Southern Lehigh School District

UbD Curriculum Template

Course: **Geometry** Unit: **Unit 1 - Foundations of Geometry** Grades: **9-10**

Teacher Team: **Greenawald, Dottery, Skrapits, Everett** Date: **October, 2016**

Stage 1 – Desired Results	
Established Goals	**Enduring Understandings/Transfer**
1. What 21st Century Essentials included in the mission statement will this unit address? *Adaptation and flexibility* *Transfer of Learning* *Problem-solving* 2. What content standards will this unit address? • ELA PA Core State Standards • Math PA Core State Standards CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures. 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. CC.2.3.HS.A.11 Apply coordinate geometry to prove simple geometric theorems algebraically. • PA Content Standards	**Written as a declarative statement, an enduring understanding is a "big idea" that focuses on larger concepts, principles, and processes that go beyond discrete facts or skills. Enduring Understandings are applicable to new situations across content areas and TRANSFERABLE (the ability to learn in one context and apply to a new situation, particularly outside of the classroom) to the real world.** 3. List the Enduring Understanding(s): *a. Geometric relationships and concepts can be modeled and applied in areas such as art, architecture, construction, and engineering.* *b. Inductive and deductive reasoning skills can be applied through geometric concepts and results in drawing reasonable conclusions.* *c. The modeling of geometric concepts apply in all worldly applications.* *d. Communication of geometric terms in proper notation and definitions is critical for understanding.* *e. Analyze, verify and justify solutions to problems and explain it to others.* *f. Communicate mathematical concepts to peers, teachers, and instructional assistants in a safe and encouraging environment.* 4. What do you want students to do with this knowledge or skill beyond this course? What is Transfer? *a. Students will make sense of and persevere in solving complex and novel mathematical problems.* *b. Students will use effective mathematical reasoning to construct viable arguments and critique the reasoning of others.* *c. Students will communicate precisely when making mathematical statements and express answers with a degree of precision appropriate for the context of the problem/situation.* *d. Students will apply mathematical knowledge to analyze and model situations/relationships using multiple representations and appropriate tools in order to make decisions, solve problems, and draw conclusions.* *e. Students will make use of structure and repeated reasoning to gain a mathematical perspective and formulate generalized problem solving strategies* *f. Given a word problem, students will solve the word problem using an appropriate strategy or strategies and will share and compare the use of multiple strategies leading to the same answer.*

Essential Questions

What thought-provoking questions will foster inquiry, meaning making, and transfer?

5. List the Essential Question(s) that students should ponder, wonder about or explain by the end of this unit:
   What definitions, equations, notation, and terminology are necessary for success in Geometry?

Acquisition

Students will know...

6. What facts should students know and be able to use to gain further knowledge?
   Notation for the building blocks of geometry
   Different line/angle relationships
   Classifications and parts of a polygon
   Classifications and parts of a triangle
   Classifications of special quadrilaterals
   Understanding slope and distance and the application with geometric figures

7. What vocabulary should students know and be able to recall?
   Points, lines, planes, line segment, ray, midpoint, endpoints, angle, vertex, protractor, degrees, angle bisector, acute angle, obtuse angle, right angle, reflex angle, linear pair of angles, vertical angles, supplementary angles, complementary angles, adjacent angles, polygon names, consecutive sides, consecutive angles, diagonal, concave/convex polygons, regular/irregular polygons, congruent polygons, acute triangle, obtuse triangle, right triangle (hypotenuse and leg), isosceles triangle (base, base angles, and vertex angle), scalene triangle, regular triangle, trapezoid, isosceles trapezoid, kite, parallelogram, rhombus, rectangle and square, midpoint, distance, slope

8. What basic concepts should students know and be able to recall and apply?
   When given examples and counterexamples,

Students will be skilled at... (be able to do)

9. What discrete skill and processes should students be able to demonstrate?

   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.2.1.1.1 Use the Pythagorean Theorem 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

   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.

	students can construct correct proper definitions. *The basic buildings biocks of geometry: point, line and plane.* *Classify and measure angles and angle pairs* *Classify polygons - polygons, triangles and special quadrilaterals*	*G.2.2.3.1* *Describe how a change in the linear dimension of a figure affects its perimeter, circumference, and area*

Stage 2 – Evidence	
NETS for Students	**PERFORMANCE TASK(S)—can include transfer tasks and Project-Based Learning**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Critical Thinking* *Creative and Innovation*	*Examples include but are not limited to:* *Labs, open-ended essays, voice recordings, videos, presentations, discussion boards, graphic organizers, songs, skits, dioramas, visual projects (posters, dioramas)* List the task(s), then explain how the student will demonstrate the transfer of knowledge or skill involved in the task(s) (reference Stage 1, Item #4): *Student work shared with explanations of work and comparisons to other solutions* *Investigations using Geometric tools, Sketchpad or Desmos to create their own conjectures* *Peer reviewed work* *Quizzes and tests* *Daily exit tickets* *Collection/grading of daily homework assignments*
	OTHER SUMMATIVE ASSESSMENTS—can include factual recall
	Examples include but are not limited to final projects, research papers, quizzes and tests. List the assessments: *Mid-Unit Quiz* *Unit 1 Test*

Stage 3 – Learning Plan		
NETS for Students	**Learning Activities**	**Progress Monitoring/Formative Assessment**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world.	Questions to consider while planning: • Are transfer and acquisition addressed in the learning plan? • Does the learning plan reflect principles of learning and best practices? • Is there tight alignment with Stages 1 and 2? • Is the plan likely to be engaging and effective for all students?	• **How will you monitor students' progress toward acquisition, meaning, and transfer during learning activities?** Daily assessments, teacher observation of student in-class performance, teacher observation of student presentations. • **What are potential rough spots and student misunderstandings?**

<table>
<tr><td rowspan="2">Communication and Collaboration
Creative and Innovation
Research and Information Fluency
Critical Thinking</td><td colspan="2"></td><td>Appropriately using notation on geometric figures: segments, points, lines, quadrilaterals, midpoints, angle bisectors…

• How will students get the feedback they need?
Graded homework assessments, immediate feedback during in-class assignments, mid-chapter quiz, peer feedback and discussion</td></tr>
<tr><td>List planned activities
(examples include but are not limited to: experiments, guided reading, worksheets, discussions, note-taking, research, games):

Definition Pictionary
Definition Presentations
Word Wall
Duplicating angles and line segments
Note-taking
In-Class Assignments</td><td>List resources required
(examples include but are not limited to: laptops, iPads, websites, digital cameras, magazines, Blackboard, textbooks, novels, primary source documents, other non-fiction text, lab equipment, maps, translator, calculators)
Textbook, notebook, ruler, protractor, compass straightedge, white boards, and calculators</td><td>FORMATIVE ASSESSMENTS—any non-graded, diagnostic assessment administered prior to or during a unit that reflects prior knowledge, skill levels, and potential misconceptions.

Examples include but are not limited to: Pre-tests, clickers (CPS), mini whiteboards, entrance and exit tickets, CDTs, DIBELS, Aimsweb

Whiteboards
Warm up problems</td></tr>
</table>

Southern Lehigh School District

UbD Curriculum Template

Course: **Geometry** Unit: **Unit 2 - Forms of Reasoning** Grades: **9-10**

Teacher Team: **Greenawald, Dottery, Skrapits, Everett** Date: **October, 2016**

Stage 1 – Desired Results	
Established Goals	**Enduring Understandings/Transfer**
1. What 21st Century Essentials included in the mission statement will this unit address? *Adaptation and flexibility* *Transfer of Learning* *Problem-solving* 2. What content standards will this unit address? • ELA PA Core State Standards • Math PA Core State Standards CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures. • PA Content Standards	**Written as a declarative statement, an enduring understanding is a "big idea" that focuses on larger concepts, principles, and processes that go beyond discrete facts or skills. Enduring Understandings are applicable to new situations across content areas and TRANSFERABLE (the ability to learn in one context and apply to a new situation, particularly outside of the classroom) to the real world.** 3. List the Enduring Understanding(s): *a. Geometric relationships and concepts can be modeled and applied in areas such as art, architecture, construction, and engineering.* *b. Inductive and deductive reasoning skills can be applied through geometric concepts and results in drawing reasonable conclusions.* *c. The modeling of geometric concepts apply in all worldly applications.* *d. Communication of geometric terms in proper notation and definitions is critical for understanding.* *e. Students analyze, verify and justify their solutions to problems and can explain it to others.* *f. Communicate mathematical concepts to peers, teachers, and instructional assistants in a safe and encouraging environment.* 4. What do you want students to do with this knowledge or skill beyond this course? What is Transfer? *a. Students will make sense of and persevere in solving complex and novel mathematical problems.* *b. Students will use effective mathematical reasoning to construct viable arguments and critique the reasoning of others.* *c. Students will communicate precisely when making mathematical statements and express answers with a degree of precision appropriate for the context of the problem/situation.* *d. Students will apply mathematical knowledge to analyze and model situations/relationships using multiple representations and appropriate tools in order to make decisions, solve problems, and draw conclusions.* *e. Students will make use of structure and repeated reasoning to gain a mathematical perspective and formulate generalized problem solving strategies* *f. Given a word problem, students will solve the word problem using an appropriate strategy or strategies and will share and compare the use of multiple strategies leading to the same answer.*

Essential Questions

What thought-provoking questions will foster inquiry, meaning making, and transfer?

