

CARLISLE AREA SCHOOL DISTRICT

Carlisle, PA 17013

**HONORS GEOMETRY**

**GRADES 8-12**

Date of Board Approval: April 17, 2014

# CARLISLE AREA SCHOOL DISTRICT

## PLANNED INSTRUCTION COVER PAGE

<b>TITLE OF COURSE:</b>	Honors Geometry	<b>SUBJECT:</b>	Honors Geometry	<b>GRADE LEVEL:</b>	8-12
<b>COURSE LENGTH:</b>	School year	<b>DURATION:</b>	50 minutes	<b>FREQUENCY:</b>	Daily
<b>PREREQUISITES:</b>	Algebra I	<b>CREDIT:</b>	1 credit	<b>LEVEL:</b>	HS

### Course Description/Objectives:

Honors Geometry is concerned with two major areas of study. The first is the study of geometric facts. These facts deal with the relationship in space of points, lines and planes, and essentially treat geometry as a mathematical model of the physical world. The second area is the study of the nature of proof and of geometry as a system of postulates dealing with precise definitions, correct reasoning, and logical attitude. This course is similar to Geometry but is a more theoretical treatment of geometry and is intended for students who will likely pursue a mathematics or science-related career. This course may not be selected if Geometry has been successfully completed.

**Text:** McDougal Littell *Geometry*, 2008

**Curriculum Writing Committee:** Kathleen Diesing and Jen Wadsworth

## **COURSE TIMELINE**

### **Unit 1: Essentials of Geometry (Chapter 1)**

3 weeks

- Points, Lines, Planes; Use Segments and Congruence
- Use Midpoint and Distance Formulas
- Measure and Classify Angles; Describe Angle Pair Relationships
- Classify Polygons
- Find Perimeter, Circumference, and Area

### **Unit 2: Reasoning and Proof (Chapter 2)**

3 weeks

- Use Inductive Reasoning
- Analyze Conditional Statements
- Apply Deductive Reasoning
- Use Postulates and Diagrams
- Reason Using Properties From Algebra
- Prove Statements and Angles
- Prove Angle Pair Relationships

### **Unit 3: Parallel and Perpendicular Lines (Chapter 3)**

2 weeks

- Use Parallel Lines and Transversals
- Prove Lines are Parallel
- Find and Use Slopes of Lines
- Write and Graph Equations of Lines
- Prove Theorems about Perpendicular Lines

### **Unit 4: Congruent Triangles (Chapter 4)**

3 weeks

- Apply Triangle Sum Properties
- Apply Congruence and Triangles; Prove Triangles Congruent by SSS, SAS, HL, ASA, AAS
- Use Congruent Triangles
- Use Isosceles and Equilateral Triangles
- Perform Congruence Transformations

### **Unit 5: Relationships within Triangles (Chapter 5)**

3 weeks

- Midsegment Theorem
- Use Perpendicular Bisectors, Use Angle Bisectors of Triangles
- Use Medians and Altitudes

- Use Inequalities in a Triangle; Inequalities in Two Triangles

#### **Unit 6: Similarity (Chapter 6)**

2 weeks

- Ratios, Proportions, and the Geometric Mean; Use Proportions to Solve Geometry Problems
- Use Similar Polygons
- Prove Triangles Similar by AA, SSS, and SAS
- Use Proportionality Theorems; Perform Similarity Transformations

#### **Unit 7: Right Triangles and Trigonometry (Chapter 7)**

5 weeks

- Radicals “Review” (Simplify, Add, Subtract, Multiply Radicals; Rationalize the Denominator)
- Apply Pythagorean Theorem; Use the Converse of the Pythagorean Theorem
- Use Similar Right Triangles
- Special Right Triangles
- Apply the Tangent, Sine, and Cosine Ratios ; Solve Right Triangles
- Law of Sines; Law of Cosines

#### **Unit 8: Quadrilaterals (Chapter 8)**

2 weeks

- Find Angle Measures in Polygons
- Use Properties of Parallelograms; Show that a Quadrilateral is a Parallelogram
- Properties of Rhombuses, Rectangles, and Squares; Use Properties of Trapezoids and Kites
- Identify Special Quadrilaterals

3 weeks

#### **Unit 9: Properties of Circles (Chapter 10)**

- Use Properties of Tangents; Apply Properties of Chords
- Find Arc Measures; Use Inscribed Angles and Polygons
- Apply Other Angle Relationships in Circles
- Find Segment Lengths in Circles
- Write and Graph Equations of Circles

