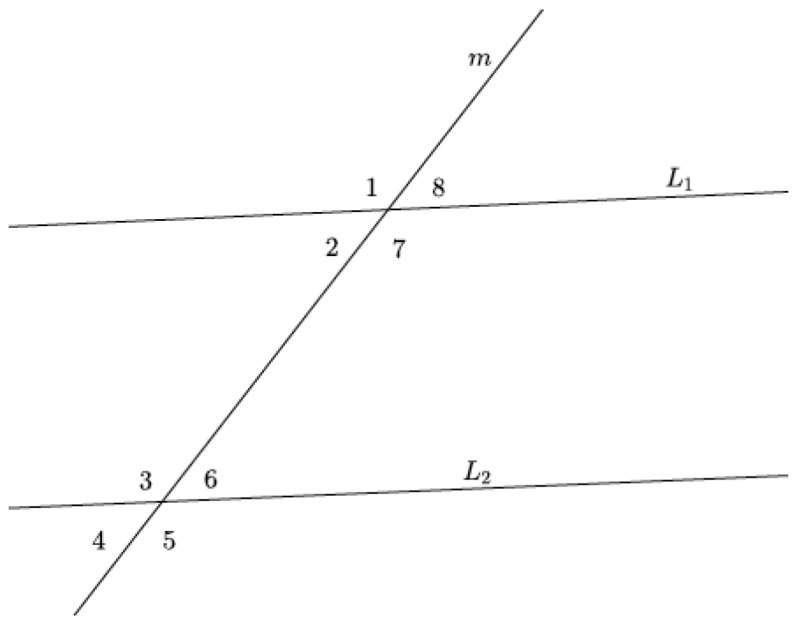
Name _____ Date _____

Angles Associated with Parallel Lines

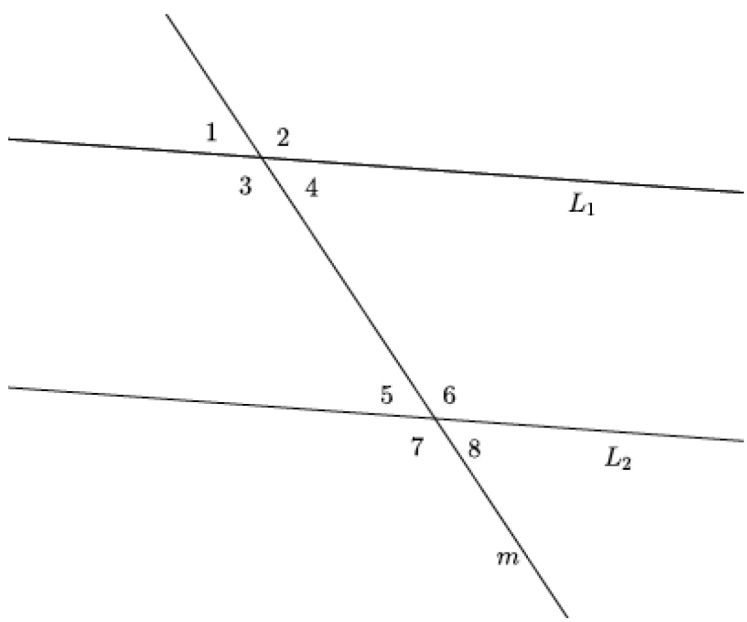
Use the diagram to answer Questions 1 and 2. In the diagram, lines L_1 and L_2 are intersected by transversal m, forming angles 1–8, as shown.



1. If $L_1 \parallel L_2$, what do know about $\angle 2$ and $\angle 6$? Use informal arguments to support your claim.

2. If $L_1 \parallel L_2$, what do know about $\angle 1$ and $\angle 3$? Use informal arguments to support your claim.

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?

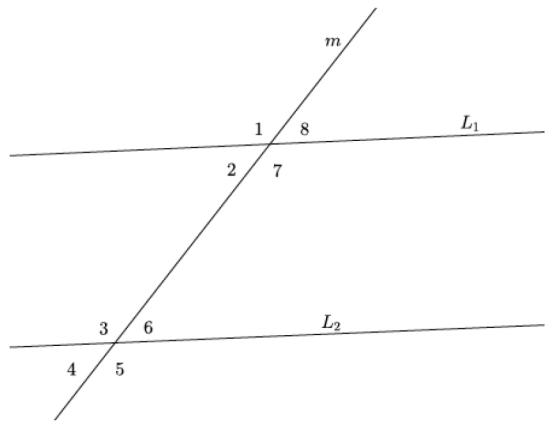
7. Would your answers to Problems 4–6 be the same if you had not been informed that $L_1 \parallel L_2$? Why, or why not?

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 $\angle 3 \neq \angle 7$.

