5.3 Use Angle Bisectors of Triangles

Before You used angle bisectors to find angle relationships.
Now You will use angle bisectors to find distance relationships.
Why? So you can apply geometry in sports, as in Example 2.

Angle bisector - A ray that divides an angle into two congruent a____________ angles.

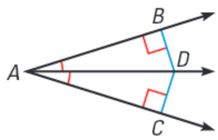
DISTANCE from a POINT to a LINE - Is the length of the ________________ segment from the point to the line.

THEOREMS *For Your Notebook*

THEOREM 5.5 Angle Bisector Theorem

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

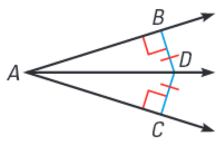
If $\overrightarrow{AD}$ bisects $\angle BAC$ and $\overline{DB} \perp \overrightarrow{AB}$ and $\overline{DC} \perp \overrightarrow{AC}$, then $DB = DC$.



THEOREM 5.6 Converse of the Angle Bisector Theorem

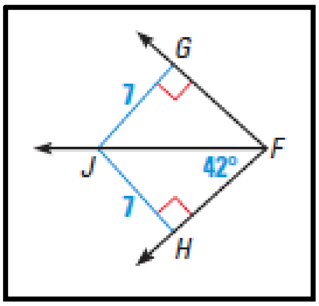
If a point is in the interior of an angle and is equidistant from the sides of the angle, then it lies on the bisector of the angle.

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



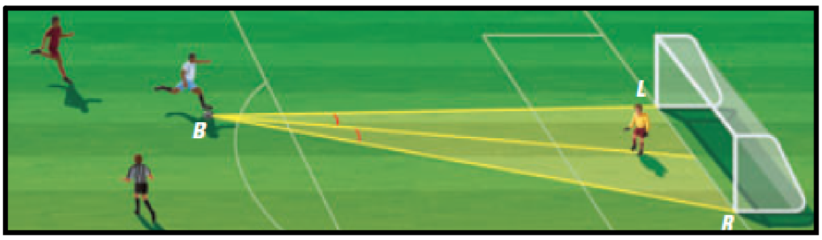
Example 1 Use the Angle Bisector Theorems

Find the measure of $\angle GFJ$



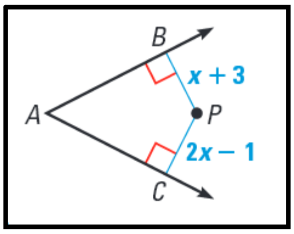
Example 2 Solve a Real-World Problem

SOCCER A soccer goalie's position relative to the ball and goalposts forms congruent angles, as shown. Will the goalie have to move farther to block a shot toward the right goalpost R or the left goalpost L?



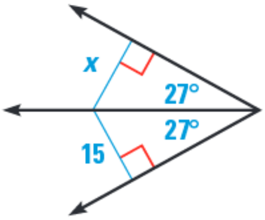
Example 3 Use Algebra to Solve a Problem

For what value of x does P lie on the bisector of $\angle A$

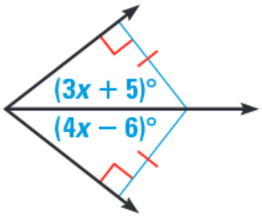


In Exercises 1–3, find the value of x.

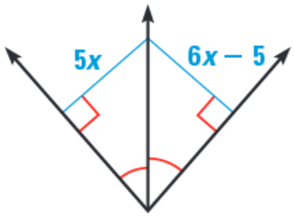
1.



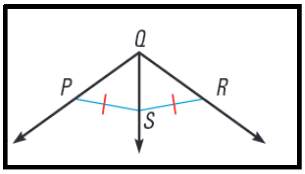
2.



3.



4. Do you have enough information to conclude that $\overrightarrow{QS}$ bisects $\angle PQR$? Explain.

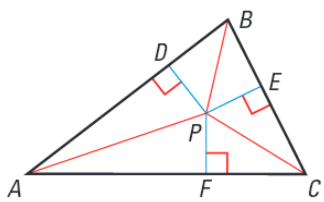


THEOREM *For Your Notebook*

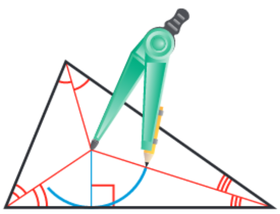
THEOREM 5.7 Concurrency of Angle Bisectors of a Triangle

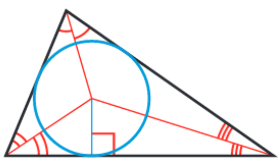
The angle bisectors of a triangle intersect at a point that is equidistant from the sides of the triangle.

If $\overline{AP}$, $\overline{BP}$, and $\overline{CP}$ are angle bisectors of $\triangle ABC$, then $PD = PE = PF$.



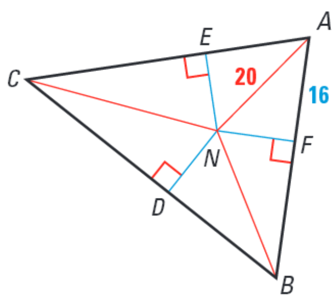
Incenter - Point of Concurrency of the three ___________________________ of a triangle.





Example 4 Use the Concurrency of Angle Bisectors

In the diagram, N is the INCENTER of ΔABC. Find ND.



Suppose you are not given AF or AN, but you are given that BF = 12 and BN = 13. Find ND.