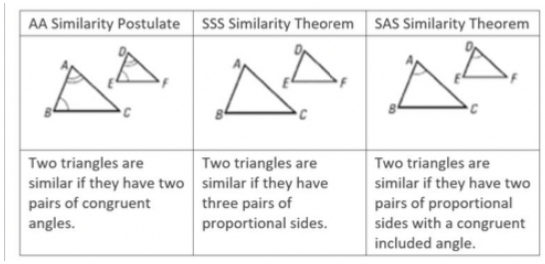
Mathematics - Geometry
Unit 5: Right Triangles and Trigonometry

Duration: 5 Weeks/2.5 Weeks

<table>
<tr><th colspan="2">Standards for Mathematical Practice</th></tr>
<tr><td>MP.1. Make sense of problems and persevere in solving them.
MP.2. Reason abstractly and quantitatively.
MP.3. Construct viable arguments and critique the reasoning of others.
MP.4. Model with mathematics.</td><td>MP.5. Use appropriate tools strategically.
MP.6. Attend to precision.
MP.7. Look for and make use of structure.
MP.8. Look for and express regularity in repeated reasoning.</td></tr>
<tr><th colspan="2">Priority Standards</th></tr>
<tr><th>Standards</th><th>Clarifications</th></tr>
<tr><td>Cluster: Define trigonometric ratios and solve problems involving right triangles.

KY.HS.G.12 Understand properties of right triangles.
c. Use trigonometric ratios and the Pythagorean Theorem to
solve right triangles in applied problems. ★

MP.3, MP.4</td><td> 
</td></tr>
<tr><th colspan="2">Supporting Standards</th></tr>
</table>

Standards	Clarifications
Cluster: Define trigonometric ratios and solve problems involving right triangles. **KY.HS.G.12 Understand properties of right triangles.** **a. 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).** **b. Explain and use the relationship between the sine and cosine of complementary angles.** MP.3, MP.4	 $\sin A = \frac{\text{opposite side}}{\text{hypotenuse}} = \frac{a}{c}$ $\cos A = \frac{\text{adjacent side}}{\text{hypotenuse}} = \frac{b}{c}$ $\tan A = \frac{\text{opposite side}}{\text{adjacent side}} = \frac{a}{b}$  $c^2 = a^2 + b^2$
Cluster: Prove theorems involving similarity. **KY.HS.G.11 Understand theorems about triangles.** **a. Apply theorems about triangles.** **c. Use similarity criteria for triangles to solve problems and to prove relationships in geometric figures.** MP.1, MP.3	Theorems include the Pythagorean Theorem and "a line parallel to one side of a triangle divides the other two proportionally and conversely." Students demonstrate the ability to copy a segment, copy an angle, bisect a segment, bisect an angle, construct perpendicular lines, which includes the perpendicular bisector of a line segment and construct a line parallel to a given line through a point not on the line. Triangle Similarity Postulate and Theorems: 

Cluster: Reason quantitatively and use units to solve problems. **KY.HS.N.5 Define appropriate units in context for the purpose of descriptive modeling. ★** MP.1, MP.6	In real-world situations, answers are usually represented by numbers with units. Units involve measurement, which requires precision and accuracy. For example, students should recognize that units measuring speed would not be appropriate for situations involving volume. Additionally students should understand when one dimensional, two dimensional, or three dimensional units are most applicable.
Cluster: Reason quantitatively and use units to solve problems. **KY.HS.N.6 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★** MP.2, MP.6	While KY.HS.N.6 does not require a formal discussion or use of significant digits in the scientific sense, students understand a level of precision. For example, when using the Pythagorean Theorem with measurements given in tenths of an inch, it is appropriate for students to express answers to the nearest tenth, but not to the nearest hundredth because that level of precision was not used in the original measures.

