5-2

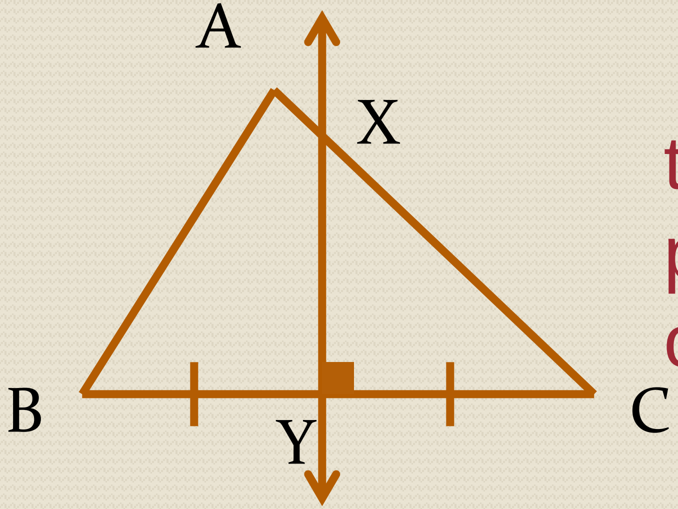
BISECTORS OF TRIANGLES

OBJECTIVE

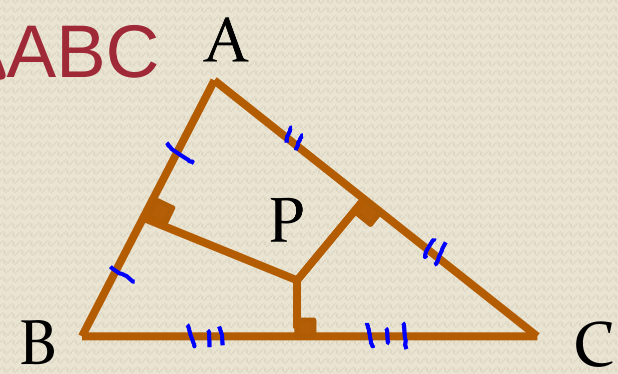
To prove and apply the properties of perpendicular bisectors and angle bisectors

KEY CONCEPT

Perpendicular bisector of a triangle – line, segment or ray that is perpendicular to a side at its midpoint



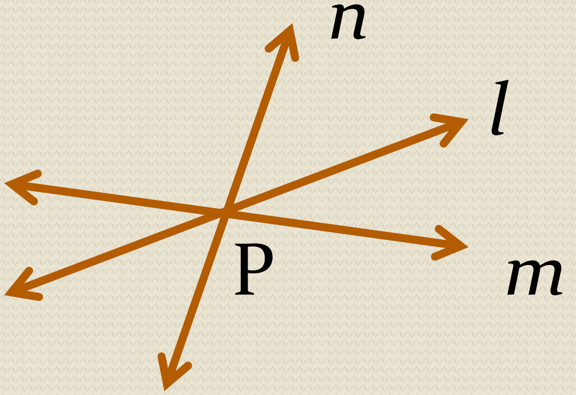
If $\overleftrightarrow{XY} \perp \overline{BC}$ and $BY = YC$,
then $\overleftrightarrow{XY}$ is a perpendicular bisector of ΔABC



VOCABULARY

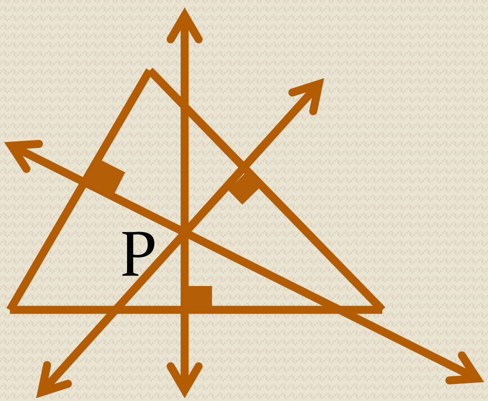
- Concurrent – When three or more lines intersect, they are concurrent. (Lines *l*, *m*, and *n* are concurrent.)

- Point of concurrency – the point at which three or more lines intersect. (Point P is the point of concurrency.)

