

	<p>board. Tell the students that each street is part of a line or is a line segment. These lines all lie on the same flat surface or plane. Ask students to work with a partner and answer the following:</p> <ol style="list-style-type: none"> 1. Two lines are coplanar if they lie in the same plane. What different relationships can occur between two coplanar lines? 2. Do parallel lines have to lie in the same plane? 3. Use the map to give an example of each relationship you described in number 1. 4. Two lines are parallel lines if they are coplanar and do not intersect. Identify 2 pairs of lines formed by the streets that appear to be parallel. <p>Assessment – Ask the following questions to verify student understanding. 1. Name several planes in our classroom. 2. What does it mean to be coplanar? 3. Locate parallel lines in our classroom. 4. Do parallel lines have to be coplanar?</p> <p>Introduce the student to angles that are formed when lines are cut by a transversal. Show a drawing of 2 lines, labeled line m and n (not parallel and a third line (line t) intersecting the first two. (They can refer to the map and use 6th Street and New Jersey Avenue as the first two lines, and New York Avenue as the street that intersects the other two.) Tell the students line t is called the transversal of lines m and n. When a line intersects two or more other lines all at different points, the line is called a transversal.</p> <p>Ask the students, how many angles are created when two lines are cut by a transversal.</p> <p>Show 2 nonparallel lines p and q cut by a transversal r. (Can use Rhode Island Ave as line p, Massachusetts Ave. as line q, and 9th Street as the transversal r). Tell students four of the eight angles formed are interior angles and 4 are exterior. Ask the students to identify which are interior</p>	<p>5 min.</p> <p>10 min.</p>	<p>g, leading class discussion Pose questions to assure understanding and a form of assessment</p> <p>Teacher will show drawing of parallel lines cut by transversal.</p> <p>Draw illustration of parallel</p>	<p>collaborate with partner, give examples, answer questions</p> <p>Observe drawing or use map and conclude there are 8 angles.</p> <p>Identify different types of</p>	<p>1 copy of map of D.C. Copy of map on white board. All other illustrations on white board</p> <p>Drawing of 2 intersecting lines cut by a transversal</p> <p>Drawing of 2 intersecting lines</p>
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	<p>and explain why. Ask students to identify which are exterior and explain why. We are going to learn about other ways to classify these angles.</p> <p>Explain that 2 angles are alternate interior angles if they lie between the 2 lines on opposite (alternate) sides of the transversal. Ask students to identify both pairs of alternate interior angles. Two angles are alternate exterior angles if they lie outside the two lines on opposite (alternate) sides of the transversal. Ask students to identify both pairs of alternate exterior angles.</p> <p>Explain two angles are corresponding angles if they are on the same side of the transversal in corresponding or the same position. Ask students to name all pairs of corresponding angles.</p> <p>Explain two angles are same side interior angles (sometimes called consecutive interior angles), if they lie in between the two parallel lines and on the same side of the transversal. Also explain that same side exterior angles lie on the exterior of the 2 parallel lines and on the same side of the transversal.</p> <p>Assessment: Have a student draw and label example of 2 non parallel lines cut by a transversal on the smart board. The student will call on another classmate to identify and label a pair of angles on the smart board. That student in will call on another classmate to identify another pair of angles on the smart board. Continue the exercise until all pairs of possible angles have been identified.</p> <p>Guided Practice: Next, students will discover properties of angles formed by intersection of transversal and <i>parallel</i> lines. Students may work in small groups (pre-assigned). Ask the students to use the worksheet with the examples of parallel lines cut by a transversal or on the DC map, consider parallel streets 9th Street and & 7th and Rhode Island Avenue as the transversal. Use a protractor to measure all of the angles. Record your results on your drawings. After measuring all angles, complete the following:</p> <ol style="list-style-type: none"> 1. Identify all congruent angles. 	10 min	<p>lines cut by transversal. Define different angles that are formed.</p> <p>Teacher calls on volunteer to start identification of angles</p> <p>Pass out protractors and worksheet with examples of parallel lines cut</p>	<p>angles</p> <p>Students create drawing & identify pairs of angles</p> <p>Work in small groups, pre assigned. Measure angles and record results.</p>	<p>cut by a transversal</p> <p>Smart board & markers</p> <p>Worksheet with several pairs of parallel lines cut by a transversal</p>
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	<p>2. Identify all pairs of corresponding angles. What do you notice about each pair of angles?</p> <p>3. Identify all pairs of alternate interior angles. What do you notice about each pair of angles.</p> <p>4. Identify all pairs of alternate exterior angles. What do you notice about each pair of angles?</p> <p>5. Identify all pairs of same side interior angles. Are the angles equal in measure? Find the sum of their measures.</p> <p>6. Identify all pairs of same side exterior angles. Are they equal in measure? Find the sum of their measures.</p> <p>Call the class back together to have the students discuss and present their work. Discuss what they can conclude about the angles formed when a transversal cuts a pair of parallel lines. Discuss what they can conclude about the pairs of same-side interior angles and same-side exterior angles.</p>		<p>by a transversal, circulate around room while students measure angles and record responses to questions 1-6.</p> <p>Teacher leads discussion on conclusions from guided practice</p>	<p>Record responses to questions 1-6.</p> <p>Students present results and give conclusions.</p> <p>Students participate in developing properties of angles formed by parallel lines cut by a transversal.</p>	
<p>Extended Practice</p>	<p>The students are given 2 parallel lines cut by a transversal. One of the 8 angles formed is given the measurement of 102 degrees. The student will find the measure of the other 7 angles using the conclusions from the guided practice. (No protractors) Students will work individually.</p>	<p>5 min.</p>	<p>Circulate, monitor, and facilitate</p>	<p>Apply conclusions to specific problem</p>	<p>Worksheet with pair of parallel lines cut by a</p>

