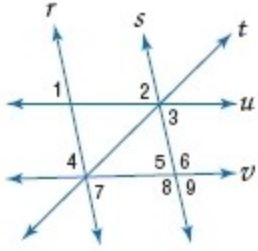


### 3-5 Proving Lines Parallel

Given the following information, determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.



12.  $m\angle 3 + m\angle 6 = 180$

**SOLUTION:**

$\angle 3$  and  $\angle 6$  are consecutive interior angles of lines  $u$  and  $v$ . Since  $m\angle 3 + m\angle 6 = 180$ ,  
 $u \parallel v$  by the Converse of Consecutive Interior Angles Theorem.

**ANSWER:**

$u \parallel v$ ; Consecutive Interior Angles Converse

13.  $\angle 3 \cong \angle 5$

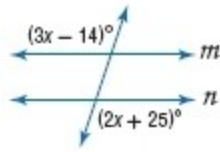
**SOLUTION:**

$\angle 3$  and  $\angle 5$  are alternate interior angles of lines  $u$  and  $v$ . Since  $\angle 3 \cong \angle 5$ ,  
 $u \parallel v$  by the Converse of Alternate Interior Angles Theorem.

**ANSWER:**

$u \parallel v$ ; Alternate Interior Angles Converse

Find  $x$  so that  $m \parallel n$ . Identify the postulate or theorem you used.



16.

**SOLUTION:**

By the Alternate Exterior Angles Converse, if  $3x - 14 = 2x + 25$ , then  $m \parallel n$ .

Solve for  $x$ .

$$3x - 14 = 2x + 25$$

$$3x - 2x - 14 = 2x - 2x + 25$$

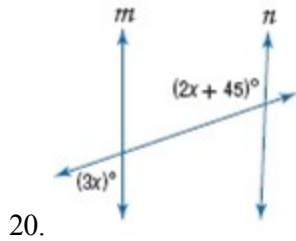
$$x - 14 + 14 = 25 + 14$$

$$x = 39$$

**ANSWER:**

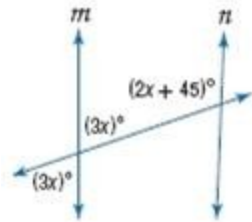
39; Alt. Ext.  $\angle$ s Conv.

### 3-5 Proving Lines Parallel



**SOLUTION:**

Use the Vertical Angle Theorem followed by Consecutive Interior Angles Converse to find  $x$ .



Then by Consecutive Interior Angles Converse, if  $3x + 2x + 45 = 180$ , then  $m \parallel n$ .

Solve for  $x$ .

$$3x + 2x + 45 = 180$$

$$6x + 45 = 180$$

$$6x + 45 - 45 = 180 - 45$$

$$6x = 135$$

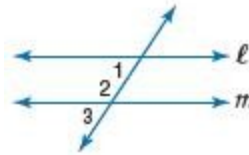
$$\frac{6x}{6} = \frac{135}{6}$$

$$x = 27$$

**ANSWER:**

27; Vert.  $\angle$ s Thm and Consec. Int.  $\angle$ s Conv.

23. **PROOF** Copy and complete the proof of Theorem 3.6.



**Given:**  $\angle 1$  and  $\angle 2$  are supplementary.

**Prove:**  $l \parallel m$

Statements	Reasons
a. $\underline{\hspace{1cm}} ?$	a. Given
b. $\angle 2$ and $\angle 3$ form a linear pair.	b. $\underline{\hspace{1cm}} ?$
c. $\underline{\hspace{1cm}} ?$	c. $\underline{\hspace{1cm}} ?$
d. $\angle 1 \cong \angle 3$	d. $\underline{\hspace{1cm}} ?$
e. $l \parallel m$	e. $\underline{\hspace{1cm}} ?$

**SOLUTION:**

Statements	Reasons
a. $\angle 1$ and $\angle 2$ are supplementary.	a. Given
b. $\angle 2$ and $\angle 3$ form a linear pair.	b. Def. of linear pair.
c. $\angle 2$ and $\angle 3$ are supplementary.	c. Suppl. Thm.
d. $\angle 1 \cong \angle 3$	d. $\cong$ Suppl. Thm.
e. $l \parallel m$	e. Converse of Corr. $\angle$ s Post.

**ANSWER:**

Statements	Reasons
a. $\angle 1$ and $\angle 2$ are supplementary.	a. Given
b. $\angle 2$ and $\angle 3$ form a linear pair.	b. Def. of linear pair.
c. $\angle 2$ and $\angle 3$ are supplementary.	c. Suppl. Thm.
d. $\angle 1 \cong \angle 3$	d. $\cong$ Suppl. Thm.
e. $l \parallel m$	e. Converse of Corr. $\angle$ s Post.

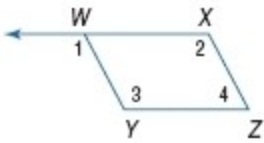
### 3-5 Proving Lines Parallel

**PROOF** Write a two-column proof for each of the following.

26. **Given:**  $\overline{WX} \parallel \overline{YZ}$

$$\angle 2 \cong \angle 3$$

**Prove:**  $\overline{WY} \parallel \overline{XZ}$



**SOLUTION:**

**Proof:**

**Statements (Reasons)**

1.  $\overline{WX} \parallel \overline{YZ}$ ,  $\angle 2 \cong \angle 3$  (Given)
2.  $\angle 2$  and  $\angle 4$  are supplementary. (Cons. Int.  $\angle$ s)
3.  $m\angle 2 + m\angle 4 = 180$  (Def. of suppl.  $\angle$ s)
4.  $m\angle 3 + m\angle 4 = 180$  (Substitution)
5.  $\angle 3$  and  $\angle 4$  are supplementary. (Def. of suppl.  $\angle$ s)
6.  $\overline{WY} \parallel \overline{XZ}$  (If cons. int.  $\angle$ s are suppl., then lines are  $\parallel$ .)

**ANSWER:**

**Proof:**

**Statements (Reasons)**

1.  $\overline{WX} \parallel \overline{YZ}$ ,  $\angle 2 \cong \angle 3$  (Given)
2.  $\angle 2$  and  $\angle 4$  are supplementary. (Cons. Int.  $\angle$ s)
3.  $m\angle 2 + m\angle 4 = 180$  (Def. of suppl.  $\angle$ s)
4.  $m\angle 3 + m\angle 4 = 180$  (Substitution)
5.  $\angle 3$  and  $\angle 4$  are supplementary. (Def. of suppl.  $\angle$ s)
6.  $\overline{WY} \parallel \overline{XZ}$  (If cons. int.  $\angle$ s are suppl., then lines are  $\parallel$ .)