#### **Unit 10: Measuring Length and Area (Chapter 11)**

3.5 weeks

- Areas of Triangles and Parallelograms; Areas of Trapezoids, Rhombuses, and Kites
- Perimeter and Area of Similar Figures
- Circumference and Arc Length; Areas of Circles and Sectors
- Areas of Regular Polygons

- Use Geometric Probability

**Unit 11: Surface Area and Volume of Solids (Chapter 12)**

3.5 weeks

- Explore Solids
- Surface Area of Prisms and Cylinders; Surface Area of Pyramids and Cones
- Volume of Prisms and Cylinders; Volume of Pyramids and Cones
- Surface Area and Volume of Spheres
- Explore Similar Solids

TOTAL: 33 weeks

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3 weeks

**UNIT #1:** Essentials of Geometry (Chapter 1)

**GRADE:** 8 – 12

## STANDARDS:

### PA Core Standards:

- CC.2.3.HS.A.3 • Verify and apply geometric theorems as they relate to geometric figures.
- CC.2.3.HS.A.11 • Apply coordinate geometry to prove simple geometric theorems algebraically.

### Keystone Geometry Eligible Content:

- G.1.2.1.4 • Identify and/or use properties of regular polygons.
- G.2.1.2.1 • Calculate the distance and/or midpoint between two points on a number line or on a coordinate plane.
- G.2.2.1.1 • Use properties of angles formed by intersecting lines to find the measures of missing angles.

### Mathematical Practices:

- 1 • Make sense of problems and persevere in solving them.
- 2 • Reason abstractly and quantitatively.
- 5 • Use appropriate tools strategically.
- 6 • Attend to precision.
- 7 • Look for and make use of structure.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3 weeks

**UNIT #1:** Essentials of Geometry (Chapter 1)

**GRADE:** 8 – 12

## UNDERSTANDINGS

In order to communicate in Geometry, students will understand the vocabulary and notation that apply to geometric concepts.

## COMMON ASSESSMENTS/CULMINATING ACTIVITY

Unit 1 Common Assessment

### KNOW

- Identify the undefined terms: point, line, and plane.
- Identify the defined terms: collinear, coplanar, segment, endpoints, ray, opposite rays, intersection.
- Know that a postulate is a rule accepted without proof.
- Apply the segment addition postulate and angle addition postulate.
- Apply the midpoint and distance formulas.
- Identify congruent segments and congruent angles.
- Identify complementary angles, supplementary angles, adjacent angles, linear pair, and vertical angles.
- Classify polygons by their number of sides and as convex, concave, equilateral, equiangular, and regular.

### DO

- Name geometric figures using correct notation. (Example:  $\overline{AB}$ ).
- Write and solve an equation using the segment and angle addition postulates.
- Calculate the midpoint and distance between two points using the midpoint and distance formulas.
- Write and solve an equation using congruent segments and congruent angles.
- Find a missing angle measure using the definitions of complementary and supplementary angles.
- Classify polygons by their number of sides and as convex, concave, equilateral, equiangular, and regular.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3 weeks

**UNIT #2:** Reasoning and Proof (Chapter 2)

**GRADE:** 8 – 12

## STANDARDS:

### PA Core Standards:

- CC.2.3.HS.A.3      • Verify and apply geometric theorems as they relate to geometric figures.

### Keystone Geometry Eligible Content:

- G.2.2.1.1      • Use properties of angles formed by intersecting lines to find the measures of missing angles.
- G.1.3.2.1      • Write, analyze, complete, or identify formal proofs (e.g., direct ad/or indirect proofs/proofs by contradiction).

### Mathematical Practices:

- 1      • Make sense of problems and persevere in solving them.
- 2      • Reason abstractly and quantitatively.
- 6      • Attend to precision.
- 7      • Look for and make use of structure.



# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3 weeks

**UNIT #2:** Reasoning and Proof (Chapter 2)

**GRADE:** 8 – 12

## UNDERSTANDINGS

Students will understand that a proof is a logical argument to show a geometric relationship is true. In a two-column proof, we use deductive reasoning to work from given information to reach a conjecture we want to prove.