Mathematics - Geometry

Unit 6: Quadrilaterals

Mathematics - Geometry
Unit 6: Quadrilaterals

Duration: 4 Weeks/ 2 Weeks

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Prove geometric theorems. **KY.HS.G.6 Apply theorems for lines, angles, triangles, parallelograms.** MP.2, MP.3	Students use previously learned definitions, theorems, postulates and properties of lines, angles, triangles and parallelograms to draw conclusions and to make inferences. Theorems for lines and angles include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. Theorems for triangles include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a

	point. Theorems for parallelograms include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other and conversely, rectangles are parallelograms with congruent diagonals.
Cluster: Use coordinates to prove simple geometric theorems algebraically. **KY.HS.G.21 Use coordinates to justify and prove simple geometric theorems algebraically.** MP.2, MP.6	Students understand how to prove or disprove a figure defined by four given points in the coordinate plane is a rectangle, as well as prove or disprove the given point lies on the circle centered at the origin and containing an additional given point.
Supporting Standards	
Standards	**Clarifications**
Cluster: Use coordinates to prove simple geometric theorems algebraically. **KY.HS.G.22 Justify and apply the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.** MP.3, MP.7	Students understand the relationship between slope and how it relates to both parallel and perpendicular lines. Within this standard, students also understand how to find the equation of a line parallel or perpendicular to a given line that passes through a given point.
Cluster: Apply geometric concepts in modeling situations. **KY.HS.G.29 Use geometric shapes, their measures and their properties to describe objects in real**	Students use geometric shapes to model objects, for example, modeling a tree trunk or a human torso as a cylinder).★

world settings. MP.1, MP.4	
Cluster: Apply geometric concepts in modeling situations. **KY.HS.G.31 Apply geometric methods to solve design problems. ★** MP.1, MP.4	Attending to the Standards for Mathematical Practice of strategies and practices, for example, structure to satisfy physical constraints or minimize cost, working with typographic grid systems based on ratios

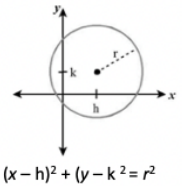
Mathematics - Geometry

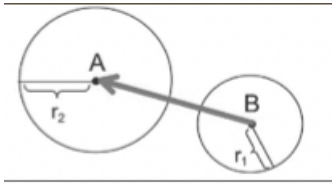
Unit 7: Circles

Mathematics - Geometry
Unit 7: Circles

Duration: 5 Weeks/ 2.5 Week

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Experiment with transformations in the plane. **KY.HS.G.2 Representing transformations in the plane.** **a. Describe transformations as functions that take points in the plane as inputs and give other points as outputs** **b. Compare transformations that preserve distance and angle measures to those that do not.** **c. Given a rectangle, parallelogram, trapezoid, or regular polygon, formally describe the rotations and reflections that carry it onto itself, using properties of these figures.**	Software, transparencies, etc. may be used to accurately represent congruence transformations in the plane. a. Students understand any point (a,b) can be thought of as an input and any image of point (a,b) can be thought of as the output of a specific transformation function. b. Students make connections between which transformations are a rigid motion (isometry) and which transformations do not have that characteristic. c. Students practice and understand the procedures needed to carry out multiple transformations that carry the figure onto itself, recognizing the important properties of these figures.

MP.5, MP.7	
Cluster: Understand and apply theorems about circles. **KY.HS.G.16 Identify and describe relationships among angles and segments within the context of circles involving:** **a. Recognize differences between and properties of inscribed, central and circumscribed angles.** **C. Understand the relationship between the radius of a circle and the line drawn through the point of tangency on that radius.** MP.3, MP.5, MP.7	Students recognize and apply relationships including the relationship between central, inscribed and circumscribed angles, inscribed angles on a diameter are right angles, the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
Cluster: Translate between the geometric description and the equation for a conic section. **KY.HS.G.19 Understand the relationship between the algebraic form and the geometric representation of a circle.** **a. Write the equation of a circle of given center and radius using the Pythagorean Theorem.** MP.6, MP.8	 $(x-h)^2+(y-k^2=r^2$
Supporting Standards	

