POCONO MOUNTAIN SCHOOL DISTRICT CURRICULUM

Honors Geometry: Grade 9	MODULE 1/UNIT 1:	Geometric Properties and Reasoning: Properties of Circles, Spheres, and Cylinders	TIME FRAME:	Ongoing

NATIONAL COMMON CORE STANDARDS:

Understand and apply theorems about circles

- **G.C.1** Prove that all circles are similar.
- **G.C.2** Identify and describe relationships among inscribed angles, radii, and chords. *Include 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.*
- **G.C.3** Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
- **G.C.4** (+) Construct a tangent line from a point outside a given circle to the circles.

Find arc lengths and areas of sectors of circles

- **G.C.5** Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

Translate between the geometric description and the equation for a conic section.

- **G.GPE.1** Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

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.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

ESSENTIAL QUESTIONS	VOCABULARY	ASSESSMENT
• **How do you apply geometric theorems to verify properties of circles?** • **How do you extend the concept of similarity to determine arc lengths and areas of sectors of circles?** • **How do you identify and/or use parts of circles and segments associated with circles, spheres, and cylinders?**	• angles of a circle • arc • arc measure • chords • circumscribed • inscribed angles • intercepted arc • point of tangency • semicircle • sectors • secants • segment measures • standard form of the equation of a circle • tangent to a circle	**Formative:** • Journals/logs • KWL chart • At the bell activities • Question and answer • Individual white boards/Promethean Board ActiVotes • Homework • Quizzes • Constructed response/open-ended problem solving • Performance tasks • Exit slips **Summative:** • CDT's • Performance based assessments o Quizzes o Tests o Constructed response/open-ended problem solving o Performance tasks o Project

UNIT OF INSTRUCTION: GEOMETRY: CIRCLES

PA CORE STANDARDS	PA Academic Standards
CC.2.3.HS.A.8: Apply geometric theorems to verify properties of circles. **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. **Essential Skills and Understanding** • Ability to identify, determine, and/or use the radius, diameter, segment, and/or tangent of a circle. • Ability to identify, determine, and/or use the arcs, semicircles, sectors, and/or angles of a circle. • Ability to use chords, tangents, and secants to find missing arc measures or missing segment measures. • Ability to identify and/or use the properties of a sphere or cylinder. • Ability to write the equation of a circle and/or identify the center and radius. • Ability to independently apply the properties of circles, spheres and cylinders in problem solving situations requiring higher level thinking skills and meta-cognition as part of instruction. • Note: Honors level students are expected to work on additional rigorous, challenging problems, formal proofs, and applications of concepts/skills as part of the course. Increased pace of instruction will occur.	**G.1.1 Properties of Circles, Spheres, and Cylinders** **G.1.1.1 Identify and/or use parts of circles and segments associated with circles, spheres, and cylinders.** **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.1.1.1.4** • Identify and/or use the properties of a sphere or cylinder.

DIFFERENTIATION ACTIVITIES:
Teacher directed differentiated instructional projects and activities are ongoing and based on student need.

ENRICHMENT:

- Pearson SuccessNet On-Line Teacher's Edition
- Pearson on-line resources and materials
- StudyIsland
- Web-based Math Resources
- Small group instruction
- Teacher generated/differentiated instruction enrichment and activities
- Supporting the range of learners as per teacher manual
- Encourage and support learners in explaining how they applied their skills during mathematical tasks
- http://www.artofproblemsolving.com/liz/Alcumus/index.php
- Enrichment based on student GIEP or need of student

REMEDIATION:

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- Teacher generated/differentiated instruction activities
- Small group instruction
- Adapted assignments
- Additional time
- Alternative Assessments
- Chunking of content, assignment and/or assessments
- One-on-one re-teaching
- Volunteer/peer tutoring
- Accommodations based on IEP and/or need
- ELL student (or based on student need) additional support
    - Provide specific examples
    - Use of Manipulatives
    - Simplified language in word problems
    - Visuals
    - Flashcards
    - Multiple-meaning words
    - Bilingual dictionary/picture dictionary
- Math Support, Learning Support, or ELL Teachers as appropriate and based on need

