

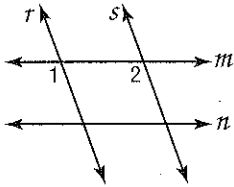
# 3-5 Study Guide and Intervention

## Proving Lines Parallel

**Identify Parallel Lines** If two lines in a plane are cut by a transversal and certain conditions are met, then the lines must be parallel.

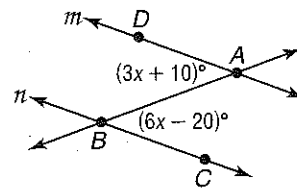
If	then
<ul style="list-style-type: none"> <li>• corresponding angles are congruent,</li> <li>• alternate exterior angles are congruent,</li> <li>• consecutive interior angles are supplementary,</li> <li>• alternate interior angles are congruent, or</li> <li>• two lines are perpendicular to the same line,</li> </ul>	the lines are parallel.

**Example 1** If  $m\angle 1 = m\angle 2$ , determine which lines, if any, are parallel.



Since  $m\angle 1 = m\angle 2$ , then  $\angle 1 \cong \angle 2$ .  $\angle 1$  and  $\angle 2$  are congruent corresponding angles, so  $r \parallel s$ .

**Example 2** Find  $x$  and  $m\angle ABC$  so that  $m \parallel n$ .



We can conclude that  $m \parallel n$  if alternate interior angles are congruent.

$$m\angle BAD = m\angle ABC$$

$$3x + 10 = 6x - 20$$

$$10 = 3x - 20$$

$$30 = 3x$$

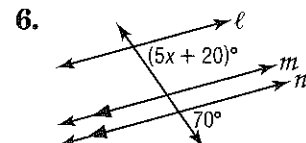
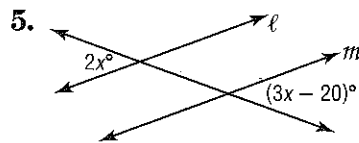
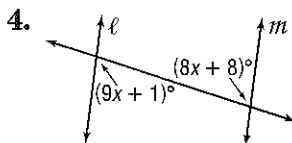
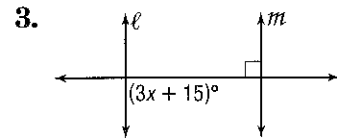
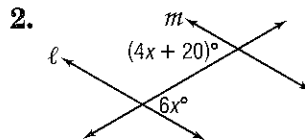
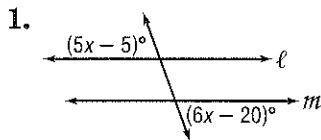
$$10 = x$$

$$m\angle ABC = 6x - 20$$

$$= 6(10) - 20 \text{ or } 40$$

### Exercises

Find  $x$  so that  $\ell \parallel m$ .



# 3-5 Study Guide and Intervention *(continued)*

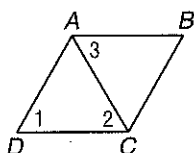
## Proving Lines Parallel

**Prove Lines Parallel** You can prove that lines are parallel by using postulates and theorems about pairs of angles. You also can use slopes of lines to prove that two lines are parallel or perpendicular.

### Example

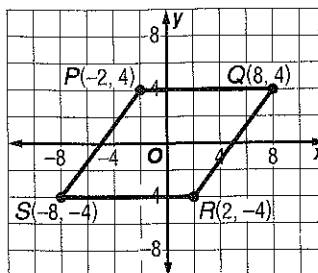
a. Given:  $\angle 1 \cong \angle 2$ ,  $\angle 1 \cong \angle 3$

Prove:  $\overline{AB} \parallel \overline{DC}$



Statements	Reasons
1. $\angle 1 \cong \angle 2$ $\angle 1 \cong \angle 3$	1. Given
2. $\angle 2 \cong \angle 3$	2. Transitive Property of $\cong$
3. $\overline{AB} \parallel \overline{DC}$	3. If alt. int. angles are $\cong$ , then the lines are $\parallel$ .

b. Which lines are parallel?  
Which lines are perpendicular?



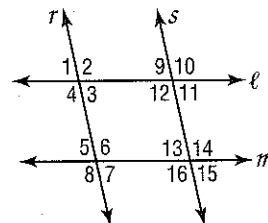
slope of  $\overline{PQ} = 0$       slope of  $\overline{SR} = 0$   
 slope of  $\overline{PS} = \frac{4}{3}$       slope of  $\overline{QR} = \frac{4}{3}$   
 slope of  $\overline{PR} = -2$       slope of  $\overline{SQ} = \frac{1}{2}$   
 So  $\overline{PQ} \parallel \overline{SR}$ ,  $\overline{PS} \parallel \overline{QR}$ , and  $\overline{PR} \perp \overline{SQ}$ .

### Exercises

For Exercises 1–6, fill in the blanks.

Given:  $\angle 1 \cong \angle 5$ ,  $\angle 15 \cong \angle 5$

Prove:  $\ell \parallel m$ ,  $r \parallel s$



Statements	Reasons
1. $\angle 15 \cong \angle 5$	1. _____
2. $\angle 13 \cong \angle 15$	2. _____
3. $\angle 5 \cong \angle 13$	3. _____
4. $r \parallel s$	4. _____
5. _____	5. Given
6. _____	6. If corr $\angle$ s are $\cong$ , then lines $\parallel$ .

7. Determine whether  $\overline{PQ} \perp \overline{TQ}$ . Explain why or why not.

