MATH -- Grade 8

Unit 2: PARALLEL LINES, TRANSVERSALS, AND ANGLES (6 DAYS)

SYNOPSIS: In this unit, students will be introduced to parallel lines, transversals and the angles they create when they cross. From here, students expand their knowledge by using similar triangles and their properties to create parallel lines and apply the concepts of this unit while they construct a geometry city.

STANDARDS

8. G.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles, created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *(e.g., arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so).*

MATH PRACTICES:
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

LITERACY
L-1 Learn to read mathematical text (including textbooks, articles, problems, problem explanations)
L-2 Communicate using correct mathematical terminology
L-4 Listen to and critique peer explanations of reasoning
L-5 Justify orally and in writing mathematical reasoning

MOTIVATION	TEACHER NOTES
1. Discuss Unit standards and preview the Authentic Assessment	
2. Preview the vocabulary using Brain Pop *Perpendicular Lines* or United Streaming *Parallel Lines and Angles*. Terms: **parallel lines, transversal, corresponding angles, vertical angles, perpendicular lines, alternate interior angles, and alternate exterior angles.**	
3. Have students set both personal and academic goals for this Unit.	

| TEACHING-LEARNING	TEACHER NOTES
1. <u>LINE REVIEW ACTIVITY:</u> Teacher provides students with a sheet of paper with a line on one side and a set of **parallel lines** on the other side. On the side with a single line, have students identify the **angle measure**, then draw a **ray** to divide the **straight angle** into **acute** and **obtuse angles**. Students measure angles and identify that they are **supplementary angles**. Students then extend the ray to create intersecting line; then identify <u>**vertical angles**</u>. Have students flip the paper over and have a discussion of <u>**parallel line attributes**</u>. Instruct students to draw a line through both lines of the set of parallels that is <u>not</u> perpendicular. Define <u>**transversal**</u>. **(8. G.5)** Label the 8 angles –<mark>attached on page 3 of unit plan</mark>. Have students measure the angles with a <u>**protractor**</u> and record the measure. Students then compare the angles and their finding with a partner's findings. Conduct class discussion about angle relationships. **(L-1, L-2, L-4, L-5; MP-4,MP-8) (8. G.5)**	

TEACHING-LEARNING	TEACHER NOTES
2. Teacher provides direct instruction of the vocabulary, by displaying an example of each of the terms and having the students work as a group and with the teacher to develop definitions: **corresponding angles, alternate interior angles, alternate exterior angles, exterior angles, interior angles, same side interior angles, same side exterior angles.** (L-2) (8. G.5) 3. Introduce the concept of finding missing angle measure by using the angle worksheet (==attached on page 3 of unit plan==). The teacher should identify the measure of angle #2 and ask the students to find the missing angle measures. Students must justify their answers using the angle attributes found in the vocabulary. (L-2, L-4, L-5; MP-1,MP-2, MP-3) (8. G.5) 4. Have students practice a variety of problems. Resources: Glenco <u>Pre-Algebra</u> "Reading to Learn" page 552 and pages 492 – 497. (L-1; MP-1) (8. G.5) 5. Using the paper from the Line Review Activity, have students color code corresponding, interior, exterior, alternate exterior, alternate interior, same side interior, and same side exterior angles on the parallel line side of page. Note: Students will have several arc colors for each angle because angles fall into more than one category. (MP-2, MP-8) (8. G.5) 6. Have students practice a variety of problems. Resources: Foresman/Wesley <u>Math 3</u> pages 416 - 420; go to websites: www.kutasoftware.com or www.shodor.org/interactivate/activities/Angles to find problems. (MP-1; MP-7) 7. Teacher provides students with an **equilateral triangle** template where each side is 3 inches, and a piece of construction paper. Students trace the template 3 times, creating a pattern where 2 triangles touch at the corner and a third rotated and placed between them. Students label the angles of the triangles and use labels to show **pattern rotation**. Discuss that the triangles are **similar** and **congruent**; also reinforce that the **sum of the interior angles is 180°.** Extend the discussion to show that when we completed the rotation of the triangle, we placed angle A, angle B, and angle C next to each other creating a **straight line**. Model for students how to extend the sides of the triangles to create three sets of parallel lines. (8. G.5) Discuss with students that by rotating triangle ABC and extending the sides of the triangle, they created sets **of parallel lines with intersecting transversals**. Students should be able to argue how they created each line through the **rotating pattern**. Extend the activity by labeling the **exterior angles** and having the students informally argue which angles are congruent and why. (L-2, L-4, L-5; MP-2, MP-3, MP-8) (8. G.5) 8. Have students practice a variety of problems. Resources: <u>Navigating through Geometry</u> pages 25 – 27. ==Sample problems are attached on page 4 of unit plan==.	Student practice can be done using white boards, Promethean boards, centers/stations, and/or partner work.

