

Reteaching with Practice

For use with pages 272–278

GOAL

Use properties of perpendicular bisectors of a triangle and use properties of angle bisectors of a triangle

VOCABULARY

A **perpendicular bisector** of a triangle is a line (or ray or segment) that is perpendicular to a side of the triangle at the midpoint of the side.

When three or more lines (or rays or segments) intersect in the same point, they are called **concurrent lines** (or rays or segments).

The point of intersection of concurrent lines is called the **point of concurrency**.

The point of concurrency of the perpendicular bisectors of a triangle is called the **circumcenter** of the triangle.

An **angle bisector** of a triangle is a bisector of an angle of the triangle.

The point of concurrency of the angle bisectors is called the **incenter** of the triangle.

Theorem 5.5 Concurrency of Perpendicular Bisectors of a Triangle

The perpendicular bisectors of a triangle intersect at a point that is equidistant from the vertices of the triangle.

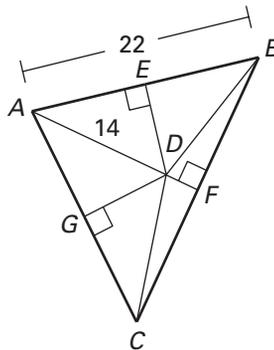
Theorem 5.6 Concurrency of Angle Bisectors of a Triangle

The angle bisectors of a triangle intersect at a point that is equidistant from the sides of the triangle.

EXAMPLE 1**Using Perpendicular Bisectors**

The perpendicular bisectors of $\triangle ABC$ meet at point D .

- Find DB .
- Find AE .

**SOLUTION**

- You are given that the perpendicular bisectors of $\triangle ABC$ meet at D . By Theorem 5.5, D is equidistant from the vertices A , B , and C of the triangle. Since you are given that $AD = 14$, it follows that $DB = 14$.
- You are given that \overline{ED} is a perpendicular bisector of side \overline{AB} . By definition of a perpendicular bisector, E is the midpoint of \overline{AB} . Because you are given that $AB = 22$, it follows that $AE = 11$.

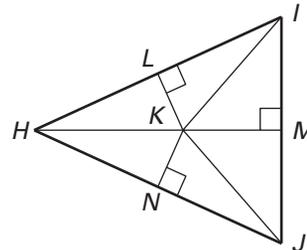
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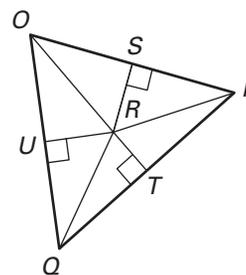
Exercises for Example 1

Use the given information to find the indicated lengths.

- The perpendicular bisectors of $\triangle HIJ$ meet at K , $IJ = 18$, and $KJ = 12$.
 - Find HK .
 - Find IM .

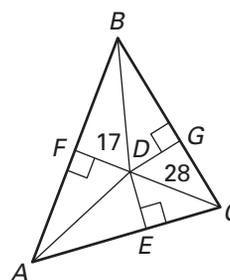


- R is the circumcenter of $\triangle OPQ$, $OS = 10$, $QR = 12$, and $PQ = 22$.
 - Find OP .
 - Find RP .
 - Find OR .
 - Find TP .



EXAMPLE 2 Using Angle Bisectors

The angle bisectors of $\triangle ABC$ meet at point D . Find DE .



SOLUTION

By Theorem 5.6, point D is equidistant from the sides of $\triangle ABC$. Thus, $FD = GD = ED$. Since $FD = 17$ units and $FD = ED$, it follows that $DE = 17$.

Exercise for Example 2

- The angle bisectors of $\triangle ABC$ meet at point P , $PR = 3$, and $PC = 5$. Find QP .

