

Lesson 12: Angles Associated with Parallel Lines

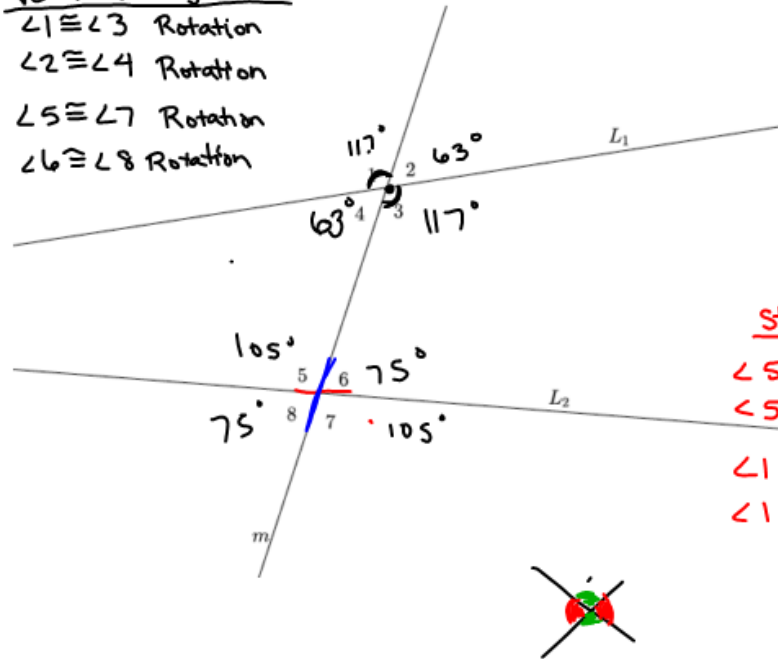
Classwork

Exploratory Challenge 1

In the figure below, L_1 is not parallel to L_2 , and m is a transversal. Use a protractor to measure angles 1–8. Which, if any, are equal? Explain why. (Use your transparency, if needed).

Vertical Angles

- $\angle 1 \cong \angle 3$ Rotation
- $\angle 2 \cong \angle 4$ Rotation
- $\angle 5 \cong \angle 7$ Rotation
- $\angle 6 \cong \angle 8$ Rotation

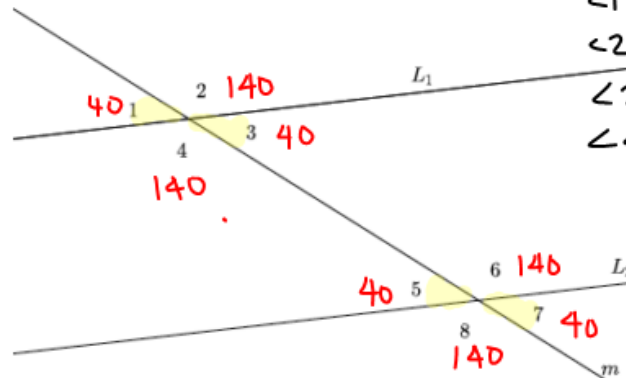


Straight lines

- $\angle 5 + \angle 6 = 180^\circ$
- $\angle 5 + \angle 8 = 180^\circ$
- $\angle 1 + \angle 2 = 180^\circ$
- $\angle 1 + \angle 4 = 180^\circ$

Exploratory Challenge 2

In the figure below, $l_1 \parallel l_2$, and m is a transversal. Use a protractor to measure angles 1–8. List the angles that are equal in measure.



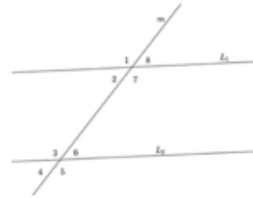
Corresponding Angles
 $\angle 1 \cong \angle 5$ translation
 $\angle 2 \cong \angle 6$ translation
 $\angle 3 \cong \angle 7$ translation
 $\angle 4 \cong \angle 8$ translation

Alternate Exterior Angles
 $\angle 1 \cong \angle 7$ Rotation
 $\angle 2 \cong \angle 8$ Rotation

Alternate Interior Angles
 $\angle 4 \cong \angle 6$ Rotation
 $\angle 3 \cong \angle 5$ Rotation

- What did you notice about the measures of $\angle 1$ and $\angle 5$? Why do you think this is so? (Use your transparency, if needed).
- What did you notice about the measures of $\angle 3$ and $\angle 7$? Why do you think this is so? (Use your transparency, if needed.) Are there any other pairs of angles with this same relationship? If so, list them.
- What did you notice about the measures of $\angle 4$ and $\angle 6$? Why do you think this is so? (Use your transparency, if needed.) Is there another pair of angles with this same relationship?

Lesson Summary



Angles that are on the same side of the transversal in corresponding positions (above each of L_1 and L_2 or below each of L_1 and L_2) are called **corresponding angles**. For example, $\angle 2$ and $\angle 4$.

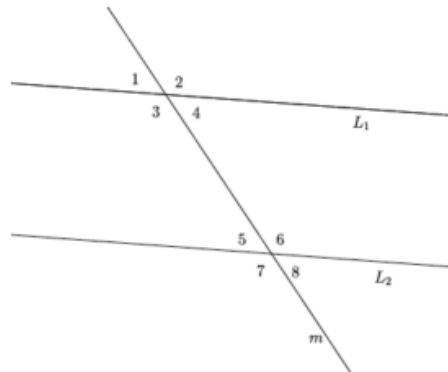
When angles are on opposite sides of the transversal and between (inside) the lines L_1 and L_2 , they are called **alternate interior angles**. For example, $\angle 3$ and $\angle 7$.

When angles are on opposite sides of the transversal and outside of the parallel lines (above L_1 and below L_2), they are called **alternate exterior angles**. For example, $\angle 1$ and $\angle 5$.

When parallel lines are cut by a transversal, the corresponding angles, alternate interior angles, and alternate exterior angles are equal. If the lines are not parallel, then the angles are not equal.

Problem Set

Use the diagram below to do Problems 1–6.



1. Identify all pairs of corresponding angles. Are the pairs of corresponding angles equal in measure? How do you know?
2. Identify all pairs of alternate interior angles. Are the pairs of alternate interior angles equal in measure? How do you know?
3. Use an informal argument to describe why $\angle 1$ and $\angle 8$ are equal in measure if $L_1 \parallel L_2$.
4. Assuming $L_1 \parallel L_2$ if the measure of $\angle 4$ is 73° , what is the measure of $\angle 8$? How do you know?
5. Assuming $L_1 \parallel L_2$, if the measure of $\angle 3$ is 107° degrees, what is the measure of $\angle 6$? How do you know?
6. Assuming $L_1 \parallel L_2$, if the measure of $\angle 2$ is 107° , what is the measure of $\angle 7$? How do you know?
7. Would your answers to Problems 4–6 be the same if you had not been informed that $L_1 \parallel L_2$? Why or why not?
8. Use an informal argument to describe why $\angle 1$ and $\angle 5$ are equal in measure if $L_1 \parallel L_2$.
9. Use an informal argument to describe why $\angle 4$ and $\angle 5$ are equal in measure if $L_1 \parallel L_2$.
10. Assume that L_1 is not parallel to L_2 . Explain why $\angle 3 \neq \angle 7$.