## COMMON ASSESSMENTS/CULMINATING ACTIVITY

Unit 2 Common Assessment

### KNOW

- Recognize that a conjecture is an unproven statement that is based on observations.
- Distinguish between inductive reasoning and deductive reasoning.
- Recognize that a counterexample is one example that proves a statement false.
- Define a conditional statement and label its hypothesis and conclusion.
- State the converse, inverse, and contrapositive of a conditional statement.
- Define perpendicular lines.
- Identify the point/line/plane postulates (Postulates 5-11) in a diagram.
- Recognize that algebraic properties can be used as reasons in an algebraic proof.
- Define a theorem as a statement that can be proven.
- State the relationships between vertical angles and angles that form a linear pair.

### DO

- Use inductive reasoning to find a pattern and make a conjecture.
- Find a counterexample to show that a conjecture is false.
- Use deductive reasoning to make a conclusion based on known facts.
- Write the converse, inverse, and contrapositive of a conditional statement.
- Apply the point/line/plane postulates (Postulate 5-11) to determine if statements about a diagram are true or false.
- Write an algebraic proof while solving an algebraic equation.
- Prove theorems about segments and angles.
- Use the vertical angles congruence theorem and the linear pair postulate to find missing angle measures.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 2 weeks

**UNIT #3:** Parallel and Perpendicular Lines (Chapter 3)

**GRADE:** 8 – 12

## STANDARDS:

### PA Core Standards:

- CC.2.3.HS.A.3      • Verify and apply geometric theorems as they relate to geometric figures.
- CC.2.3.HS.A.11      • Apply coordinate geometry to prove simple geometric theorems algebraically.

### Keystone Geometry Eligible Content:

- G.2.1.2.2      • Relate slope to perpendicularity and/or parallelism (limit to linear algebraic equations).
- G.2.1.2.3      • Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a two-dimensional shape
- G.2.2.1.1      • Use properties of angles formed by intersecting lines to find measures of missing angles.
- G.2.2.1.2      • Use properties of angles formed when two parallel lines are cut by a transversal to find the measures of missing angles.

### Mathematical Practices:

- 1      • Make sense of problems and persevere in solving them.
- 2      • Reason abstractly and quantitatively.
- 6      • Attend to precision.
- 7      • Look for and make use of structure.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 2 weeks

**UNIT #3:** Parallel and Perpendicular Lines (Chapter 3)

**GRADE:** 8 – 12

## UNDERSTANDINGS

When parallel lines are cut by a transversal, angle pair relationships are formed allowing us to find missing angle measures and/or determine if lines are parallel.

When objects are placed on a coordinate plane, you can use coordinate geometry to determine if lines are parallel or perpendicular.

## COMMON ASSESSMENTS/CULMINATING ACTIVITY

Unit 3 Common Assessment

### KNOW

- Identify the types of angles formed by a transversal intersecting parallel line.
- Identify the relationships between planes and coplanar and non-coplanar lines.
- Recognize the relationships between the types of angles formed by a transversal intersecting parallel lines.
- State the slope formula and recognize the relationship between the slopes of parallel and perpendicular lines.
- Identify the relationship between the graph of a line and the equation of a line.
- Recall the slope-intercept form and standard form for the equation of a line.

### DO

- Classify pairs of angles, lines, and planes.
- Use the postulates and theorems for angles formed by a transversal intersecting parallel lines to find missing angle measures.
- Use the postulates and theorems for angles formed by a transversal intersecting parallel lines to prove that two lines are parallel when cut by a transversal.
- Calculate the slope of the line given a graph or two points on a line.
- Show that two lines are parallel or perpendicular based on the calculation of slope.
- Graph a line on a coordinate plane given its equation.
- Write the equation of a line given a graph, the slope of the line and a point on the line, or two points on the line.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3 weeks

**UNIT #4:** Congruent Triangles (Chapter 4)

**GRADE:** 8 – 12

## STANDARDS:

### PA Core Standards:

- CC.2.3.HS.A.1 • Use geometric figures and their properties to represent transformations in the plane.
- CC.2.3.HS.A.2 • Apply rigid transformations to determine and explain congruence.
- CC.2.3.HS.A.3 • Verify and apply geometric theorems as they relate to geometric figures.
- CC.2.3.HS.A.11 • Apply coordinate geometry to prove simple geometric theorems algebraically.

