Unit Background

Course:	7^{th} Grade Mathematics	**Unit #**	12	**Days:**	18
Unit Title *Does the unit title reflect the standards?*	Angle Relationships, Transversals & 3-Dimensional Geometry				
Unit Designer:	PCCMS	**Unit Reviewer (s):**			
Resources Used:					
Prentice Hall Mathematics					

Unit Vision and Narrative Description:

Summary: In this unit, students will build on their prior knowledge of different types of angles and triangles and basic protractor skills in order to construct their own triangles and other geometric figures.

Stage 1: Big Goals

Established Standards:

Standards for Assessment:	**Content Limitations:**
7.G.2 – Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	**7.G.2** – Students will not use computer technology to draw geometric figures with given conditions but will use a compass for freehand drawing.
7.G.3 – Describe the two-dimensional figures that result from slicing three- dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.	**7.G.3** – No content limitations.
7.G.5 – Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	**7.G.5** – No content limitations.
7.G.6 – Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	**7.G.6** – Problems involving volume should only apply to scenarios involving cubes and/or rectangular prisms.

Enduring Understandings:

- The sum of the angles of a triangle must equal 180 degrees and the sum of two sides of a triangle must be greater than the third side.
- Given conditions allow us to determine whether one unique triangle, more than one triangle or no triangle can be constructed.
- Geometry is used to draw, construct and model real-life problems.
- Angle relationships can be used to write and solve equations to determine an unknown angle measurement.
- Information about the net of a three-dimensional figure can be used to construct a formula to find its surface area.
- Figures can be composed and deconstructed into smaller, simpler figures.

Essential Questions:

1. How do we use different measurement tools to accurately draw geometric figures with given angle degrees and/or side lengths?
2. What algebraic methods and angle relationships can be used to find and justify missing angle measurements in a transversal?
3. How can we construct formulas to solve practical problems involving surface area?
4. How does decomposing shapes help us determine the area of irregular figures?
5. How does knowing surface area and volume help make informed decisions in the real world?

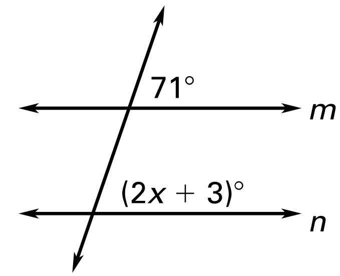
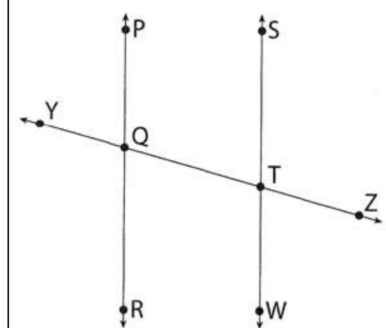
Stage 2: End in Mind

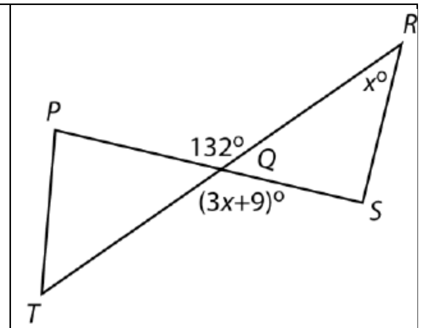
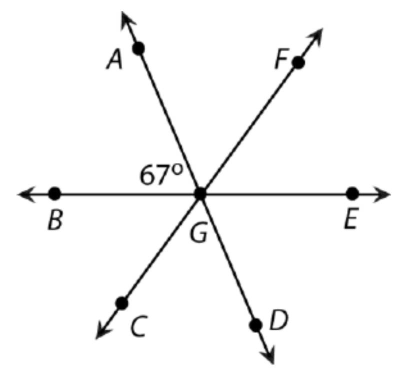
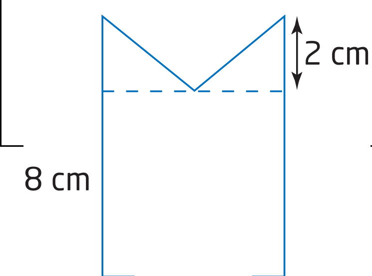
Assessment:

