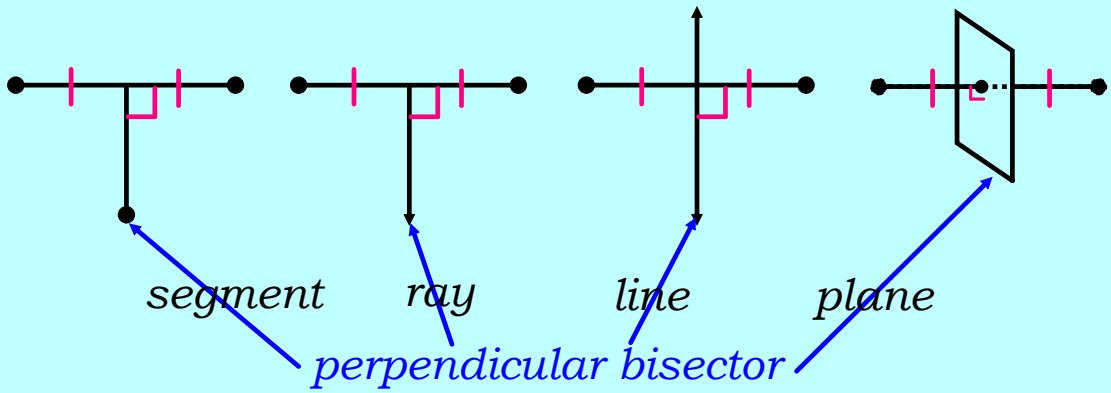
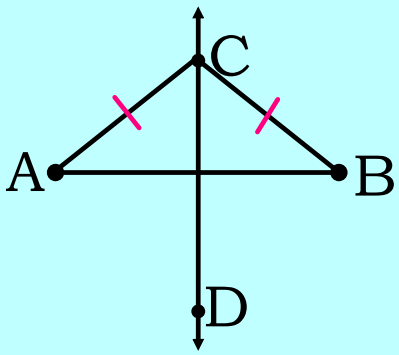
5.2 *Perpendicular Bisectors*

A perpendicular bisector is a segment, ray, line, or plane that is perpendicular to a segment at its midpoint.



A point is equidistant from two figures if the point is the same distance from each figure.

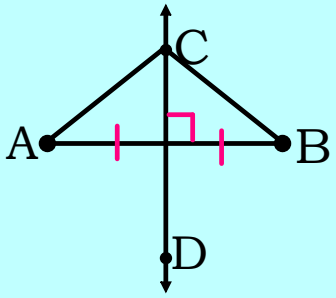


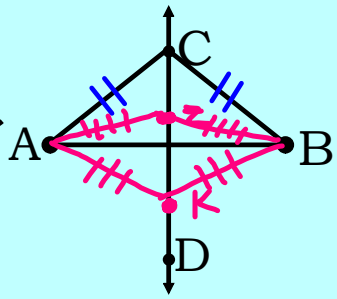
Point C is equidistant from point A & point B.

Theorem 5.2 ***Perpendicular Bisector Theorem***

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

have to know

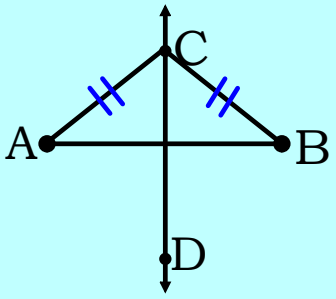
If 

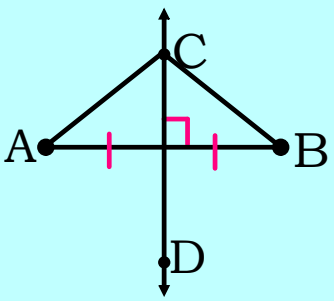
, then 

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

Theorem 5.3 ***Converse of Perp. Bis. Theorem***

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

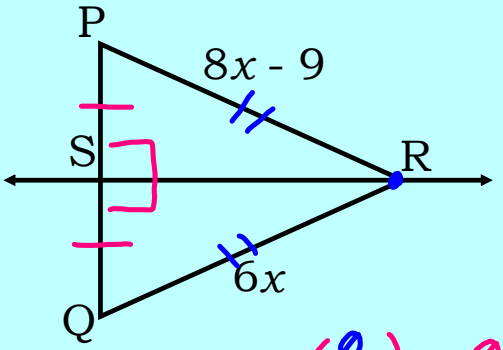
If 

, then 

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

Example 1

In the diagram, $\overleftrightarrow{RS}$ is the perpendicular bisector of $\overline{PQ}$. Find PR.



