NAME ______________________________ DATE __________

Reteaching with Practice

For use with pages 264–271

GOAL **Use properties of perpendicular bisectors and use properties of angle bisectors to identify equal distances**

VOCABULARY

A segment, ray, line, or plane that is perpendicular to a segment at its midpoint is called a **perpendicular bisector.**

A point is **equidistant from two points** if its distance from each point is the same.

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

When a point is the same distance from a line as it is from another line, then the point is **equidistant from the two lines** (or rays or segments).

Theorem 5.1 Perpendicular Bisector Theorem
If a point is on the perpendicular bisector of a segment, then it is equidistant from the endpoints of the segment.

Theorem 5.2 Converse of the Perpendicular Bisector Theorem
If a point is equidistant from the endpoints of a segment, then it is on the perpendicular bisector of the segment.

Theorem 5.3 Angle Bisector Theorem
If a point is on the bisector of an angle, then it is equidistant from the two sides of the angle.

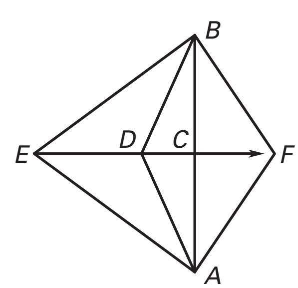
Theorem 5.4 Converse of the Angle Bisector Theorem
If a point is in the interior of an angle and is equidistant from the sides of the angle, then it lies on the bisector of the angle.

EXAMPLE 1 *Using Perpendicular Bisectors*

In the diagram shown, $\overrightarrow{EC}$ is the perpendicular bisector of $\overline{AB}$ and $\overline{AF} \cong \overline{BF}$.

a. Explain how you know that $AC = BC$.

b. Explain why F is on $\overrightarrow{EC}$.



SOLUTION

a. $\overrightarrow{EC}$ bisects $\overline{AB}$, so $AC = BC$ by the definition of bisector.

b. $\overline{AF} \cong \overline{BF}$ and by definition of congruence, this means that $AF = BF$ and hence F is equidistant from A and B. By Theorem 5.2, F is on the perpendicular bisector of $\overline{AB}$, which is $\overrightarrow{EC}$.

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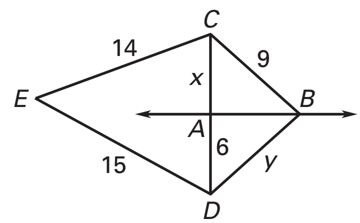
Exercises for Example 1

Use the diagram shown. In the diagram, $\overleftrightarrow{AB}$ is the perpendicular bisector of $\overline{CD}$.

1. Find the value of *x*.

2. Find the value of *y*.

3. Is *E* on $\overleftrightarrow{AB}$? Explain.



EXAMPLE 2

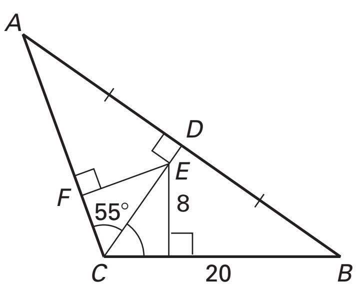
Using Bisector Theorems

Determine the correct measurement for the angle or segment given.

a. $\angle DCB$

b. $\overline{FE}$

c. $\overline{AC}$



Solution

a. $\overline{CD}$ is the angle bisector of $\angle ACB$ because $m\angle ACD = m\angle DCB$. Since you are given that $m\angle ACD = 55°$, $m\angle DCB = 55°$.

b. By Theorem 5.3, *E* is equidistant from $\overline{AC}$ and $\overline{BC}$. So $FE = 8$.

c. Because $\overline{CD}$ is the perpendicular bisector of $\overline{AB}$, then by Theorem 5.1 *C* is equidistant from *A* and *B*. Thus, $AC = 20$.

Exercises for Example 2

Determine the correct measurement for the angle or segment given.

4. $\overline{EG}$

5. $\angle GDE$

6. $\overline{ED}$

7. $\overline{HD}$

8. $\overline{FD}$