RESOURCES:

- Pearson Geometry: Units 10, 11, 12
- PDE SAS portal: http://www.pdesas.org
- Thinking Maps
- Graphing calculator
- Exit Tickets
- Adaptions checklist
- ELL Instructional Strategies for Math
- ESL Handbook
  - Click on "Academic Resources" from PMSD website
  - Click on "ESL" on left side of tool bar.
  - Click on the link to the PMSD ESL Handbook
  - Scroll through to page 44 in the appendices.
- Teacher generated/differentiated instruction resources and activities
- Algebra I released state sample questions
- Algebra I generated sample questions
- Promethean Flipcharts/ActiveVotes
- Math flipcharts
- Math Internet Resources from PMSD Resource Page
- StudyIsland
- http://www.khanacademy.org/
- Thinkfinity website: http://www.thinkfinity.org/home
- IXL Website: http://www.IXL.com/math/
- United Streaming: http://streaming.discoveryeducation.com/index.cfm
- http://edhelper.com/place_value.html
- http://illuminations.nctm.org
- http://insidemathematics.org
- www.teachingchannel.org
- www.Learnzillion.com
- http://illustrativemathematics.org/standards/k8
- http://wiki.warren.kyschools.us/groups/wcpscommoncorestandards/
- www.teachingchannel.org
- http://www.learnzillion.com
- http://www.teacherspayteachers.com
- flexmath.ck12.org/

POCONO MOUNTAIN SCHOOL DISTRICT CURRICULUM

Honors Geometry: Grade 9	MODULE 1/UNIT 2:	Geometric Properties and Reasoning: Properties of Polygons and Polyhedra	TIME FRAME:	Ongoing

NATIONAL COMMON CORE STANDARDS:

Experiment with transformations in the plane

- **G.CO.2** Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs.
- **G.CO.3** Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
- **G.CO.5** Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software.

Prove geometric theorems

- **G.CO.9** Prove theorems about lines and angles. *Theorems 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.*
- **G.CO.10** Prove theorems about triangles. *Theorems 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.*
- **G.CO.11** Prove theorems about parallelograms. *Theorems 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.*

Use coordinates to prove simple geometric theorems algebraically

- **G.GPE.4** Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0,2).*
- **G.GPE.5** Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
- **G.GPE.6** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
- **G.GPE.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Apply geometric concepts in modeling situations

- **G.MG.1** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- **G.MG,2** Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
- **G.MG.3** Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

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.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

POCONO MOUNTAIN SCHOOL DISTRICT CURRICULUM

ESSENTIAL QUESTIONS	VOCABULARY		ASSESSMENT
• **How can coordinate geometry describe rigid motion?** • **What are the properties of the types of triangles?** • **What are the properties of the types of quadrilateral?**	• altitude • angle bisector • base of a triangle • base angles • centroid • circumcenter • concurrent • consecutive angles • distance • legs of a triangle • incenter • isosceles trapezoid • kite • median • midpoint	• midsegment • orthocenter • parallel • parallelogram • perimeter • perpendicular • perpendicular bisector • polygon • rectangle • regular • rhombus • slope • square • triangle • trapezoid • vertex angle of a triangle	**Formative:** • Journals/logs • KWL chart • At the bell activities • Question and answer • Individual white boards/Promethean Board ActiVotes • Homework • Quizzes • Constructed response/open-ended problem solving • Performance tasks • Exit slips **Summative:** • CDT's • Performance based assessments o Quizzes o Tests o Constructed response/open-ended problem solving o Performance tasks o Project

UNIT OF INSTRUCTION:
GEOMETRY: EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS

