7-2 Angles and Parallel Lines

What You'll Learn 8.G.5

To identify parallel lines and the angles formed by parallel lines and transversals

You will need Evernote today.

WARM UP TIME

Check Skills You'll Need

1. **Vocabulary Review** Which of the following pairs of angles are *supplementary*?
   50° and 40°,
   100° and 90°,
   120° and 60°,
   75° and 125°

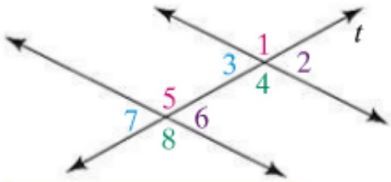
Find the measure of the supplement of each angle.

2. 48°
3. 119°
4. 67°
5. 131°

Why Learn This?

Carpenters must know about angles and parallel lines in order to make correct measurements and cuts.

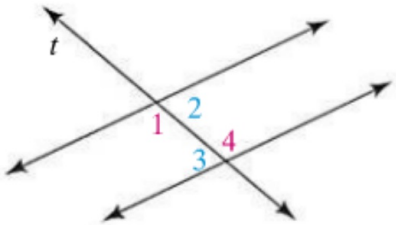
A line that intersects two other lines at different points is a **transversal**. In the diagrams below, line *t* is a transversal. Some pairs of angles formed by two lines and a transversal have special names.



Corresponding angles lie on the same side of the transversal and in corresponding positions.

∠1 and ∠5 ∠2 and ∠6

∠3 and ∠7 ∠4 and ∠8



Alternate interior angles lie within a pair of lines and on opposite sides of the transversal.

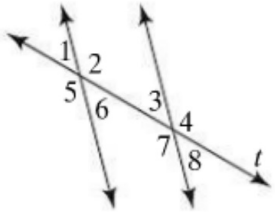
∠1 and ∠4 ∠2 and ∠3

EXAMPLE Identifying Angles

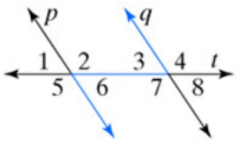
1. Identify a pair of corresponding angles and a pair of alternate interior angles.

   $\angle 1$ and $\angle 3$ are corresponding angles.

   $\angle 2$ and $\angle 7$ are alternate interior angles.

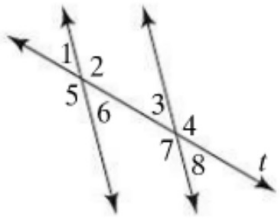


1 EXAMPLE Identify each pair of corresponding angles and each pair of alternate interior angles.



$\angle 1$ and $\angle 3$, $\angle 2$ and $\angle 4$, $\angle 5$ and $\angle 7$, $\angle 6$ and $\angle 8$ are pairs of corresponding angles.

$\angle 2$ and $\angle 7$, $\angle 3$ and $\angle 6$, are pairs of alternate interior angles.



Quick Check

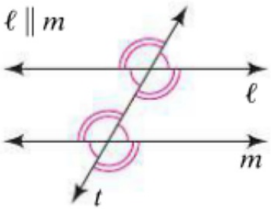
1. Use the diagram in Example 1. Identify each pair of angles as *corresponding, alternate interior,* or *neither.*

   a. $\angle 3, \angle 6$ **b.** $\angle 5, \angle 7$ **c.** $\angle 1, \angle 8$

KEY CONCEPTS Transversals and Parallel Lines

When a transversal intersects two parallel lines,

- corresponding angles are congruent, and
- alternate interior angles are congruent.



Vocabulary Tip

Recall that parallel lines lie in the same plane and do not intersect.

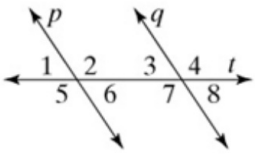
EXAMPLE Finding Angle Measures

2 **Gridded Response** A carpenter wants to make the hat rack at the left and needs to find all the angle measurements. He knows that line r is parallel to line s, and $m\angle 4 = 63°$. What is $m\angle 5$ measured in degrees?

$m\angle 5 = m\angle 4 = 63°$ ← **Alternate interior angles are congruent.**

The correct answer is 63 degrees.

