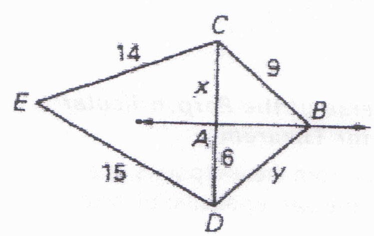
Exercises for Example 1

Use the diagram shown. In the diagram, $\overleftrightarrow{AB}$ is the perpendicular bisector of $\overline{CD}$.

1. Find the value of x.
2. Find the value of y.
3. Is E on $\overleftrightarrow{AB}$? Explain.



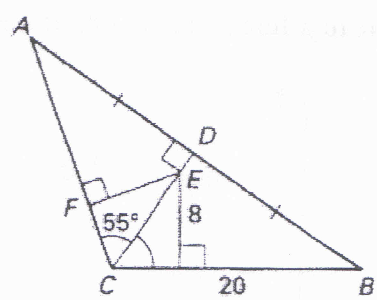
2 Using Bisector Theorems

Determine the correct measurement for the angle or segment given.

a. $\angle DCB$

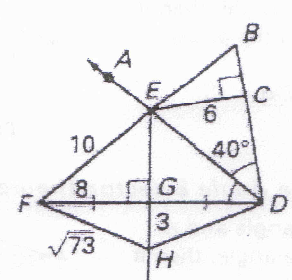
b. $\overline{FE}$

c. $\overline{AC}$



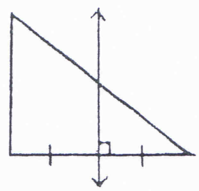
Determine the correct measurement for the angle or segment given.

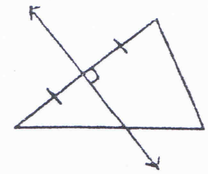
4. $\overline{EG}$
5. $\angle GDE$
6. $\overline{ED}$
7. $\overline{HD}$
8. $\overline{FD}$.



5.2 Bisectors of a Triangle

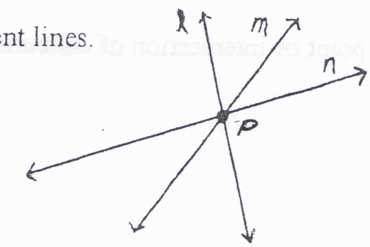
1. Perpendicular Bisector of a Triangle – line (or ray or segment) that is perpendicular to a side of the triangle at the midpoint of that side.





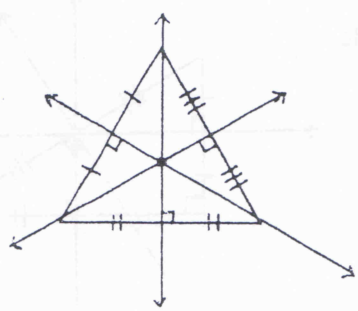
2. Concurrent Lines – 3 or more lines (or rays or segments) that intersect at the same point.

3. Point of Concurrency – point of intersection of concurrent lines.

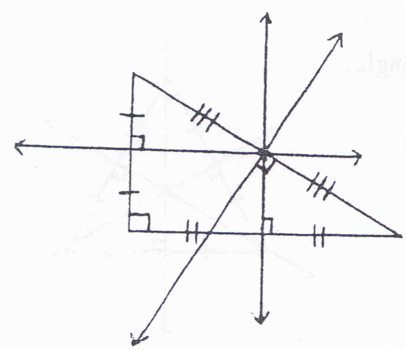


4. Circumcenter – point of concurrency of the perpendicular bisectors of a triangle.

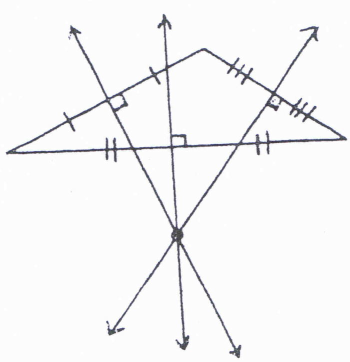
Acute Triangle:
(inside)



Right Triangle:
(on)



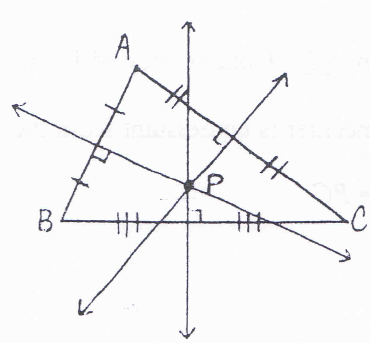
Obtuse Triangle:
(outside)