PA CORE STANDARDS	PA Academic Standards
CC.2.3.HS.A.2: Understand and apply congruence, similarity, and geometric transformations using various tools. **CC.2.3.HS.A.3:** Verify and apply geometric theorems as they relate to geometric figures. **CC.2.3.HS.A.13:** Analyze relationships between two-dimensional and three-dimensional objects. **Essential Skills and Understanding** • Ability to identify and/or use properties of triangles. • Ability to identify and/or use properties of quadrilaterals. • Ability to identify and/or use properties of isosceles and equilateral triangles. • Ability to identify and/or use properties of regular polygons. • Ability to identify and/or use properties of pyramids and prisms. • Ability to independently apply the properties of polygons and polyhedra in problem solving situations requiring higher level thinking skills and meta-cognition as part of instruction. • Note: Honors level students are expected to work on additional rigorous, challenging problems, formal proofs, and applications of concepts/skills as part of the course. Increased pace of instruction will occur.	**G.1.2 Properties of Polygons and Polyhedra** **G.1.2.1: Recognize and/or apply properties of angles, polygons, and polyhedral.** **G.1.2.1.1** • Identify and/or use properties of triangles. **G.1.2.1.2** • Identify and/or use properties of quadrilaterals. **G.1.2.1.3** • Identify and/or use properties of isosceles and equilateral triangles. **G.1.2.1.4** • Identify and/or use properties of regular polygons. **G.1.2.1.5** • Identify and/or use properties of pyramids and prisms.

DIFFERENTIATION ACTIVITIES:
Teacher directed differentiated instructional projects and activities are ongoing and based on student need.

ENRICHMENT:

- Pearson SuccessNet On-Line Teacher's Edition
- Pearson on-line resources and materials
- StudyIsland
- Web-based Math Resources
- Small group instruction
- Teacher generated/differentiated instruction enrichment and activities
- Supporting the range of learners as per teacher manual
- Encourage and support learners in explaining how they applied their skills during mathematical tasks
- http://www.artofproblemsolving.com/liz/Alcumus/index.php
- Enrichment based on student GIEP or need of student

REMEDIATION:

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- Adapted assignments
- Additional time
- Alternative Assessments
- Chunking of content, assignment and/or assessments
- One-on-one re-teaching
- Volunteer/peer tutoring
- Accommodations based on IEP and/or need
- ELL student (or based on student need) additional support
    - Provide specific examples
    - Use of Manipulatives
    - Simplified language in word problems
    - Visuals
    - Flashcards
    - Multiple-meaning words
    - Bilingual dictionary/picture dictionary
- Math Support, Learning Support, or ELL Teachers as appropriate and based on need

RESOURCES:	• Pearson Geometry: Units 4, 5, 6, 11
	• PDE SAS portal: http://www.pdesas.org
	• Thinking Maps
	• Graphing calculator
	• Exit Tickets
	• Adaptions checklist
	• ELL Instructional Strategies for Math
	• ESL Handbook
	  o Click on "Academic Resources" from PMSD website
	  o Click on "ESL" on left side of tool bar.
	  o Click on the link to the PMSD ESL Handbook
	  o Scroll through to page 44 in the appendices.
	• Teacher generated/differentiated instruction resources and activities
	• Algebra I released state sample questions
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	• http://www.khanacademy.org/
	• Thinkfinity website: http://www.thinkfinity.org/home
	• IXL Website: http://www.IXL.com/math/
	• United Streaming: http://streaming.discoveryeducation.com/index.cfm
	• http://edhelper.com/place_value.html
	• http://illuminations.nctm.org
	• http://insidemathematics.org
	• www.teachingchannel.org
	• www.Learnzillion.com
	• http://illustrativemathematics.org/standards/k8
	• http://wiki.warren.kyschools.us/groups/wcpscommoncorestandards/
	• www.teachingchannel.org
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	• http://www.teacherspayteachers.com
	• flexmath.ck12.org/

POCONO MOUNTAIN SCHOOL DISTRICT CURRICULUM

Honors Geometry: Grade 9	MODULE 1/UNIT 3:	Geometric Properties of Reasoning: Congruence, Similarity, and Proofs	TIME FRAME:	Ongoing

NATIONAL COMMON CORE STANDARDS:

Experiment with transformation in the plane

- **G.CO.1** Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line distance along a line, and distance around a circular arc.
- **G.CO.2** Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and gibe other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
- **G.CO.3** Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
- **G.CO.4** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
- **G.CO.5** Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Understand congruence in terms of rigid motions