### Keystone Geometry Eligible Content:

- G.1.3.1.1 • Identify and/or use properties of congruent and similar polygons or solids.
- G.1.2.1.1 • Identify and/or use properties of triangles.
- G.1.2.1.3 • Identify and/or use properties of isosceles and equilateral triangles.
- G.1.3.2.1 • Write, analyze, complete, or identify formal proofs (e.g., direct ad/or indirect proofs/proofs by contradiction).
- G.2.1.2.3 • Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a two-dimensional shape
- G.2.2.1.1 • Use properties of angles formed by intersecting lines to find measures of missing angles.

### Mathematical Practices:

- 1 • Make sense of problems and persevere in solving them.
- 2 • Reason abstractly and quantitatively.
- 3 • Construct viable arguments and critique the reasoning of others.
- 7 • Look for and make use of structure.
- 8 • Look for and express regularity in repeated reasoning.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3 weeks

**UNIT #4:** Congruent Triangles (Chapter 4)

**GRADE:** 8 – 12

## UNDERSTANDINGS

Triangles can be classified and proved congruent based on their sides and angles.

## COMMON ASSESSMENTS/CULMINATING ACTIVITY

Unit 4 Common Assessment

### KNOW

- Classify triangles by their sides and angles.
- State the triangle properties such as triangle sum theorem and exterior angles theorem.
- List the corresponding parts of two congruent triangles given their congruence statement.
- Identify congruent triangles using the congruence shortcuts (SSS, SAS, ASA, AAS, HL).
- Recognize that if two triangles are congruent, then their corresponding parts are congruent (CPCTC).
- Recognize that an isosceles triangle has congruent base angles.
- Recall the different types of transformations (translation, rotation, reflection).

### DO

- Find missing angles of a triangle by applying the triangle sum and exterior angles theorems.
- Write a congruence statement for two congruent figures.
- Prove two triangles are congruent.
- Prove corresponding parts of congruent triangles are congruent.
- Apply the base angles theorem and its converse to find measures of missing angles and sides of isosceles triangles.
- Perform transformations to create an image congruent to a given triangle.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3 weeks

**UNIT #5:** Relationships within Triangles (Chapter 5)

**GRADE:** 8 – 12

## STANDARDS:

### PA Core Standards:

- CC.2.3.HS.A.3 • Verify and apply geometric theorems as they relate to geometric figures.
- CC.2.3.HS.A.4 • Apply the concept of congruence to create geometric constructions.
- CC.2.3.HS.A.11 • Apply coordinate geometry to prove simple geometric theorems algebraically.
- CC.2.3.HS.A.14 • Apply geometric concepts to model and solve real-world problems.

### Keystone Geometry Eligible Content:

- G.1.2.1.1 • Identify and/or use properties of triangles.
- G.2.1.2.3 • Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a two-dimensional shape

### Mathematical Practices:

- 1 • Make sense of problems and persevere in solving them.
- 2 • Reason abstractly and quantitatively.
- 4 • Model with mathematics.
- 5 • Use appropriate tools strategically.
- 6 • Attend to precision.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3 weeks

**UNIT #5:** Relationships within Triangles (Chapter 5)

**GRADE:** 8 – 12

## UNDERSTANDINGS

When three segments form a triangle, there exist special segments and points of concurrency that have unique properties within those triangles.

## COMMON ASSESSMENTS/CULMINATING ACTIVITY

Unit 5 Common Assessment

### KNOW

- Define the midsegment of a triangle and recognize that it is parallel to the triangle's third side.
- Recognize that a point on the perpendicular bisector of a segment is equidistant from the endpoints of that segment, and vice versa.
- Identify the circumcenter as the point of concurrency that is equidistant from the vertices of a triangle.
- Recognize that a point on the angle bisector is equidistant from the sides of that angle, and vice versa.
- Identify the incenter as the point of concurrency that is equidistant from the sides of a triangle.
- Identify the centroid as the point of concurrency that is the center of gravity of the triangle and that the centroid divides the median into a ratio of 1:2.
- Identify the orthocenter as the point of concurrency where the altitudes intersect.
- Conclude that the longest side of a triangle is opposite the largest angle, and the shortest side of a triangle is opposite the smallest angle.
- Infer that the sum of the lengths of two sides of a triangle must be greater than the length of the third side.

