Problem 1 – Exploring the Perpendicular Bisectors of a Triangle

1. Define **concurrent**.

2. Define **point of concurrency**.

Construct an acute $\triangle ABC$ and construct the perpendicular bisector of all three sides on page 1.4. Using $\triangle ABC$, answer the following questions.

3. What do you notice about the perpendicular bisectors of all three sides?

4. The point of concurrency for the three perpendicular bisectors is the circumcenter; create and label this point *R*. Can you move vertex *A* so that the circumcenter is on a side of $\triangle ABC$? If so, what kind of triangle is *ABC* in this case?

5. Can you move vertex *A* so that the circumcenter is outside of $\triangle ABC$? If so, what kind of triangle is $\triangle ABC$ in this case?

6. What kind of a triangle guarantees that the circumcenter is on the inside of the triangle?

7. On page 1.5, measure the distance from the circumcenter to each vertex of the triangle. What relationship is true about the distances?

8. On page 1.5, create a circle with center *R* that passes through one of the three vertices of your triangle. This circle **circumscribes** $\triangle ABC$. How many vertices of the triangle does the circle go through?

9. What is the radius of your circle?

Problem 2 – An Application of the Circumcenter

1. A local community has a memorial for fallen firefighters. The memorial consists of a large circle of monuments and a continuous flame at the center of the circle. After a devastating hurricane, all but three monuments are destroyed. In addition, the continuous flame and all original building documentation were destroyed. The community wanted to reconstruct the original monument and created a Cartesian grid with the location of the three remaining monuments. The monuments were at (1, 1), (2, 4), and (5, 1). Use page 2.3 to find the location where the continuous flame should be on the grid and the radius, in feet, of the circle needed to reconstruct all missing monuments. (1 unit = 100 feet)

2. A mathematician in Texas had three large trees and wanted to create a large circle of trees that included his three original trees. He looked at his plot of land and his trees were located at (0, 4), (5, 1), and (1, 1). Where on the plot of land is the center of the circle created by the trees and what is the measurement of the radius, in feet? (1 unit = 10 feet) Use page 2.5 to help you answer the problem.