- **G.CO.6** 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.
- **G.CO.7** 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.
- **G.CO.8** Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Prove geometric theorems

- **G.CO.9** Prove theorems about lines and angles. *Theorems 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 endpoint.*
- **G.CO.10** Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum of 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.*
- **G.CO.11** Prove theorems about parallelograms. *Theorems 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.*

Make geometric constructions

- **G.CO.12** Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*
- **G.CO.13** Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

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.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
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POCONO MOUNTAIN SCHOOL DISTRICT CURRICULUM

Prove theorems involving similarity

- **G.SRT.4** Prove theorems about triangles. *Theorems include; a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*
- **G.*SRT.5*** *Use congruence and* similarity criteria to triangles to solve problems and to prove relationships in geometric figures.

ESSENTIAL QUESTIONS	VOCABULARY	ASSESSMENT
• **What does it mean for two figures to be congruent?** • **How is coordinate geometry used to prove congruence?** • **What are the two types of reasoning that are used to prove statements true?** • **How are the types of reasoning similar and different?** • **What are the triangle congruence postulates/theorems?** • **How do you use the triangle congruence postulates/theorems to solve problems?** • **How are congruent triangles similar and different?**	• congruent polygons • corollary • cross product property • geometric mean • hypotenuse • legs of a right triangle • postulate • proportion • ratio • reflection • right triangle • rotation • scale factor • scale drawing • similar • theorem • translation	**Formative:** • Journals/logs • KWL chart • At the bell activities • Question and answer • Individual white boards/Promethean Board ActiVotes • Homework • Quizzes • Constructed response/open-ended problem solving • Performance tasks • Exit slips **Summative:** • CDT's • Performance based assessments o Quizzes o Tests o Constructed response/open-ended problem solving o Performance tasks o Project

UNIT OF INSTRUCTION: GEOMETRY: CONGRUENCE

PA CORE STANDARDS	PA Academic 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.5:** Create justifications based on transformations to establish similarity of plane figures. **CC.2.3.HS.A.6:** Verify and apply theorems involving similarity as they relate to plane figures. **CC.2.3.HS.A.8:** Apply geometric theorems to verify properties of circles. **CC.2.3.HS.C.9:** Prove the Pythagorean identity and use it to calculate trigonometric ratios. **Essential Skills and Understanding** • Ability to identify and/or use properties of congruent and similar polygons or solids. • Ability to identify and/or use proportional relationships in similar figures. • Ability to write, analyze, complete, or identify formal proofs (e.g., direct and/or indirect proofs/proofs by contradiction). • Ability to independently use congruence, similarity, and proofs in problem solving situations requiring higher level thinking skills and meta-cognition as part of instruction. • Note: Honors level students are expected to work on additional rigorous, challenging problems, formal proofs, and applications of concepts/skills as part of the course. Increased pace of instruction will occur.	**G.1.3 Congruence, Similarity, and Proofs** **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.1.3.2.1** • Write, analyze, complete, or identify formal proofs (e.g., direct and/or indirect proofs/proofs by contradiction).

DIFFERENTIATION ACTIVITIES:
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ENRICHMENT:

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    - Use of Manipulatives
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    - Bilingual dictionary/picture dictionary
- Math Support, Learning Support, or ELL Teachers as appropriate and based on need

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- Thinkfinity website: http://www.thinkfinity.org/home
- IXL Website: http://www.IXL.com/math/
- United Streaming: http://streaming.discoveryeducation.com/index.cfm
- http://edhelper.com/place_value.html
- http://illuminations.nctm.org
- http://insidemathematics.org
- www.teachingchannel.org
- www.Learnzillion.com
- http://illustrativemathematics.org/standards/k8
- http://wiki.warren.kyschools.us/groups/wcpscommoncorestandards/
- www.teachingchannel.org
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POCONO MOUNTAIN SCHOOL DISTRICT CURRICULUM

Honors Geometry: Grade 9	MODULE 2/UNIT 4:	Coordinate Geometry and Measurement: Coordinate Geometry and Right Triangles	TIME FRAME:	Ongoing

NATIONAL COMMON CORE STANDARDS:

Use coordinates to prove simple geometric theorems algebraically

- **G.GPE.4** Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0,2).*
- **G.GPE.5** Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Explain volume formulas and use them to solve problems

- **G.SRT.1** Verify experimentally the properties of dilations given by a center and a scale factor:
  A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
  The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
- **G.SRT.2** Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
- **G.SRT.3** Use the properties of similarity transformation to establish the AA criterion for two triangles to be similar.

