Looking Between the Lines

Parallel Lines, Transversal Lines, and Angles

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Grade Level	10th Grade	**Time Frame**	120 Minutes
Subject	Mathematics	**Duration**	2 Periods
Course	Geometry		

Essential Question

How do the angles formed by two parallel lines and a transversal relate to each other?

Summary

This lesson focuses on an extension of parallel lines by exploring what happens when a transversal line passes through them. The goal is for students to understand the different angles that form due to the intersection and to apply that knowledge to real-world situations. Students will be able to identify special angle pairs and then solve problems in real-world scenarios using those properties.

Snapshot

Engage

Students create captions for two pictures based on observations and inferences.

Explore

Students use a protractor to measure different angles and compare their findings.

Explain

Students review the definitions of different types of angles and how they apply to real-world situations.

Extend

Students design a blueprint of their dream town, complete with at least one transversal street and all four types of special angle pairs covered in this lesson.

Evaluate

Students analyze their peers' blueprints and provide feedback.

Standards

Oklahoma Academic Standards for Mathematics (Grades 9, 10, 11, 12)

G.2D.1.1: Apply the properties of parallel and perpendicular lines, including properties of angles formed by a transversal, to solve real-world and mathematical problems and determine if two lines are parallel, using algebraic reasoning and proofs.

Attachments

- Diving-into-the-Vocab-Looking-Between-the-Lines - Spanish.docx
- Diving-into-the-Vocab-Looking-Between-the-Lines - Spanish.pdf
- Diving-into-the-Vocab-Looking-Between-the-Lines.docx
- Diving-into-the-Vocab-Looking-Between-the-Lines.pdf
- Engage-Explore-and-Explain-Looking-Between-the-Lines - Spanish.docx
- Engage-Explore-and-Explain-Looking-Between-the-Lines - Spanish.pdf
- Engage-Explore-and-Explain-Looking-Between-the-Lines.docx
- Engage-Explore-and-Explain-Looking-Between-the-Lines.pdf
- Lesson-Slides-Looking-Between-the-Lines.pptx
- Potential-Buyer-Looking-Between-the-Lines - Spanish.docx
- Potential-Buyer-Looking-Between-the-Lines - Spanish.pdf
- Potential-Buyer-Looking-Between-the-Lines.docx
- Potential-Buyer-Looking-Between-the-Lines.pdf

Materials

- Lesson Slides (attached)
- Engage, Explore, and Explain handout (attached; one per student)
- Diving into the Vocab handout (attached; one per student)
- Potential Buyer handout (attached; one per student)
- Reusable Frayer models (optional)
- Dry erase markers (optional)
- Paper
- Pencil
- Markers (optional)
- Ruler
- Computer paper
- Colored pencils (optional)

Engage

Teacher's Note: Preparation

Before beginning the lesson, print out a copy of the attached **Engage, Explore, and Explain** handout for each student. This will be a handout they refer to throughout the lesson.

Introduce the lesson using the attached **Lesson Slides**. Display **slide 3** and go over the lesson's essential question: *How do the angles formed by two parallel lines and a transversal relate to each other?* Then display **slide 4**, which identifies the lesson's learning objective. Review these slides with your class to the extent you feel necessary.

Display **slide 5**. Using the Caption This strategy, students should observe the two pictures on the slide and begin to make real-world connections. To start the conversation about parallel lines and transversal lines, refer to Picture 1 on the left and Picture 2 on the right. Have students write a caption about each picture on their Engage, Explore, and Explain worksheet. Do not tell them to write about parallel lines and transversal lines. Let them write about anything they observe. This is a time for them to gather their thoughts and for you to see what their prior knowledge might be.

Display **slide 6**. After students are done writing their captions, have some students share what they observed. Their captions might be simple descriptions of the pictures, and they might not immediately see the connection between parallel lines and transversal lines. Once you feel like enough students have volunteered, ask what the pictures have in common and how they relate to mathematics.

Explore

Display **slide 7**. Place students in groups of two (or three), and pass out a protractor to each group. Within each group, students should investigate the relationships among different angles by drawing lines on their own worksheets and then measuring the angles. Each person in the group should draw two parallel lines with a transversal line that is *not* perpendicular to the parallel lines.

