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 Theorems

Find the value of *x*.

a.

b.
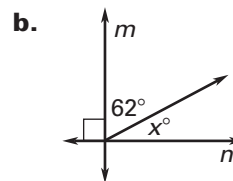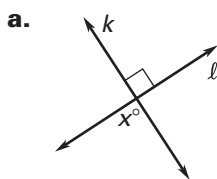
Solution

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° angle and the $x°$ angle are complementary. Thus $x + 62 = 90$, so $x = 28$.

Exercises for Example 1

Find the value of *x*.

1.

2.

3.
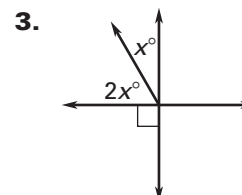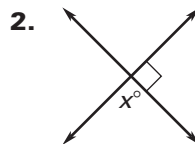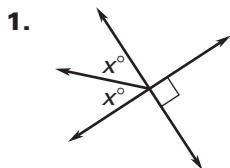
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EXAMPLE 2 **Find the distance between a point and a line**

What is the distance from point *A* to line *b*?
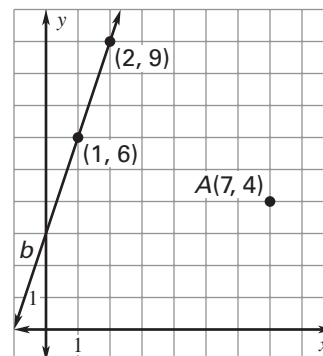
Solution

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*?