

6.1**Perpendicular and Angle Bisectors**

For use with Exploration 6.1

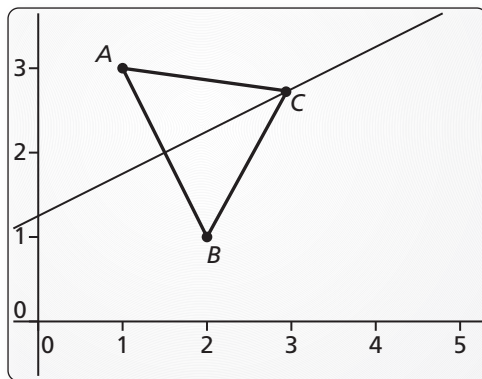
Essential Question What conjectures can you make about a point on the perpendicular bisector of a segment and a point on the bisector of an angle?

1 EXPLORATION: Points on a Perpendicular Bisector

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Use dynamic geometry software.

- Draw any segment and label it \overline{AB} . Construct the perpendicular bisector of \overline{AB} .
- Label a point C that is on the perpendicular bisector of \overline{AB} but is not on \overline{AB} .
- Draw \overline{CA} and \overline{CB} and find their lengths. Then move point C to other locations on the perpendicular bisector and note the lengths of \overline{CA} and \overline{CB} .
- Repeat parts (a)–(c) with other segments. Describe any relationship(s) you notice.

**Sample**

Points

 $A(1, 3)$ $B(2, 1)$ $C(2.95, 2.73)$

Segments

 $AB = 2.24$ $CA = ?$ $CB = ?$

Line

 $-x + 2y = 2.5$ **2 EXPLORATION: Points on an Angle Bisector**

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Use dynamic geometry software.

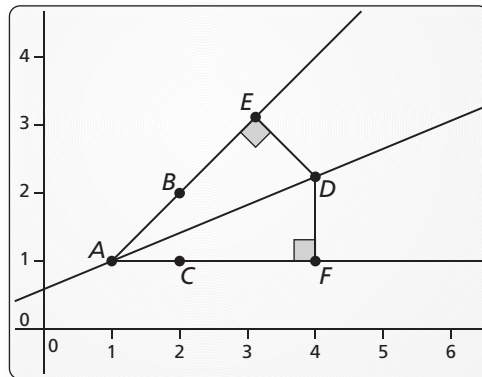
- Draw two rays \overrightarrow{AB} and \overrightarrow{AC} to form $\angle BAC$. Construct the bisector of $\angle BAC$.
- Label a point D on the bisector of $\angle BAC$.

6.1 Perpendicular and Angle Bisectors (continued)

2 EXPLORATION: Points on an Angle Bisector (continued)

c. Construct and find the lengths of the perpendicular segments from D to the sides of $\angle BAC$. Move point D along the angle bisector and note how the lengths change.

d. Repeat parts (a)–(c) with other angles. Describe any relationship(s) you notice.



Sample
 Points
 $A(1, 1)$
 $B(2, 2)$
 $C(2, 1)$
 $D(4, 2.24)$
 Rays
 $AB = -x + y = 0$
 $AC = y = 1$
 Line
 $-0.38x + 0.92y = 0.54$

Communicate Your Answer

3. What conjectures can you make about a point on the perpendicular bisector of a segment and a point on the bisector of an angle?

4. In Exploration 2, what is the distance from point D to \overrightarrow{AB} when the distance from D to \overrightarrow{AC} is 5 units? Justify your answer.

6.1**Notetaking with Vocabulary**

For use after Lesson 6.1

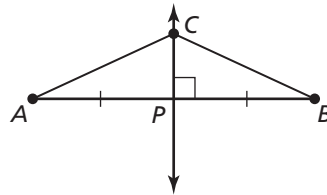
In your own words, write the meaning of each vocabulary term.

equidistant

Theorems**Theorem 6.1 Perpendicular Bisector Theorem**

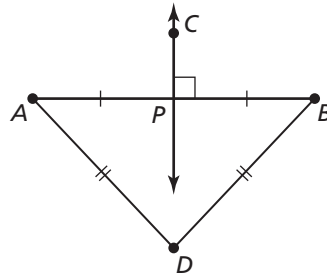
In a plane, if a point lies on the perpendicular bisector of a segment, then it is equidistant from the endpoints of the segment.

