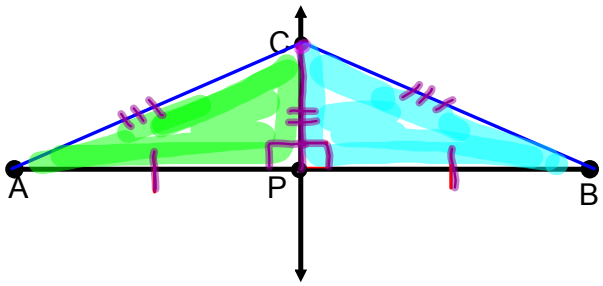
5.2 Use Perpendicular Bisectors

Before You used segment bisectors and perpendicular lines.
Now You will use perpendicular bisectors to solve problems.
Why? So you can solve a problem in archaelogy, as in Ex. 28.

Segment Bisector - Intersects a segment at its MIDPOINT.

Perpendicular Bisector - A segment, ray, line, or plane that is PERPENDICULAR to a segment at its MIDPOINT.

Equidistant - A point that is the SAME DISTANCE from each figure.



$\overleftrightarrow{CP}$ is a $\perp$ bisector to $\overline{AB}$

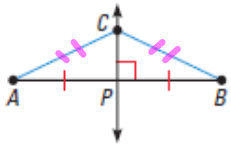
What can you state about $\overline{AC}$ and $\overline{BC}$?

THEOREMS *For Your Notebook*

THEOREM 5.2 Perpendicular Bisector Theorem

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

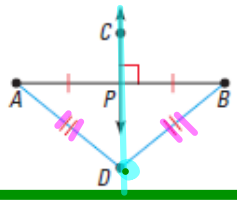
If $\overleftrightarrow{CP}$ is the $\perp$ bisector of $\overline{AB}$, then $CA = CB$.



THEOREM 5.3 Converse of the Perpendicular Bisector Theorem

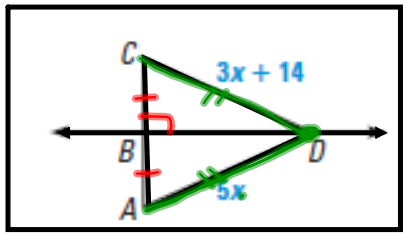
In a plane, if a point is equidistant from the endpoints of a segment, then it is on the perpendicular bisector of the segment.

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



Use the Perpendicular Bisector Theorem

$\overleftrightarrow{BD}$ is the perpendicular bisector of $\overline{AC}$. Find AD.



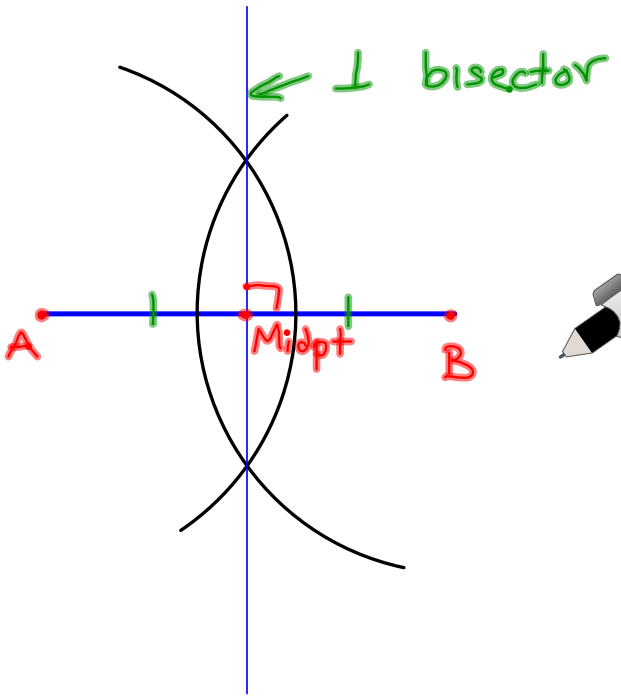
$3x + 14 = 5x$

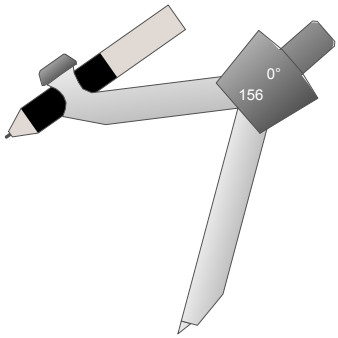
$14 = 2x$

$7 = x$

$AD = 5(7) = 35$

$CD = 3(7) + 14 = 35$


⊥ bisector
A
Midpt
B


0°
156

Use Perpendicular Bisectors

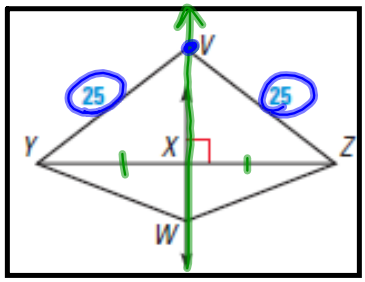
In the diagram, $\overleftrightarrow{WX}$ is the perpendicular bisector of $\overline{YZ}$.

a. What segment lengths in the diagram are equal?

$\overline{YX} \cong \overline{ZX}$, $\overline{YW} \cong \overline{ZW}$

b. Is V on $\overleftrightarrow{WX}$? Explain.

