

LESSON  
3.6**Study Guide**

For use with pages 190–197

**GOAL** Find the distance between a point and a line.**Vocabulary**

The **distance from a point to a line** is the length of the perpendicular segment from the point to the line.

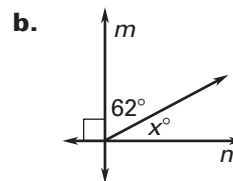
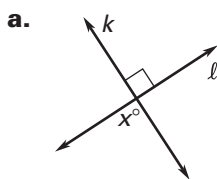
**Theorem 3.8:** If two lines intersect to form a linear pair of congruent angles, then the lines are perpendicular.

**Theorem 3.9:** If two lines are perpendicular, then they intersect to form four right angles.

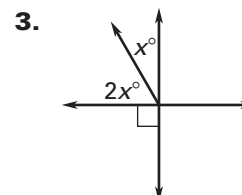
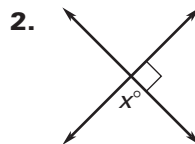
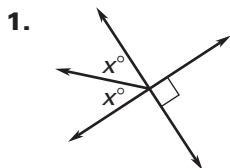
**Theorem 3.10:** If two sides of two adjacent acute angles are perpendicular, then the angles are complementary.

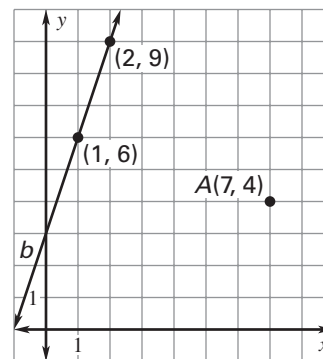
**Theorem 3.11 Perpendicular Transversal Theorem:** If a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other.

**Theorem 3.12 Lines Perpendicular to a Transversal Theorem:** In a plane, if two lines are perpendicular to the same line, then they are parallel to each other.

**EXAMPLE 1** Application of the TheoremsFind the value of  $x$ .**Solution**

- a.  $x = 90$ , by Theorem 3.9, because  $k$  and  $l$  are perpendicular, all four angles formed are right angles. By definition of a right angle,  $x$  is 90.
- b. By Theorem 3.9, because  $m$  and  $n$  are perpendicular, all four angles formed are right angles. By Theorem 3.2, the  $62^\circ$  angle and the  $x^\circ$  angle are complementary. Thus  $x + 62 = 90$ , so  $x = 28$ .

**Exercises for Example 1**Find the value of  $x$ .

LESSON  
3.6**Study Guide** *continued*  
For use with pages 190–197**EXAMPLE 2** Find the distance between a point and a line**What is the distance from point  $A$  to line  $b$ ?****Solution**

You need to find the slope of line  $b$ . Using the points  $(1, 6)$  and  $(2, 9)$ , the slope of the line is

$$m = \frac{9 - 6}{2 - 1} = 3.$$

The distance from point  $A$  to line  $b$  is the perpendicular segment from the point to the line. The slope of a perpendicular segment from point  $A$  to line  $b$  is  $-\frac{1}{3}$ . The segment from  $(1, 6)$  to  $(7, 4)$  has a slope of  $-\frac{1}{3}$ .

Find the distance between these points.

$$d = \sqrt{(1 - 7)^2 + (6 - 4)^2} \approx 6.3$$

The distance from point  $A$  to line  $b$  is about 6.3 units.

**Exercises for Example 2****Use the graph at the right.**

4. What is the distance from point  $H$  to line  $j$ ?
5. What is the distance from line  $j$  to line  $k$ ?

