Properties of Parallel and Perpendicular Lines

Review It!
When you work with parallel and perpendicular lines cut by a transversal, remember these words:

transversal: a line that crosses other lines at different points
parallel lines: lines in the same plane that never meet

1) alternate interior angles: two angles on opposite sides of a transversal, both between two lines
   pairs of alternate interior angles: ∠2 and ∠7; ∠3 and ∠6

2) corresponding angles: two nonadjacent angles on the same side of a transversal, one between two lines and one outside the lines
   pairs of corresponding angles: ∠1 and ∠3; ∠2 and ∠4; ∠5 and ∠7; ∠6 and ∠8

3) alternate exterior angles: two nonadjacent angles on opposite sides of a transversal, both outside two lines
   alternate exterior angles: ∠1 and ∠8; ∠4 and ∠5

When parallel lines are cut by a transversal, pairs of alternate interior angles, corresponding angles, and alternate exterior angles are congruent.
Assume lines l and m are parallel in the figure above, and ∠1 in the figure measures 112°. What is the measure of ∠3?

Step 1: Find the relationship. ∠1 and ∠3 are corresponding angles.

Step 2: Find the measure.
   Corresponding angles are congruent, so ∠1 ≅ ∠3.

   The measures of ∠1 and ∠3 are 112°.

   m∠1 = 112°, so m∠3 = 112°.

   THINK: Congruent angles have equal measures.

So, the measure of ∠3 is 112°.
In the figure below, lines $r$ and $s$ are parallel. Use the figure for questions 1–9.

- $\angle 1$ and $\angle 8$ are alternate exterior angles.
- $\angle 1$ and $\angle 5$ are corresponding angles.
- $\angle 3$ and $\angle 6$ are alternate interior angles.

Write true or false for each.

- $\angle 2$ and $\angle 6$ are congruent. Yes, corresponding.
- $\angle 4$ and $\angle 6$ are congruent. No, supplementary.
- $\angle 4$ and $\angle 5$ are congruent. Yes, alternate interior.
- $\angle 7$ and $\angle 1$ are congruent. No, supplementary.

Solve.

- If the measure of $\angle 2$ is $59^\circ$, then what is the measure of $\angle 7$? $59^\circ$, because they are alternate exterior angles.
- If the measure of $\angle 6$ is $60^\circ$, then what is the measure of $\angle 3$? $60^\circ$, because they are alternate interior angles.