Prove theorems involving similarity

- **G.SRT.4** Prove theorems about triangles. *Theorems include; a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*
- ***G.SRT.5*** *Use congruence and* similarity criteria to triangles to solve problems and to prove relationships in geometric figures.

Define trigonometric ratios and solve problems involving right triangles

- **G.SRT.6** Understand that by similarity, side ratios in right triangles are properties of the angles in triangle, leading to definitions of trigonometric ratios for acute angles.
- **G.SRT.7** Explain and use the relationship between the sine and cosine of complementary angles.
- **G.SRT.8** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Apply trigonometry to general triangles

- **G.SRT.9** (+) Derive the formula *A = ½ ab sin(C)for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.*
- **G.SRT.10** (+) Prove the Laws of Sines and Cosines and use them to solve problems.
- **G.SRT.11** (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

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.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

POCONO MOUNTAIN SCHOOL DISTRICT CURRICULUM

ESSENTIAL QUESTIONS	VOCABULARY	ASSESSMENT
• **How can you use the coordinate plane to establish properties of a 2-dimensional shape?** • **How are side lengths or angle measures found in right triangles?** • **How do you use trigonometric ratios to write and/or solve problems involving right triangles?** • **How do you relate slope to perpendicularity and/or parallelism (limit to linear algebraic equations)?**	• angle of depression • angle of elevation • cosine • identity • parallel • perpendicular • slope • distance • midpoint • Pythagorean theorem • Pythagorean triple • sine • tangent	**Formative:** • Journals/logs • KWL chart • At the bell activities • Question and answer • Individual white boards/Promethean Board ActiVotes • Homework • Quizzes • Constructed response/open-ended problem solving • Performance tasks • Exit slips **Summative:** • CDT's • Performance based assessments o Quizzes o Tests o Constructed response/open-ended problem solving o Performance tasks o Project

UNIT OF INSTRUCTION: GEOMETRY: SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY	PA CORE STANDARDS	PA Academic Standards
	CC.2.2.HS.C.9: Prove the Pythagorean identity and use it to calculate trigonometric ratios. **CC.2.3.HS.A.7:** Apply trigonometric ratios to solve problems involving right triangles. **CC.2.3.8.A.3:** Understand and apply the Pythagorean theorem to solve problems. **CC.2.3.HS.A.11:** Apply coordinate geometry to prove simple geometric theorems algebraically. **Essential Skills and Understanding** • Ability to use the Pythagorean theorem to write and /or solve problems involving right triangles. • Ability to use trigonometric ratios to write and/or solve problems involving right triangles. • Ability to calculate the distance and/or midpoint between two points on a number line or on a coordinate plane. • Ability to relate slope to perpendicularity and/or parallelism (limit to linear algebraic equations).	**G.2.1 Coordinate Geometry and Right 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.2.1.2.1** • Calculate the distance and/or midpoint between two points on a number line or on a coordinate plane. **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.

	• Ability to use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a two-dimensional shape. • Ability to use the Laws of Sines and Cosines. • Ability to independently apply coordinate geometry and right triangles in problem solving situations requiring higher level thinking skills and meta-cognition as part of instruction. • Note: Honors level students are expected to work on additional rigorous, challenging problems, formal proofs, and applications of concepts/skills as part of the course. Increased pace of instruction will occur.	

DIFFERENTIATION ACTIVITIES:
Teacher directed differentiated instructional projects and activities are ongoing and based on student need.