2 EXAMPLE If p is parallel to q, and $m\angle 3 = 56°$, find $m\angle 6$.



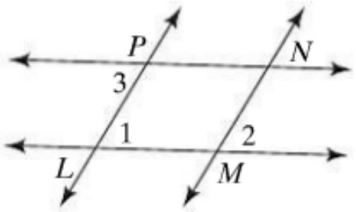
$m\angle 6 = m\angle 3 = 56°$ ← Alternate interior angles are congruent.

$m\angle 6 = 56°$

When a transversal intersects two parallel lines, some pairs of angles are congruent. The reverse is also true. If the corresponding angles or the alternate interior angles are congruent, the lines are parallel. To show that $\overleftrightarrow{AB}$ is parallel to $\overleftrightarrow{CD}$, you write $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$.

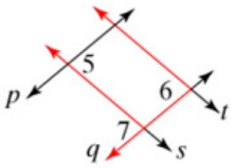
EXAMPLE Identifying Parallel Lines

3 In the diagram at the right, $m\angle 1 = 60°$, $m\angle 2 = 60°$, and $m\angle 3 = 60°$. Explain how you know $\overleftrightarrow{LP} \parallel \overleftrightarrow{MN}$ and $\overleftrightarrow{LM} \parallel \overleftrightarrow{PN}$.



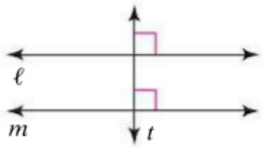
$\overleftrightarrow{LP} \parallel \overleftrightarrow{MN}$ because $\angle 1$ and $\angle 2$ are congruent corresponding angles. $\overleftrightarrow{LM} \parallel \overleftrightarrow{PN}$ because $\angle 1$ and $\angle 3$ are congruent alternate interior angles.

3 EXAMPLE In the diagram below, $m\angle 5 = m\angle 6 =$ and $m\angle 7 = 80°$. Explain why p and q are parallel and why s and t are parallel.



$p \parallel q$ because $\angle 5$ and $\angle 7$ are congruent alternate interior angles.

$s \parallel t$ because $\angle 6$ and $\angle 7$ are congruent corresponding angles.



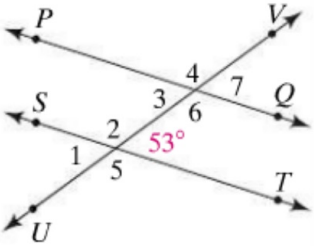
Quick Check

3. Transversal t at the left is perpendicular to lines ℓ and m. Explain how you know $\ell \parallel m$.

The reasoning used in Example 3 is called *deductive reasoning*. Deductive reasoning is the logical process of drawing conclusions from given facts.

Check Your Understanding

In the diagram at the right, $\overleftrightarrow{PQ} \parallel \overleftrightarrow{ST}$.



1. Name a pair of corresponding angles.

2. Name a pair of alternate interior angles.

3. Which line is the transversal?

4. What other angles have measures of 53°?

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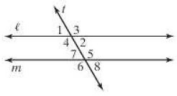
Practice 7-2

Angles and Parallel Lines

Identify each pair of angles as *vertical, adjacent, corresponding, alternate interior,* or *none of these.*



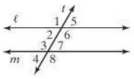
1. ∠7, ∠5 _____

2. ∠1, ∠2 _____

3. ∠1, ∠7 _____

4. ∠4, ∠7 _____

Use the diagrams at the right for Exercises 5 and 6.



5. Name four pairs of corresponding angles.

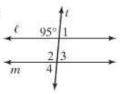
_____

6. Name two pairs of alternate interior angles

_____

In each diagram below, $\ell \parallel m$. Find the measure of each numbered angle.

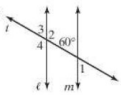
7.



$m\angle 1 =$ _____ $m\angle 3 =$ _____

$m\angle 2 =$ _____ $m\angle 4 =$ _____

8.



$m\angle 1 =$ _____ $m\angle 3 =$ _____

$m\angle 2 =$ _____ $m\angle 4 =$ _____

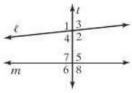
9. Use the figure at the right. Is line ℓ parallel to line m? Explain how you could use a protractor to support your conjecture.

_____

_____

_____

_____



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