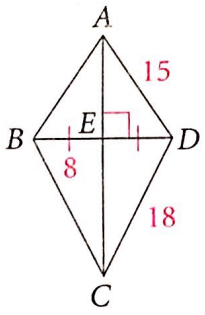
ctice by Example

Example 1 (page 250)

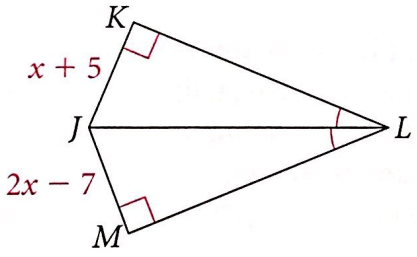
Use the figure at the right for Exercises 1–4.



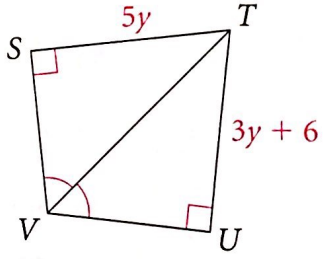
1. From the information given in the figure, how is $\overline{AC}$ related to $\overline{BD}$?
2. Find AB.
3. Find BC.
4. Find ED.
5. On a piece of paper, mark a point H for home and a point S for school. Describe the set of points equidistant from H and S

Example 2 (page 251)

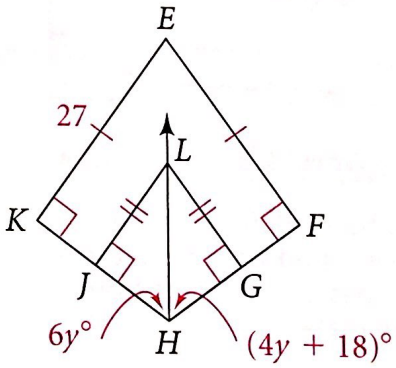
x^2 6. **Algebra** Find x, JK, and JM.



7. **Algebra** Find y, ST, and TU.



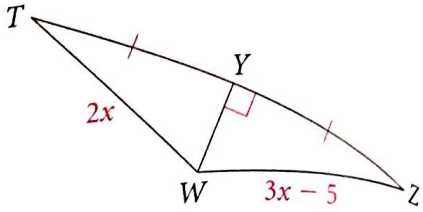
Use the figure at the right for Exercises 8–11.



8. From the information given in the figure, how is $\overrightarrow{HL}$ related to $\angle JHG$? Explain.
9. Find the value of y, then find $m\angle FHL$ and $m\angle KHL$.
10. Find EF.
11. What can you conclude about point E?

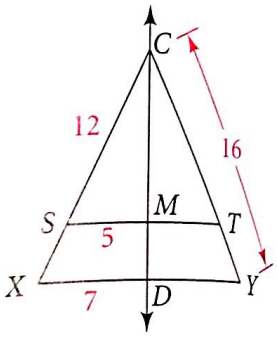
B Apply Your Skills

Algebra Use the figure, below right, for Exercises 12–16.

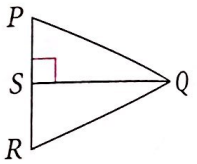


12. Find the value of x.
13. Find TW.
14. Find WZ.
15. What kind of triangle is $\triangle TWZ$? Explain.
16. If R is on the perpendicular bisector of $\overline{TZ}$, then R is __?__ from T and Z, or __?__ = __?__.
17. Write Theorems 5-2 and 5-3 as a single biconditional statement.

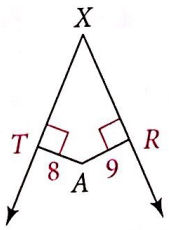
$\overleftrightarrow{CD}$ is the perpendicular bisector of both $\overline{XY}$ and $\overline{ST}$, and $CY = 16$. Find each length.



18. CT
19. TY
20. SX
21. CX
22. MT
23. ST
24. DY
25. XY
26. What kind of triangles are $\triangle SCT$ and $\triangle XCY$? Explain.
27. **Error Analysis** To prove that $\triangle PQR$ is isosceles, a student began by stating that since Q is on the segment perpendicular to $\overline{PR}$, Q is equidistant from the endpoints of $\overline{PR}$. What additional information does the student need in order to make that statement?



Writing Determine whether point A must be on the bisector of $\angle TXR$. Explain.

28.


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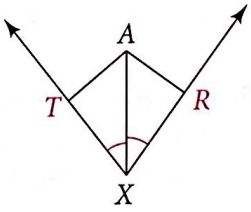

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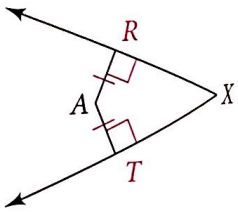
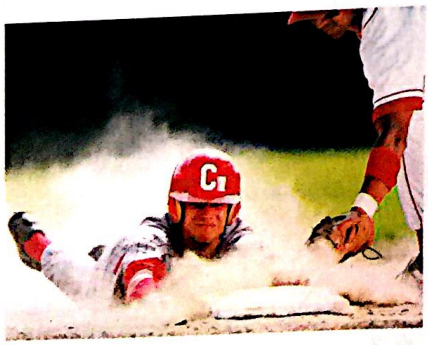
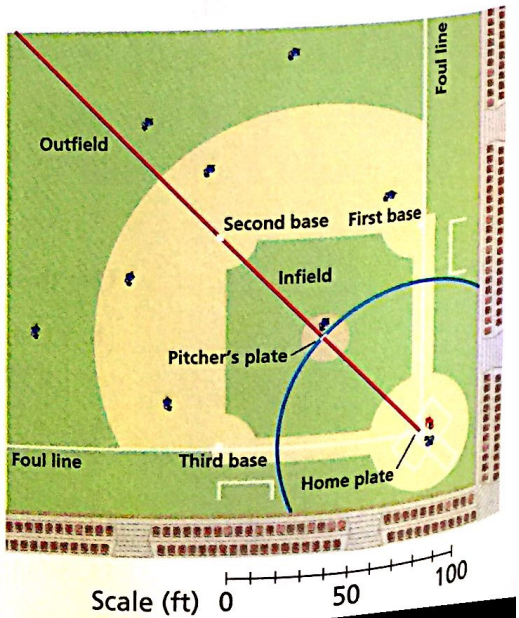




