In this lab exercise you will construct the so-called *Nine Point Circle* of a triangle. This circle is described in exercises 37 in Chapter 6 and 42 in Chapter 4.

GeoGebra Construction

(1) Open a new GeoGebra window. Go to the View menu and turn off the axes, so the drawing pad is blank. I'd also recommend going to the Options menu, choose Labeling, and select "New Points Only" to avoid having GeoGebra display a label for every single line segment you create.

(2) Choose the *Polygon* tool (it looks like a triangle) and click three times (and once more at your first point) to create $\triangle ABC$. Make sure each vertex angle is acute.

(3) Use the *Midpoint* tool to add D, E and F, the midpoints of the sides opposite your vertices.

(4) Use the *Perpendicular Line* tool to select a vertex and the opposite side. Repeat for the other vertices, so you now have three altitutdes. Use the *Intersection* tool to click on an altitude and the segment it intersects to label the feet of the altitudes. (Alternatively, if you've been keeping track on the left of what GeoGebra has been naming the segments and altitudes, you could type a command like `L = Intersect[a,d]` in the Input field.)

(5) Continuing with the *Intersection* tool, add a point at the orthocenter by marking the intersection of two (and therefore all three) altitudes.

(6) Use the *Midpoint* tool to find the midpoints of the segments from the vertices to the orthocenter.

(7) Use the *Circle* tool to create a circle which goes through the midpoints of the sides of the triangles. (Alternatively, type `Circle[D,E,F]` in the Input field.

(8) Click and drag the vertices of your triangle to make sure the circle goes through *nine* (!) of the points you just constructed: the midpoints of the sides, the feet of the altitudes, and the midpoints between the vertices and the orthocenter. If your circle does not go through these points, look through your previous work for a mistake.

To receive credit for this assignment, save your file as `lastname-5335-lab3.ggb` and email it to me at `<rogness@math.umn.edu>` as an attachment by Friday, 11/06/09. The subject line should be the same as your filename. In the body of the email, you must *briefly* answer the following question:

- What happens to your Nine Point Circle if the triangle has a right angle? An obtuse angle?

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