5. List the Essential Question(s) that students should ponder, wonder about or explain by the end of this unit:
   What is the difference between inductive and deductive reasoning and how can each help us solve real-world problems?

Acquisition

Students will know...

6. What facts should students know and be able to use to gain further knowledge?
   Basic algebraic concepts such as variables and solving a two step equation, factoring, etc.

7. What vocabulary should students know and be able to recall?
   Inductive reasoning, deductive reasoning, nth term, conditional, inverse, converse, contrapositive, biconditional, two column proof,direct proofs, indirect proofs, conclusion, conjecture, counterexample, equivalent statements, negation, theorem, hypothesis

8. What basic concepts should students know and be able to recall and apply?
   Difference between inductive and deductive reasoning
   Difference between a conditional statement, it's converse, it's inverse, it's biconditional, and it's contrapositive
   How to determine the nth term of a sequence
   How to write a two column proof
   How to make a proper conjecture using inductive reasoning

Students will be skilled at... (be able to do)

9. What discrete skill and processes should students be able to demonstrate?

   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.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.

Stage 2 – Evidence	
NETS for Students	**PERFORMANCE TASK(S)—can include transfer tasks and Project-Based Learning**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Critical Thinking* *Creative and Innovation*	*Examples include but are not limited to:* *Labs, open-ended essays, voice recordings, videos, presentations, discussion boards, graphic organizers, songs, skits, dioramas, visual projects (posters, dioramas)* List the task(s), then explain how the student will demonstrate the transfer of knowledge or skill involved in the task(s) (reference Stage 1, Item #4): *Student work shared with explanations of work and comparisons to other solutions* *Investigations using Geometric tools, Sketchpad or Desmos to create their own conjectures* *Peer reviewed work* *Quizzes and tests* *Daily exit tickets* *Collection/grading of daily homework assignments*
	OTHER SUMMATIVE ASSESSMENTS—can include factual recall
	Examples include but are not limited to final projects, research papers, quizzes and tests. List the assessments: *Basic Reasoning/nth Term Quiz* *Unit 2 Exam*

Stage 3 – Learning Plan		
NETS for Students	**Learning Activities**	**Progress Monitoring/Formative Assessment**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Communication and Collaboration* *Creative and Innovation* *Research and Information Fluency* *Critical Thinking*	Questions to consider while planning: • Are transfer and acquisition addressed in the learning plan? • Does the learning plan reflect principles of learning and best practices? • Is there tight alignment with Stages 1 and 2? • Is the plan likely to be engaging and effective for all students?	• **How will you monitor students' progress toward acquisition, meaning, and transfer during learning activities?** Daily assessments, teacher observation of student in-class performance, teacher observation of student presentations. • **What are potential rough spots and student misunderstandings?** Finding the nth term Students' first experience with proofs • **How will students get the feedback they need?** Graded homework assessments, immediate feedback during in-class assignments, mid-chapter quiz, peer

			feedback and discussion
	List planned activities *(examples include but are not limited to: experiments, guided reading, worksheets, discussions, note-taking, research, games)*: Proof Puzzle Activity Definition Presentations Note-taking In-Class Assignments	**List resources required** *(examples include but are not limited to: laptops, iPads, websites, digital cameras, magazines, Blackboard, textbooks, novels, primary source documents, other non-fiction text, lab equipment, maps, translator, calculators)* Textbook, notebook, ruler, protractor, compass straightedge, white boards, and calculators	**FORMATIVE ASSESSMENTS—any non-graded, diagnostic assessment administered prior to or during a unit that reflects prior knowledge, skill levels, and potential misconceptions.** *Examples include but are not limited to: Pre-tests, clickers (CPS), mini whiteboards, entrance and exit tickets, CDTs, DIBELS, Aimsweb* Whiteboards Warm up problems

Southern Lehigh School District

UbD Curriculum Template

Course: **Geometry** Unit: **Unit 3 - Triangle Congruence** Grades: **9-10**

Teacher Team: **Greenawald, Dottery, Skrapits, Everett** Date: **October, 2016**

Stage 1 – Desired Results	
Established Goals	**Enduring Understandings/Transfer**
1. What 21st Century Essentials included in the mission statement will this unit address? *Adaptation and flexibility* *Transfer of Learning* *Problem-solving* *Effective Communication Skills* 2. What content standards will this unit address? • ELA PA Core State Standards • Math PA Core State Standards CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures. CC.2.3.HS.A.14: Apply geometric concepts to model and solve real world problems. CC.2.3.HS.A.2 Apply rigid transformation to determine and explain congruence CC.2.3.HS.A.4 Apply the concept of congruence to create geometric constructions. • PA Content Standards	**Written as a declarative statement, an enduring understanding is a "big idea" that focuses on larger concepts, principles, and processes that go beyond discrete facts or skills. Enduring Understandings are applicable to new situations across content areas and TRANSFERABLE (the ability to learn in one context and apply to a new situation, particularly outside of the classroom) to the real world.** 3. List the Enduring Understanding(s): *a. Geometric relationships and concepts can be modeled and applied in areas such as art, architecture, construction, and engineering.* *b. Inductive and deductive reasoning skills can be applied through geometric concepts and results in drawing reasonable conclusions.* *c. The modeling of geometric concepts apply in all worldly applications.* *d. Communication of geometric terms in proper notation and definitions is critical for understanding.* *e. Students analyze, verify and justify their solutions to problems and can explain it to others.* *f. Communicate mathematical concepts to peers, teachers, and instructional assistants in a safe and encouraging environment.* 4. What do you want students to do with this knowledge or skill beyond this course? What is Transfer? *a. Students will make sense of and persevere in solving complex and novel mathematical problems.* *b. Students will use effective mathematical reasoning to construct viable arguments and critique the reasoning of others.* *c. Students will communicate precisely when making mathematical statements and express answers with a degree of precision appropriate for the context of the problem/situation.* *d. Students will apply mathematical knowledge to analyze and model situations/relationships using multiple representations and appropriate tools in order to make decisions, solve problems, and draw conclusions.* *e. Students will make use of structure and repeated reasoning to gain a mathematical perspective and formulate generalized problem solving strategies* *f. Given a word problem, students will solve the word problem using an appropriate strategy or strategies and will share and compare the use of multiple strategies leading to the same answer.*

	Essential Questions	
	What thought-provoking questions will foster inquiry, meaning-making, and transfer? 5. List the Essential Question(s) that students should ponder, wonder about or explain by the end of this unit: *How do the relationships of congruence help us solve real-world problems?*	
	Acquisition	
	Students will know...	**Students will be skilled at... (be able to do)**
	6. What facts should students know and be able to use to gain further knowledge? *Proper Geometry notation* *Classification of triangles by sides and angles* *Deductive Reasoning skills and proof* 7. What vocabulary should students know and be able to recall? *acute, obtuse, right, equiangular, scalene, equilateral, isosceles triangles, base, legs, hypotenuse of triangles, base, base angle, vertex, vertex angle, interior and exterior angles, remote interior angles, corresponging angles, corresponding sides, included side and angle, congruence, CPCTC* 8. What basic concepts should students know and be able to recall and apply? *Classifying Triangles by sides and angles* *Angle Relationships in Triangles* *Congurence in Triangles and proving these relationships* *Isosceles and Equilateral Triangle Relationships*	9. What discrete skill and processes should students be able to demonstrate? *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.1.3.1.1 Identify and/or use properties of congruence.* *G.1.3.2.1 Write, analyze, complete or identify formal proofs.*