Real-World Connection

On a baseball field, second base is equidistant from the foul lines and 127 feet from home plate.

31. **Baseball** What is the common name for the part of a baseball field that is equidistant from the foul lines and 60 ft 6 in. from home plate?
32. a. **Constructions** Draw a large triangle, $\triangle CDE$. Construct the angle bisectors of each angle.
    b. **Make a Conjecture** What appears to be true about the angle bisectors?
    c. Test your conjecture with another triangle.



Need Help?

In Exercise 33a, your construction may suggest something but be slightly off. If so, test your conjecture *very* carefully in part (c).

33. a. Constructions Draw a large acute scalene triangle, $\triangle PQR$. Construct the perpendicular bisectors of each side.

b. Make a Conjecture What appears to be true about the perpendicular bisectors?

c. Test your conjecture with another triangle.

Coordinate Geometry **Find two points on the perpendicular bisector of $\overline{AB}$. Verify your results by showing each point is equidistant from A and B.**

34. $A(0,0), B(0,4)$ **35.** $A(0,2), B(6,2)$ **36.** $A(3,3), B(3,-3)$

37. $A(3,0), B(0,3)$ **38.** $A(3,0), B(1,4)$ **39.** $A(3,0), B(2,5)$

40. Coordinate Geometry You are given points $A(6,8)$, $O(0,0)$, and $B(10,0)$.

a. Write equations of lines ℓ and m such that $\ell \perp \overleftrightarrow{OA}$ at A and $m \perp \overleftrightarrow{OB}$ at B.

b. Find the intersection C of lines ℓ and m.

c. Show that $CA = CB$.

d. Explain why C is on the bisector of $\angle AOB$.

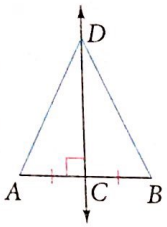
Real-World Connection

The picture hangs straight when the hook is on the perpendicular bisector of the picture's top edge.

Proof **41. Developing Proof** Complete this paragraph proof of the Perpendicular Bisector Theorem.

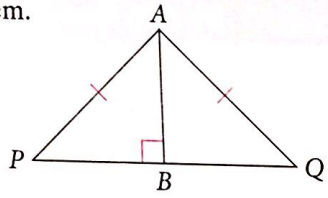
Given: $\overleftrightarrow{CD} \perp \overline{AB}, \overleftrightarrow{CD}$ bisects $\overline{AB}$.

Prove: $DA = DB$



Proof: $\overline{AC} \cong \overline{BC}$ by definition of ___?___.
$\overleftrightarrow{CD} \perp \overline{AB}$, so $\angle DCA$ and $\angle DCB$ are ___?___ angles.
Therefore, $\angle DCA \cong \angle DCB$.
$\overline{DC} \cong \overline{DC}$ by the ___?___ Property of Congruence.
Therefore, $\triangle CDA \cong \triangle CDB$ by ___?___. $\overline{DA} \cong \overline{DB}$ because ___?___, so $DA = DB$.

42. Developing Proof Complete the paragraph proof of the Converse of the Perpendicular Bisector Theorem.



Given: $AP = AQ$ with $\overline{AB} \perp \overline{PQ}$ at B.

Prove: $\overline{AB}$ is the perpendicular bisector of ___?___.

Proof: $\triangle ABP$ and $\triangle ABQ$ are right triangles with a common leg and congruent hypotenuses.
Thus $\triangle BAP \cong$ ___?___ by the HL Theorem. $\overline{PB} \cong \overline{BQ}$ using ___?___, so $\overline{AB}$ bisects $\overline{PQ}$ by the definition of ___?___. Hence, $\overline{AB}$ is the perpendicular bisector of $\overline{PQ}$.

43. Developing Proof Use the paragraph proof from Exercise 41 or 42 to help you write a flow proof of either the Perpendicular Bisector Theorem or the Converse of the Perpendicular Bisector Theorem.

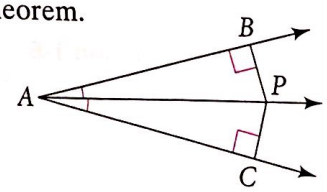
Coordinate Geometry **Write an equation of the perpendicular bisector of $\overline{AB}$.**

44. $A(0,0), B(6,0)$ **45.** $A(1,-1), B(3,1)$ **46.** $A(-2,0), B(2,8)$

Challenge

47. Reasoning Sketch a line equidistant from three noncollinear points. Explain your procedure.

Proof **48.** Write a paragraph proof of the Angle Bisector Theorem.



Given: $\overline{PB} \perp \overrightarrow{AB}, \overline{PC} \perp \overrightarrow{AC}$, $\overrightarrow{AP}$ bisects $\angle BAC$.

Prove: $PB = PC$