### DO

- Write an equation that shows the relationship between the midsegment of a triangle and its third side.
- Use the properties of perpendicular bisectors and the circumcenter to relate parts of a triangle.
- Construct the perpendicular bisector of a segment.
- Construct the three perpendicular bisectors of a triangle to form the circumcenter.
- Use the properties of angle bisectors and the incenter to relate parts of a triangle.
- Construct the angle bisector given acute, right, and obtuse angles.
- Construct the three angle bisectors of a triangle to form the incenter.
- Construct the three medians of a triangle to form the centroid.
- Use the properties of medians and the centroid to relate parts of a triangle.
- Construct a perpendicular from a point to a given line.
- Construct the three altitudes of a triangle to form the orthocenter.
- Arrange the side lengths and angle measures of a triangle in order from least to greatest.
- Determine if three given side lengths can form a triangle.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 2 weeks

**UNIT #6:** Similarity (Chapter 6)

**GRADE:** 8 – 12

## STANDARDS:

### PA Core Standards:

- CC.2.3.HS.A.3 • Verify and apply geometric theorems as they relate to geometric figures.
- CC.2.3.HS.A.5 • Create justifications based on transformations to determine and explain congruence.
- CC.2.3.HS.A.6 • Verify and apply theorems involving similarity as they relate to plane figures.
- CC.2.3.HS.A.14 • Apply geometric concepts to model and solve real-world problems.

### Keystone Geometry Eligible Content:

- G.1.3.1.1 • Identify and/or use properties of congruent and similar polygons or solids.
- G.1.3.1.2 • Identify and/or use proportional relationships in similar figures.
- G.1.2.1.1 • Identify and/or use properties of triangles.

### Mathematical Practices:

- 1 • Make sense of problems and persevere in solving them.
- 2 • Reason abstractly and quantitatively.
- 4 • Model with mathematics.
- 6 • Attend to precision.
- 7 • Look for and make use of structure.



# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 2 weeks

**UNIT #6:** Similarity (Chapter 6)

**GRADE:** 8 – 12

## UNDERSTANDINGS

Ratios and proportions can be used to solve geometry problems involving similar figures. Indirect measurement is a real world application of similar triangles.

## COMMON ASSESSMENTS/CULMINATING ACTIVITY

Unit 6 Common Assessment

### KNOW

- Recall that a proportion can be solved by applying the cross products property.
- Define the scale of a scale drawing.
- Define the scale factor of similar polygons.
- Identify similar triangles using the similarity shortcuts (AA, SSS, SAS).
- Define the similarity transformation of dilation as a reduction or enlargement of a figure.

### DO

- Solve problems by writing and solving proportions.
- Find the scale of a drawing.
- Use proportions to identify similar polygons.
- Relate the ratio of the perimeters of similar polygons to the scale factor.
- Prove two triangles are similar.
- Use proportions to solve problems with triangles and parallel lines.
- Reduce or enlarge a figure in the coordinate plane using a given scale factor.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 2 weeks

**UNIT #7:** Right Triangles and Trigonometry (Chapter 7)

**GRADE:** 8 – 12

## STANDARDS:

### PA Core Standards:

- |                |   |
|----------------|---|
| CC.2.3.HS.A.3  | • Verify and apply geometric theorems as they relate to geometric figures.    |
| CC.2.3.HS.A.7  | • Apply trigonometric ratios to solve problems involving right triangles.     |
| CC.2.3.HS.A.11 | • Apply coordinate geometry to prove simple geometric theorems algebraically. |
| CC.2.3.HS.A.14 | • Apply geometric concepts to model and solve real-world problems.            |

### Keystone Geometry Eligible Content:

- |           |  |
|-----------|--|
| G.1.2.1.1 | • Identify and/or use properties of triangles.   |
| G.2.1.1.1 | • Use the Pythagorean Theorem to write and/or solve problems involving right triangles.  |
| G.2.1.1.2 | • Use trigonometric ratios to write and/or solve problems involving right triangles.   |
| G.2.1.2.3 | • Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a two-dimensional shape |

### Mathematical Practices:

- |   |  |
|---|--|
| 1 | • Make sense of problems and persevere in solving them.  |
| 2 | • Reason abstractly and quantitatively.                  |
| 4 | • Model with mathematics.                                |
| 6 | • Attend to precision.                                   |
| 7 | • Look for and make use of structure.                    |
| 8 | • Look for and express regularity in repeated reasoning. |

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 2 weeks

**UNIT #7:** Right Triangles and Trigonometry (Chapter 7)

**GRADE:** 8 – 12

## UNDERSTANDINGS

The Pythagorean Theorem can be used to find missing side lengths in a right triangle when no other angle measures are known. Trigonometric ratios can be used to find unknown side lengths and angle measures in right triangles. Indirect measurement is a real world application of trigonometry.