Stage 2 – Evidence	
NETS for Students	**PERFORMANCE TASK(S)—can include transfer tasks and Project-Based Learning**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to	*Examples include but are not limited to:* *Labs, open-ended essays, voice recordings, videos, presentations, discussion boards, graphic organizers, songs, skits, dioramas, visual projects (posters, dioramas)*

learn effectively and live productively in an increasingly global and digital world. *Critical Thinking* *Creative and Innovation* *Communication and Collaboration* *Technology Operations*	List the task(s), then explain how the student will demonstrate the transfer of knowledge or skill involved in the task(s) (reference Stage 1, Item #4): *Student work shared with explanations of work* *Investigations using Geometric tools, Sketchpad or Desmos to create their own conjectures* *Quizzes and tests* *Daily exit tickets* *Practice proofs* *Questions regarding daily homework assignments*
	OTHER SUMMATIVE ASSESSMENTS—can include factual recall
	Examples include but are not limited to final projects, research papers, quizzes and tests. List the assessments: *Mid-Unit Quiz* *End of Unit Quiz* *Proof Test*

Stage 3 – Learning Plan		
NETS for Students	**Learning Activities**	**Progress Monitoring/Formative Assessment**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Communication and Collaboration* *Creative and Innovation* *Research and Information Fluency* *Critical Thinking*	Questions to consider while planning: • Are transfer and acquisition addressed in the learning plan? • Does the learning plan reflect principles of learning and best practices? • Is there tight alignment with Stages 1 and 2? • Is the plan likely to be engaging and effective for all students?	• **How will you monitor students' progress toward acquisition, meaning, and transfer during learning activities?** Daily assessments, teacher observation of student in-class performance, teacher observation of student presentations. • **What are potential rough spots and student misunderstandings?** Students will have difficulty completing proofs in both equality or congruence situations. • **How will students get the feedback they need?** Homework assessments, immediate feedback during in-class assignments, mid-chapter quiz, peer feedback and discussion

	List planned activities *(examples include but are not limited to: experiments, guided reading, worksheets, discussions, note-taking, research, games)*: Practice Proofs Peer and Group Proof practice Note-taking In-Class Assignments	**List resources required** *(examples include but are not limited to: laptops, iPads, websites, digital cameras, magazines, Blackboard, textbooks, novels, primary source documents, other non-fiction text, lab equipment, maps, translator, calculators)* Textbook, notebook, ruler, protractor, compass straightedge, white boards, and calculators, sketchpad	**FORMATIVE ASSESSMENTS—any non-graded, diagnostic assessment administered prior to or during a unit that reflects prior knowledge, skill levels, and potential misconceptions.** *Examples include but are not limited to: Pre-tests, clickers (CPS), mini whiteboards, entrance and exit tickets, CDTs, DIBELS, Aimsweb* Whiteboards Warm up problems Lesson Quizzes

Southern Lehigh School District

UbD Curriculum Template

Course: **Geometry** Unit: **Unit 4 - Triangle Similarity** Grades: **9-10**

Teacher Team: **Greenawald, Dottery, Skrapits, Everett** Date: **October, 2016**

Stage 1 – Desired Results	
Established Goals	**Enduring Understandings/Transfer**
1. What 21st Century Essentials included in the mission statement will this unit address? *Adaptation and flexibility* *Transfer of Learning* *Problem-solving* *Effective Communication Skills* 2. What content standards will this unit address? Please access the appropriate standards and copy/paste in the gray region • ELA PA Core State Standards • Math PA Core State Standards CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures. CC.2.3.HS.A.14: Apply geometric concepts to model and solve real world problems. CC.2.3.HS.A.5 Create justifications based on transformations to establish similarity of plane figures. **CC.2.3.HS.A.9 Extend the concept of similarity to determine arc lengths and	**Written as a declarative statement, an enduring understanding is a "big idea" that focuses on larger concepts, principles, and processes that go beyond discrete facts or skills. Enduring Understandings are applicable to new situations across content areas and TRANSFERABLE (the ability to learn in one context and apply to a new situation, particularly outside of the classroom) to the real world.** 3. List the Enduring Understanding(s): *a. Geometric relationships and concepts can be modeled and applied in areas such as art, architecture, construction, and engineering.* *b. Inductive and deductive reasoning skills can be applied through geometric concepts and results in drawing reasonable conclusions.* *c. The modeling of geometric concepts apply in all worldly applications.* *d. Communication of geometric terms in proper notation and definitions is critical for understanding.* *e. Students analyze, verify and justify their solutions to problems and can explain it to others.* *f. Communicate mathematical concepts to peers, teachers, and instructional assistants in a safe and encouraging environment.* 4. What do you want students to do with this knowledge or skill beyond this course? What is Transfer? *a. Students will make sense of and persevere in solving complex and novel mathematical problems.* *b. Students will use effective mathematical reasoning to construct viable arguments and critique the reasoning of others.* *c. Students will communicate precisely when making mathematical statements and express answers with a degree of precision appropriate for the context of the problem/situation.* *d. Students will apply mathematical knowledge to analyze and model situations/relationships using multiple representations and appropriate tools in order to make decisions, solve problems, and draw conclusions.* *e. Students will make use of structure and repeated reasoning to gain a mathematical perspective and formulate generalized problem solving strategies* *f. Given a word problem, students will solve the word problem using an appropriate strategy or strategies and will share and compare the use of multiple strategies leading to the same answer.*

areas of sectors of circles.

CC.2.3.8.A.2 Understand and apply congruence, similarity and geometric transformations using various tools.
CC.2.3.HS.A.2 Apply rigid transformation to determine and explain congruence
CC.2.3.HS.A.6 Verify and apply theormens involving similarity as they relate to plane figures.
CC.2.3.HS.A.1 Use geometric figures and their properties to represent transformations in the plane.

- PA Content Standards

Essential Questions

What thought-provoking questions will foster inquiry, meaning-making, and transfer?

5. List the Essential Question(s) that students should ponder, wonder about or explain by the end of this unit:
How do the relationships of angles and segments that intersect with circles help us solve real-world problems?

Acquisition

Students will know...

6. What facts should students know and be able to use to gain further knowledge?
Proper Geometry notation
Classification of angles
Deductive Reasoning skills and proof

7. What vocabulary should students know and be able to recall?
acute, obtuse, right, scalene, equilateral, isosceles triangles, base, legs, hypotenuse of triangles, base, vertex, interior and exterior angles, remote interior angles, corresponging angles, corresponding sides, included side and angle, corresponding angles of similar triangles are congruent, corresponding sides of similar triangles are proportional, dialation, scale factor, scale drawing, scale, similar, similarity ratio

8. What basic concepts should students know and be able to recall and apply?
Transformations in the coordinate plane (dialations)
Ratios in Similar Polygons
Triangle Similarity: AA, SSS, SAS
Properties and Relationships in Similar Triangles and using them to solve problems
Similarity in Triangles and proving these relationships

Students will be skilled at... (be able to do)

9. What discrete skill and processes should students be able to demonstrate?

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.1.3.1.1 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)

Stage 2 – Evidence	
NETS for Students	**PERFORMANCE TASK(S)—can include transfer tasks and Project-Based Learning**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Critical Thinking* *Creative and Innovation* *Communication and Collaboration* *Technology Operations*	*Examples include but are not limited to:* *Labs, open-ended essays, voice recordings, videos, presentations, discussion boards, graphic organizers, songs, skits, dioramas, visual projects (posters, dioramas)* List the task(s), then explain how the student will demonstrate the transfer of knowledge or skill involved in the task(s) (reference Stage 1, Item #4): *Student work shared with explanations of work* *Investigations using Geometric tools, Sketchpad or Desmos to create their own conjectures* *Quizzes and tests* *Daily exit tickets* *Practice proofs* *Questions regarding daily homework assignments* *Scale Drawing*
	OTHER SUMMATIVE ASSESSMENTS—can include factual recall
	Examples include but are not limited to final projects, research papers, quizzes and tests. List the assessments: *Mid-Unit Quiz* *End of Unit Quiz* *Proof Test*