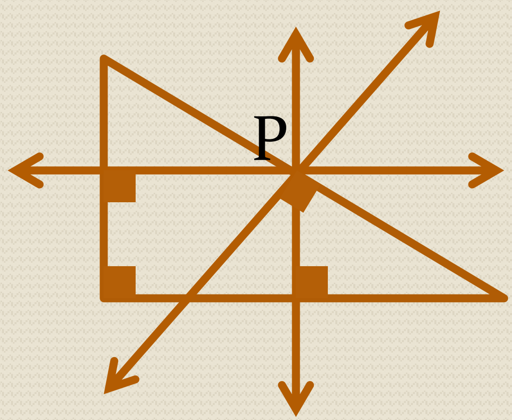


KEY CONCEPT

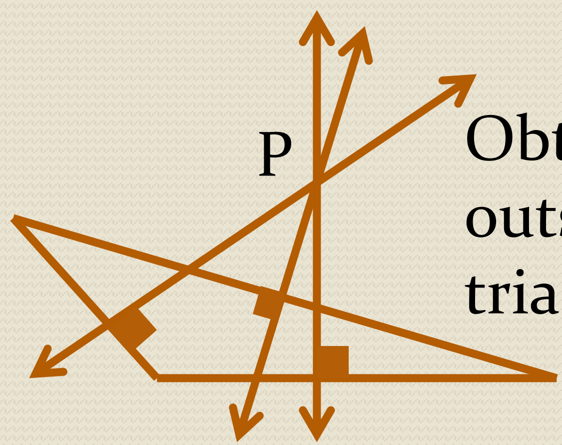
Circumcenter – the point of concurrency of the perpendicular bisectors of a triangle (P)



Acute – inside the triangle



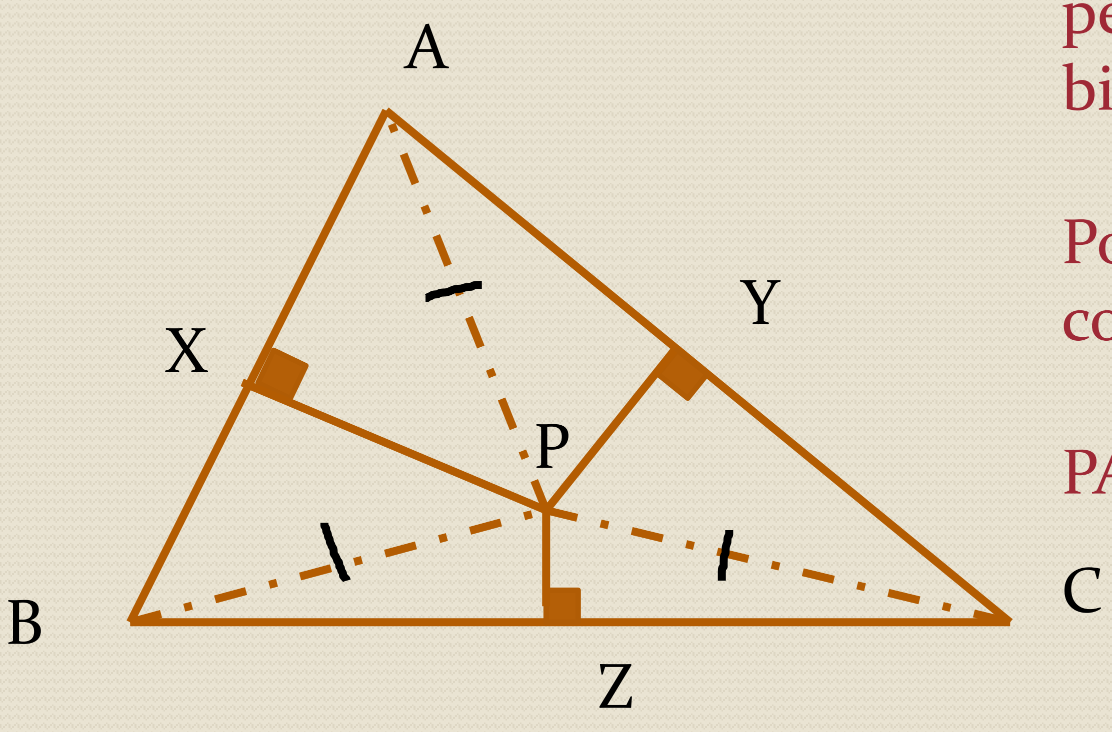
Right – on the triangle



Obtuse – outside the triangle

KEY CONCEPT

Circumcenter Theorem – The circumcenter of a triangle is equidistant from the vertices.



