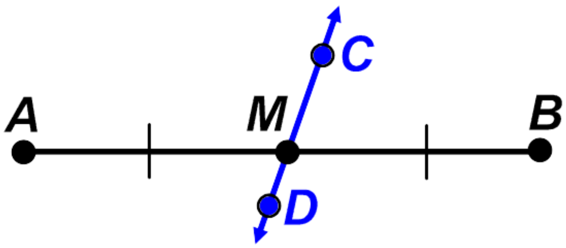
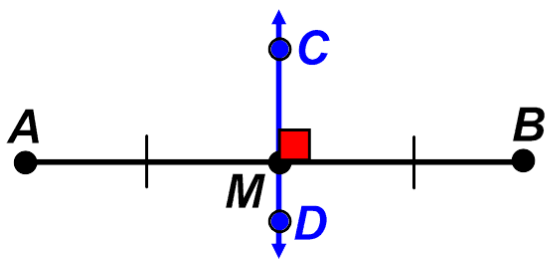
Section 5.1
Perpendiculars and Bisectors

Segment Bisector: A segment, ray, line, or plane that intersects a segment into two congruent segments.



$\overleftrightarrow{CD}$ *bisects* $\overline{AB}$, *thus making* $\overline{AM} \cong \overline{BM}$.

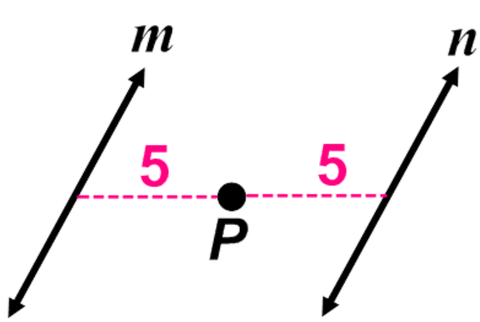
Perpendicular Bisector: A segment, ray, line, or plane that is perpendicular to a segment at its midpoint.



$\overleftrightarrow{CD}$ *bisects* $\overline{AB}$, *thus making* $\overline{AM} \cong \overline{BM}$.

and making 4 perpendicular angles.

Equidistant: When a point is the same distance from one line as it is from another line.



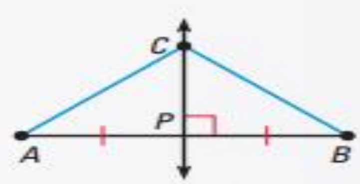
$\cdot$ *P is equidistant from lines a and b.*

THEOREMS

THEOREM 5.1 ***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 perpendicular bisector of $\overline{AB}$, then $CA = CB$.

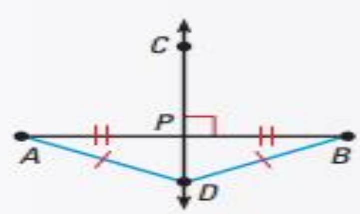


$CA = CB$

THEOREM 5.2 ***Converse of the Perpendicular Bisector Theorem***

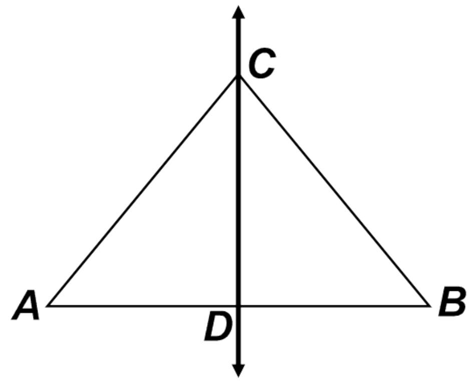
If a point is equidistant from the endpoints of a segment, then it is on the perpendicular bisector of the segment.

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



D is on $\overleftrightarrow{CP}$.

1. $\overleftrightarrow{CD}$ is the perpendicular bisector of $\overline{AB}$.



A. What is the relationship between $\overline{AD}$ and $\overline{BD}$?
$\overline{AD} \cong \overline{BD}$

B. What is the relationship between $\angle CDA$ and $\angle CDB$?
$\angle CDA \cong \angle CDB$

C. What is the relationship between $\overline{AC}$ and $\overline{BC}$?
$\overline{AC} \cong \overline{BC}$

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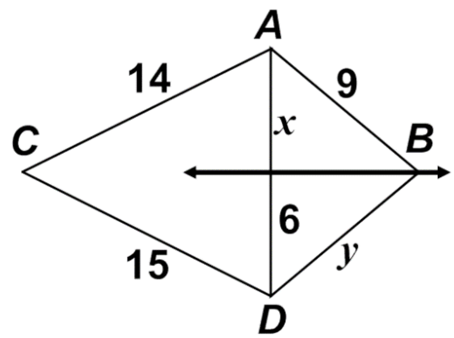
2. $\overleftrightarrow{CD}$ is the perpendicular bisector of $\overline{AB}$.



A. Find the value of x. 6

B. Find the value of y. 9

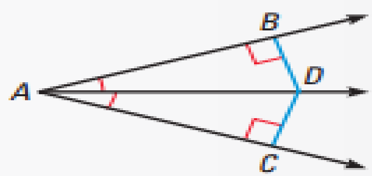
C. Is $\cdot E$ on $\overleftrightarrow{CD}$? No because $CA \neq CD$.

THEOREMS

THEOREM 5.3 ***Angle Bisector Theorem***

If a point is on the bisector of an angle, then it is equidistant from the two sides of the angle.

If $m\angle BAD = m\angle CAD$, then $DB = DC$.