## COMMON ASSESSMENTS/CULMINATING ACTIVITY

Unit 7 Common Assessment

### KNOW

- Recall the Pythagorean Theorem.
- Identify patterns that exist between the outcome of Pythagorean Theorem and the type of triangle that is formed.
- Recognize that the altitude to the hypotenuse of a right triangle divides the triangle into two similar right triangles.
- Locate the relationships among the sides of special right triangles on a formula sheet.
- Locate the tangent, sine, and cosine ratios on a formula sheet.
- Locate the Law of Sines and Law of Cosines on a formula sheet.
- Understand that tangent, sine, and cosine can be used with right triangles while Law of Sines and Law of Cosines can be used with any type of triangle.

### DO

- Simplify a radical expression.
- Add, subtract, and multiply radical expressions.
- Rationalize the denominator of a radical expression.
- Apply the Pythagorean Theorem to find a missing side length of a right triangle.
- Use the Converse of the Pythagorean Theorem and inequalities to classify a triangle by angle.
- Find the length of the altitude to the hypotenuse of a right triangle.
- Apply the relationships among the sides of special right triangles to find missing side lengths.
- Use trigonometric ratios to solve triangles.
- Use indirect measurement to estimate distance in real world problems.
- Use the Law of Sines and Law of Cosines to find missing angle and side measures in nonright triangles.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 2 weeks

**UNIT #8:** Quadrilaterals (Chapter 8)

**GRADE:** 8 – 12

## STANDARDS:

### PA Core Standards:

- CC.2.3.HS.A.3      • Verify and apply geometric theorems as they relate to geometric figures.
- CC.2.3.HS.A.11    • Apply coordinate geometry to prove simple geometric theorems algebraically.

### Keystone Geometry Eligible Content:

- G.1.2.1.2          • Identify and/or use properties of quadrilaterals.
- G.1.2.1.4          • Identify and/or use properties of regular polygons.
- G.2.1.2.3          • Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a two-dimensional shape.

### Mathematical Practices:

- 1                    • Make sense of problems and persevere in solving them.
- 2                    • Reason abstractly and quantitatively.
- 6                    • Attend to precision.
- 7                    • Look for and make use of structure.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 2 weeks

**UNIT #8:** Quadrilaterals (Chapter 8)

**GRADE:** 8 – 12

## UNDERSTANDINGS

All polygons can be broken into smaller triangular regions which allows to determine the sum of the angles of any polygon.

Quadrilaterals can be classified by their unique properties, and those properties can be used to determine missing side lengths and angle measures.

## COMMON ASSESSMENTS/CULMINATING ACTIVITY

Unit 8 Common Assessment

### KNOW

- Summarize that the relationship between the sum of the interior angles of an  $n$ -gon is  $(n - 2)180$  and the sum of the exterior angles is 360 degrees.
- List the properties of special quadrilaterals (parallelogram, rhombus, rectangle, square, trapezoid, isosceles trapezoid, kite).

### DO

- Identify and classify polygons.
- Write and solve algebraic equations using properties of quadrilaterals and polygons.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3 weeks

**UNIT #9:** Properties of Circles (Chapter 10)

**GRADE:** 8 – 12

## STANDARDS:

### PA Core Standards:

- |                |   |
|----------------|---|
| CC.2.3.HS.A.3  | • Verify and apply geometric theorems as they relate to geometric figures.          |
| CC.2.3.HS.A.8  | • Apply geometric theorems to verify properties of circles.                         |
| CC.2.3.HS.A.10 | • Translate between the geometric description and the equation for a conic section. |
| CC.2.3.HS.A.11 | • Apply coordinate geometry to prove simple geometric theorems algebraically.       |

### Keystone Geometry Eligible Content:

- |           |   |
|-----------|---|
| G.1.1.1.1 | • Identify, determine, and/or use the radius, diameter, segment, and/or tangent of a circle.  |
| G.1.1.1.2 | • Identify, determine, and/or use the arcs, semicircles, sectors, and/or angles of a circle.  |
| G.1.1.1.3 | • Use chords, tangents, and secants to find missing arc measures or missing segment measures.                                       |
| G.2.1.2.3 | • Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a two-dimensional shape. |

### Mathematical Practices:

- |   |   |
|---|---|
| 1 | • Make sense of problems and persevere in solving them. |
| 2 | • Reason abstractly and quantitatively.                 |
| 6 | • Attend to precision.                                  |
| 7 | • Look for and make use of structure.                   |

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3 weeks

**UNIT #9:** Properties of Circles (Chapter 10)

**GRADE:** 8 – 12

## UNDERSTANDINGS

The properties of angles, arcs, chords, secants, and tangents can be used to solve problems involving circles.