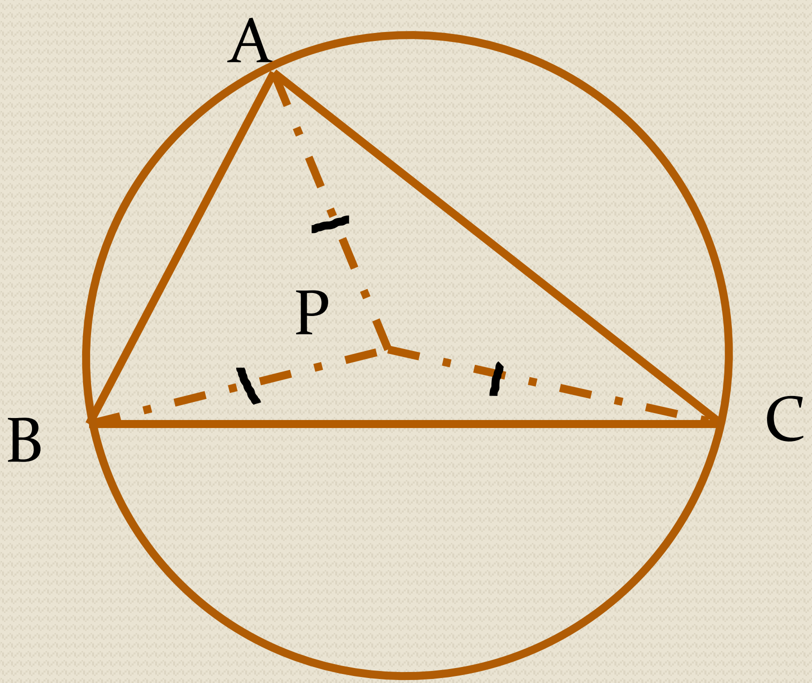
$\overline{PX}$, $\overline{PY}$ and $\overline{PZ}$ are the perpendicular bisectors.

Point P is the point of concurrency.

PA = PB = PC

VOCABULARY

Circumscribed about – Since the circumcenter is equidistant from the vertices, you can use the circumcenter as the center of the circle that contains each vertex of the triangle.



CLASS WORK

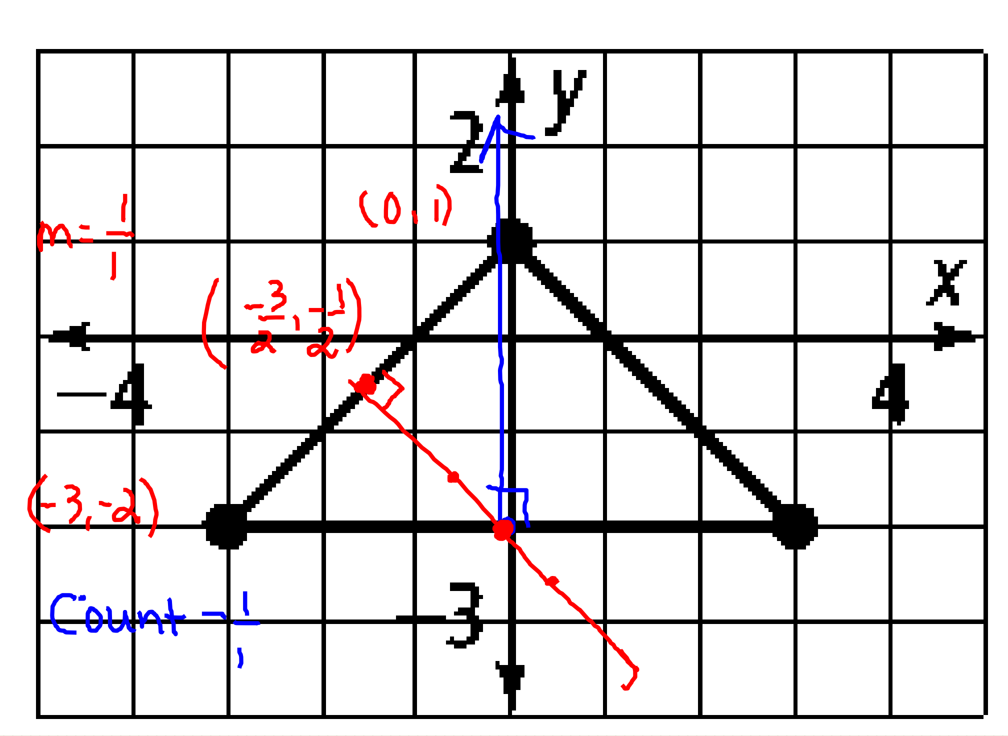
1. Find the circumcenter of the triangle.

