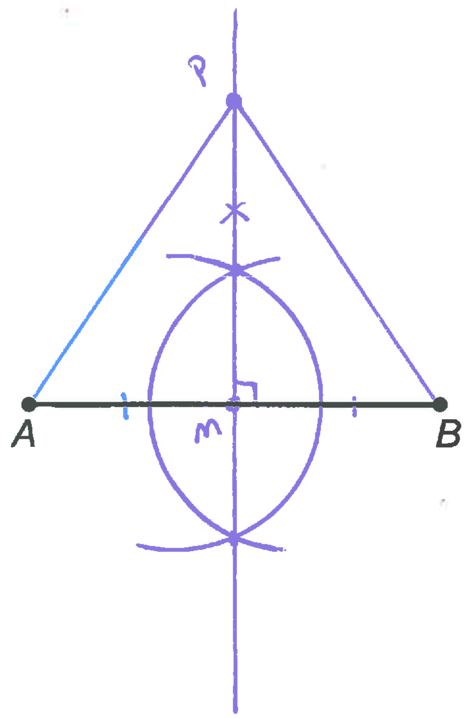
Geometry R – Mr. Bo
Unit 6 – Day 1 Notes

Name notes.
Date________________

Perpendicular Bisectors & Circumcenters
Angle Bisectors & Incenters

Perpendicular Bisector Theorem – Any point on the perpendicular bisector of a segment is **equidistant** to the endpoints of the segment.



1. Let's justify this theorem using a compass and straight edge:

a. Construct the perpendicular bisector of $\overline{AB}$ and label the point of intersection M.

b. Place a point anywhere on the bisector and label it P. What does the **Perpendicular Bisector Theorem** claim is true in your picture? *(Write a congruency statement).*

$\overline{PA} \cong \overline{PB}$

c. Draw ΔAPB. Notice that $\overline{AP}$ and $\overline{BP}$ are corresponding parts? What triangle congruency postulate would be used to show $\Delta APM \cong \Delta BPM$?

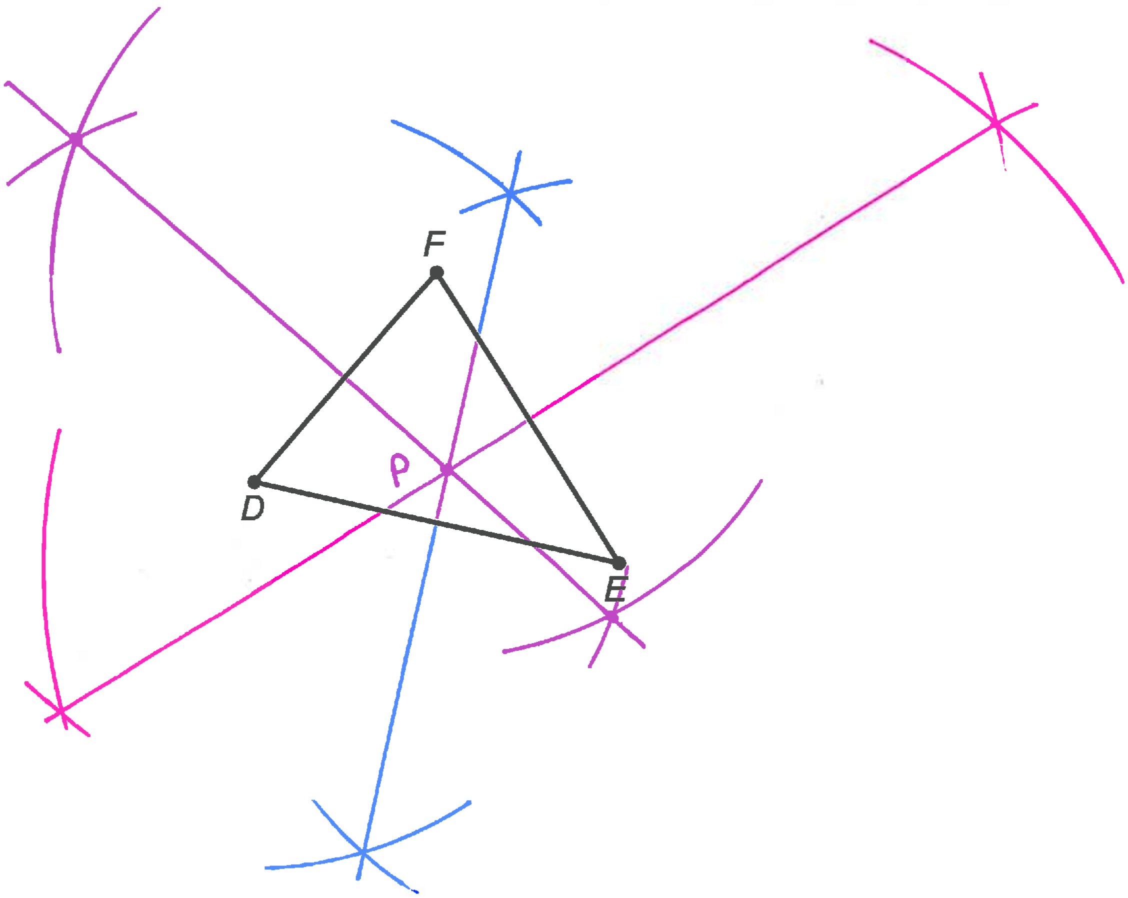
$\Delta APM \cong \Delta BPM$ SAS.

