Geometry 6.2 Notes: Circumcenters and Incenters

Concurrent Lines: When _____ lines, rays, or segments intersect in the same point, they are called concurrent lines.

Point of Concurrency: The point of intersection of the _____, _____, or _____.

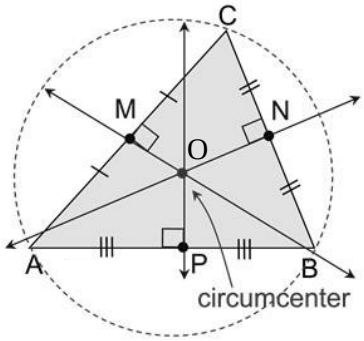
In a triangle, the three ⊥ bisectors of the sides are concurrent.

➔ The point of concurrency is called the _____

Circumcenter Theorem

The circumcenter of a triangle is _____ from the _____ of the triangle.

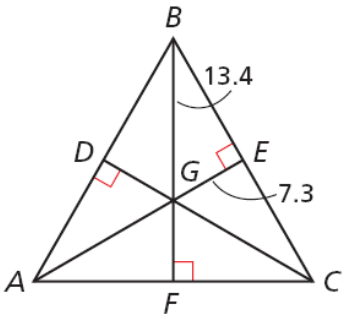
If _____, _____, and _____ are perpendicular bisectors or triangle ABC, then _____



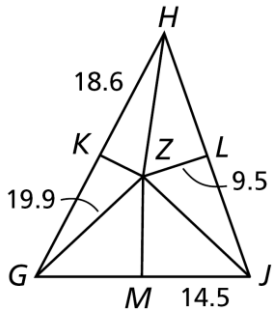
**Remember, the "equidistant" is because this length (AP, CP, and BP in the diagram above) represents the _____ of the circle!

Example:

1. *DG*, *EG*, and *FG* are the perpendicular bisectors of Δ*ABC*. Find *GC*.

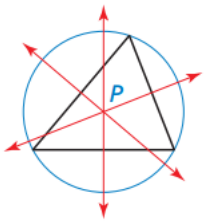


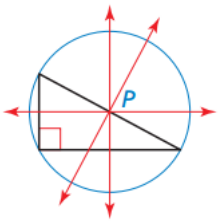
2. Use the diagram. Find GK.

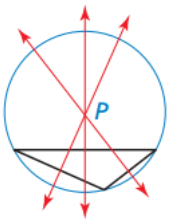


**The location of the circumcenter (point P in the diagrams below) depends on the type of triangle.

**The circle with center P is said to be _____ about the triangle.







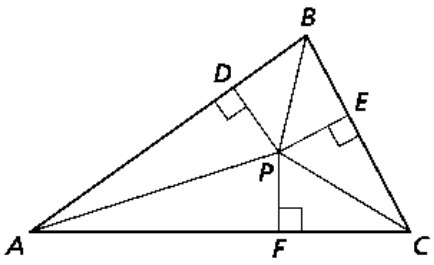
Just as a triangle has three ⊥ bisectors, it also has three angle bisectors.

The angle bisectors of a triangle are also concurrent. This point of concurrency is the _____ of the triangle.

Incenter Theorem

The incenter of a triangle is _____ from the _____ of the triangle.

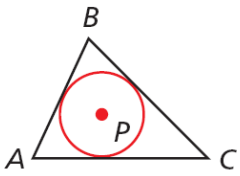
If _____, _____, and _____ are angle bisectors of triangle ABC, then _____



**Remember, the "equidistant" is because this length (DP, EP, and FP in the diagram above) represents the _____ of the circle!

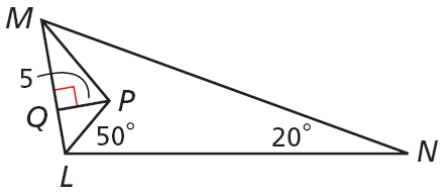
The **incenter** is the center of the triangle's *inscribed circle*, so it will ALWAYS be <u>inside</u> the triangle.

<u>Inscribed circle:</u> a circle that is tangent to (touches the side at exactly one point) each side of a polygon.



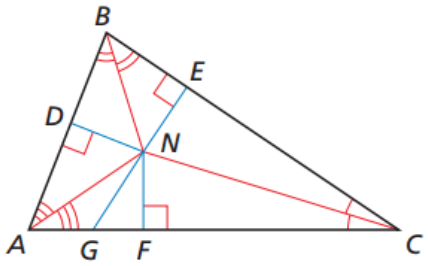
Examples:

3. *MP* and *LP* are angle bisectors of Δ*LMN*. Find m∠*PMN*.



4. In the figure shown, $ND = 5x - 1$ and $NE = 2x + 11$.
   a. Find NF.

   b. Can NG be equal to 18? Explain your reasoning.



Example 5: A city wants to place a lamppost on the boulevard shown so that the lamppost of the <u>same distance</u> from all three <u>streets</u>. Should the location of the lamppost be at the *circumcenter* or the *incenter* of the triangle boulevard? Explain.