Use the diagram to answer Questions 1 and 2. In the diagram, lines L_1 and L_2 are intersected by transversal m, forming angles 1–8, as shown.



1. **If $L_1 \parallel L_2$, what do know about $\angle 2$ and $\angle 6$. Use informal arguments to support your claim.**

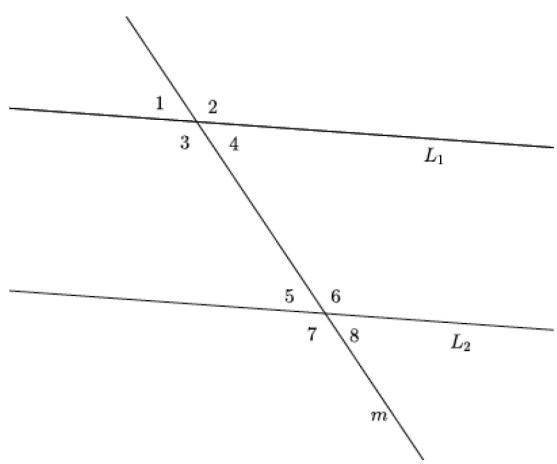
   They are alternate interior angles because they are on opposite sides of the transversal and inside of lines L_1 and L_2. Also, the angles are equal in measure because the lines L_1 and L_2 are parallel. If we rotated angle 2 around the midpoint of the segment between the parallel lines, then it would map onto angle 6.

2. **If $L_1 \parallel L_2$, what do know about $\angle 1$ and $\angle 3$? Use informal arguments to support your claim.**

   They are corresponding angles because they are on the same side of the transversal and above each of lines L_1 and L_2. Also, the angles are equal in measure because the lines L_1 and L_2 are parallel. If we translated angle 1 along a vector (the same length as the segment between the parallel lines), then it would map onto angle 3.

Students practice identifying corresponding, alternate interior, and alternate exterior angles from a diagram.

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?**

   $\angle 1$ and $\angle 5$, $\angle 4$ and $\angle 8$, $\angle 2$ and $\angle 6$, $\angle 3$ and $\angle 7$

   There is no information provided about the lines in the diagram being parallel. For that reason, we do not know if the pairs of corresponding angles are equal. If we knew the lines were parallel, we could use translation to map one angle onto another.

2. **Identify all pairs of alternate interior angles. Are the pairs of alternate interior angles equal in measure? How do you know?**

   $\angle 4$ and $\angle 5$, $\angle 3$ and $\angle 6$

   There is no information provided about the lines in the diagram being parallel. For that reason, we do not know if the pairs of alternate interior angles are equal in measure. If the lines were parallel, we could use rotation to show that the pairs of angles would map onto one another proving they are equal in measure.

3. **Use an informal argument to describe why $\angle 1$ and $\angle 8$ are equal in measure if $L_1 \parallel L_2$.**

   The reason that angle 1 and angle 8 are equal in measure when the lines are parallel is because you can rotate around the midpoint of the segment between the parallel lines. A rotation would then map angle 1 onto angle 8, showing that they are congruent and equal in measure.

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?**

   The measure of $\angle 8$ is $73°$. This must be true because they are corresponding angles of parallel lines.

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?**

   The measure of $\angle 6$ is $107°$. This must be true because they are alternate interior angles of parallel lines.

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?**

   The measure of $\angle 7$ is $107°$. This must be true because they are alternate exterior angles of parallel lines.

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?**

   No. The fact that the lines are parallel is the reason we can state that specific pairs of angles are equal. We can use basic rigid motions to prove that angles associated with parallel lines have the property of being equal when they are corresponding, alternate interior, or alternate exterior angles. If the lines are not parallel, then we could still classify the angles, but we would not know anything about their measures.

8. **Use an informal argument to describe why $\angle 1$ and $\angle 5$ are equal in measure if $L_1 \parallel L_2$.**

   The reason that angle 1 and angle 5 are equal in measure when the lines are parallel is because you can translate along a vector equal in length of the segment between the parallel lines; then, angle 1 would map onto angle 5.

9. **Use an informal argument to describe why $\angle 4$ and $\angle 5$ are equal in measure if $L_1 \parallel L_2$.**

   The reason that angle 4 and angle 5 are equal in measure when the lines are parallel is because when you rotate angle 4 around the midpoint of the segment between the parallel lines, angle 4 will map onto angle 5.

10. **Assume that L_1 is not parallel to L_2. Explain why $\angle 3 \neq \angle 7$.**

    If the lines are not parallel, then all we know about angle 3 and angle 7 is that they are corresponding angles. If the lines are parallel, we could use translation to map one angle onto the other to show that they are equal in measure. However, we are to assume that the lines are not parallel, which means that their corresponding angles will not be equal in measure.