Concurrency Worksheet

1. Find the incenter of the triangle.

2. Find the orthocenter of the triangle.

3. Find the centroid of the triangle.
4. Find the circumcenter in the triangle.

5. Given:
   \[
   \angle 1 = x^2 + 6x - 19 \\
   \angle 3 = x^2 - 3x + 41 \\
   \angle 4 = 10x + 79
   \]

Find: The supplement of \( \angle 2 = \)__________

6. Given:
   MP bisects \( \angle NMO \\
   \angle 1 = x^2 - 3x \\
   \angle 2 = 4 - 6x \\
   \text{Ratio of } \angle 3 \text{ to } \angle 4 \text{ is } 2:3

Find: \( m \angle 5 = \)__________
Complement of \( \angle 6 = \)____________
7. **Step 1:** Find the Circumcenter of the triangle
**Step 2:** Using your compass, measure the distance from the circumcenter to point A. Then measure the distance from the circumcenter to point B. Do the same for point C. What do you notice?

**Step 3:** Circumscribe a circle around triangle ABC with the circumcenter as the center of the circle and the circumference of the circle extending out to the 3 vertices of triangle ABC.

From the conjecture you made earlier about perpendicular bisectors, you know that each point on a perpendicular bisector of a segment is equally distant from the ends. If the circumcenter of a triangle is on all three perpendicular bisectors, then it is equally distant from all three vertices of the triangle. Since it is equally distant from all three vertices of the triangle, the circumcenter is the center of a circle circumscribed about the triangle.

8. **Step 1:** Find the incenter of the triangle XYZ. Label it point Q.
**Step 2:** Construct perpendicular segments from Q to each one of the sides of the triangle XYZ. Label the intersection of these perpendicular segments to the sides of triangle XYZ points R, S, and T.
**Step 3:** Put your compass on the incenter and inscribe a circle inside triangle XYZ by using points R, S, and T as the radius length.

From the conjecture you made earlier about angle bisectors, you know that each point on an angle bisector is equally distant from the sides of the angle. Since the incenter of a triangle is on all three angle bisectors, then it is equally distant from all three sides. Since it is equally distant from all three sides, the incenter is the center of a circle inscribed in the triangle.
9. **Step 1:** Find the centroid of triangle LMN. Label the centroid point E.

**Step 2:** Draw in medians LK, MH, and NG

**Step 3:** Measure the following lengths using a metric ruler

- ME = _______
- LE = _______
- NE = _______
- EH = _______
- EK = _______
- GE = _______
- MH = _______
- LK = _______
- GN = _______

**Step 4:** Formulate a conjecture using the data you collected in the above problem. Be sure to be as detailed as possible when writing your conjecture.

*Centroid conjecture:

__________________________________________________________________________
__________________________________________________________________________

10. Divide AB so the length of AC to CB is a ratio of 2:3  
(can not guess and check using different compass sizes Cannot using a ruler, only a straightedge)