Stage 3 – Learning Plan		
NETS for Students	**Learning Activities**	**Progress Monitoring/Formative Assessment**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Communication and Collaboration* *Creative and Innovation* *Research and Information Fluency* *Critical Thinking*	Questions to consider while planning: • Are transfer and acquisition addressed in the learning plan? • Does the learning plan reflect principles of learning and best practices? • Is there tight alignment with Stages 1 and 2? • Is the plan likely to be engaging and effective for all students?	• **How will you monitor students' progress toward acquisition, meaning, and transfer during learning activities?** Daily assessments, teacher observation of student in-class performance, teacher observation of student presentations. • **What are potential rough spots and student misunderstandings?** Students will have difficulty completing proofs in similarity situations. • **How will students get the feedback they need?** Homework assessments, immediate feedback during in-class assignments, mid-chapter quiz, peer feedback

			and discussion
	List planned activities *(examples include but are not limited to: experiments, guided reading, worksheets, discussions, note-taking, research, games)*: Practice Proofs Peer and Group Proof practice Note-taking In-Class Assignments	**List resources required** *(examples include but are not limited to: laptops, iPads, websites, digital cameras, magazines, Blackboard, textbooks, novels, primary source documents, other non-fiction text, lab equipment, maps, translator, calculators)* Textbook, notebook, ruler, protractor, compass straightedge, white boards, and calculators, sketchpad	**FORMATIVE ASSESSMENTS—any non-graded, diagnostic assessment administered prior to or during a unit that reflects prior knowledge, skill levels, and potential misconceptions.** *Examples include but are not limited to: Pre-tests, clickers (CPS), mini whiteboards, entrance and exit tickets, CDTs, DIBELS, Aimsweb* Whiteboards Warm up problems Lesson Quizzes

Southern Lehigh School District

UbD Curriculum Template

Course: **Geometry** Unit: **Unit 5 - Quadrilaterals and Polygons** Grades: **9-10**

Teacher Team: **Greenawald, Dottery, Skrapits, Everett** Date: **October, 2016**

Stage 1 – Desired Results	
Established Goals	**Enduring Understandings/Transfer**
1. What 21st Century Essentials included in the mission statement will this unit address? *Adaptation and flexibility* *Transfer of Learning* *Problem-solving* *Effective Communication Skills* 2. What content standards will this unit address? • ELA PA Core State Standards • Math PA Core State 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. CC.2.3.HS.A.14: Apply geometric concepts to model and solve real world problems. CC.2.3.HS.A.2 Apply rigid transformation to determine and explain congruence • PA Content Standards	**Written as a declarative statement, an enduring understanding is a "big idea" that focuses on larger concepts, principles, and processes that go beyond discrete facts or skills. Enduring Understandings are applicable to new situations across content areas and TRANSFERABLE (the ability to learn in one context and apply to a new situation, particularly outside of the classroom) to the real world.** 3. List the Enduring Understanding(s): *a. Geometric relationships and concepts can be modeled and applied in areas such as art, architecture, construction, and engineering.* *b. Inductive and deductive reasoning skills can be applied through geometric concepts and results in drawing reasonable conclusions.* *c. The modeling of geometric concepts apply in all worldly applications.* *d. Communication of geometric terms in proper notation and definitions is critical for understanding.* *e. Students analyze, verify and justify their solutions to problems and can explain it to others.* *f. Communicate mathematical concepts to peers, teachers, and instructional assistants in a safe and encouraging environment.* 4. What do you want students to do with this knowledge or skill beyond this course? What is Transfer? *a. Students will make sense of and persevere in solving complex and novel mathematical problems.* *b. Students will use effective mathematical reasoning to construct viable arguments and critique the reasoning of others.* *c. Students will communicate precisely when making mathematical statements and express answers with a degree of precision appropriate for the context of the problem/situation.* *d. Students will apply mathematical knowledge to analyze and model situations/relationships using multiple representations and appropriate tools in order to make decisions, solve problems, and draw conclusions.* *e. Students will make use of structure and repeated reasoning to gain a mathematical perspective and formulate generalized problem solving strategies* *f. Given a word problem, students will solve the word problem using an appropriate strategy or strategies and will share and compare the use of multiple strategies leading to the same answer.*

	Essential Questions	
	What thought-provoking questions will foster inquiry, meaning-making, and transfer? 5. List the Essential Question(s) that students should ponder, wonder about or explain by the end of this unit: *How do the relationships of quadrilaterals/polygons help us solve real-world problems?*	
	Acquisition	
	Students will know...	**Students will be skilled at... (be able to do)**
	6. What facts should students know and be able to use to gain further knowledge? *Proper Geometry notation* *Basic geometry defintions* *Classification of angles and sides* *Writing linear equations* *Determine missing angles: vertical, linear pairs, alternate interior/exterior, and cooresponding* *Deductive Reasoning skills and proof* 7. What vocabulary should students know and be able to recall? *polygon, n-gon, exterior/interior angle, regular/irregular, base, leg, base angle, vertex, side, concave, convex, diagonal, isosceles, parallelogram, kite, non vertex angles, midsegment, rectangle, rhombus, square, trapezoid* 8. What basic concepts should students know and be able to recall and apply? *Classify polygons based on sides and angles* *Find measures of interior and exterior angles of polygons* *Properties and Conditions of Parallelograms and special parallelograms, kites and trapezoids*	9. What discrete skill and processes should students be able to demonstrate? *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.1.3.1.1 Identify and/or use properties of congruence.* *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 the measures of missing angles.* *G.2.2.1.2 Use properties of angles formed when two parallel lines are cut by a transversal*

Stage 2 – Evidence	
NETS for Students	**PERFORMANCE TASK(S)—can include transfer tasks and Project-Based Learning**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Critical Thinking* *Creative and Innovation* *Communication and Collaboration* *Technology Operations*	*Examples include but are not limited to:* *Labs, open-ended essays, voice recordings, videos, presentations, discussion boards, graphic organizers, songs, skits, dioramas, visual projects (posters, dioramas)* List the task(s), then explain how the student will demonstrate the transfer of knowledge or skill involved in the task(s) (reference Stage 1, Item #4): *Student work shared with explanations of work* *Investigations using Geometric tools, Sketchpad or Desmos to create their own conjectures* *Quizzes and tests* *Exit tickets* *Questions regarding daily homework assignments*
	OTHER SUMMATIVE ASSESSMENTS—can include factual recall
	Examples include but are not limited to final projects, research papers, quizzes and tests. List the assessments: *Mid-Unit Quiz* *End of Unit Test*

Stage 3 – Learning Plan		
NETS for Students	**Learning Activities**	**Progress Monitoring/Formative Assessment**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Communication and Collaboration* *Creative and Innovation* *Research and Information Fluency* *Critical Thinking*	Questions to consider while planning: • Are transfer and acquisition addressed in the learning plan? • Does the learning plan reflect principles of learning and best practices? • Is there tight alignment with Stages 1 and 2? • Is the plan likely to be engaging and effective for all students?	• **How will you monitor students' progress toward acquisition, meaning, and transfer during learning activities?** Daily assessments, teacher observation of student in-class performance, teacher observation of student presentations. • **What are potential rough spots and student misunderstandings?** Solving for unknown amount of sides given the interior angle sum. Using algebra to find missing meausures in polygons. • **How will students get the feedback they need?** Homework assessments, immediate feedback during in-class assignments, mid-chapter quiz, peer feedback

			and discussion
	List planned activities *(examples include but are not limited to: experiments, guided reading, worksheets, discussions, note-taking, research, games)*: Experiments Study Guide Development Note-taking In-Class Assignments	**List resources required** *(examples include but are not limited to: laptops, iPads, websites, digital cameras, magazines, Blackboard, textbooks, novels, primary source documents, other non-fiction text, lab equipment, maps, translator, calculators)* Textbook, notebook, ruler, protractor, compass straightedge, white boards, and calculators, sketchpad	**FORMATIVE ASSESSMENTS—any non-graded, diagnostic assessment administered prior to or during a unit that reflects prior knowledge, skill levels, and potential misconceptions.** *Examples include but are not limited to: Pre-tests, clickers (CPS), mini whiteboards, entrance and exit tickets, CDTs, DIBELS, Aimsweb* Whiteboards Warm up problems Lesson Quizzes