## COMMON ASSESSMENTS/CULMINATING ACTIVITY

Unit 9 Common Assessment

### KNOW

- Identify special segments (chord, radius, diameter), lines (secant, tangent), and points (center, point of tangency) involving circles.
- Memorize that a tangent line is perpendicular to the radius drawn to the point of tangency.
- Memorize that tangent segments from a common external point are congruent.
- Distinguish between a minor arc, a semicircle, and a major arc, and use the proper notation for naming each.
- Distinguish between a central angle and an inscribed angle.
- Locate the angle relationships in circles on a formula sheet (ex: Tangent-Secant).
- Locate the segment length relationships on a formula sheet (ex: Tangent-Secant).
- Locate the equation of a circle on a formula sheet.

### DO

- Write and solve equations using properties of tangent lines, chords, tangent segments, and secant segments.
- Find the measure of missing arcs using either the central angle or the inscribed angle.
- Write and solve equations using angle relationships in circles.
- Write and graph equations of circles.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3.5 weeks

**UNIT #10:** Measuring Length and Area (Chapter 11)

**GRADE:** 8 – 12

## STANDARDS:

### PA Core Standards:

- CC.2.3.HS.A.3 • Verify and apply geometric theorems as they relate to geometric figures.
- CC.2.3.HS.A.9 • Extend the concept of similarity to determine arc lengths and areas of sectors of circles
- CC.2.3.HS.A.13 • Analyze relationships between two-dimensional and three-dimensional objects.
- CC.2.3.HS.A.14 • Apply geometric concepts to model and solve real-world problems.

### Keystone Geometry Eligible Content:

- G.1.1.1.1 • Identify, determine, and/or use the radius, diameter, segment, and/or tangent of a circle.
- G.1.1.1.2 • Identify, determine, and/or use the arcs, semicircles, sectors, and/or angles of a circle.
- G.1.2.1.4 • Identify and/or use properties of regular polygons.
- G.1.3.1.2 • Identify and/or use proportional relationships in similar figures.
- G.2.2.2.1 • Estimate area, perimeter, or circumference of an irregular figure.
- G.2.2.2.2 • Find the measurement of a missing length given the perimeter, circumference, or area.
- G.2.2.2.3 • Find the side lengths of a polygon with a given perimeter to maximize the area of the polygon.
- G.2.2.2.4 • Develop and/or use strategies to estimate the area of a compound/composite figure.
- G.2.2.2.5 • Find the area of a sector of a circle.



**COURSE:** Honors Geometry

**TIME FRAME:** 3.5 weeks

**UNIT #10:** Measuring Length and Area (Chapter 11)

**GRADE:** 8 – 12

G.2.2.3.1 • Describe how a change in the linear dimension of a figure affects its perimeter, circumference and area (e.g., How does changing the length of the radius of a circle affect the circumference of the circle?).

G.2.2.4.1 • Use area models to find probabilities.

**Mathematical Practices:**

1 • Make sense of problems and persevere in solving them.

2 • Reason abstractly and quantitatively.

4 • Model with mathematics.

6 • Attend to precision.

7 • Look for and make use of structure.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3.5 weeks

**UNIT #10:** Measuring Length and Area (Chapter 11)

**GRADE:** 8 – 12

## UNDERSTANDINGS

You can apply formulas for perimeter, circumference, and area to find and compare measures of polygons, circles, and portions of circles.

## COMMON ASSESSMENTS/CULMINATING ACTIVITY

Unit 10 Common Assessment

### KNOW

- Locate perimeter, circumference, and area formulas on a formula sheet and identify what each variable represents.
- Recognize that the ratio of the perimeters of similar polygons is equal to the ratio of corresponding side lengths.
- Recognize that the ratio of the areas of similar polygons is equal to the square of the ratio of corresponding side lengths.
- Understand that the ratio of the shaded area of a figure to the total area of the figure is geometric probability.