Yes, $\overline{VY} \cong \overline{VZ}$



In the diagram, $\overleftrightarrow{JK}$ is the perpendicular bisector of $\overline{NL}$.

1. What segment lengths are equal? Explain.

$\overline{NJ} \cong \overline{LJ}$, $\overline{NK} \cong \overline{LK}$

2. Find NK.

$6x - 5 = 4x + 1$

$-4x \quad -4x$

$2x - 5 = 1$

$2x = 6$

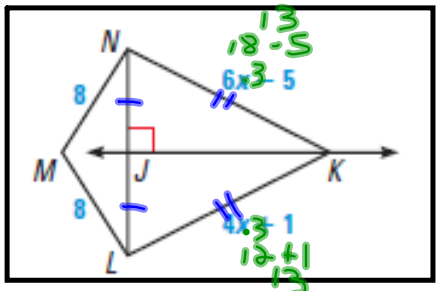
$x = 3$

$6(3) - 5 = 13$

$4(3) + 1 = 13$

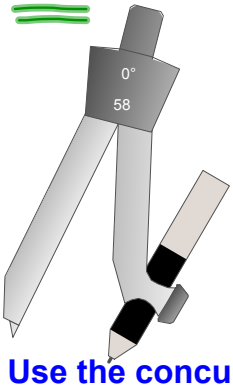
3. Explain why M is on $\overleftrightarrow{JK}$.

Yes, $\overline{NM} \cong \overline{LM}$



Concurrency - When 3 or more lines, rays, or segments intersect in the same point. The lines are called CONCURRENT lines, rays or segments.

Point of Concurrency - The point of INTERSECTION of the lines, rays, or segments.



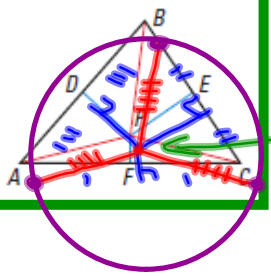
THEOREM *For Your Notebook*

THEOREM 5.4 Concurrency of Perpendicular Bisectors of a Triangle

The perpendicular bisectors of a triangle intersect at a point that is equidistant from the vertices of the triangle.

If $\overline{PD}$, $\overline{PE}$, and $\overline{PF}$ are perpendicular bisectors, then $PA = PB = PC$.

Proof: See Additional Proofs.

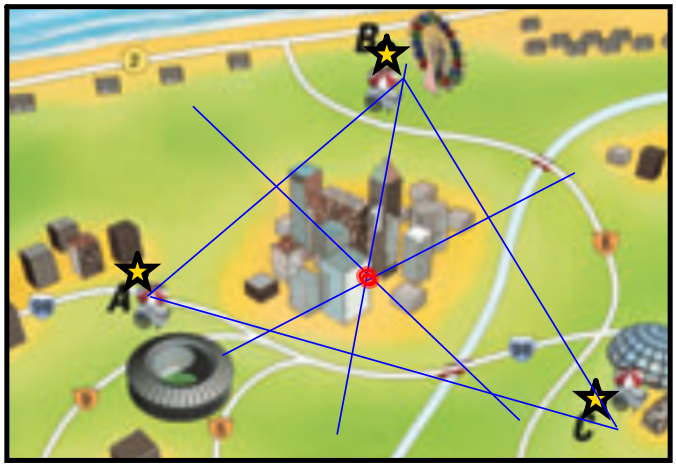


Point of Concurrency

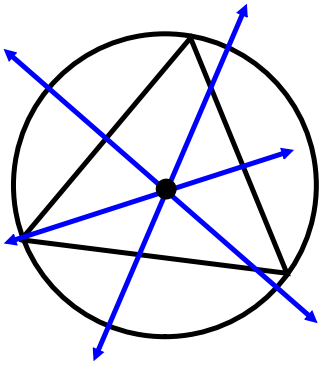
Use the concurrency of Perpendicular Bisectors.

Frozen Yogurt. Three snack carts sell frozen yogurt from points A, B, and C outside a city. Each of the three carts is the same distance from the frozen yogurt distributor.

Find a location for the distributor that is equidistant from the three carts.

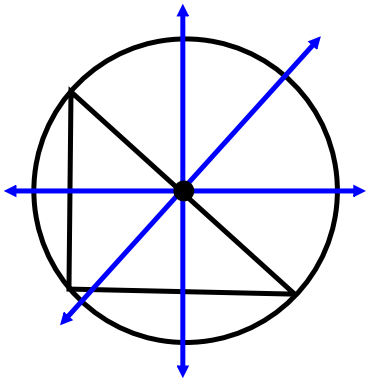


Circumcenter - The point of concurrency of the three perpendicular bisectors of a triangle .



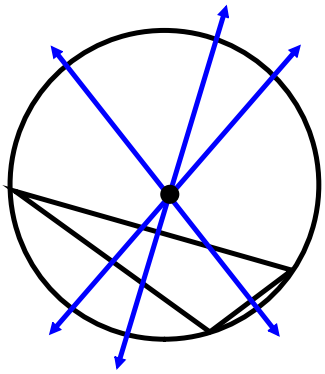
Acute Triangle

P is INSIDE triangle



Right Triangle

P is ON the triangle



Obtuse Triangle

P is OUTSIDE triangle

Find the CIRCUMCENTER of each triangle and then CONSTRUCT the CIRCUMSCRIBED CIRCLE.