Before using a protractor and finding out the exact measurements of the angles, each student should shade the acute angles with one color and shade the obtuse angles with another color. After shading the angles, group members should take turns determining the exact measurements of each angle and writing the measurement in the shaded region. Students should talk about their measurements and the relationships among them.

After they discuss their findings, students should draw another set of parallel lines with a transversal that is *not* perpendicular. They should repeat the steps above and compare their findings to determine whether they are consistent with their first trial.

Explain

Display **slide 8**. Students should construct an argument explaining why parallel lines do not intersect. They should begin with the Think-Pair-Share strategy.

With a partner, students should write a statement at the bottom of their worksheets based on their findings during the Explore activity. Tell students to be as specific as they can with their claim about the connection between a transversal line and parallel lines. Once each student pair creates a statement, have them join another pair to share their statements in groups of four. After students discuss in their small groups, bring all students back together and then discuss the following questions as a class:

- Did your findings differ or were they similar to others?
- What do we now know about parallel lines when a transversal cuts through them?

Display **slide 9**. Pass out the **Diving into the Vocab** handout to each student. As a class, create definitions for parallel lines, transversal lines, corresponding angles, consecutive interior angles, alternate interior angles, and alternate exterior angles. With each definition and explanation, have students draw pictures on their own sheets so they can make connections visually as well. With each definition, also talk about how these angles are represented in a real-world setting. This should help students create their town maps in the next section of the lesson.

Teacher's Note

Consider utilizing reusable Frayer Models as a tool to support the development of class definitions. Students can record the final definition and details on the Diving into the Vocab handout as described.

Display **slide 10**. As a class, go over how to solve for x using the definitions that the class just discussed. Depending on the situation, show students they may have to set the equations equal to each other, or that the equations add up to a certain number.

Students can solve the examples on the slide using the Notes section of the Diving into the Vocab handout. Have them check their work by plugging the answer back into x and seeing what their values are for those angles.

Teacher's Note: More Examples

Please remember these lessons are created for the general student population in mind. Please add more examples to this section to fit the needs of your classroom and your students!

Extend

Display **slide 11**. Remind students of the activity they completed at the beginning of the lesson, when they looked at pictures and had to write captions for what they saw. Ask them what they see now in the picture on the slide after knowing more about angles in relation to parallel lines.

After having a brief class discussion, set up a scenario where each student is the mayor of a new town and gets to help design its layout. Pose the following question to the class: *What needs to be in a town for people to survive and thrive?* Let them talk with their peers and then have a few students share their ideas with the class.

Display **slide 12**. Pass out a white sheet of computer paper to each student. By now, students should be able to envision what components make up a town, including a grocery store, a school, etc. Students should now create their own blueprint of their dream town. The town can be designed any way they would like, but it must have these components:

- Name of the town
- Streets that are parallel with at least one street that is transversal to them
- Buildings or landmarks that are corresponding angles
- Buildings or landmarks that are consecutive interior angles
- Buildings or landmarks that are alternate interior angles
- Buildings or landmarks that are alternate exterior angles
- Two algebraic problems involving the angles, where students have to solve for x

Encourage students to be creative and have fun with it! Let them know their blueprints will be displayed around the room and will be used to wrap up the lesson.

Evaluate

Display **slide 13** and pass out the **Potential Buyer** handout to each student. Have each student pick a blueprint that is not their own and then analyze whether the town is somewhere they want to move.

On the handout, students should write down the name of the town, answer the two algebraic equations, and give an explanation for why they would or would not move to the town. This activity is a combination of two different instructional tools: the Gallery Walk strategy and the Exit Ticket strategy. Students should be picking a different blueprint on the wall or desk as with a Gallery Walk, but they should not visit multiple locations as they would in a traditional Gallery Walk.

If time allows, have students replace their first blueprint and then pick a second town to analyze. They should use the space on the handout to answer the same questions they did for the first town. Each student should turn in their handout as their Exit Ticket.

Resources

- K20 Center. (n.d.). Bell Ringers and Exit Tickets. Strategies. https://learn.k20center.ou.edu/strategy/125
- K20 Center. (n.d.). Caption This. Strategies. https://learn.k20center.ou.edu/strategy/82
- K20 Center. (n.d.). Gallery Walk/Carousel. Strategies. https://learn.k20center.ou.edu/strategy/118
- K20 Center. (n.d.). Think-Pair-Share. Strategies. https://learn.k20center.ou.edu/strategy/139