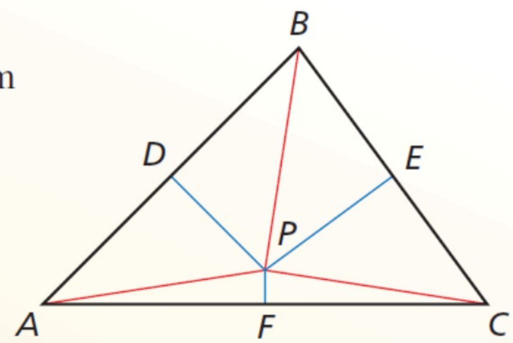
Theorems

Theorem 6.5 Circumcenter Theorem

The circumcenter of a triangle is equidistant from the vertices of the triangle.

If $\overline{PD}$, $\overline{PE}$, and $\overline{PF}$ are perpendicular bisectors, then $PA = PB = PC$.

Proof p. 310



Perpendicular Bisectors

Circle is always on the outside

Acute: inside
Obtuse: outside
Right: on the hypotenuse

From the vertex to the circumcenter are your radii (congruent)

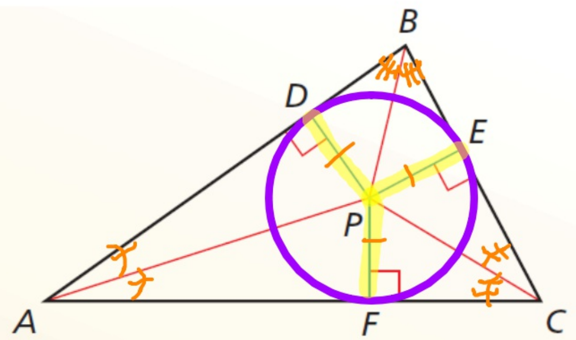
Theorem

Theorem 6.6 Incenter Theorem

The incenter of a triangle is equidistant from the sides of the triangle.

If $\overline{AP}$, $\overline{BP}$, and $\overline{CP}$ are angle bisectors of $\triangle ABC$, then $PD = PE = PF$.

Proof Ex. 38, p. 317



Angle Bisectors

Incenter is always inside the triangle

Radii go from the incenter to the side of the circle (perpendicular)

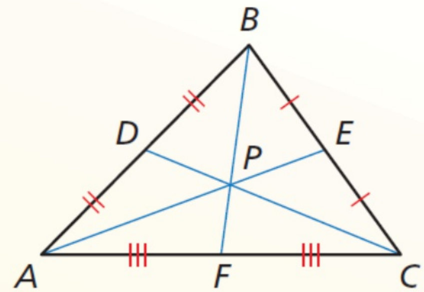
Theorem

Theorem 6.7 Centroid Theorem

The centroid of a triangle is two-thirds of the distance from each vertex to the midpoint of the opposite side.

The medians of $\triangle ABC$ meet at point P, and $AP = \frac{2}{3}AE$, $BP = \frac{2}{3}BF$, and $CP = \frac{2}{3}CD$.

Proof *BigIdeasMath.com*



Medians (midpoint) to the vertex
Center of Gravity

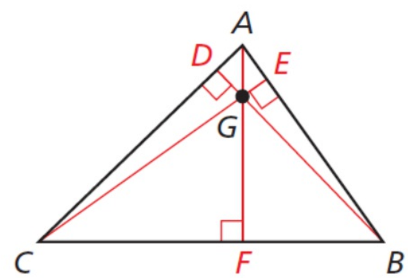
From the vertex to the centroid is 2/3 distance of the median. From the midpoint to the centroid 1/3 the distance of the median - it is also 1/2 the distance of the vertex to the centroid.

Core Concept

Orthocenter

The lines containing the altitudes of a triangle are concurrent. This point of concurrency is the **orthocenter** of the triangle.

The lines containing $\overline{AF}$, $\overline{BD}$, and $\overline{CE}$ meet at the orthocenter G of $\triangle ABC$.



Altitudes (height) from the vertex to the opposite side (perpendicular)

Acute: inside
Obtuse: outside
Right: on the right angle