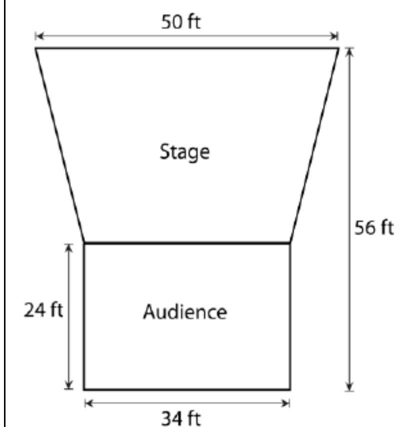
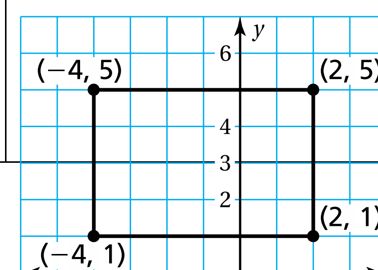
Formative –	**Summative –**	**Track –**	**Tell –**
Textbook Tasks Workbook Exercises Math Journal Daily Problem Vocabulary Homework Classwork Participation Learning Maps	Unit Assessments Quizzes Cumulative Assessments Performance Tasks Rubrics	Assessments will be tracked through eSchoolPLUS	Teachers will inform students of assessment grades. Students will be required to have all assessments signed by a parent/guardian.

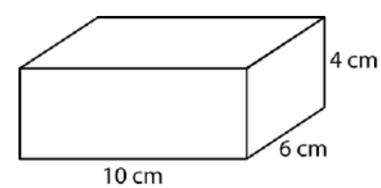
Part 3 – Schedule Learning Experiences					
Day	**Aim & Standard** *(include assessment days)*	**Learning Experience(s)** *Brief description of how you'll approach this aim*	**Vocab**	**Potential Misconception(s)**	**Sample Assessment Item**
1	To understand the triangle angle sum theorem and use it to determine unknown triangle measurements. *(7.G.2)*	Students will be introduced to new vocabulary at the beginning of this lesson. Students will prove the triangle angle sum theorem in two different ways and will begin constructing equations to find the measurement of missing angles in a triangle.	• Supplementary Angles • Complementary Angles • Triangle Angle Sum Theorem	Students often believe that the sum of the angles in a triangle is 360 degrees.	Felicity drew a triangle on her paper. Angle A of the triangle was $\frac{1}{3}$ as big as angle B. Angle C was bigger than angle B. Which list can represent the angle measures in this triangle? **A.** 30°, 60°, 90° **B.** 15°, 45°, 120° **C.** 25°, 55°, 100° **D.** 20°, 60°, 110°
2	To use a protractor and ruler to construct triangles when given measures of an included angle and 2 sides or an included side and 2 angles. *(7.G.2)*	Students will review the parts of a protractor and proper ways to use a protractor to accurately measure and draw angles. Students will use this knowledge base along with appropriate tools to begin constructing triangles.		When using a protractor, students confuse the inner ruler with the outer ruler and are often inconsistent within problems. Students fail to use the set of numbers that starts at zero when measuring angles. Students also do not extend the side lengths enough in order to accurately construct a triangle.	In triangle *XYZ*, $\overline{YZ}$ = 8 cm, $m\angle XYZ = 40°$, and $m\angle XZY = 35°$. Draw a sketch of what this triangle should look like. Then, use a ruler and a protractor to draw triangle XYZ in the space below. Use the **angle sum theorem** to determine the measure of the third angle. Then check it with your protractor ☺
3	To explore the uses of a compass and incorporate a compass as another tool to accurately construct triangles in addition to	This lesson begins with an introduction to compasses. Students will spend a bit of time using a compass to construct circles with different radii. Then,		Students have not been required to use a compass for several years and therefore tend to struggle with manipulating and properly using the	In triangle *PIG*, $\overline{PI}$ = 3.5 cm, $\overline{PG}$ = 9 cm and $m\angle PIG = 85°$. Use a compass, protractor and ruler to construct triangle *PIG*.