Standards	Clarifications
Cluster: Make geometric constructions. **KY.HS.G.8 Create and apply geometric constructions.** **a. Make formal geometric constructions with a variety of tools and methods.** **b. Apply basic construction procedures to construct more complex figures.** MP.5, MP.6	Methods for formal constructions may include but are not limited to: · compass and straightedge · string · reflective devices · paper folding · technology Students demonstrate the ability to copy a segment, copy an angle, bisect a segment, bisect an angle, construct perpendicular lines which includes the perpendicular bisector of a line segment and construct a line parallel to a given line through a point not on the line.
Cluster: Understand and apply theorems about circles. **KY.HS.G.15 Verify using dilations that all circles are similar.** MP.5, MP.8	
Cluster: Understand and apply theorems about circles. **KY.HS.G.16 Identify and describe relationships among angles and segments within the context of circles involving:** **b. Understand relationships between inscribed angles and the diameter of a circle.**	Students recognize and apply relationships including the relationship between central, inscribed and circumscribed angles, inscribed angles on a diameter are right angles, the radius of a circle is perpendicular to the tangent where the radius intersects the circle.

MP.3, MP.5, MP.7	
Cluster: Explain volume formulas and use them to solve problems. **KY.HS.G.25 Analyze and determine the validity of arguments for the formulas for the various figures and shapes.** **a. Finding the circumference and area of a circle.** **b. Finding the volume of a sphere, prism, cylinder, pyramid and cone.** MP.3, MP.7	Students may use dissection arguments, Cavalieri's principle and informal limit arguments in order to find these values for these figures.

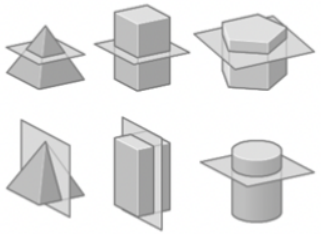
Mathematics - Geometry

Unit 8: Solids

Mathematics - Geometry
Unit 8: Solids

Duration: 4 Weeks/ 2 Week

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Explain volume formulas and use them to solve problems. **KY.HS.G.25 Analyze and determine the validity of arguments for the formulas for the various figures and shapes.** **b. Finding the volume of a sphere, prism, cylinder, pyramid and formulas for the various figures and shapes.** MP.3, MP.7	Students may use dissection arguments, Cavalieri's principle and informal limit arguments in order to find these values for these figures.
Supporting Standards	

Standards	Clarifications
Cluster: Explain volume formulas and use them to solve problems. **KY.HS.G.27 Use volume formulas to solve problems for cylinders, pyramids, cones, spheres, prisms ★** MP.4, MP.6	General Prism: $V = Bh$ Right Circular Cylinder: $V = \pi r^2 h$ Pyramid: $V = \frac{1}{3}Bh$ Right Circular Cone: $V = \frac{1}{3}\pi r^2 h$ Sphere: $V = \frac{4}{3}\pi r^3$
Cluster: Visualize relationships between two-dimensional and three-dimensional objects. **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.** MP.5, MP.7	Students recognize visually the two dimensional shapes created via the cross sections of three dimensional solid figures. Examples include, but are not limited to 
Cluster: Apply geometric concepts in modeling situations. **KY.HS.G.29 Use geometric shapes, their measures and their properties to describe objects in real world settings.** MP.1, MP.4	Students use geometric shapes to model objects, for example, modeling a tree trunk or a human torso as a cylinder).★

Cluster: Apply geometric concepts in modeling situations. **KY.HS.G.30 Apply concepts of density based on area and volume in modeling situations, using appropriate units of measurement.** **MP.4, MP.6**	Students explore scenarios where they find the area of regions and the volume of solid figures. In the process, they appropriately use units of measurement, for example, persons per square mile, BTUs per cubic foot.
Cluster: Reason quantitatively and use units to solve problems. **KY.HS.N.5 Define appropriate units in context for the purpose of descriptive modeling. ★** MP.1, MP.6	In real-world situations, answers are usually represented by numbers with units. Units involve measurement, which requires precision and accuracy. For example, students should recognize that units measuring speed would not be appropriate for situations involving volume. Additionally students should understand when one dimensional, two dimensional, or three dimensional units are most applicable.
Cluster: Reason quantitatively and use units to solve problems. **KY.HS.N.6 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★** MP.2, MP.6	While KY.HS.N.6 does not require a formal discussion or use of significant digits in the scientific sense, students understand a level of precision. For example, when using the Pythagorean Theorem with measurements given in tenths of an inch, it is appropriate for students to express answers to the nearest tenth, but not to the nearest hundredth because that level of precision was not used in the original measures.