Southern Lehigh School District

UbD Curriculum Template

Course: **Geometry** Unit: **Unit 6 - Polygon Similarity** Grades: **8-11**

Teacher Team: **Greenawald, Dottery, Skrapits, Everett** Date: **October, 2016**

Stage 1 – Desired Results	
Established Goals	**Enduring Understandings/Transfer**
1. What 21st Century Essentials included in the mission statement will this unit address? *Adaptation and flexibility* *Transfer of Learning* *Problem-solving* *Effective Communication Skills* 2. What content standards will this unit address? • ELA PA Core State Standards • Math PA Core State Standards CC.2.3.HS.A.1 Use geometric figures and their properties to represent transformations in the plane. CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures. CC.2.3.HS.A.14: Apply geometric concepts to model and solve real world problems. 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.	**Written as a declarative statement, an enduring understanding is a "big idea" that focuses on larger concepts, principles, and processes that go beyond discrete facts or skills. Enduring Understandings are applicable to new situations across content areas and TRANSFERABLE (the ability to learn in one context and apply to a new situation, particularly outside of the classroom) to the real world.** 3. List the Enduring Understanding(s): *a. Geometric relationships and concepts can be modeled and applied in areas such as art, architecture, construction, and engineering.* *b. Inductive and deductive reasoning skills can be applied through geometric concepts and results in drawing reasonable conclusions.* *c. The modeling of geometric concepts apply in all worldly applications.* *d. Communication of geometric terms in proper notation and definitions is critical for understanding.* *e. Students analyze, verify and justify their solutions to problems and can explain it to others.* *f. Communicate mathematical concepts to peers, teachers, and instructional assistants in a safe and encouraging environment.* 4. What do you want students to do with this knowledge or skill beyond this course? What is Transfer? *a. Students will make sense of and persevere in solving complex and novel mathematical problems.* *b. Students will use effective mathematical reasoning to construct viable arguments and critique the reasoning of others.* *c. Students will communicate precisely when making mathematical statements and express answers with a degree of precision appropriate for the context of the problem/situation.* *d. Students will apply mathematical knowledge to analyze and model situations/relationships using multiple representations and appropriate tools in order to make decisions, solve problems, and draw conclusions.* *e. Students will make use of structure and repeated reasoning to gain a mathematical perspective and formulate generalized problem solving strategies* *f. Given a word problem, students will solve the word problem using an appropriate strategy or strategies and will share and compare the use of multiple strategies leading to the same answer.*

CC.2.3.HS.A.8 Apply geometric theorems to verify properties of circles.
CC.2.3.HS.A.13 Analyze relationships between two - dimensional and three - dimensional objects.
CC.2.3.8.A.1 Apply the concepts of volume of cylinders, cones, and spheres to solve real - world and mathematical problems.
CC.2.3.8.A.2 Understand and apply congruence, similarity, and geometric transformations using various tools.
CC.2.3.HS.A.2 Apply rigid transformation to determine and explain congruence

- PA Content Standards

Essential Questions

What thought-provoking questions will foster inquiry, meaning-making, and transfer?

5. List the Essential Question(s) that students should ponder, wonder about or explain by the end of this unit:
How do similar figures help us solve real-world problems?

Acquisition

Students will know...

6. What facts should students know and be able to use to gain further knowledge?
Proper Geometry notation
Basic geometry definitions
Solving and setting up proportions
Distributive property
Classification of angles
Deductive Reasoning skills and proof

7. What vocabulary should students know and be able to recall?
acute, obtuse, right, scalene, equilateral, isosceles triangles, base, legs, hypotenuse of triangles, base, vertex, interior and exterior angles, remote interior angles, corresponging angles, corresponding sides, included side and angle, CPCTC, AA, SSS, SAS, angle bisectors, medians, altitudes, midsegment, parallel lines, polygons

8. What basic concepts should students know and be able to recall and apply?
Transformations in the coordinate plane
Classifying Triangles by sides and angles
Angle Relationships in Triangles
Congurence in Triangles and proving these relationships
Isosceles and Equilateral Triangle Relationships

Students will be skilled at... (be able to do)

9. What discrete skill and processes should students be able to demonstrate?

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.1.3.1.1 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).

Stage 2 – Evidence	
NETS for Students	**PERFORMANCE TASK(S)—can include transfer tasks and Project-Based Learning**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Critical Thinking* *Creative and Innovation* *Communication and Collaboration* *Technology Operations*	*Examples include but are not limited to:* *Labs, open-ended essays, voice recordings, videos, presentations, discussion boards, graphic organizers, songs, skits, dioramas, visual projects (posters, dioramas)* List the task(s), then explain how the student will demonstrate the transfer of knowledge or skill involved in the task(s) (reference Stage 1, Item #4): *Student work shared with explanations of work* *Investigations using Geometric tools, Sketchpad or Desmos to create their own conjectures* *Quizzes and tests* *Daily exit tickets* *Practice proofs* *Questions regarding daily homework assignments*
	OTHER SUMMATIVE ASSESSMENTS—can include factual recall
	Examples include but are not limited to final projects, research papers, quizzes and tests. List the assessments: *Mid-Unit Quiz* *End of Unit Quiz* *Proof Test*

Stage 3 – Learning Plan		
NETS for Students	**Learning Activities**	**Progress Monitoring/Formative Assessment**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Communication and Collaboration* *Creative and Innovation* *Research and Information Fluency* *Critical Thinking*	Questions to consider while planning: • Are transfer and acquisition addressed in the learning plan? • Does the learning plan reflect principles of learning and best practices? • Is there tight alignment with Stages 1 and 2? • Is the plan likely to be engaging and effective for all students?	• **How will you monitor students' progress toward acquisition, meaning, and transfer during learning activities?** Daily assessments, teacher observation of student in-class performance, teacher observation of student presentations. • **What are potential rough spots and student misunderstandings?** Students will have difficulty completing proofs in both equality or congruence situations. Students will struggle calculating missing measures, when the smaller similar triangle is inside the larger corresponding triangle. • **How will students get the feedback they need?**

			Homework assessments, immediate feedback during in-class assignments, mid-chapter quiz, peer feedback and discussion
	List planned activities *(examples include but are not limited to: experiments, guided reading, worksheets, discussions, note-taking, research, games)*: Practice Proofs Peer and Group Proof practice Experimentation Indirect Measurement Activity Dilation Activity Note-taking In-Class Assignments	**List resources required** *(examples include but are not limited to: laptops, iPads, websites, digital cameras, magazines, Blackboard, textbooks, novels, primary source documents, other non-fiction text, lab equipment, maps, translator, calculators)* Textbook, notebook, ruler, protractor, compass straightedge, white boards, and calculators, sketchpad	**FORMATIVE ASSESSMENTS—any non-graded, diagnostic assessment administered prior to or during a unit that reflects prior knowledge, skill levels, and potential misconceptions.** *Examples include but are not limited to: Pre-tests, clickers (CPS), mini whiteboards, entrance and exit tickets, CDTs, DIBELS, Aimsweb* Whiteboards Warm up problems Lesson Quizzes Dilation Project

Southern Lehigh School District

UbD Curriculum Template

Course: **Geometry** Unit: **Unit 7 - Triangle Applications** Grades: **9-10**

Teacher Team: **Greenawald, Dottery, Skrapits, Everett** Date: **October, 2016**

Stage 1 – Desired Results

Established Goals

1. What 21st Century Essentials included in the mission statement will this unit address?
   Adaptation and flexibility
   Transfer of Learning
   Problem-solving

2. What content standards will this unit address?

   - ELA PA Core State Standards

   - Math PA Core State Standards
     CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures.
     CC.2.3.HS.A.14: Apply geometric concepts to model and solve real world problems.
     CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.
     CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.
   - PA Content Standards

Enduring Understandings/Transfer

Written as a declarative statement, an enduring understanding is a "big idea" that focuses on larger concepts, principles, and processes that go beyond discrete facts or skills. Enduring Understandings are applicable to new situations across content areas and TRANSFERABLE (the ability to learn in one context and apply to a new situation, particularly outside of the classroom) to the real world.

