Functions Worksheet 3 - Answers

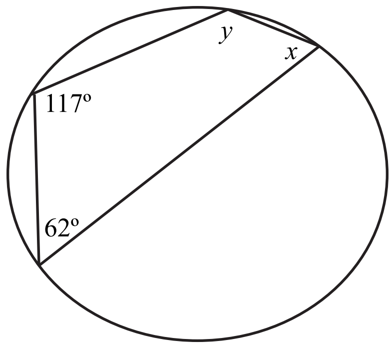

Figure 1

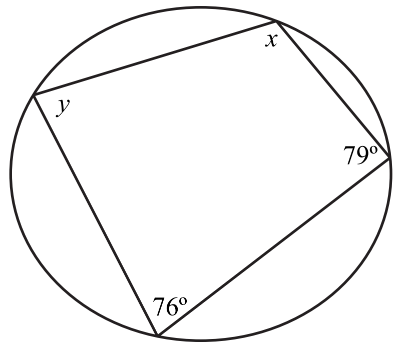

Figure 2

1. How would you construct a circle that circumscribes a given triangle?
   Construct the perpendicular bisectors of each side of the triangle. These three lines intersect at a point, which is exactly the center we want. Using the intersection point as a center, draw a circle through one of the vertices of the triangle. The circle should pass through the other two vertices as well.

2. Why is the center of the circle that circumscribes a triangle at the intersection of the perpendicular bisectors?
   Any point on a perpendicular bisector of a given segment is equidistant from the endpoints of the segment. Every point on each side's perpendicular bisector is equidistant from two of the vertices. The intersection of these three perpendicular bisectors will be equidistant from the three vertices of the triangle and therefore the center of the circle that circumscribes it.

3. Which theorem is needed to prove that the opposite angles in a cyclic quadrilateral are supplementary?
   The Inscribed Angle theorem

Refer to the Figure 1 for questions 4 and 5.

4. Determine the measure of $\angle x$.
   $63°$.

5. Determine the measure of $\angle y$.
   $118°$.

Refer to the Figure 1 for questions 4 and 5.

6. Determine the measure of $\angle x$.
   $104°$.

7. Determine the measure of $\angle y$.
   $101°$.

8. How would you construct the inscribed circle of a triangle?
   First, locate the incenter by constructing the angle bisectors. The incenter is the point where the angle bisectors meet. Construct a line from the incenter perpendicular to a side. The point of intersection is the point of tangency. Finally, construct the incircle, with center as the incenter, passing through the point of tangency.

9. Describe the relationship among the circumcenter, orthocenter, and centroid of a triangle.
   They are collinear. They all lie on the Euler line.

10. They are collinear. They all lie on the Euler line.
    Three points are necessary to fix a unique circle in the plane. If only one point is used, there are infinitely many circles passing through that point, with all different radii. If two points are used, then an infinite number of circles is still possible, since the two points could be at ends of a diameter, or near the "top" of a circle, or any variation between. Three points are necessary to fix a circle in space.