

Honors Geometry
Section 5.3 Notes
Bisectors in Triangles

Name: Key

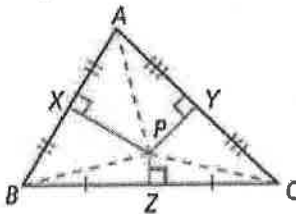
Key Definitions:

1. The point of concurrency is the point at which three or more lines intersect.

Perpendicular Bisectors Theorem – The perpendicular bisectors of the sides of a triangle are concurrent at a point equidistant from the vertices.

2. The circumcenter of the triangle is the point of concurrency of the perpendicular bisectors of a triangle. It forms a circle that is *circumscribed* about the triangle.

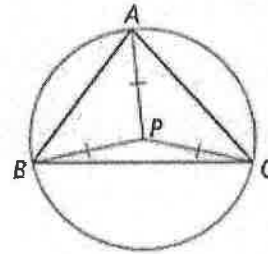
Diagram



Symbols

Perpendicular bisectors
 \overline{PX} , \overline{PY} , and \overline{PZ} are concurrent at P .

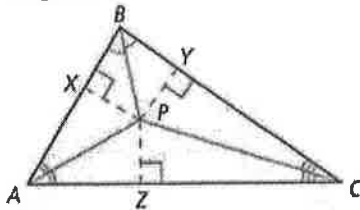
$$PA = PB = PC$$



Angle Bisectors Theorem – The bisectors of the angles of a triangle are concurrent at a point equidistant from the sides of the triangle.

3. The incenter of a triangle is the point of concurrency of the angle bisectors of a triangle. It forms a circle that is *inscribed* within the triangle.

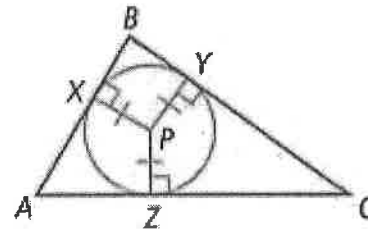
Diagram



Symbols

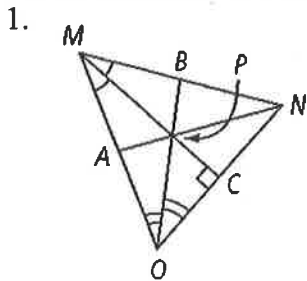
Angle bisectors
 \overline{AP} , \overline{BP} , and \overline{CP} are concurrent at P .

$$PX = PY = PZ$$

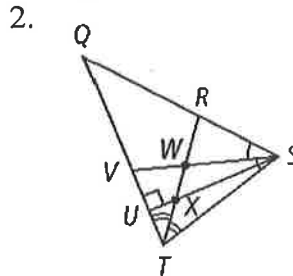


Practice Problems

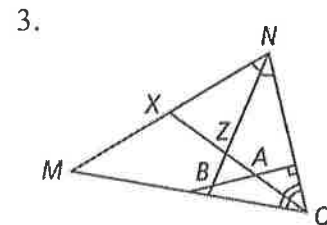
Name the point of concurrency of the angle bisectors.



Point P



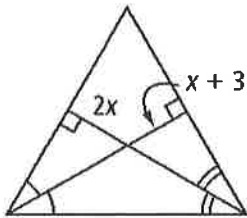
Point W



Point Z

Find the value of x .

1.

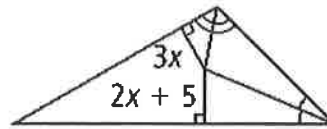


$$2x = x + 3$$

$$-x \quad -x$$

$$x = 3$$

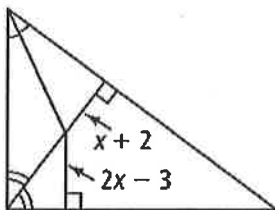
2.



$$3x = 2x + 5$$

$$x = 5$$

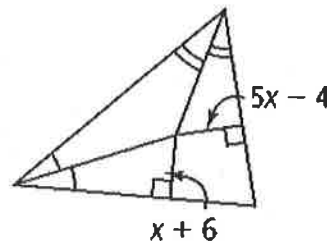
3.



$$x + 2 = 2x - 3$$

$$5 = x$$

4.



$$5x - 4 = x + 6$$

$$4x = 10$$

$$x = \frac{10}{4} = \frac{5}{2}$$

Answer the following questions.

1. Find $m\angle ABC$ if \overline{BD} is an angle bisector of triangle ABC and $m\angle ABC = (4x - 6)^\circ$.

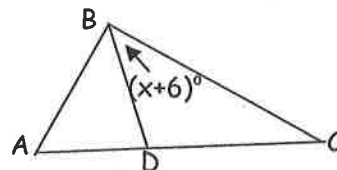
$$4x - 6 = 2(x + 6)$$

$$4x - 6 = 2x + 12$$

$$2x = 18$$

$$x = 9$$

$$m\angle ABC = 4(9) - 6 = 30$$



Determine whether each statement is *true* or *false*. If *false*, provide a counterexample.

1. The *circumcenter* of a triangle is formed by the concurrent perpendicular bisectors of a triangle.

True

2. The *circumcenter* of a triangle is equidistant from the sides of the triangle.

False, equidistant from the vertices.

3. The *incenter* of a triangle is formed by the concurrent angle bisectors of a triangle.

True

4. The *incenter* of a triangle forms a circle that is circumscribed about the triangle.

False, forms a circle that is inscribed inside the triangle.