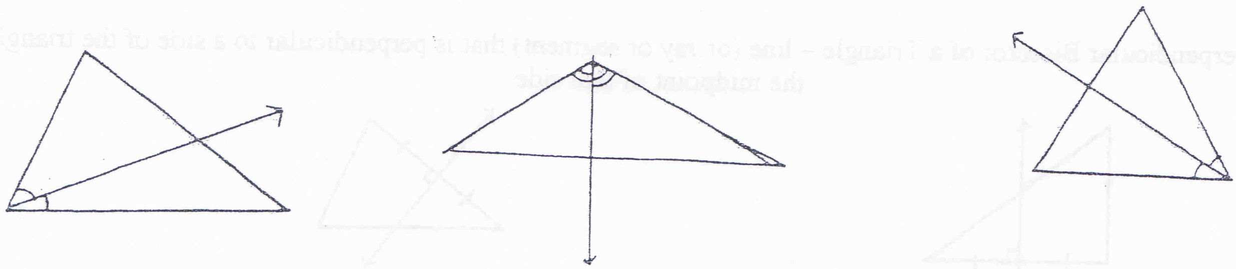
5. Theorem 5.5 – Concurrency of Perpendicular Bisectors of a Triangle

The circumcenter is equidistant from the vertices of the triangle.

$PA = PB = PC$



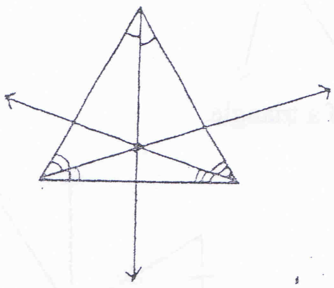
6. Angle Bisector of a Triangle – bisector of an angle of the triangle.



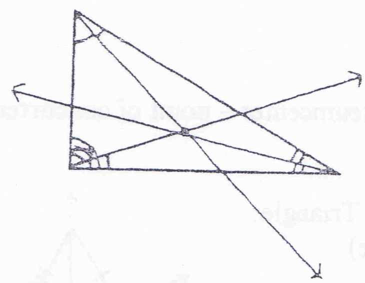
7. Incenter – point of concurrency of the angle bisectors of the triangle.

The incenter is always inside the triangle.

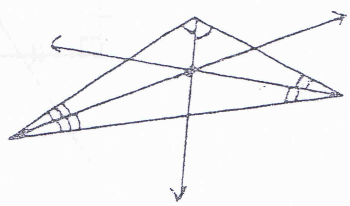
Acute Triangle:



Right Triangle:



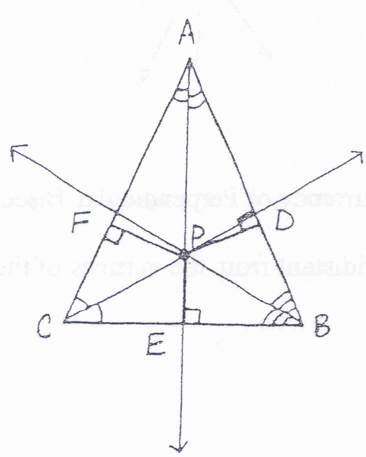
Obtuse Triangle:



8. Theorem <u>5.6</u> – Concurrency of Angle Bisectors of a Triangle

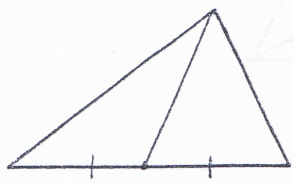
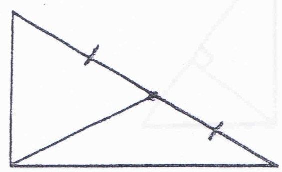
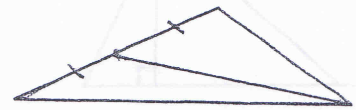
The incenter is equidistant from the sides of the triangle.

PD = *PE* = *PF*



5.3 – Medians and Altitudes of a Triangle

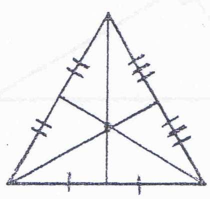
1. Median of a Triangle – segment whose endpoints are a vertex of the triangle and the midpoint of the opposite side.