TRADITIONAL ASSESSMENT	TEACHER NOTES
1. Paper-pencil test with M-C questions and 2-and 4-point questions 2. CFA as a M-C test	

| AUTHENTIC ASSESSMENT	TEACHER NOTES
1. Students evaluate goals they set at beginning of unit. 2. Geometry Project where students create specific angles and lines to achieve what is given in a specific set of directions as it relates to parallel lines and transversals with different types of angles created. (MP-5, MP-6, MP-7, MP-8) (8. G.5)	

Teaching-Learning #1 and #3:

Sample of the activity for labeling the 8 angles
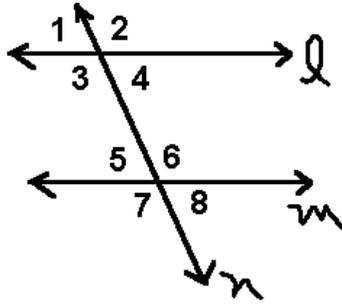
## 3-2 Word Problem Practice

Angles and Parallel Lines

1. RAMPS A parking garage ramp rises to connect two horizontal levels of a parking lot. The ramp makes a 10° angle with the horizontal. What is the measure of angle 1 in the figure?

Ramp
Level 2
1
10°
Level 1
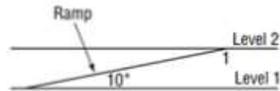
2. BRIDGES A double decker bridge has two parallel levels connected by a network of diagonal girders. One of the girders makes a 52° angle with the lower level as shown in the figure. What is the measure of angle 1?

1
52°
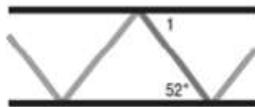
3. CITY ENGINEERING Seventh Avenue runs perpendicular to both 1st and 2nd Streets, which are parallel. However, Maple Avenue makes a 115° angle with 2nd Street. What is the measure of angle 1?

Maple Ave.
7th Ave.
115°
2nd St.
1
1st St.
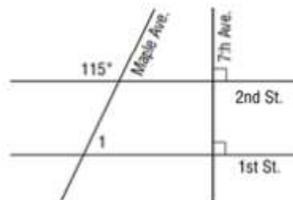
4. PODIUMS A carpenter is building a podium. The side panel of the podium is cut from a rectangular piece of wood.

1
116°

The rectangle must be sawed along the dashed line in the figure. What is the measure of angle 1?

SECURITY For Exercises 5 and 6, use the following information.

An important bridge crosses a river at a key location. Because it is so important, robotic security cameras are placed at the locations of the dots in the figure. Each robot can scan x degrees. On the lower bank, it takes 4 robots to cover the full angle from the edge of the river to the bridge. On the upper bank, it takes 5 robots to cover the full angle from the edge of the river to the bridge.

upper bank
Bridge
lower bank
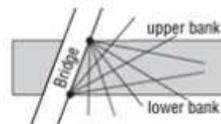
5. How are the angles that are covered by the robots at the lower and upper banks related? Derive an equation that x satisfies based on this relationship.

6. How wide is the scanning angle for each robot? What are the angles that the bridge makes with the upper and lower banks?

Chapter 3 17 Glencoe Geometry

Lesson 3-2