$8x - 9 = 6x$
$-8x \quad -8x$
$-9 = -2x$
$\frac{-9}{-2} = \frac{-2x}{-2}$
$\frac{9}{2} = x$

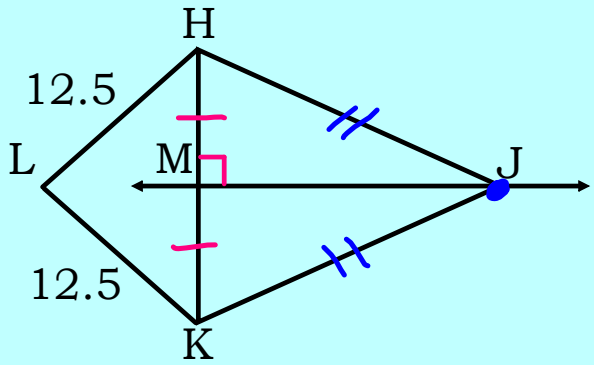
$PR = 8(\frac{9}{2}) - 9$

$PR = 36 - 9$

$PR = 27$

Example 2

In the diagram, $\overleftrightarrow{JM}$ is the perpendicular bisector of $\overline{HK}$.

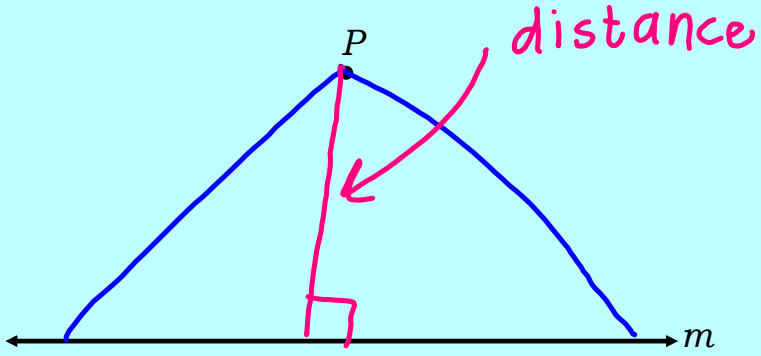


a) *Which lengths in the diagram are equal?*
$HJ = JK$
$LH = LK$
$HM = MK$

b) *Is L on $\overleftrightarrow{JM}$? Why or why not?* ← ⊥ bis.
Yes b/c $LH = LK$

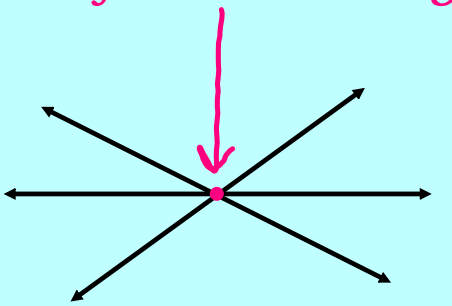
The distance from a point to a line is defined as the length of the perpendicular segment from the point to the line.

Draw the segment that represents the distance from point P to line m.