	a protractor and ruler. *(7.G.2)*	students will apply this skill to construct triangles with given constraints that cannot be formed by solely using a protractor.		instrument.	
4	To use given constraints to determine whether one unique triangle, more than one triangle or no triangle can be formed. *(7.G.2)*	Students will explore the question, "Is it always possible to draw a triangle given information about some of its measures? Do the measures that you are provided always produce one single triangle?" Students will discover that there are instances where one triangle (unique), more than one triangle or no triangle can be drawn based on angle and side measurement criteria.		Believing that a triangle can be constructed when the sum of the other two sides is equivalent to the third side (or less than the 3rd side).	Construct a triangle with the following measurements. △GUM: $\overline{GU}$ = 6 cm, $\overline{GM}$ = 5.7 cm and $m\angle GUM = 50°$ The given measures can be used to construct *(circle one)*: I. one "unique" triangle II. more than one triangle III. no triangle
5	To construct quadrilaterals when given certain conditions using appropriate mathematical tools. *(7.G.2)*	Students will use skills that they have developed in the previous four lessons and apply them to constructing quadrilaterals. Students will continue to use a protractor, ruler and compass in toady's lesson.		Students struggle to use protractors, compasses and rulers accurately which makes the free-hand construction of geometric figures challenging. Students also often forget the properties of different quadrilateral figures.	Construct **rhombus** *CITY* with $\overline{CT} = 6$ cm and $\overline{CY} = 3.5$ cm. It is important to note that all the side lengths in a rhomus are equal and the diagonals of a rhombus intersect at right angles.
6	To use angle relationships to write equations that will ultimately determine missing values in angles that are complementary, supplementary, vertical or adjacent. *(7.G.5)*	Students will be introduced to new vocabulary at the beginning of this lesson. Students will use prior knowledge as well as the sum of the measurements around a point ($360°$) to argue why vertical angles are congruent. Students will begin to write statement and reason proofs	• Intersecting Lines • Transversal • Congruent Angles • Adjacent Angles • Vertical Angles	Students may believe that the definitions for the different types of angles are interchangeable.	Angles *R* and *S* are complementary. The measure of $\angle S$ is $6°$ more than twice the measure of $\angle R$. What is the measure of $\angle R$?

		in preparation for 8^{th} grade.			
7	To identify and solve for angle measures of corresponding angles formed by parallel lines and a transversal. *(7.G.5)*	Students will watch a clip from Learn Zillion about corresponding angles. The concept of corresponding angles being congruent will also be illustrated using a plastic projection sheet to create two transversals and an overlay. Students will set up equations to determine unknown variables based on corresponding angle relationships.		Students will think that angles are congruent when there are no parallel lines present. It is important to emphasize that angles (alternate exterior, alternate interior, corresponding, and adjacent angles) can only be congruent when they are formed by parallel lines being intersected by a transversal.	Find the value of *x* that makes $m \parallel n$. ***Show your work.*** 
8	To discover the relationship between alternate angles and apply this logic when solving for unknown angle measures. *(7.G.5)*	Students will explore parallel lines cut by a transversal by using angle cutouts to prove which angles below are congruent (≅) and, furthermore, which theorem justifies this statement.	• Alternate Interior Angles • Alternate Exterior Angles • Proof	Students may fail to recognize that alternate interior/exterior angles can only be found on parallel lines.	Which pair of angles are alternate interior?  **A** ∠PQY, ∠WTZ **B** ∠PQT, ∠YTW **C** ∠RQZ, ∠PQZ **D** ∠RQZ, ∠YTW
9	To think critically about angle relationships and prove angle measures by setting up appropriate equations. *(7.G.5)*	Students will complete a "math lab" in pairs. This lesson provides students with fewer questions in order to give them the time and space to process and persevere through more challenging		Students may be confused when the transversal is slanted differently. Exploring examples where the transversal is increasing from left to right and decreasing from left to right will help	What is the measure of angle QRS in the diagram below?

