

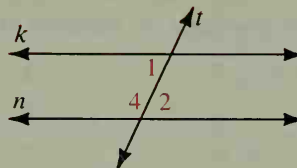
### Theorem 3-3

**If two parallel lines are cut by a transversal, then same-side interior angles are supplementary.**

Given:  $k \parallel n$ ; transversal  $t$  cuts  $k$  and  $n$ .

Prove:  $\angle 1$  is supplementary to  $\angle 4$ .

The proof is left as Exercise 22.



### Theorem 3-4

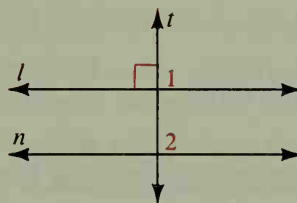
**If a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other one also.**

Given: Transversal  $t$  cuts  $l$  and  $n$ ;

$t \perp l$ ;  $l \parallel n$

Prove:  $t \perp n$

The proof is left as Exercise 13.



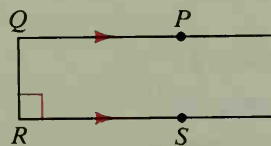
For the rest of this book, arrowheads will no longer be used in diagrams to suggest that a line extends in both directions without ending. Instead, pairs of arrowheads (and double arrowheads when necessary) will be used to indicate parallel lines, as shown in the following examples.

**Example 1** Find the measure of  $\angle PQR$ .

**Solution** The diagram shows that

$$\overleftrightarrow{QR} \perp \overleftrightarrow{RS} \text{ and } \overleftrightarrow{QP} \parallel \overleftrightarrow{RS}.$$

Then by Theorem 3-4,  $\overleftrightarrow{QR} \perp \overleftrightarrow{QP}$  and  $m\angle PQR = 90$ .



**Example 2** Find the values of  $x$ ,  $y$ , and  $z$ .

**Solution** Since  $a \parallel b$ ,  $2x = 40$ . (Why?)

Thus,  $x = 20$ .

Since  $c \parallel d$ ,  $y = 40$ . (Why?)

Since  $a \parallel b$ ,  $y + z = 180$ . (Why?)

$$40 + z = 180$$

$$z = 140$$