(0 , -2)

Step 1: Find the midpoint of the side.

Step 2: Draw the perpendicular line. (Count opposite reciprocal slope.)

Step 3: Repeat to find the circumcenter.



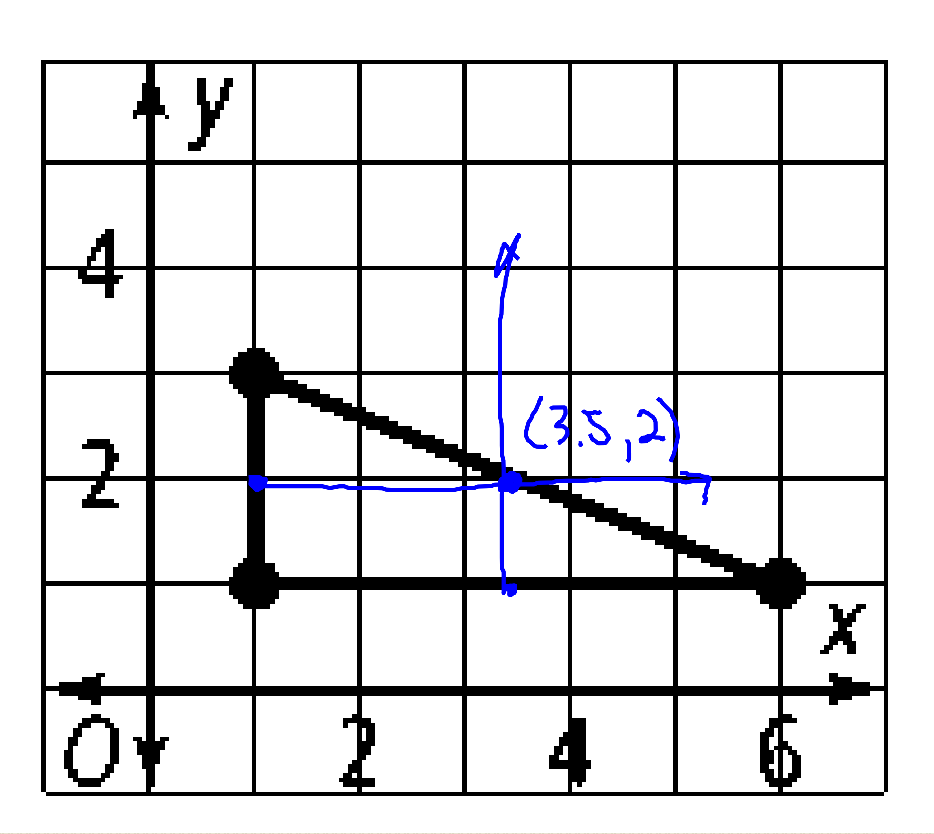
CLASS WORK

2. Find the circumcenter of the triangle.

Step 1: Find the midpoint of the side.

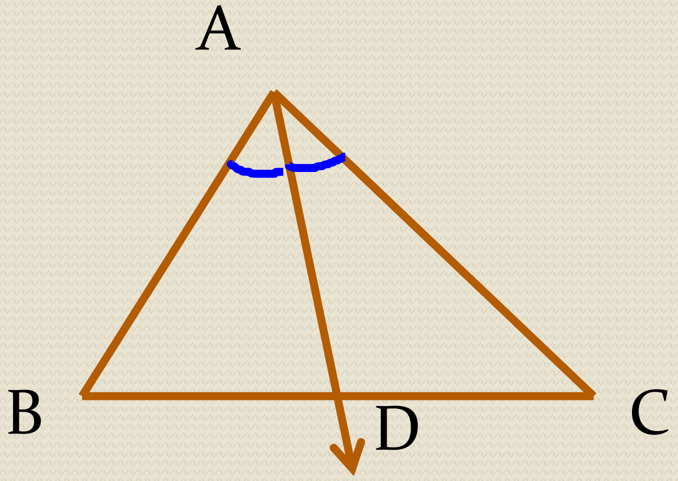
Step 2: Draw the perpendicular line. (Count opposite reciprocal slope.)