3. List the Enduring Understanding(s):
   a. Geometric relationships and concepts can be modeled and applied in areas such as art, architecture, construction, and engineering.
   b. The modeling of geometric concepts apply in all worldly applications.
   c. Communication of geometric terms in proper notation and definitions is critical for understanding.
   d. Analyze, verify and justify solutions to problems and explain it to others.
   e. Communicate mathematical concepts to peers, teachers, and instructional assistants in a safe and encouraging environment.

4. What do you want students to do with this knowledge or skill beyond this course? What is Transfer?
   a. Students will make sense of and persevere in solving complex and novel mathematical problems.
   b. Students will use effective mathematical reasoning to construct viable arguments and critique the reasoning of others.
   c. Students will communicate precisely when making mathematical statements and express answers with a degree of precision appropriate for the context of the problem/situation.
   d. Students will apply mathematical knowledge to analyze and model situations/relationships using multiple representations and appropriate tools in order to make decisions, solve problems, and draw conclusions.
   e. Students will make use of structure and repeated reasoning to gain a mathematical perspective and formulate generalized problem solving strategies
   f. Given a word problem, students will solve the word problem using an appropriate strategy or strategies and will share and compare the use of multiple strategies leading to the same answer.

Essential Questions

What thought-provoking questions will foster inquiry, meaning-making, and transfer?

5. List the Essential Question(s) that students should ponder, wonder about or explain by the end of this unit:
In what ways can triangles be applied in the real world: engineering, construction, etc?

Acquisition

Students will know...

6. What facts should students know and be able to use to gain further knowledge?
Difference between a leg and the hypotenuse
Applying the Pythagorean Theorem
Notation of special right triangles
Applying the basic trigonometric functions (SOHCAHTOA)
Applying angles of elevation and depression
Solving for missing lengths and angles

7. What vocabulary should students know and be able to recall?
Right triangle, obtuse triangle, acute triangle, Pythagorean Theorem, legs, hypotenuse, isosceles right triangles, 30/60/90 triangles sin, cos, tan, SOHCAHTOA, theta, angle of elevation, angle of depression, Law of Sines, Law of Cosines, Unit Circle

8. What basic concepts should students know and be able to recall and apply?
Students will apply the Pythagorean Theorem to solve for legs or the hypotenuse of a right triangle.
Students will use the shortcuts to determine missing lengths in special right triangles
Students will use the basic trigonometric functions to determine missing angles or sides in right triangles
Students will apply angles of elevation and angles of depression to real life situations
Students will apply the Law of Sines or the Law of Cosines to triangles that are not right triangles
Students will apply special right triangles to the Unit Circle

Students will be skilled at... (be able to do)

9. What discrete skill and processes should students be able to demonstrate?

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 and/or indirect proofs/proofs by contradiction)

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.2.2.3.1
Describe how a change in the linear dimension of a figure affects its perimeter, circumference, and area

Stage 2 – Evidence	
NETS for Students	**PERFORMANCE TASK(S)—can include transfer tasks and Project-Based Learning**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Critical Thinking* *Creative and Innovation*	*Examples include but are not limited to:* *Labs, open-ended essays, voice recordings, videos, presentations, discussion boards, graphic organizers, songs, skits, dioramas, visual projects (posters, dioramas)* List the task(s), then explain how the student will demonstrate the transfer of knowledge or skill involved in the task(s) (reference Stage 1, Item #4): *Student work shared with explanations of work and comparisons to other solutions* *Investigations using Geometric tools, Sketchpad or Desmos to create their own conjectures* *Peer reviewed work* *Quizzes and tests* *Daily exit tickets* *Collection/grading of daily homework assignments*
	OTHER SUMMATIVE ASSESSMENTS—can include factual recall
	Examples include but are not limited to final projects, research papers, quizzes and tests. List the assessments: *Mid-Unit Quiz* *Unit 6 Exam*

Stage 3 – Learning Plan		
NETS for Students	**Learning Activities**	**Progress Monitoring/Formative Assessment**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Communication and Collaboration* *Creative and Innovation* *Research and Information Fluency* *Critical Thinking*	Questions to consider while planning: • Are transfer and acquisition addressed in the learning plan? • Does the learning plan reflect principles of learning and best practices? • Is there tight alignment with Stages 1 and 2? • Is the plan likely to be engaging and effective for all students?	• **How will you monitor students' progress toward acquisition, meaning, and transfer during learning activities?** Daily assessments, teacher observation of student in-class performance, teacher observation of student presentations. • **What are potential rough spots and student misunderstandings?** Appropriately determining the proper trigonometric functions or rules for determining missing pieces of triangles. • **How will students get the feedback they need?** Graded homework assessments, immediate feedback during in-class assignments, mid-chapter quiz, peer feedback and discussion

	List planned activities *(examples include but are not limited to: experiments, guided reading, worksheets, discussions, note-taking, research, games)*: Pythagorean Pictionary Definition Presentations Word Wall Note-taking In-Class Assignments	**List resources required** *(examples include but are not limited to: laptops, iPads, websites, digital cameras, magazines, Blackboard, textbooks, novels, primary source documents, other non-fiction text, lab equipment, maps, translator, calculators)* Textbook, notebook, ruler, protractor, compass straightedge, white boards, and calculators	**FORMATIVE ASSESSMENTS—any non-graded, diagnostic assessment administered prior to or during a unit that reflects prior knowledge, skill levels, and potential misconceptions.** *Examples include but are not limited to: Pre-tests, clickers (CPS), mini whiteboards, entrance and exit tickets, CDTs, DIBELS, Aimsweb* Whiteboards Warm up problems

Southern Lehigh School District

UbD Curriculum Template

Course: **Geometry** Unit: **Unit 8 - Circles** Grades: **9-10**

Teacher Team: **Greenawald, Dottery, Skrapits, Everett** Date: **October, 2016**

Stage 1 – Desired Results	
Established Goals	**Enduring Understandings/Transfer**
1. What 21st Century Essentials included in the mission statement will this unit address? *Adaptation and flexibility* *Transfer of Learning* *Problem-solving* *Effective Communication Skills* 2. What content standards will this unit address? • ELA PA Core State Standards • Math PA Core State Standards CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures. CC.2.3.HS.A.14: Apply geometric concepts to model and solve real world problems. CC.2.3.HS.A.8 Apply theorems to verify properties of circles. • PA Content Standards	**Written as a declarative statement, an enduring understanding is a "big idea" that focuses on larger concepts, principles, and processes that go beyond discrete facts or skills. Enduring Understandings are applicable to new situations across content areas and TRANSFERABLE (the ability to learn in one context and apply to a new situation, particularly outside of the classroom) to the real world.** 3. List the Enduring Understanding(s): *a. Geometric relationships and concepts can be modeled and applied in areas such as art, architecture, construction, and engineering.* *b. Inductive and deductive reasoning skills can be applied through geometric concepts and results in drawing reasonable conclusions.* *c. The modeling of geometric concepts apply in all worldly applications.* *d. Communication of geometric terms in proper notation and definitions is critical for understanding.* *e. Students analyze, verify and justify their solutions to problems and can explain it to others.* *f. Communicate mathematical concepts to peers, teachers, and instructional assistants in a safe and encouraging environment.* 4. What do you want students to do with this knowledge or skill beyond this course? What is Transfer? *a. Students will make sense of and persevere in solving complex and novel mathematical problems.* *b. Students will use effective mathematical reasoning to construct viable arguments and critique the reasoning of others.* *c. Students will communicate precisely when making mathematical statements and express answers with a degree of precision appropriate for the context of the problem/situation.* *d. Students will apply mathematical knowledge to analyze and model situations/relationships using multiple representations and appropriate tools in order to make decisions, solve problems, and draw conclusions.* *e. Students will make use of structure and repeated reasoning to gain a mathematical perspective and formulate generalized problem solving strategies* *f. Given a word problem, students will solve the word problem using an appropriate strategy or strategies and will share and compare the use of multiple strategies leading to the same answer.*

Essential Questions

What thought-provoking questions will foster inquiry, meaning-making, and transfer?

5. List the Essential Question(s) that students should ponder, wonder about or explain by the end of this unit:
   How do the relationships of angles and segments that intersect with circles help us solve real-world problems?

