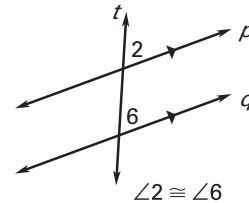# 3.2 Use Parallel Lines and Transversals

Goal • Use angles formed by parallel lines and transversals.

Your Notes

POSTULATE 15 CORRESPONDING ANGLES POSTULATE

If two parallel lines are cut by a transversal, then the pairs of corresponding angles are __congruent__ .

$\angle 2 \cong \angle 6$

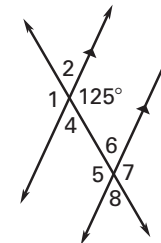**Example 1** *Identify congruent angles*

The measure of three of the numbered angles is 125°. Identify the angles. *Explain* your reasoning.

Solution

By the Corresponding Angles Postulate,
__$m\angle 7$__ = 125°.

Using the Vertical Angles Congruence Theorem,
__$m\angle 1$__ = 125°.

Because $\angle 1$ and $\angle 5$ are corresponding angles, by the
__Corresponding Angles Postulate__ , you know
that __$m\angle 5$__ = 125°.

✔ *Checkpoint* **Complete the following exercise using the diagram shown.**

1. If $m\angle 7 = 75°$, find $m\angle 1$, $m\angle 3$, and $m\angle 5$. Tell which postulate or theorem you use in each case.
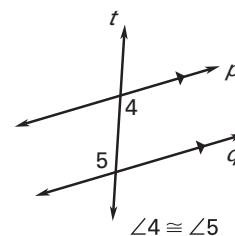
$m\angle 3 = 75°$,
Corresponding Angles Postulate;
$m\angle 5 = 75°$, Vertical Angles Congruence Theorem;
$m\angle 1 = 75°$, Corresponding Angles Postulate
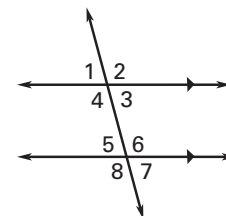
THEOREM 3.1   ALTERNATE INTERIOR ANGLES THEOREM

If two parallel lines are cut by a transversal, then the pairs of alternate interior angles are <u>congruent</u>.

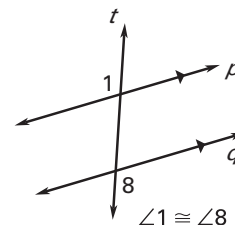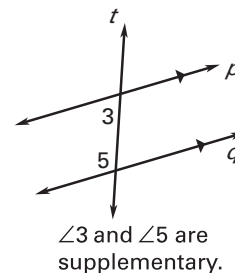∠4 ≅ ∠5

THEOREM 3.2   ALTERNATE EXTERIOR ANGLES THEOREM

If two parallel lines are cut by a transversal, then the pairs of alternate exterior angles are <u>congruent</u>.
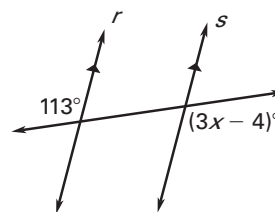
∠1 ≅ ∠8

THEOREM 3.3   CONSECUTIVE INTERIOR ANGLES THEOREM

If two parallel lines are cut by a transversal, then the pairs of consecutive interior angles are <u>supplementary</u>.

∠3 and ∠5 are supplementary.

Example 2   *Use properties of parallel lines*

Find the value of x.

$113°$ $(3x - 4)°$

Solution

Lines *r* and *s* are <u>parallel</u>, so you can use the theorems about parallel lines.

$\underline{113°} = (3x - 4)°$ <u>Alternate Exterior Angles Theorem</u>

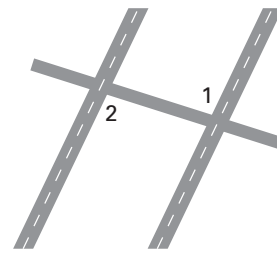$\underline{117} = 3x$ Add <u>4</u> to each side.

$\underline{39} = x$ Divide each side by <u>3</u>.

The value of *x* is <u>39</u>.

Example 3 *Solve a real-world problem*

Runways A taxiway is being constructed that intersects two parallel runways at an airport. You know that $m\angle 2 = 98°$. What is $m\angle 1$? How do you know?
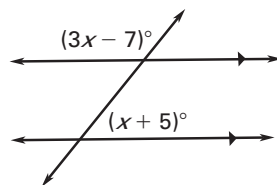
Solution

Because the runways are parallel, $\angle 1$ and $\angle 2$ are alternate interior angles . By the Alternate Interior Angles Theorem, $\angle 1 \cong \angle 2$. By the definition of congruent angles, $m\angle 1 = m\angle 2 = 98°$.

✔ *Checkpoint* **Complete the following exercises.**

2. Find the value of x.

$(3x - 7)°$

$(x + 5)°$

$x = 45.5$

3. In Example 3, suppose $\angle 3$ is the consecutive interior angle with $\angle 2$. What is $m\angle 3$?

$82°$

Homework