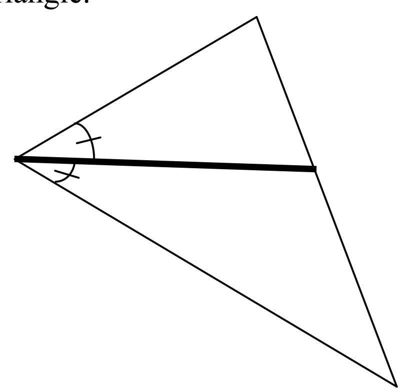
A.M.D.G.

Geometry Accelerated
Chapter 5: Properties & Attributes of Triangles
5.1-5.4 Notes

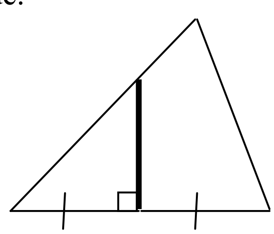
Special Segments in Triangles:

Generally, there are several "special" segments in triangles. These segments are named based on how they are constructed in a triangle, so they are fairly easy to memorize. The five special segments are as follows (in all cases the special segment is the darkest line in the illustration:

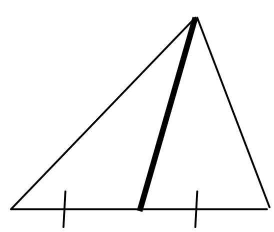
- **Angle Bisector:** The angle bisector is the segment that cuts one of the angles in half and continues to the opposite side of the triangle.



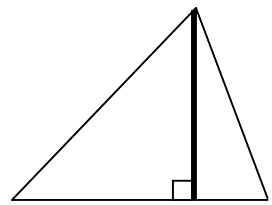
- **Perpendicular Bisector:** The perpendicular bisector cuts one side in half and forms a right angle with that side.



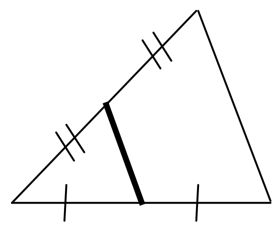
- **Median:** The Median connects the midpoint of a side with the vertex across from that side.



- **Altitude (or Height):** This is the distance from the vertex to a side of the triangle, so it forms a right angle with a side and intersects the vertex opposite the side.



- **Midsegment:** The midsegment joins the midpoints of two sides in a triangle.



Points of Concurrency:

A point of concurrency is simply where several segments or lines intersect at the same point (see the illustration below, the point marked is a point of concurrency). There are four points of concurrency for the special segments. These are harder to memorize because they are not as intuitive. We will discuss their names and their importance later in class. The book has good illustrations of all of these points, so you should look them up.

Circumcenter: If you construct 3 perpendicular bisectors for a triangle, they meet at a point of concurrency called the circumcenter.

Incenter: If you construct 3 angle bisectors for a triangle, they meet at a point of concurrency called the incenter.

Centroid: If you construct 3 medians for a triangle, they meet at a point of concurrency called the centroid.

Orthocenter: If you construct 3 altitudes for a triangle, they meet at a point of concurrency called the orthocenter.

Important Theorems from Chapter 5:

There are several important theorems from chapter 5. You should find them and write them below. You may also want to add them (and some of the definitions above) to your toolkit.

- **Perpendicular Bisector Theorem** (and its **Converse**):

- **Angle Bisector Theorem** (and its **Converse**):

- **Triangle Midsegment Theorem:**

- **Circumcenter Theorem:**

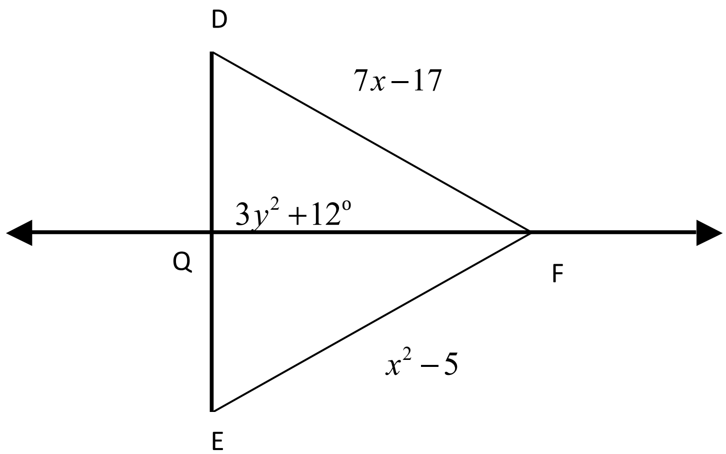
- **Incenter Theorem:**

- **Centroid Theorem:**

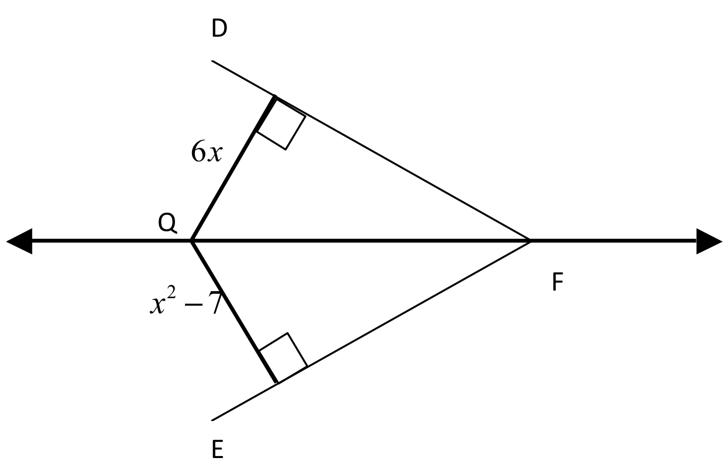
- **Triangle Inequality Theorem:**

Examples:

1. Given that $\overleftrightarrow{FQ}$ perpendicularly bisects $\overline{ED}$, solve for x and y.



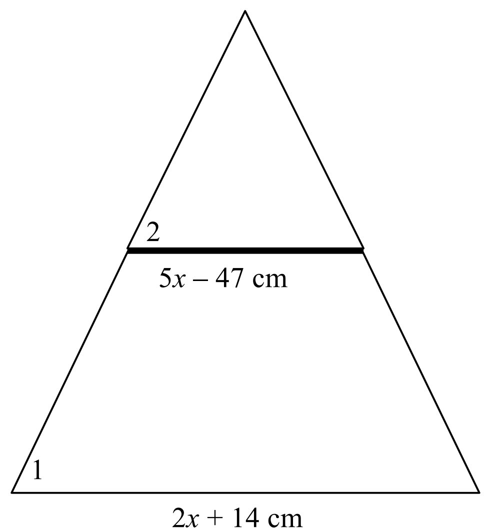
2. Given that $\overleftrightarrow{FQ}$ is the angle bisector of $\angle F$, solve for x and y.



$\angle QFE = y^2 - 2y + 12^\circ$

$\angle DFE = 72^\circ$

3. Given the darkened segment below is the midsegment of the triangle, find the values of x and y.



$m\angle 1 = y^2 - 7^\circ$

$m\angle = 60^\circ - 2y$

4. Which of the following side lengths could make a triangle? Answer yes or no for each of them.

a) 3, 4, 5 b) 7, 9, 17 c) 11, 19, 30 d) 8, 15, 17 e) 9, 12, 23