Acquisition

Students will know...	**Students will be skilled at... (be able to do)**
6. What facts should students know and be able to use to gain further knowledge? *Proper Geometry notation* *Properties of Similar Triangles* *Area and perimeter formulas for circles* *How to prove similarity in triangles* 7. What vocabulary should students know and be able to recall? *adjacent arcs, arc, arc length, central angle, chord, common tangent, concentric circles, congruent arcs, congruent circles, exterior of a circle, inscribed angle, intercepted arc, interior of a circle, major arc, minor arc, point of tangency, secant, sector of a circle, semicircle, tangent* 8. What basic concepts should students know and be able to recall and apply? *Identify and describe relationships among inscribed angles, radii and chords.* *Apply properties of arcs and chords.* *Find the area of sectors and lengths of arcs* *Find the measure of inscribed angles, central angles, and measures of angles formed by lines that intersect circles.* *Find the lengths of segments formed by lines that intersect circles.* *Write equations and graph circles to solve problems.*	9. What discrete skill and processes should students be able to demonstrate? *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.1.2.1.1 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.1.3.1.1 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.2.1.1.1 Use the Pythagorean Theorem to write and/or solve problems involving right triangles.* *G.2.2.2.5 Find the area of a sector of a circle.* *G.1.3.2.1 Write, analyze, complete or identify formal proofs.*

		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.2.2.3.1* *Describe how a change in the linear dimension of a figure affects its perimeter, circumference, and area*

Stage 2 – Evidence	
NETS for Students	**PERFORMANCE TASK(S)—can include transfer tasks and Project-Based Learning**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Critical Thinking* *Creative and Innovation* *Communication and Collaboration* *Technology Operations*	*Examples include but are not limited to:* *Labs, open-ended essays, voice recordings, videos, presentations, discussion boards, graphic organizers, songs, skits, dioramas, visual projects (posters, dioramas)* List the task(s), then explain how the student will demonstrate the transfer of knowledge or skill involved in the task(s) (reference Stage 1, Item #4): *Student work shared with explanations of work* *Investigations using Geometric tools, Sketchpad or Desmos to create their own conjectures* *Peer reviewed work - Angle Puzzles* *Peer reviewed work - Segment Problems* *Quizzes and tests* *Daily exit tickets* *Questions regarding daily homework assignments*
	OTHER SUMMATIVE ASSESSMENTS—can include factual recall
	Examples include but are not limited to final projects, research papers, quizzes and tests. List the assessments: *Mid-Unit Quiz* *End of Unit Quiz*

<table>
<tr><th colspan="4">Stage 3 – Learning Plan</th></tr>
<tr><th>NETS for Students</th><th colspan="2">Learning Activities</th><th>Progress Monitoring/Formative Assessment</th></tr>
<tr><td rowspan="2">NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world.

Communication and Collaboration
Creative and Innovation
Research and Information Fluency
Critical Thinking</td><td colspan="2">Questions to consider while planning:
• Are transfer and acquisition addressed in the learning plan?
• Does the learning plan reflect principles of learning and best practices?
• Is there tight alignment with Stages 1 and 2?
• Is the plan likely to be engaging and effective for all students?</td><td>• How will you monitor students' progress toward acquisition, meaning, and transfer during learning activities?
Daily assessments, teacher observation of student in-class performance, teacher observation of student presentations.
• What are potential rough spots and student misunderstandings?
Students will have difficulty with the quantity of equations to remember. Segments in circles give students the most difficutly when applying the algebra.

• How will students get the feedback they need?
Homework assessments, immediate feedback during in-class assignments, mid-chapter quiz, peer feedback and discussion</td></tr>
<tr><td>List planned activities
(examples include but are not limited to: experiments, guided reading, worksheets, discussions, note-taking, research, games):

Student-created Angle Puzzles
Student-created Segment problems
Note-taking
In-Class Assignments</td><td>List resources required
(examples include but are not limited to: laptops, iPads, websites, digital cameras, magazines, Blackboard, textbooks, novels, primary source documents, other non-fiction text, lab equipment, maps, translator, calculators)
Textbook, notebook, ruler, protractor, compass straightedge, white boards, and calculators, sketchpad</td><td>FORMATIVE ASSESSMENTS—any non-graded, diagnostic assessment administered prior to or during a unit that reflects prior knowledge, skill levels, and potential misconceptions.

Examples include but are not limited to: Pre-tests, clickers (CPS), mini whiteboards, entrance and exit tickets, CDTs, DIBELS, Aimsweb

Whiteboards
Warm up problems
Lesson Quizzes</td></tr>
</table>

Southern Lehigh School District

UbD Curriculum Template

Course: **Geometry** Unit: **Unit 9 - Area of Polygons/Polyhedrons** Grades: **9-10**

Teacher Team: **Greenawald, Dottery, Skrapits, Everett** Date: **October, 2016**

Stage 1 – Desired Results	
Established Goals	**Enduring Understandings/Transfer**
1. What 21st Century Essentials included in the mission statement will this unit address? *Adaptation and flexibility* *Transfer of Learning* *Problem-solving* 2. What content standards will this unit address? • ELA PA Core State Standards • Math PA Core State Standards CC.2.3.HS.A.3: Verify and apply geometric theorems as they relate to geometric figures. CC.2.3.HS.A.14: Apply geometric concepts to model and solve real world problems. • PA Content Standards	**Written as a declarative statement, an enduring understanding is a "big idea" that focuses on larger concepts, principles, and processes that go beyond discrete facts or skills. Enduring Understandings are applicable to new situations across content areas and TRANSFERABLE (the ability to learn in one context and apply to a new situation, particularly outside of the classroom) to the real world.** 3. List the Enduring Understanding(s): *a. Geometric relationships and concepts can be modeled and applied in areas such as art, architecture, construction, and engineering.* *b. Inductive and deductive reasoning skills can be applied through geometric concepts and results in drawing reasonable conclusions.* *c. The modeling of geometric concepts apply in all worldly applications.* *d. Communication of geometric terms in proper notation and definitions is critical for understanding.* *e. Analyze, verify and justify solutions to problems and explain it to others.* *f. Communicate mathematical concepts to peers, teachers, and instructional assistants in a safe and encouraging environment.* *g. Area of polygons and surface area of polyhedrons are critical in solving real world problems and situations.* 4. What do you want students to do with this knowledge or skill beyond this course? What is Transfer? *a. Students will make sense of and persevere in solving complex and novel mathematical problems.* *b. Students will use effective mathematical reasoning to construct viable arguments and critique the reasoning of others.* *c. Students will communicate precisely when making mathematical statements and express answers with a degree of precision appropriate for the context of the problem/situation.* *d. Students will apply mathematical knowledge to analyze and model situations/relationships using multiple representations and appropriate tools in order to make decisions, solve problems, and draw conclusions.* *e. Students will make use of structure and repeated reasoning to gain a mathematical perspective and formulate generalized problem solving strategies* *f. Given a word problem, students will solve the word problem using an appropriate strategy or strategies and will share and compare the use of multiple strategies leading to the same answer.*

Essential Questions

What thought-provoking questions will foster inquiry, meaning-making, and transfer?

5. List the Essential Question(s) that students should ponder, wonder about or explain by the end of this unit:
   How do I determine surface area of various polygons and polyhedrons and how are these skills applied to real world problems?

Acquisition

Students will know...

6. What facts should students know and be able to use to gain further knowledge?
   Concept of area and square units
   Classifying polygons and polyhedrons
   Solving for a single variable using algebra

7. What vocabulary should students know and be able to recall?
   Rectangle, parallelogram, triangle, kite, trapezoid, regular polygon, apothem, side length, equilateral, isosceles, diagonal, base, altitude (height), circle, sector of a circle, segment of a circle, annulus, cone, sphere, pyramid, cylinder, prism

8. What basic concepts should students know and be able to recall and apply?
   Determine the type of polygon or polyhedron.
   Apply the corresponding area formula to the polygon or polyhedron.
   Use basic algebraic skills to solve for missing variables.
   Apply the formula to the real world application.

Students will be skilled at... (be able to do)

9. What discrete skill and processes should students be able to demonstrate?

   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.1.1.1.4 Identify and/or use the properties of a sphere or cylinder

   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

   G.2.1.1.1 Use the Pythagorean Theorem to write and/or solve problems involving right triangles.