If \overleftrightarrow{CP} is the \perp bisector of \overline{AB} , then $CA = CB$.

**Notes:****Theorem 6.2 Converse of the Perpendicular Bisector Theorem**

In a plane, if a point is equidistant from the endpoints of a segment, then it lies on the perpendicular bisector of the segment.

If $DA = DB$, then point D lies on the \perp bisector of \overline{AB} .

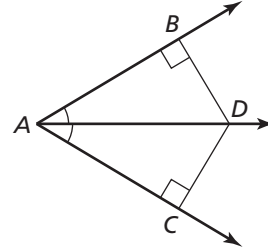
**Notes:**

6.1 Notetaking with Vocabulary (continued)

Theorem 6.3 Angle Bisector Theorem

If a point lies on the bisector of an angle, then it is equidistant from the two sides of the angle.

If \overrightarrow{AD} bisects $\angle BAC$ and $\overline{DB} \perp \overline{AB}$ and $\overline{DC} \perp \overline{AC}$, then $DB = DC$.

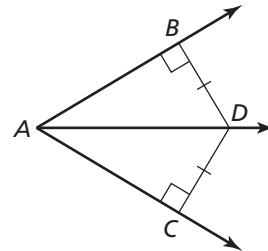


Notes:

Theorem 6.4 Converse of the Angle Bisector Theorem

If a point is in the interior of an angle and is equidistant from the two sides of the angle, then it lies on the bisector of the angle.

If $\overline{DB} \perp \overline{AB}$ and $\overline{DC} \perp \overline{AC}$ and $DB = DC$, then \overrightarrow{AD} bisects $\angle BAC$.



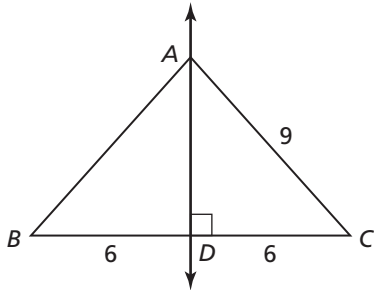
Notes:

6.1 Notetaking with Vocabulary (continued)

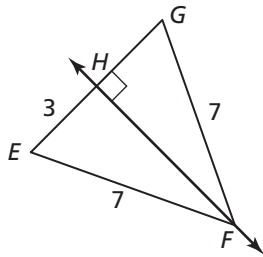
Extra Practice

In Exercises 1–3, find the indicated measure. Explain your reasoning.

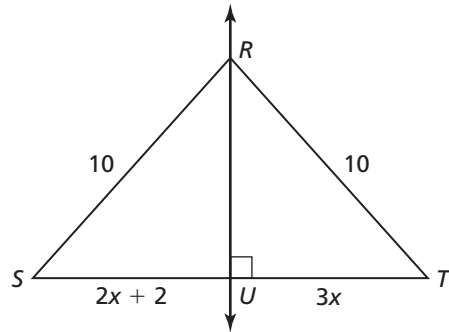
1. AB



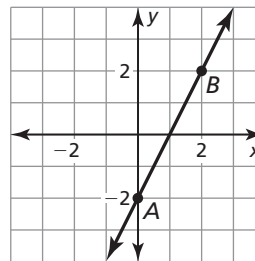
2. EG



3. SU

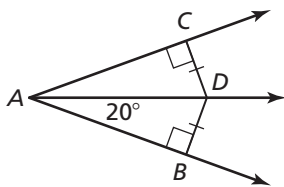


4. Find the equation of the perpendicular bisector of AB .

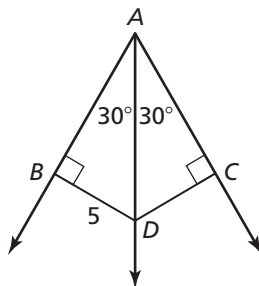


In Exercises 5–7, find the indicated measure. Explain your reasoning.

5. $m\angle CAB$



6. DC



7. BD

