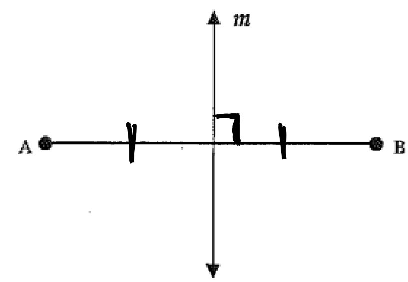
Perpendiculars and Bisectors

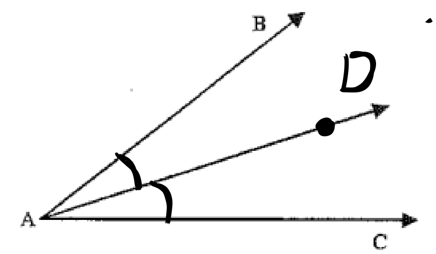
❖ ***Review*** → A **<u>segment bisector</u>** intersects a segment at its midpoint.

<u>Vocabulary!!</u>



- **<u>Perpendicular Bisector</u>** – a segment, ray, line or plane that is perpendicular to a segment at its midpoint.

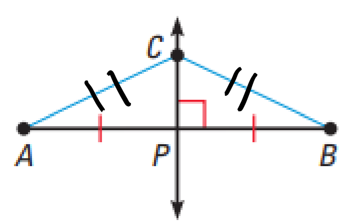
- A point is **<u>equidistant</u>** from two figures if the point is the same distance from each figure.



- **<u>Angle Bisector</u>** – A ray that divides an angle into two adjacent angles that are congruent.

Perpendicular Bisector Theorem

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

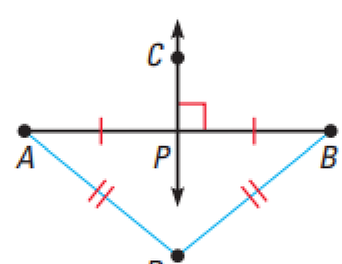


If $\overleftrightarrow{CP}$ is the $\perp$ bisector of $\overline{AB}$, then

$AC = BC$

Converse of the Perpendicular Bisector Theorem

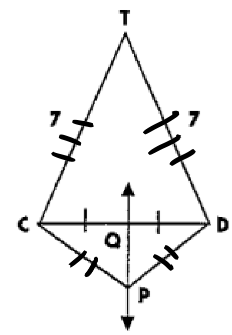
If a point is **equidistant** from the endpoints of a segment, then it is on the **perpendicular bisector** of the segment.



If $DA = DB$, then

D is on $\perp$ bisector of $\overline{AB}$

Ex 1 **Given:** $\overleftrightarrow{PQ}$ is the perpendicular bisector of $\overline{CD}$.



a.) Which segments are congruent?

$\overline{CP} \cong \overline{DP}$, $\overline{CQ} \cong \overline{DQ}$, $\overline{CT} \cong \overline{DT}$

b.) Explain why we know T is on $\overleftrightarrow{PQ}$ (without extending $\overleftrightarrow{PQ}$)?

T is equidistant to C and D

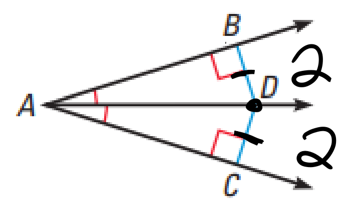
❖ ***Review*** **→** The *distance from a point to a line* is the length of the perpendicular segment from the point to the line.

Angle Bisector Theorem

If a point is on the **angle bisector** then it is **equidistant** from the SIDES of the angle.

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

then $\overline{BD} \cong \overline{DC}$

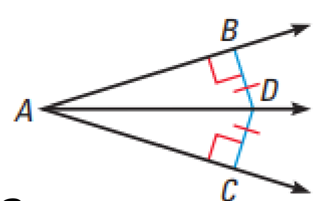


Converse to Angle Bisector Theorem

If a point is on the interior of an angle and it is **equidistant** from the SIDES, then it is on the **angle bisector** of the angle.

If $\overline{DB} \perp \overrightarrow{AB}$ and $\overline{DC} \perp \overrightarrow{AC}$ and $DB = DC$,

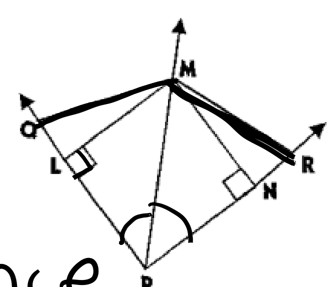
then $\overrightarrow{AD}$ bisects $\angle BAC$



Ex 2 **Given:** $\overrightarrow{PM}$ is the angle bisector of $\angle LPN$.

a.) What is the relationship between $\angle LPM$ and $\angle NPM$?

$\angle LPM \cong \angle NPM$



b.) How is the distance between M and $\overrightarrow{PL}$ related to the distance between point M and $\overrightarrow{PN}$?

the same Distance

$ML = NM$

c.) Since $\overrightarrow{PM}$ is the angle bisector, is $\overline{QM} \cong \overline{RM}$?

NO