   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.2.2.3.1 Describe how a change in the linear dimension of a figure affects its perimeter, circumference, and area* *G.2.2.4.1 Use area models to find probabilities* *G.2.3.2.1 Describe how a change in the linear dimension of a figure affects its surface area or volume* *G.2.3.1.1 Calculate the surface area of prisms, cylinders, cones, pyramids, and/or spheres* *G.2.3.1.3 Find the measurement of a missing length given the surface area or volume*

Stage 2 – Evidence	
NETS for Students	**PERFORMANCE TASK(S)—can include transfer tasks and Project-Based Learning**
NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world. *Critical Thinking* *Creative and Innovation*	*Examples include but are not limited to:* *Labs, open-ended essays, voice recordings, videos, presentations, discussion boards, graphic organizers, songs, skits, dioramas, visual projects (posters, dioramas)* List the task(s), then explain how the student will demonstrate the transfer of knowledge or skill involved in the task(s) (reference Stage 1, Item #4): *Student work shared with explanations of work and comparisons to other solutions* *Investigations using Geometric tools, Sketchpad or Desmos to create their own conjectures* *Peer reviewed work* *Quizzes and tests* *Daily exit tickets* *Collection/grading of daily homework assignments*
	OTHER SUMMATIVE ASSESSMENTS—can include factual recall
	Examples include but are not limited to final projects, research papers, quizzes and tests. List the assessments: *Mid-Unit Quiz* *Unit 9 Test*

Stage 3 – Learning Plan

<table>
<tr><th>NETS for Students</th><th colspan="2">Learning Activities</th><th>Progress Monitoring/Formative Assessment</th></tr>
<tr><td rowspan="2">NETS—National Educational Technology Standards; i.e., the standards for evaluating the skills and knowledge students need to learn effectively and live productively in an increasingly global and digital world.

Communication and Collaboration
Creative and Innovation
Research and Information Fluency
Critical Thinking</td><td colspan="2">Questions to consider while planning:
• Are transfer and acquisition addressed in the learning plan?
• Does the learning plan reflect principles of learning and best practices?
• Is there tight alignment with Stages 1 and 2?
• Is the plan likely to be engaging and effective for all students?</td><td>• How will you monitor students' progress toward acquisition, meaning, and transfer during learning activities?
Daily assessments, teacher observation of student in-class performance, teacher observation of student presentations.
• What are potential rough spots and student misunderstandings?
Determining the 2 or 3 dimensional shape and it's appropriate formula.
Solving for missing lengths, sides, etc. using algebra.

• How will students get the feedback they need?
Graded homework assessments, immediate feedback during in-class assignments, mid-chapter quiz, peer feedback and discussion</td></tr>
<tr><td>List planned activities
(examples include but are not limited to: experiments, guided reading, worksheets, discussions, note-taking, research, games):

Area Investigations
Definition Presentations
Word Wall
Note-taking
In-Class Assignments</td><td>List resources required
(examples include but are not limited to: laptops, iPads, websites, digital cameras, magazines, Blackboard, textbooks, novels, primary source documents, other non-fiction text, lab equipment, maps, translator, calculators)

Textbook, notebook, ruler, protractor, compass straightedge, white boards, and calculators</td><td>FORMATIVE ASSESSMENTS—any non-graded, diagnostic assessment administered prior to or during a unit that reflects prior knowledge, skill levels, and potential misconceptions.

Examples include but are not limited to: Pre-tests, clickers (CPS), mini whiteboards, entrance and exit tickets, CDTs, DIBELS, Aimsweb

Whiteboards
Warm up problems</td></tr>
</table>

Southern Lehigh School District

UbD Curriculum Template

Course: **Geometry** Unit: **Unit 10 - Volume** Grades: **9-10**

Teacher Team: **Greenawald, Dottery, Skrapits, Everett** Date: **October, 2016**

Stage 1 – Desired Results	
Established Goals	**Enduring Understandings/Transfer**
1. What 21st Century Essentials included in the mission statement will this unit address? *Adaptation and flexibility* *Transfer of Learning* *Problem-solving* 2. What content standards will this unit address? • ELA PA Core State Standards • Math PA Core State 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.14: Apply geometric concepts to model and solve real world problems. • PA Content Standards	**Written as a declarative statement, an enduring understanding is a "big idea" that focuses on larger concepts, principles, and processes that go beyond discrete facts or skills. Enduring Understandings are applicable to new situations across content areas and TRANSFERABLE (the ability to learn in one context and apply to a new situation, particularly outside of the classroom) to the real world.** 3. List the Enduring Understanding(s): *a. Geometric relationships and concepts can be modeled and applied in areas such as art, architecture, construction, and engineering.* *b. Inductive and deductive reasoning skills can be applied through geometric concepts and results in drawing reasonable conclusions.* *c. The modeling of geometric concepts apply in all worldly applications.* *d. Communication of geometric terms in proper notation and definitions is critical for understanding.* *e. Analyze, verify and justify solutions to problems and explain it to others.* *f. Communicate mathematical concepts to peers, teachers, and instructional assistants in a safe and encouraging environment.* *g. Volume of 3 dimensional objects are critical in solving real world problems and situations.* 4. What do you want students to do with this knowledge or skill beyond this course? What is Transfer? *a. Students will make sense of and persevere in solving complex and novel mathematical problems.* *b. Students will use effective mathematical reasoning to construct viable arguments and critique the reasoning of others.* *c. Students will communicate precisely when making mathematical statements and express answers with a degree of precision appropriate for the context of the problem/situation.* *d. Students will apply mathematical knowledge to analyze and model situations/relationships using multiple representations and appropriate tools in order to make decisions, solve problems, and draw conclusions.* *e. Students will make use of structure and repeated reasoning to gain a mathematical perspective and formulate generalized problem solving strategies* *f. Given a word problem, students will solve the word problem using an appropriate strategy or strategies and will share and compare the use of multiple strategies leading to the same answer.*

Essential Questions

What thought-provoking questions will foster inquiry, meaning making, and transfer?

5. List the Essential Question(s) that students should ponder, wonder about or explain by the end of this unit:
   How do I determine volume of various 3 dimensional solids and how are these skills applied to real world problems?

Acquisition

Students will know...

6. What facts should students know and be able to use to gain further knowledge?
   Concept of volume and cubic units
   Classifying 3 dimensional solids
   Solving for a single variable using algebra

7. What vocabulary should students know and be able to recall?
   Rectangle, parallelogram, triangle, kite, trapezoid, regular polygon, apothem, side length, equilateral, isosceles, diagonal, base, altitude (height), circle, sector of a circle, segment of a circle, annulus, cone, sphere, hemisphere, pyramid, cylinder, prism, polyhedron, edge, face, vertex, lateral, oblique

8. What basic concepts should students know and be able to recall and apply?
   Determine the type of polyhedron
   Apply the corresponding volume formula to the 3 dimensional solid
   Use basic algebraic skills to solve for missing variables
   Apply the formula to the real world application.

Students will be skilled at... (be able to do)

9. What discrete skill and processes should students be able to demonstrate?

   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
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   G.1.2.1.5 Identify and/or use properties of pyramids and prisms

   G.2.1.1.1 Use the Pythagorean Theorem to write and/or solve problems involving right triangles.

   G.2.2.3.1 Describe how a change in the linear dimension of a figure affects its perimeter, circumference, and area

		G.2.3.1.1 Calculate the surface area of prisms, cylinders, cones, pyramids, and/or spheres *G.2.3.1.2 Calculate the volume of prisms, cylinders, cones, pyramids, and/or spheres* *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*

Stage 2 – Evidence	
NETS for Students	**PERFORMANCE TASK(S)—can include transfer tasks and Project-Based Learning**
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Stage 3 – Learning Plan		
NETS for Students	**Learning Activities**	**Progress Monitoring/Formative Assessment**

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• Is the plan likely to be engaging and effective for all students?</td>
<td>• How will you monitor students' progress toward acquisition, meaning, and transfer during learning activities?
Daily assessments, teacher observation of student in-class performance, teacher observation of student presentations.
• What are potential rough spots and student misunderstandings?
Applying area formulas appropriately and applying them to their respective needs in determining volume.
Algebraically solving for missing variables or lengths.

• How will students get the feedback they need?
Graded homework assessments, immediate feedback during in-class assignments, mid-chapter quiz, peer feedback and discussion</td>
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