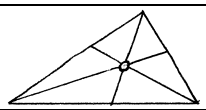
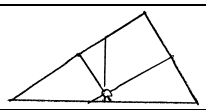
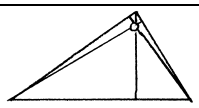
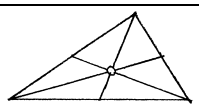
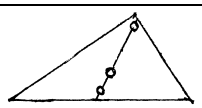
Sheet #471: Concurrent Lines and Centers of Triangles

v.2.2

Concurrent lines are three or more lines that intersect at a point.

Point of concurrency	A point where three or more lines meet	**Points of concurrency of a triangle**	**Triangle Centers**	**Theorems**	**More theorems / Constructions**
Bisector of an Angle	A ray or segment that divides an angle into two congruent adjacent angles	Angular Bisectors intersect at this point	Incenter (I)	The point equidistant from the three sides of a triangle	The center of the incircle (the circle inscribed in the triangle)
Perpendicular Bisector of a segment	A line or ray (or segment) that is perpendicular to a (another) segment at its midpoint	Perpendicular Bisectors intersect at this point	Circumcenter (C)	The point equidistant from the three vertices of a triangle	The center of the circumcircle (circle circumscribed about a triangle)
Altitude of a triangle	The perpendicular segment from a vertex to the line that contains the opposite side	Altitudes intersect at this point	Orthocenter (H)		
Median of a triangle	A segment from the vertex to the midpoint of the opposite side	Medians intersect at this point	Centroid, Geometric (G)	The point that is 2/3 of the distance from each vertex to the midpoint of the opposite side	Point of balance of a triangle with uniform mass (center of mass or center of gravity)
Euler Line	The line that passes through the circumcenter, orthocenter, and centroid				
Distance from a point to a line	The length of the perpendicular segment from the point to the line				

Incenter	Circumcenter	Orthocenter	Centroid, Geometric	Euler Line
				

Bisector-Distance Theorems	• A point is on the perpendicular bisector of a segment if and only if it is equidistant from the endpoints of the segment.
	• A point is on the bisector of an angle if and only if it is equidistant from the sides of the angle.

- For isosceles triangles only, the Euler line passes through the incenter, circumcenter, orthocenter, and centroid (I, C, H, G). All four centers coincide in an equilateral triangle.
- The distance from the Centroid to the Circumcenter is 1/2 the distance from the Centroid to the Orthocenter.
- There are more than one hundred named triangle centers.

Sections 1.3 (p.13), 1.4 (p.19), 4.7 (pp.152-153), 10.3 (pp.386-387), 13.7 (p.556, Wr. Ex. 36-39).