Lesson Title	Making Parallel Lines
Length of Lesson	1 day
Created By	Kylie Nash
Subject	Math
Grade Level	10^{th} – 12^{th} (Geometry)
State Standards	9^{th} -12^{th} Geometry
DOK Level	DOK 2
DOK Application	Compare, Make Predictions, Identify Patterns, Make Observations, Relate, Understand
National Standards	9^{th}- 12^{th} Geometry
Graduate Research Element	Angle relationships and parallel lines are used in Industrial Engineering Ergonomic Design Principles.

Student Learning Goal:
Students make conjectures and apply angle relationships in situations involving intersecting lines, perpendicular lines and parallel lines cut by a transversal. Learn terminology related to characteristics of angles and lines. Students then develop skills in making, identifying and using angle relationships to find the measures of angles.

State Standards for 9^{th} – 12^{th} Geometry:
(1a) Number and Operations: Apply problem-solving skills and verify the solutions for unknown measures in similar polygons (DOK 2)
(3c) Geometry: Identify, classify, and apply angle relationships formed by parallel lines cut by transversals (DOK2)

National Standards for 9^{th} -12^{th} Geometry Standard:

- Make decisions about units and scales that are appropriate for problem situations involving measurement.
- Analyze properties and determine attributes of two and three dimensional objects.
- Explore relationships (including congruence and similarity) among classes of two and three dimensional geometric objects, make and test conjectures about them, and solve problems involving them.

Materials Needed (supplies, hand-outs, resources):
Writing utensils, sheets of lined notebook paper (2 sheets per person), rulers, scissors, and protractors.

Lesson Performance Task/Assessment:
Students will be able to make conclusions and determine angle relationships of parallel lines by completing a paper folding activity. Students will get practice and experience with problems that involving finding angle relationships and determining interior and exterior angles.

Lesson Relevance to Performance Task and Students:
Students will be gain a better understanding of angles measurements, supplementary angles, interior, and exterior angles and get hands on practice identifying, and labeling congruent and supplementary angles.

Anticipatory Set/Capture Interest:
Students will be told that they Industrial Engineers designing a new Flight Simulation HUD for the Bowing Airlines. Students will be told that as a first step they have to present mock up designs based on angle relationships and parallel lines of the HUD.

Guided Practice:
The instructor will help students individually or as a class fold and label their designs and identify relationships correctly.

Independent Practice:
Students may work in groups or individually. Students will:

1. Fold paper in half vertically and crease. While paper is folded in this "hot dog" style, fold it once more along the pink margin line. When paper is unfolded there should be three creases.

2. Using a ruler draw a vertical line along the middle crease -- transversal. (The outside fold lines are an aid in drawing parallel lines.)

3. Fold paper in half horizontally in the "hamburger" style and crease. Unfold paper.

4. Draw Parallel Lines -- On the top half of the paper, left of the transversal, place a point at the intersection of a blue line and the left hand crease. Your choice which line is chosen. Label point as point A.

5. Count down from pt. A _____ number of lines. Follow this line to the right hand crease and place another point. Label the right hand point as point B. Use ruler to connect points to form line AB.

6. On the bottom half of the paper, left of the transversal, place a point at the intersection of a blue line and the left hand crease. Label point as point C.

7. Count down the same number of lines that you chose on step 5. Follow this line to the right hand crease and place another point. Label the right hand point as point D. Use a ruler to connect points to form line CD.

8. Number angles 1-4 down the left hand side of the transversal and 5-8 down the

right hand side of the transversal.

9. The angles in the gray areas are called exterior angles because they are outside of the parallel lines. The angles in the white area are called interior angles because they are between the parallel lines.

10. Use scissors to cut along the transversal, both parallel lines, and the hamburger crease.

11. Identify different components of the different pieces? May have to reconstruct the original paper.

Remediation and/or Enrichment:
Remediation:
Individual IEP

Enrichment/Extension:
An extension to this activity could be to include topics slope theorem and transivity of parallelism theorem.

Check(s) for Understanding:
1. Do you have a better understanding of transversals, parallel lines, intersecting lines, interior angles and exterior angles?

2. Can you identify supplementary angles?

Possible Alternate Subject Integrations:
Physics, computer aided design, and architecture

Teacher Notes:
Reference:
http://www.lessonplanspage.com/MathAngleRelationshipsAndParallelLinesPaperFoldingActivity810.htm