Step 3: Repeat to find the circumcenter.

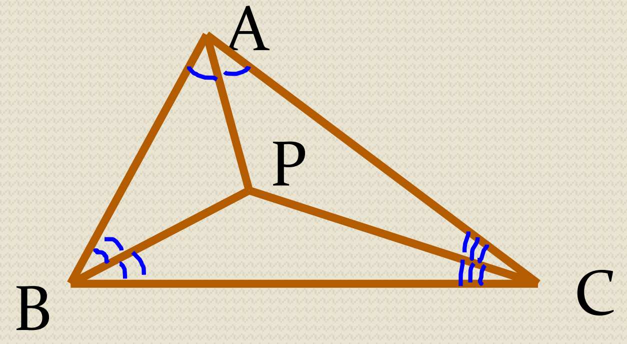


KEY CONCEPT

Angle bisector of a triangle – line, segment or ray that bisects an angle of the triangle

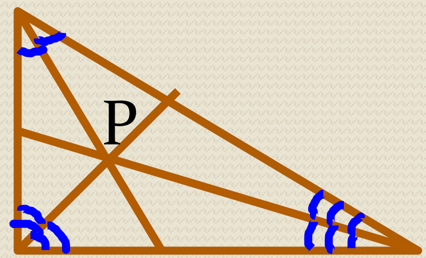


If $\angle BAD \cong \angle CAD$, then $\overrightarrow{AD}$ is an angle bisector of ΔABC

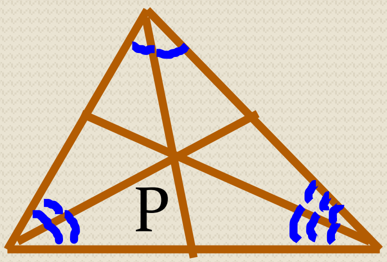


KEY CONCEPT

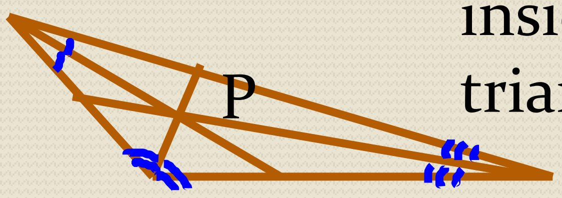
Incenter – the point of concurrency of the angle bisectors of a triangle (P).