					transversal. Given the measurement of one angle.
Lesson Closing	Assessment: Pass out a 3x5 index card to each student. Have them draw a pair of parallel lines cut by a transversal. Number the angles formed from 1 to 8. Identify 1 pair of angles and describe their relationship. Please hand me the card as you leave class.	2 min	Pass out index cards as Exit Cards and give the directions	Students complete Exit cards	3x5 Index Cards

Possible Learner Barriers:	Possible Solutions
Making connections to real life	Relate idea of parallel lines and transversal to streets on map of capital. (Relate to a place they have interest in and motivate interest in lesson.) May ask student to look up map of where they live and have them write directions to get from their house to school. Need to include words from new vocabulary.
Language barrier	Review vocabulary, theorems, and symbols that are needed for the student to explain their answers. (Specific needs of students should be met before lesson is presented.) Vocabulary words are presented with pictures and symbols with consistent reference to the spoken word, written word, and the visual representation.
Processing Comprehension	Differentiated instruction. Use masking tape to mark two parallel lines and a transversal on the floor. Have pairs of students stand in angles that are congruent or

	<p>supplementary, and have them explain whether their angles are alternate interior, alternate exterior, corresponding, or same-side angles.</p> <p>Marking related lines and angles with colored markers.</p> <p>Chunking the material. Direct instruction. Peer tutoring. Scaffolding.</p>
Organization	<p>Post objective and agenda before class. Advance organizer available. Foldable.</p>
ADD students	<p>Preferential seating. Close proximity to teacher will aid student in staying on task.</p>

Possible UDL Applications for Extension	
Representation	<p>Some students may use the video “Figuring out angles between transversal and parallel lines”, at https://www.khanacademy.org.</p> <p>Some students may watch power-point available on CD from <i>Glencoe McGraw-Hill</i> textbook on identifying and finding measure of angles formed by transversal and parallel lines.</p> <p>All students have access to a TI-84 graphing calculator. Capri Jr. is an apps on the calculator, very much like Geometer’s Sketchpad.</p> <p>The student could use the apps to find the measure of the angles and the relationship between the angles.</p>
Engagement	<p>A Parallel Scavenger Hunt may be a way to motivate and engage some students. The student should find as many examples of parallel lines and planes in the following categories: Architecture, Art, Your Home, Logos, Maps, Music and Musical Instruments, and nature.</p> <p>You can use any reference materials you find helpful, including books, encyclopedias, magazines, and the internet.</p> <p>Use different colored markers to identify parallel lines and the transversal. Use different colored makers to identify different types of angles and congruent angles.</p>

	<p>Mark off parallel lines on floor with masking tape. Have pairs of students stand in angles that are congruent or supplementary. Have them identify the types of angles and their relationship.</p> <p>Another idea as suggested in the lesson critique, students could make use of flip cameras and take pictures of parallel lines in their world.</p>
Expression	<p>Students take a pre and post-test to express their comprehension. They will take a unit test after the unit on angles is completed. The students may use the following alternative ways to illustrate their comprehension.</p> <p>All students have access to a TI-84 graphing calculator. Thus, the student may choose to use the Capri Jr. apps on the calculator to investigate angles formed by 2 parallel lines and a transversal. Geometer's Sketchpad could also be used to assess the objective. Student may use alternative assessment where they choose a presentation website to show comprehensive of the objective. The use of GeoGebra as an additional or alternative means of expression was suggested in the critique.</p>

Level III: A few students will...write a two column proof or paragraph proof proving if two parallel lines are cut by a transversal, then each pair of corresponding angles are congruent.

Level II: Some students will...complete the proof of Corresponding Angles Postulate by writing the missing statements or reasons in a formal proof.

Level I: All students will...identify the relationship between two lines, classify angles formed by two lines and a transversal, and find their measures. The student will determine the relationship between angles formed by two parallel lines cut by a transversal.

References:

Teacher's Geometry Activities Kit, Judith A. Muschla, Gary R Muschla, Jossey-Bass, A. Wiley Imprint
Carnegie Learning, Inc. 2008 Transversals and Parallel Lines

TIgeometry.com, Texas Instruments Incorporated, 2007. ID: 8681 Parallel Lines Cut by a Transversal (Capri Jr. Apps)

<https://www.khanacademy.org>,” Figuring out angles between transversal and parallel Lines.

Glencoe McGraw-Hill, Geometry CD Interactive Classroom, 2011.