Lesson 14.3
The Concurrence Theorems
Lines that have exactly one point in common are said to be *concurrent*.

…….thus we have……..

**Definition:**

*Concurrent Lines* are lines that intersect in a single point

\[ l, m \text{ and } n \text{ are concurrent at } P \]

\[ s, v, \text{ and } t \text{ are NOT concurrent} \]
Theorem

The perpendicular bisectors of the sides of a triangle are concurrent at a point that is equidistant from the vertices of a triangle.

The point of concurrency of the perpendicular bisectors is called the **circumcenter**.
Theorem
The bisectors of the angles of a triangle are concurrent at a point that is equidistant from the sides of a triangle.

The point of concurrency of the angle bisectors is called the **incenter**.
**Theorem**

The lines containing the altitudes of a triangle are concurrent at a point.

The point of concurrency of the altitudes is called the **orthocenter**.

**Note:**

The orthocenter is not always inside the triangle!
Theorem

The medians of a triangle are concurrent at a point that is $2/3$ of the way from any vertex of the triangle to the midpoint of the opposite side.

The point of concurrency of the medians is called the **centroid**.

The centroid of a triangle is important in physics because it is the center of gravity of the triangle!
Example:

In triangle PQR, the medians, QT and PS are concurrent at C.

PC = 4x – 6
CS = x

Find:

a. x
b. PS

Answers:

a. x = 3
b. PS = PC + CS = 6 + 3 = 9