### DO

- Find the area of rectangles, parallelograms, triangles, trapezoids, rhombuses, and kites.
- Find missing dimensions of rectangles, parallelograms, triangles, trapezoids, rhombuses, and kites given area.
- Apply the ratios of corresponding side lengths, perimeters, and areas of similar polygons to find missing dimensions.
- Find the circumference and area of a circle.
- Find the arc length and area of a sector of a circle.
- Find the area of regular polygons.
- Find the geometric probability that a point randomly selected in a region is in a particular part of that region.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3.5 weeks

**UNIT #11:** Surface Area and Volume of Solids (Chapter 12)

**GRADE:** 8 – 12

## STANDARDS:

### PA Core Standards:

- CC.2.3.HS.A.3 • Verify and apply geometric theorems as they relate to geometric figures.
- CC.2.3.HS.A.12 • Explain volume formulas and use them to solve problems.
- CC.2.3.HS.A.13 • Analyze relationships between two-dimensional and three-dimensional objects.
- CC.2.3.HS.A.14 • Apply geometric concepts to model and solve real-world problems.

### Keystone Geometry Eligible Content:

- G.1.1.1.1 • Identify, determine and/or use the radius, diameter, segment and/or tangent of a circle.
- G.1.1.1.4 • Identify and/or use the properties of a sphere or cylinder.
- G.1.2.1.5 • Identify and/or use properties of pyramids and prisms.
- G.1.3.1.2 • Identify and/or use proportional relationships in similar figures.
- G.2.3.1.1 • Calculate the surface area of prisms, cylinders, cones, pyramids, and/or spheres. Formulas are provided on a reference sheet.
- G.2.3.1.2 • Calculate the volume of prisms, cylinders, cones, pyramids, and/or spheres. Formulas are provided on a reference sheet.
- G.2.3.1.3 • Find the measurement of a missing length given the surface area or volume.
- G.2.3.2.1 • Describe how a change in the linear dimension of a figure affects surface area or volume (e.g., How does changing the length of the edge of a cube affect the volume of the cube?).

### Mathematical Practices:

- 1 • Make sense of problems and persevere in solving them.
- 2 • Reason abstractly and quantitatively.
- 4 • Model with mathematics.
- 6 • Attend to precision.
- 7 • Look for and make use of structure.

# KNOW, UNDERSTAND, DO

**COURSE:** Honors Geometry

**TIME FRAME:** 3.5 weeks

**UNIT #11:** Surface Area and Volume of Solids (Chapter 12)

**GRADE:** 8 – 12

## UNDERSTANDINGS

Knowing how to use surface area and volume formulas can help you solve problems in three dimensions.

## COMMON ASSESSMENTS/CULMINATING ACTIVITY

Unit 11 Common Assessment

### KNOW

- Locate surface area and volume formulas on a formula sheet and identify what each variable represents.
- Recognize that the ratio of the surface areas of similar solids is equal to the square of the ratio of corresponding edge lengths.
- Recognize that the ratio of the volumes of similar solids is equal to the cube of the ratio of corresponding edge lengths.

### DO

- Find the surface area of prisms, cylinders, pyramids, cones, and spheres.
- Find missing dimensions of prisms, cylinders, pyramids, cones, and spheres given surface area.
- Find volumes of prisms, cylinders, pyramids, cones, and spheres.
- Find missing dimensions of prisms, cylinders, pyramids, cones, and spheres given volume.
- Apply the ratios of corresponding edges, surface areas, and volumes of similar solids to find missing dimensions.

### **Adaptations/Modifications for Students with I.E.P.s**

Adaptations or modifications to this planned course will allow exceptional students to earn credits toward graduation or develop skills necessary to make a transition from the school environment to community life and employment. The I.E.P. team has determined that modifications to this planned course will meet the student's I.E.P. needs.

Adaptations/Modifications may include but are not limited to:

#### **INSTRUCTION CONTENT**

- Modification of instructional content and/or instructional approaches
- Modification or deletion of some of the essential elements

#### **SETTING**

- Preferential seating

#### **METHODS**

- Additional clarification of content
- Occasional need for one to one instruction
- Minor adjustments or pacing according to the student's rate of mastery
- Written work is difficult, use verbal/oral approaches
- Modifications of assignments/testing
- Reasonable extensions of time for task/project completion
- Assignment sheet/notebook
- Modified/adjusted mastery rates
- Modified/adjusted grading criteria
- Retesting opportunities

#### **MATERIALS**

- Supplemental texts and materials
- Large print materials for visually impaired students
- Outlines and/or study sheets
- Carbonless notebook paper
- Manipulative learning materials
- Alternatives to writing (tape recorder/calculator)