ENRICHMENT:

- Pearson SuccessNet On-Line Teacher's Edition
- Pearson on-line resources and materials
- StudyIsland
- Web-based Math Resources
- Small group instruction
- Teacher generated/differentiated instruction enrichment and activities
- Supporting the range of learners as per teacher manual
- Encourage and support learners in explaining how they applied their skills during mathematical tasks
- http://www.artofproblemsolving.com/liz/Alcumus/index.php
- Enrichment based on student GIEP or need of student

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- Additional time
- Alternative Assessments
- Chunking of content, assignment and/or assessments
- One-on-one re-teaching
- Volunteer/peer tutoring
- Accommodations based on IEP and/or need
- ELL student (or based on student need) additional support
    - Provide specific examples
    - Use of Manipulatives
    - Simplified language in word problems
    - Visuals
    - Flashcards
    - Multiple-meaning words
    - Bilingual dictionary/picture dictionary
- Math Support, Learning Support, or ELL Teachers as appropriate and based on need

RESOURCES:	• Pearson Geometry: Units 3, 5, 8
	• PDE SAS portal: http://www.pdesas.org
	• Thinking Maps
	• Graphing calculator
	• Exit Tickets
	• Adaptions checklist
	• ELL Instructional Strategies for Math
	• ESL Handbook
	  o Click on "Academic Resources" from PMSD website
	  o Click on "ESL" on left side of tool bar.
	  o Click on the link to the PMSD ESL Handbook
	  o Scroll through to page 44 in the appendices.
	• Teacher generated/differentiated instruction resources and activities
	• Algebra I released state sample questions
	• Algebra I generated sample questions
	• Promethean Flipcharts/ActiveVotes
	• Math flipcharts
	• Math Internet Resources from PMSD Resource Page
	• StudyIsland
	• http://www.khanacademy.org/
	• Thinkfinity website: http://www.thinkfinity.org/home
	• IXL Website: http://www.IXL.com/math/
	• United Streaming: http://streaming.discoveryeducation.com/index.cfm
	• http://edhelper.com/place_value.html
	• http://illuminations.nctm.org
	• http://insidemathematics.org
	• www.teachingchannel.org
	• www.Learnzillion.com
	• http://illustrativemathematics.org/standards/k8
	• http://wiki.warren.kyschools.us/groups/wcpscommoncorestandards/
	• www.teachingchannel.org
	• http://www.learnzillion.com
	• http://www.teacherspayteachers.com
	• flexmath.ck12.org/

POCONO MOUNTAIN SCHOOL DISTRICT CURRICULUM

Honors Geometry: Grade 9	**MODULE 2/UNIT 5:**	Coordinate Geometry and Measurement: Measurements of Two-Dimensional Shapes and Figures	**TIME FRAME:**	Ongoing

NATIONAL COMMON CORE STANDARDS:

Find arc lengths and areas of sectors of circles

- **G.C.5** Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

Prove geometric theorems

- **G.CO.9** Prove theorems about lines and angles. Theorems 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.

Explain volume formulas and use them to solve problems

- **G.GMD.1** Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
- **G.GMD.2** (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
- **G.GMD.3** Use volume formulas for cylinders, pyramids, cones and spheres to solve problems.

Visualize relationships between two-dimensional and three-dimensional objects

- **G.GMD.4** Identify the shapes of two-dimensional cross-sections of three-dimensional objects generated by rotations of two-dimensional objects.

Use the rules of probability to compute probabilities of compound events in a uniform probability model

- **S.CP.6** Find the conditional probability of *A* given *B* as the fraction of *B's outcomes that also belong to* A, and interpret the answer in terms of the model.
- **S.MD.6** (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

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.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