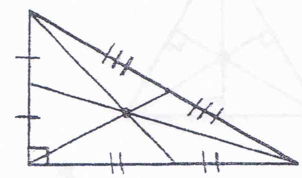
2. Centroid – point of concurrency of the medians of a triangle.

The centroid is **always** inside the triangle.

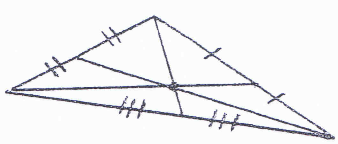
Acute Triangle:



Right Triangle:

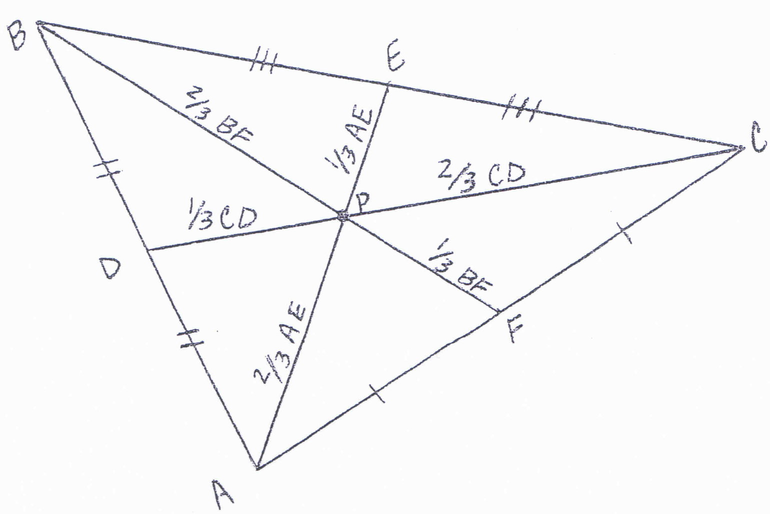


Obtuse Triangle:

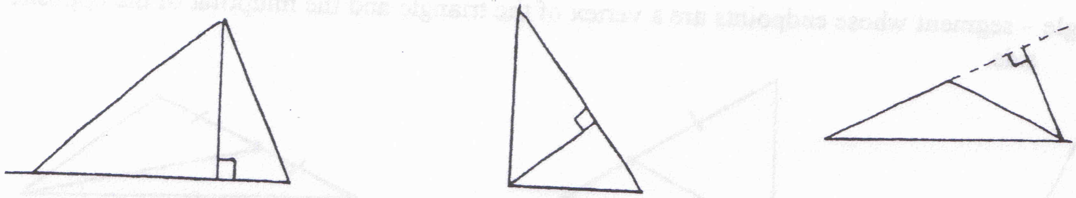


3. Theorem 5.7 – Concurrency of Medians of a Triangle

The centroid is two-thirds of the distance from each vertex and one-third the distance to the midpoint of the opposite side.

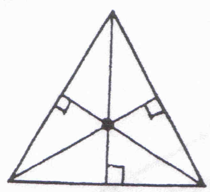


4. Altitude of a Triangle – perpendicular segment from a vertex to the opposite side or to the line containing the opposite side.

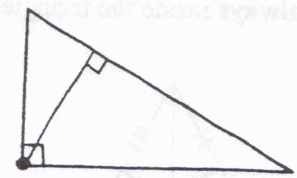


5. Orthocenter – point of concurrency for the altitudes of a triangle.

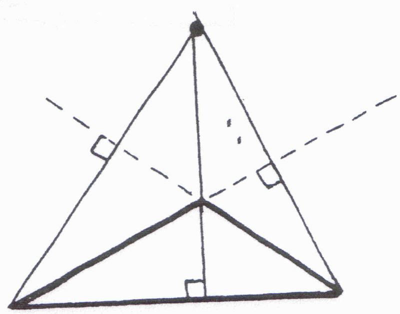
Acute Triangle:
(In)



Right Triangle:
(On)



Obtuse Triangle:
(out)



6. Theorem 5.8 – Concurrency of Altitudes of a Triangle

The lines containing the altitudes of a triangle are concurrent.

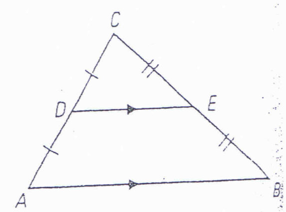
Section 5-4 Midsegments.