Right – inside the triangle



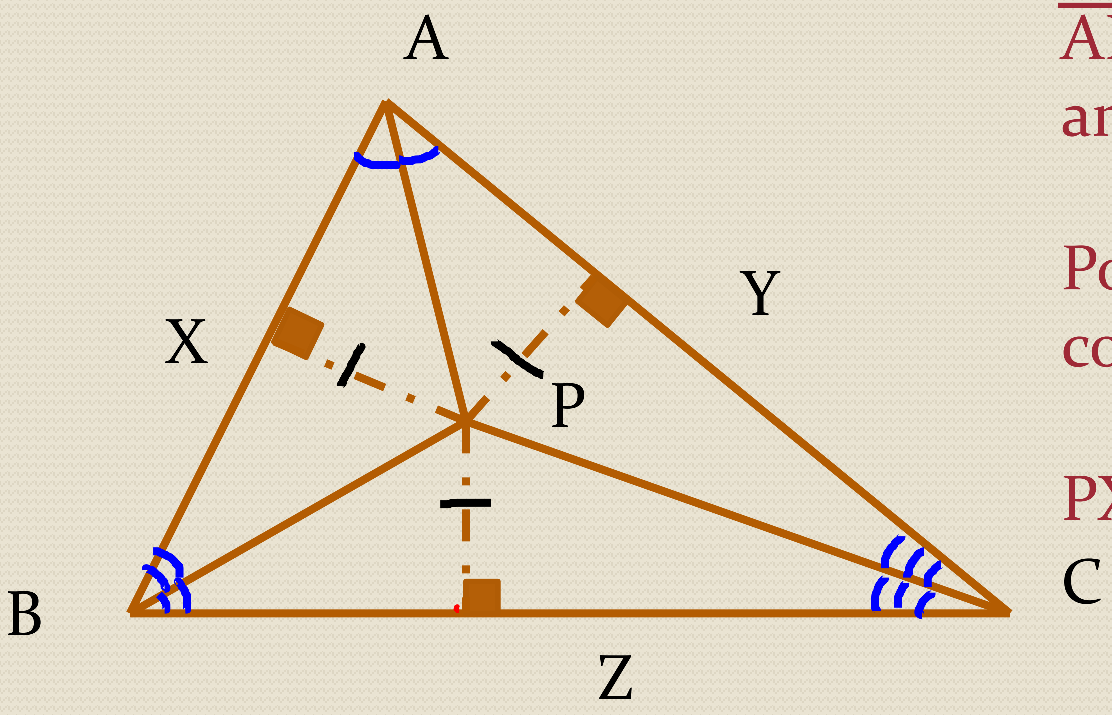
Acute – inside the triangle



Obtuse – inside the triangle

KEY CONCEPT

Incenter Theorem – The incenter of a triangle is equidistant from the sides of the triangle.



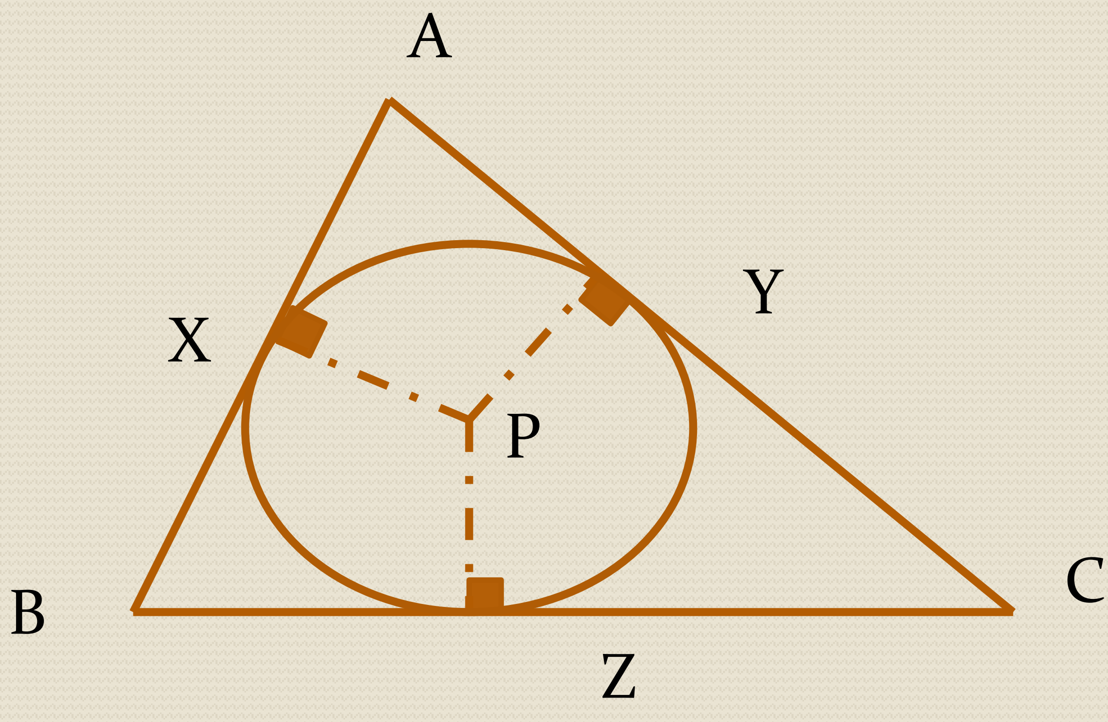
$\overline{AP}$, $\overline{BP}$ and $\overline{CP}$ are the angle bisectors.

Point P is the point of concurrency.