POCONO MOUNTAIN SCHOOL DISTRICT CURRICULUM

ESSENTIAL QUESTIONS	VOCABULARY	ASSESSMENT
• **How do you use the properties of angles formed by intersecting lines or when two parallel lines are cut by a transversal to find the measures of missing angles?** • **How can probability be used to make decisions?** • **How do you know how to calculate the area, circumference, or perimeter of irregular figures?** • **How do you know how to find the measure of a missing dimension?** • **How does a change in linear dimension affect the figure?**	• adjacent angles • alternate exterior angles • alternate interior angles • corresponding angles • event • geometric probability • intersecting lines • irregular figure • linear pair • outcome • parallel lines • same side interior angles • same side exterior angles • sector • supplementary • transversal • vertical angles	**Formative:** • Journals/logs • KWL chart • At the bell activities • Question and answer • Individual white boards/Promethean Board ActiVotes • Homework • Quizzes • Constructed response/open-ended problem solving • Performance tasks • Exit slips **Summative** • CDT's • Performance based assessments o Quizzes o Tests o Constructed response/open-ended problem solving o Performance tasks o Project

UNIT OF INSTRUCTION:
GEOMETRY: GEOMETRIC MEASUREMENT AND DIMENSION

PA CORE STANDARDS	PA Academic Standards
CC.2.3.8.A.2: Understand and apply congruence, similarity, and geometric transformations using various tools. **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.9:** Extend the concept of similarity to determine arc lengths and areas of sectors of circles. **CC.2.3.HS.A.14:** Apply geometric concepts to model and solve real-world problems. **CC.2.2.HS.C.1:** Use the concept and notation of functions to interpret and apply them in terms of their context. **Essential Skills and Understanding** • Ability to use properties of angles formed by intersecting lines to find the measures of missing angles. • Ability to use properties of angles formed when two parallel lines are cut by a transversal to find the measures of missing angles. • Ability to estimate area, perimeter, or circumference of an irregular figure. • Ability to find the measurement of a missing length, given the perimeter, circumference or area. • Ability to find the side lengths of a polygon with a given perimeter to maximize the area of the polygon. • Ability to develop and/or use strategies to estimate the area of a compound/composite figure. • Ability to find the area of a section of a circle. • Ability to 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?) • Ability to use area models to find probabilities. • Ability to independently apply measurements of two-dimensional shapes and figures in problem solving situations requiring higher level thinking skills and meta-cognition as part of instruction. • Note: Honors level students are expected to work on additional rigorous, challenging problems, formal proofs, and applications of concepts/skills as part of the course. Increased pace of instruction will occur.	**G.2.2 Measurements of Two-Dimensional Shapes and Figures** **G.2.2.1.1** • Use properties of angles formed by intersecting lines to find the 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. **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. **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.

DIFFERENTIATION ACTIVITIES:
Teacher directed differentiated instructional projects and activities are ongoing and based on student need.

ENRICHMENT:

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- Web-based Math Resources
- Small group instruction
- Teacher generated/differentiated instruction enrichment and activities
- Supporting the range of learners as per teacher manual
- Encourage and support learners in explaining how they applied their skills during mathematical tasks
- http://www.artofproblemsolving.com/liz/Alcumus/index.php
- Enrichment based on student GIEP or need of student

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- Volunteer/peer tutoring
- Accommodations based on IEP and/or need
- ELL student (or based on student need) additional support
  - Provide specific examples
  - Use of Manipulatives
  - Simplified language in word problems
  - Visuals
  - Flashcards
  - Multiple-meaning words
  - Bilingual dictionary/picture dictionary
- Math Support, Learning Support, or ELL Teachers as appropriate and based on need

RESOURCES:

- Pearson Geometry: Units 3, 6, 10
- PDE SAS portal: http://www.pdesas.org
- Thinking Maps
- Graphing calculator
- Exit Tickets
- Adaptions checklist
- ELL Instructional Strategies for Math
- ESL Handbook
  - Click on "Academic Resources" from PMSD website
  - Click on "ESL" on left side of tool bar.
  - Click on the link to the PMSD ESL Handbook
  - Scroll through to page 44 in the appendices.
- Teacher generated/differentiated instruction resources and activities
- Algebra I released state sample questions
- Algebra I generated sample questions
- Promethean Flipcharts/ActiveVotes
- Math flipcharts
- Math Internet Resources from PMSD Resource Page
- StudyIsland
- http://www.khanacademy.org/
- Thinkfinity website: http://www.thinkfinity.org/home
- IXL Website: http://www.IXL.com/math/
- United Streaming: http://streaming.discoveryeducation.com/index.cfm
- http://edhelper.com/place_value.html
- http://illuminations.nctm.org
- http://insidemathematics.org
- www.teachingchannel.org
- www.Learnzillion.com
- http://illustrativemathematics.org/standards/k8
- http://wiki.warren.kyschools.us/groups/wcpscommoncorestandards/
- www.teachingchannel.org
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- http://www.teacherspayteachers.com
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POCONO MOUNTAIN SCHOOL DISTRICT CURRICULUM