		angle-relationship problems.		with this confusion.	
10	To review writing and solving complex equations through angle relationships. *(7.G.5)*	This is the last day to for students to use all angle relationships, and particularly to properly identify the postulate or theorem used in proofs, to justify the solution to problems involving parallel lines cut by a transversal.		Students may be overwhelmed by the wealth of skills this lesson requires. If students struggle with the foundations of identifying angle relationships and/or writing and solving equations, this lesson will surely be challenging.	This figure shows 3 intersecting lines. The measure of $\angle CGD$ is $5°$ greater than the measure of $\angle BGC$. What is the measure of $\angle AGF$? 
11	To determine the area of composite two-dimensional figures by finding the sum of the area of the given figures. *(7.G.6)*	Students will review the formula to determine the area of simple polygons such as triangles and rectangles. Students will also practice determining ways to break composite figures into	• Composite Figure	Students struggle to recall the correct formula for the area of triangles, rectangles and squares. Additionally, students struggle to visualize the ways that a composite figure can be divided into	Calculate the area of the composite figure below: 

		triangles, rectangles and squares and should understand that some figures have a variety of ways that they can be divided while yielding the same total area.		smaller, more familiar figures.	
12	To represent the area of composite two-dimensional figures by determining its simpler components. *(7.G.6)*	Students will continue to work on finding the area of composite figures by finding the area of the simpler figures that it can be divided into. Since this is a skill that will develop once the conceptual understanding is in place, students should have plenty of work time during today's lesson to practice.		*Same misconceptions as previous lesson:* Students struggle to recall the correct formula for the area of triangles, rectangles and squares. Additionally, students struggle to visualize the ways that a composite figure can be divided into smaller, more familiar figures.	The school drama club practiced their play in the gym. The director marked off the floor in two sections: the stage is in the shape of a trapezoid, and the audience area is in the shape of a rectangle. What is the total area of the two sections? 
13	To determine the distance between two points on a coordinate plane in order to determine the area of composite two-dimensional figures. *(7.G.6)*	Students will use the distance between points on a coordinate plane to determine side lengths of geometric figures.	• Coordinate Plane • Origin • X-axis • Y-axis • Quadrant • Ordered Pair	Students struggle to recall whether a coordinate pair is (x, y) or (y, x). Additionally, students struggle to find the distance between two points if one point has a positive coordinate while the other has a negative coordinate.	Determine the area of the following figure using it's geometric coordinates: 

14	To solve real-world mathematical problems involving surface area and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms. *(7.G.6)*	Students will determine the meaning of surface area and justify ways to find the surface area of three-dimensional objects by considering the polygons that make up the faces of the figure. Students will use net images to help organize this thinking.	• Face • Edge • Vertex • Polyhedron • Net • Surface Area	Students fail to find notice the figures that create the faces of three-dimensional figures that are not immediately seen in a drawing. These often include the base, side and backside of a shape.	The dimensions for two rectangular prisms are shown below. Prism A: 2 cm by 3 cm by 4 cm Prism B: 4 cm by 6 cm by 8 cm The surface area of prism B is how many times the surface area of prism A? **A.** 2 times **B.** 3 times **C.** 4 times **D.** 8 times
15	To describe the two-dimensional figures that result from slicing three-dimensional figures. *(7.G.2)*	Students will observe the three cross-sections created when a three-dimensional figure is sliced. This will be done using clay models as well as a website that nicely demonstrates this concept.	• Cross section • Parallel • Perpendicular	This is a completely new concept for students and requires a good amount of abstract thinking. Students often confuse the term cross-section with one of the faces of a figure. Students also struggle to visualize the cross section created when figures are cut open.	The diagram shows a right rectangular prism. If the prism is sliced by a plane that is parallel to the base of the prism, what is the shape and size of the resulting cross section?  A. A quadrilateral with sides measuring 10 cm, 10 cm,

					6 cm and 4cm B. A rectangle measuring 10 cm by 6 cm C. A triangle with sides measuring 10cm, 6cm and 4cm D. A rectangle measuring 10 cm by 4 cm
16	***Unit Assessment***				