So, $\overline{PA} \cong \overline{PB}$ by CPCTC.

Point of Concurrence – The point where 3 or more lines intersect.

Circumcenter – The *point of concurrence* of the 3 **Perpendicular Bisectors** of a triangle.

2. Construct the perpendicular bisectors for each side of the triangle. Label the **Circumcenter** P.
(Be careful and precise or they may not intersect).



The Circumcenter Theorem – The **Circumcenter** is equidistant to the vertices of a triangle.

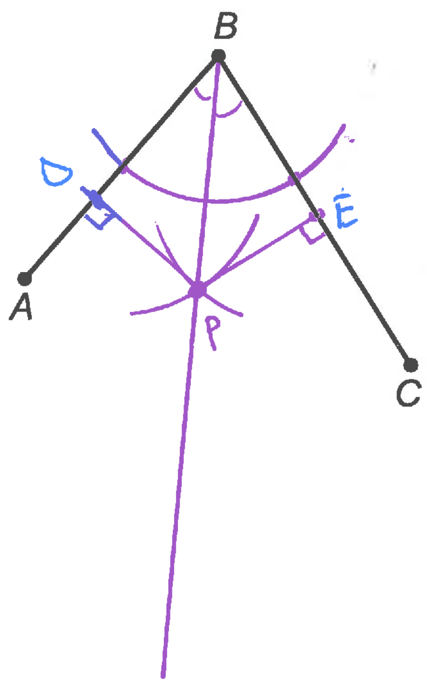
3a. What does the **Circumcenter Theorem** claim is true in your picture above? *(Write a congruency statement)*

$\overline{PD} \cong \overline{PF} \cong \overline{PE}$

b. Explain how the **Perpendicular Bisector Theorem** implies that the **Circumcenter Theorem** must be true?

Since P is on the $\perp$ bisector of each side, it must be equidistant to the endpoints of each side. the endpoints of each side are the vertices of the Δ.

Angle Bisector Theorem – Any point on the angle bisector of an angle is **equidistant** to the sides of the angle.



4. Let's justify this theorem using a compass and straight edge:

a. Construct the angle bisector of $\angle ABC$.

b. Place a point anywhere on the bisector, label it P.

c. The distance from a *point* to a *line* is always measured at a *right angle*. Using a protractor, place point D on $\overline{BA}$ such that $\overline{BA} \perp \overline{PD}$. Also, place point E on $\overline{BC}$ such that $\overline{BC} \perp \overline{PE}$.

d. What does the **Angle Bisector Theorem** claim is true in your picture? *(Write a congruency statement)*

$\overline{PD} \cong \overline{PE}$.

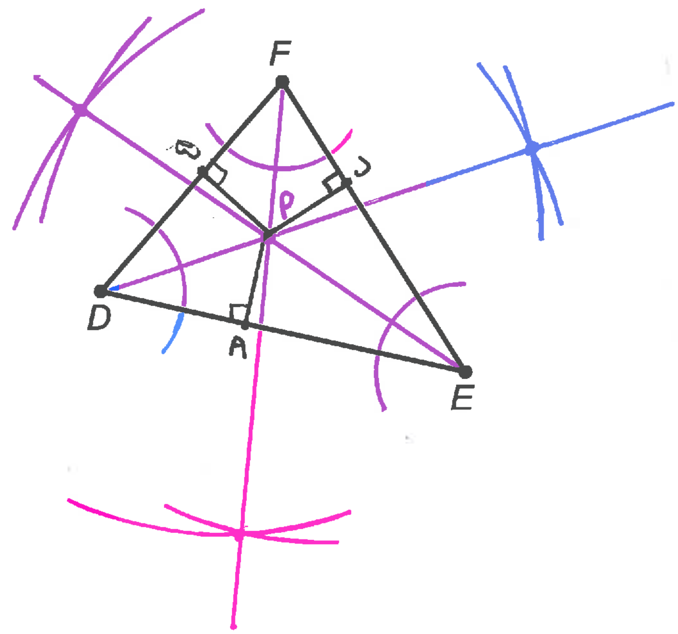
C. Notice that $\overline{PD}$ and $\overline{PE}$ are corresponding parts? What triangle congruency postulate would be used to show $\Delta BPD \cong \Delta BPE$?

$\Delta BPD \cong \Delta BPE$ by AAS.

So, $\overline{PD} \cong \overline{PE}$ by CPCTC.

Incenter – The *point of concurrence* of the 3 **Angle Bisectors** of a triangle.

5. Construct the angle bisectors for each angle of the triangle. Label the **Incenter** P.
(Be careful and precise or they may not intersect).



The Incenter Theorem – The **Incenter** is equidistant to the sides of a triangle.

6a. What does the **Incenter Theorem** claim is true in your picture above? *(Write a congruency statement. Remember, the distance from a point to a line must be measured at a right angle.)*

$\overline{PB} \cong \overline{PA} \cong \overline{PC}$

Where: $\overline{PA} \perp \overline{DE}$

$\overline{PB} \perp \overline{DF}$

and $\overline{PC} \perp \overline{FE}$

b. Explain how the **Angle Bisector Theorem** implies that the **Incenter Theorem** must be true?

Since P is on the angle bisector of each angle of the Δ, then P must be equidistant to the sides of the angles. the sides of the angles are also the sides of the Δ.