Honors Geometry: Grade 9	**MODULE 2/UNIT 6:**	Coordinate Geometry and Measurement: Measurements of Three-Dimensional shapes and Figures	**TIME FRAME:**	Ongoing

NATIONAL COMMON CORE STANDARDS:

Explain volume formulas and use them to solve problems

- **G.GMD.1** Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
- **G.GMD.3** Use volume formulas for cylinders, pyramids, cones and spheres to solve problems.

Explain volume formulas and use them to solve problems

- **G.MG.1** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- **G.MG.2** Apply concepts of density based on area and volume in modeling situations (e.g., person per square mile, BTUs per cubic foot).

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.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

ESSENTIAL QUESTIONS	VOCABULARY	ASSESSMENT
• **What are the three types of measurement? How do you know which measurement to calculate? What are the units of measure associated with each type of measurement?** • **What is similar and different between measuring area and volume? When do you use each?** • **How can the intersection of a solid and a plane be determined?**	• area of the base • cone • cube • cylinder • edge • Euler's Formula • face • lateral area • polyhedron • prism • pyramid • rectangular prism • sphere • surface area • vertices • volume	**Formative:** • Journals/logs • KWL chart • At the bell activities • Question and answer • Individual white boards/Promethean Board ActiVotes • Homework • Quizzes • Constructed response/open-ended problem solving • Performance tasks • Exit slips **Summative:** • CDT's • Performance based assessments o Quizzes o Tests o Constructed response/open-ended problem solving o Performance tasks o Project

UNIT OF INSTRUCTION: GEOMETRY: MODELING WITH GEOMETRY	PA CORE STANDARDS	PA Academic Standards
	CC.2.3.8.A.1: Apply the concepts of volume of cylinders, cones, and spheres to solve real-world and mathematical problems. **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. . **Essential Skills and Understanding** • Ability to calculate the surface area of prisms, cylinders, cones, pyramids, and/or spheres. Formulas are provided on a reference sheet. • Ability to calculate the volume of prisms, cylinders, cones, pyramids, and/or spheres. Formulas are provided on a reference sheet. • Ability to find the measurement of a missing length given the surface area or volume. • Ability to describe how a change in the linear dimension of a figure affects its surface area or volume (e.g., how does changing the length of the edge of a cube affect the volume of the cube?) • Ability to independently apply measurements of three-dimensional shapes and figures in problem solving situations requiring higher level thinking skills and meta-cognition as part of instruction. • Note: Honors level students are expected to work on additional rigorous, challenging problems, formal proofs, and applications of concepts/skills as part of the course. Increased pace of instruction will occur.	**G.2.3 Measurements of Three-Dimensional Shapes and 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 its surface area or volume (e.g., how does changing the length of the edge of a cube affect the volume of the cube?)

DIFFERENTIATION ACTIVITIES:
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    - Provide specific examples
    - Use of Manipulatives
    - Simplified language in word problems
    - Visuals
    - Flashcards
    - Multiple-meaning words
    - Bilingual dictionary/picture dictionary
- Math Support, Learning Support, or ELL Teachers as appropriate and based on need

RESOURCES:

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- http://edhelper.com/place_value.html
- http://illuminations.nctm.org
- http://insidemathematics.org
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- www.Learnzillion.com
- http://illustrativemathematics.org/standards/k8
- http://wiki.warren.kyschools.us/groups/wcpscommoncorestandards/
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