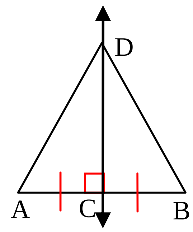
<name>
Class: Honors Geometry
Date: 9/14/06
Topic: Lesson 5-2 (Bisectors in Triangles)

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.

Proof



Given: $\overleftrightarrow{CD} \perp \overline{AB}, \overleftrightarrow{CD}$ bisects $\overline{AB}$
Prove: $DA = DB$

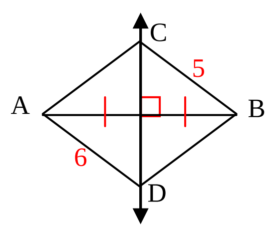
Proof: $\overline{AC} \cong \overline{BC}$	(defn. bisector)
$\overleftrightarrow{CD} \perp \overline{AB}$	(Given)
$\angle DCA \,\&\, \angle DCB$ are rt $\angle$'s	(defn. perpendicular)
$\angle DCA \cong \angle DCB$	(all rt. $\angle$'s are $\cong$)
$\overline{DC} \cong \overline{DC}$	(Reflexive POC)
$\Delta ADC \cong \Delta BDC$	(SAS)
$\overline{AD} \cong \overline{BD}$	(CPCTC)
$DA = DB$	(defn. congruence)
Q.E.D.	

Theorem 5-3

Converse of the Perpendicular Bisector Theorem
If a point is equidistant from the endpoints a segment, then it is the perpendicular bisector of the segment.

Example

Pg 250, Check Understanding 1
Use the information given in the diagram. $\overleftrightarrow{CD}$ is the perpendicular bisector of $\overline{AB}$. Find *CA & DB*. Explain your reasoning.



CA = 5; DB = 6;

$\overleftrightarrow{CD}$ is the $\perp$ bisector of $\overline{AB}$, therefore $CA = CB$ and $DA = DB$.

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Definition

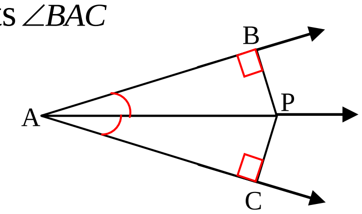
Distance from a point to a line
The distance from a point to a line is the length of the perpendicular segment from the point to the line.

Theorem 5-4

Angle Bisector Theorem
If a point is on the bisector of an angle, then the point is equidistant from the sides of the angle.

Proof

Given: $\overline{PB} \perp \overrightarrow{AB}, \overline{PC} \perp \overrightarrow{AC}, \overrightarrow{AP}$ bisects $\angle BAC$
Prove: $PB = PC$



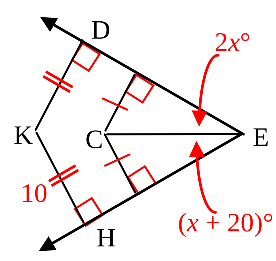
Proof: $\angle PBA \cong \angle PCA$ (all rt. $\angle$'s are $\cong$)
$\angle BAP \cong \angle CAP$ (defn. angle bisector)
$\overline{AP} \cong \overline{AP}$ (reflexive POC)
$\Delta BAP \cong \Delta CAP$ (AAS)
$\overline{PB} \cong \overline{PC}$ (CPCTC)
$PB = PC$ (defn. of segment congruence)
Q.E.D.

Theorem 5-5

Converse of the Angle Bisector Theorem
If a point **in the interior of an angle** is equidistant from the sid the angle, then the point is on the bisector of the angle.

Example

Pg. 251 – Check Understanding 2



a) According to the diagram, how far is K
from $\overrightarrow{EH}$? 10
from $\overrightarrow{ED}$? 10

b) What can you conclude about $\overrightarrow{EK}$?
It is the angle bisector of $\angle DEH$.

c) Find the value of x.
$2x = x + 20$
$x = 20$

d) Find $m\angle DEH$.
$2*x + (x + 20) = 2*20 + (20 + 20) = 80$

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