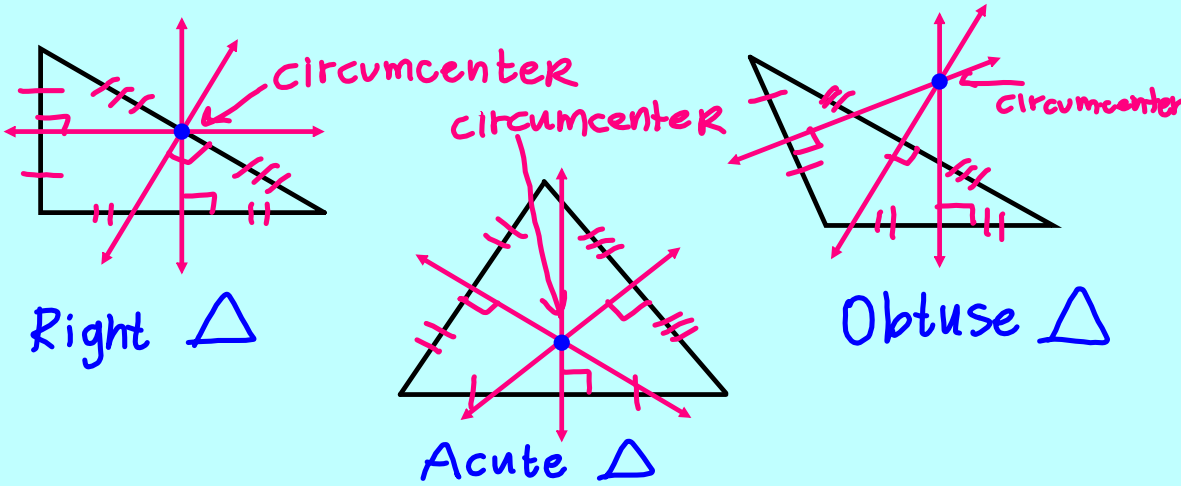


When three or more lines, rays, or segments intersect in the same point, they are called concurrent.

The point of intersection is called the point of concurrency.



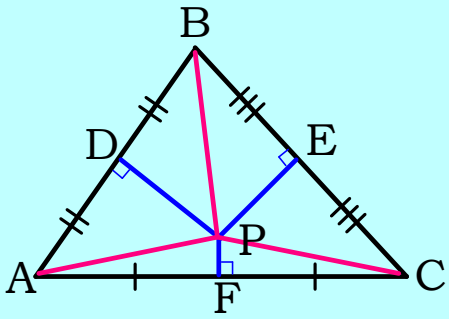
The point of concurrency of the three perpendicular bisectors of a triangle is called the circumcenter.



Acute triangle: circumcenter is inside the triangle
Right triangle: circumcenter is on the triangle
Obtuse triangle: circumcenter is outside the triangle

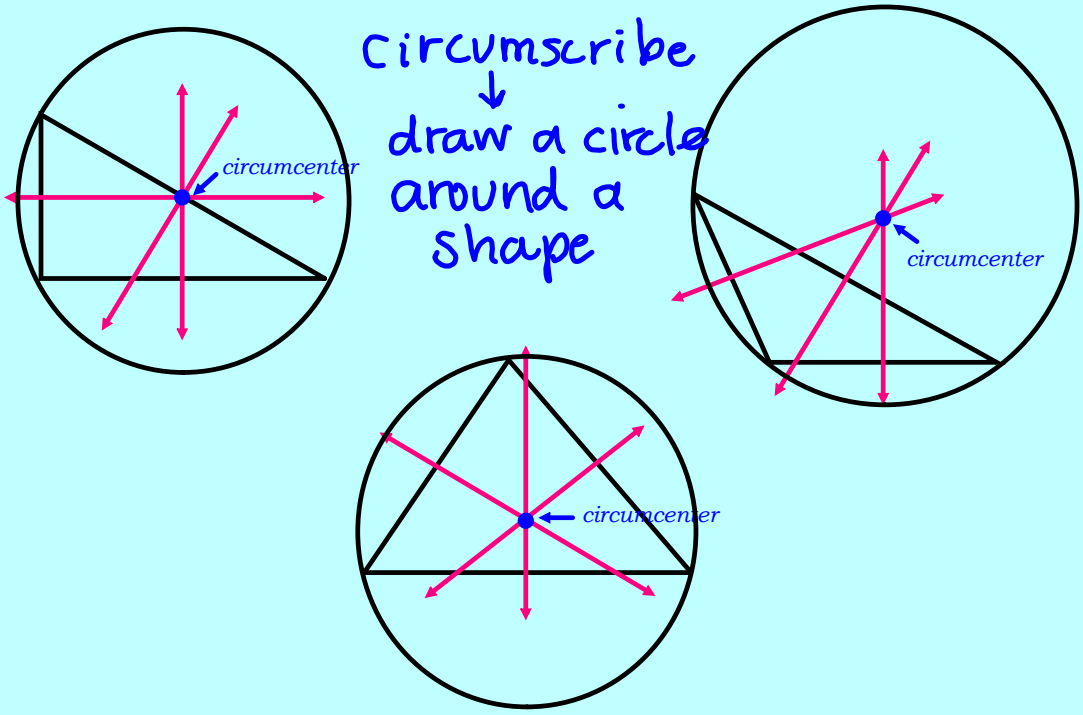
Theorem 5.4 ***Concurrency of Perp. Bis. of a △***

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



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

circumcenter is equidistant from 3 vertices



Example 3

Frozen lemonade is sold from points A & B, and also from a cart at point C. Where could the frozen lemonade distributor be located if it is equidistant from those three points? Sketch the triangle to show the location.