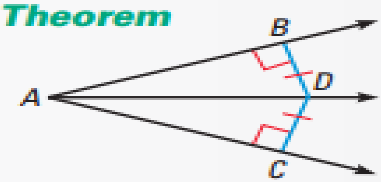


$DB = DC$

THEOREM 5.4 ***Converse of the Angle Bisector Theorem***

If a point is in the interior of an angle and is equidistant from the sides of the angle, then it lies on the bisector of the angle.

If $DB = DC$, then $m\angle BAD = m\angle CAD$.



$m\angle BAD = m\angle CAD$

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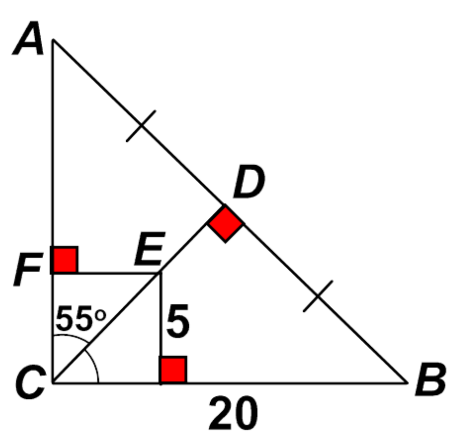
3. $\overleftrightarrow{CD}$ is the perpendicular bisector of $\overline{AB}$ where $\cdot E$ is on the perpendicular bisector.



A. $m\angle DCB = 55°$

B. $m\angle FEC = 35°$

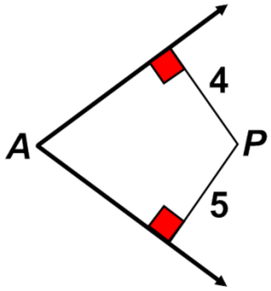
C. $m\angle FED = 145°$

D. $m\angle DBC = 35°$

E. $FE = 5$

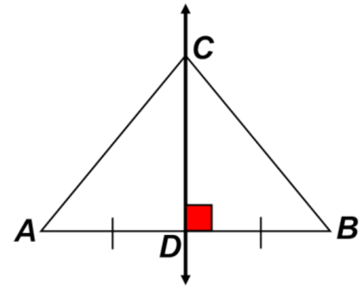
F. $AC = 20$

4. Is $\cdot P$ on the bisector of $\angle A$?



NO

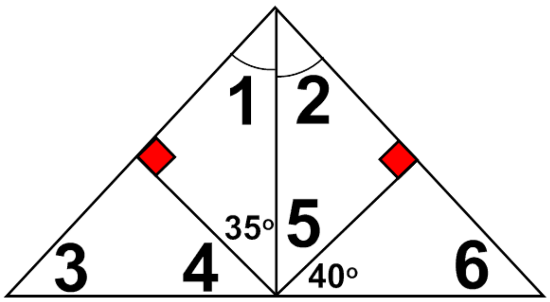
5. $\overleftrightarrow{CD}$ is the perpendicular bisector of $\overline{AB}$. What kind of triangle is ΔABC?



Isosceles, Right

Find the measure of the numbered angles.

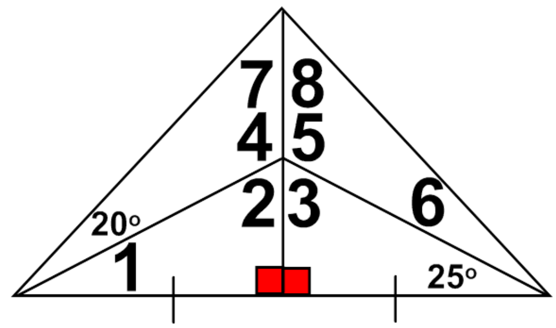
6.



$m\angle 1 = 55°$ $m\angle 2 = 55°$ $m\angle 3 = 20°$

$m\angle 4 = 70°$ $m\angle 5 = 35°$ $m\angle 6 = 50°$

7.



$m\angle 1 = 25°$ $m\angle 2 = 65°$ $m\angle 3 = 65°$

$m\angle 4 = 115°$ $m\angle 5 = 115°$ $m\angle 6 = 20°$

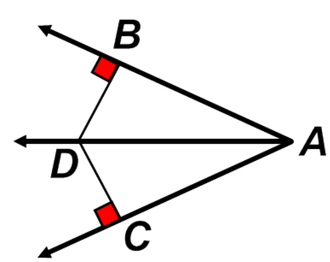
$m\angle 7 = 45°$ $m\angle 8 = 45°$

8. Given: $\cdot D$ *is on the bisector of* $\angle BAC$

$\overline{DB} \perp \overline{AB}$

$\overline{DC} \perp \overline{AC}$

Prove: $\overline{DB} \cong \overline{DC}$



Statements	Reasons
1. $\cdot D$ *is on the bisector of* $\angle BAC$	1. Given
2. $\overline{DB} \perp \overline{AB}$	2. Given
3. $\overline{DC} \perp \overline{AC}$	3. Given
4. $\angle BAD \cong \angle CAD$	4. Def. of Angle Bisector
5. $\angle DBA$ *and* $\angle DCA$ *are right angles*	5. Def. of Perpendicular Lines
6. $\angle DBA \cong \angle DCA$	6. All right angles are congruent.
7. $\overline{DA} \cong \overline{DA}$	7. Reflexive Property
8. $\Delta DBA \cong \Delta DCA$	8. AAS
9. $\overline{DB} \cong \overline{DC}$	9. CPCTC