PX = PY = PZ

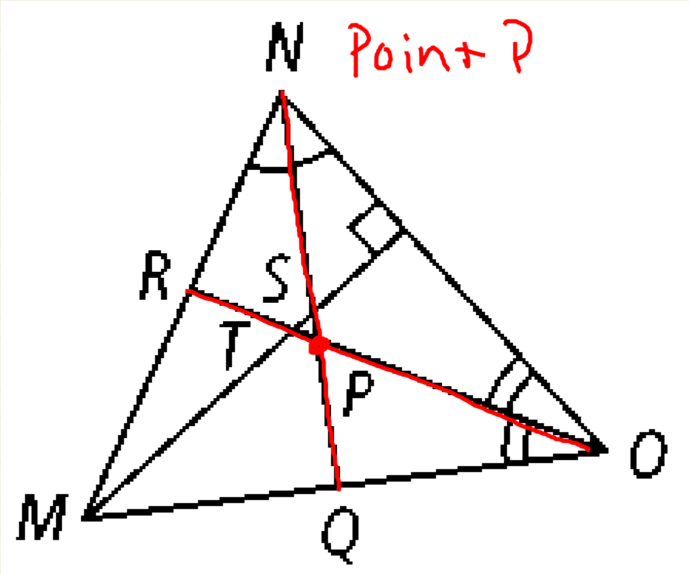
VOCABULARY

Inscsribed in – Since the incenter is equidistant from the sides, you can use the incenter as the center of the circle that contains a point from each side of the triangle.



CLASS WORK

3. **Name the point of concurrency of the angle bisectors.**

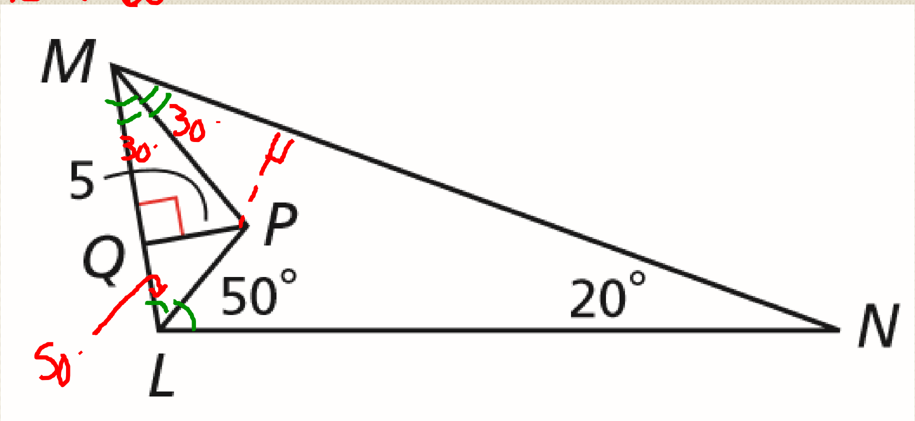


4. **Point P is the incenter. Find:**

a) the distance from P to $\overline{MN}$ 5

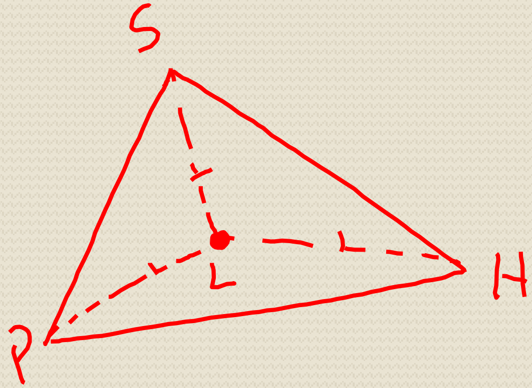
b) $m\angle PMN$ = 30

m∠M=60



EXIT PROBLEM

6. A city planner wants to build a new library between a school, a post office, and a hospital. Draw a sketch to show where the library should be placed so it is the same distance from all three buildings.



The library should be at Point L.

SUMMARY

- When three or more lines intersect, they are concurrent.
- The point of concurrency of the perpendicular bisectors of a triangle is the circumcenter of the triangle.
- The point of concurrency of the angle bisectors of a triangle is the incenter of the triangle.

LEARNING RUBRIC

- Got It: Proves circumcenter and Incenter Theorems
- Almost There: Locate the Circumcenter on the coordinate plane
- Moving Forward: Applies the Circumcenter and Incenter Theorems to problem solving
- Getting Started: Identifies circumcenters and incenters

HOMEWORK

- 5-1 WS Side 2
- 5-2 WS Side 1