The **midsegment** of a triangle is a segment that connects the midpoints of 2 sides.

THEOREM 5.9 *Midsegment Theorem*

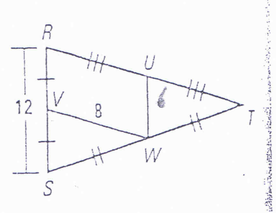
The segment connecting the midpoints of two sides of a triangle is parallel to the third side and is half as long.

$\overline{DE} \parallel \overline{AB}$ and $DE = \frac{1}{2}AB$

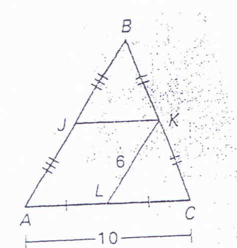


Examples

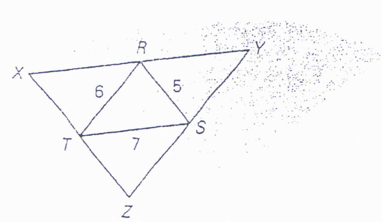
1. $\overline{UW}$ *and* $\overline{VW}$ *are midsegments.*
   Find UW and RT.



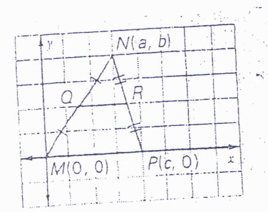
2. $\overline{JK}$ *and* $\overline{KL}$ *are midsegments.*
   Find JK and AB.



3. $\overline{RS}, \overline{ST}$ *and* $\overline{RT}$ *are midsegments.*
   Find the perimeter of $\triangle$XYZ.



4. What are the coordinates of Q and R ?



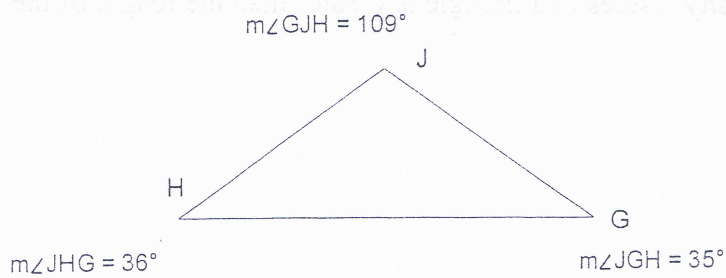
Section 5.5. Inequalities in 1 Triangle.

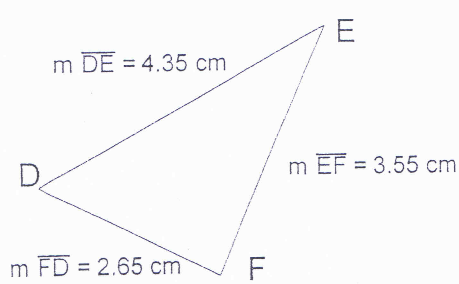
Goal: Compare sides and compare angles in 1 triangle.

Theorem 5.10-If one side of a triangle is longer than another side, then the angle opposite the longer side is larger than the angle opposite the shorter side.

Theorem 5.11-If one angle of a triangle is larger than another angle, then the side opposite the larger angle is longer than the side opposite the smaller angle.

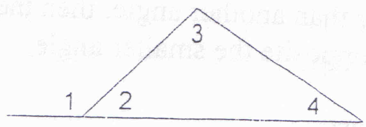
Write measurements in order from least to greatest





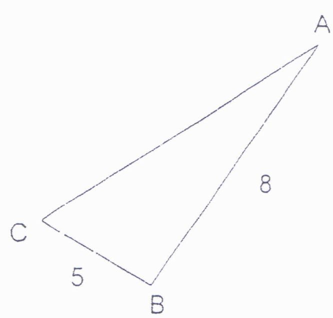
Theorem 5.12-Exterior Angle Inequality

- An exterior angle of a triangle is greater than the measure of either of the 2 nonadjacent interior.



Theorem 5.13-Triangle Inequality

- The sum of the lengths of any 2 sides of a triangle is greater than the length of the third angle



1. Given 5, 8, and 'x'. Find 'x'

2. Given 6, 4, and 'x'. Find 'x'

3. Can we construct a triangle with lengths with 4, 12, and 7?