Lesson 31: Construct a Square and a Nine-Point Circle

Classwork

Opening Exercise

With a partner, use your construction tools and what you learned in Lessons 1–5 to attempt the construction of a square. Once you are satisfied with your construction, write the instructions to perform the construction.

Exploratory Challenge

Now, we are going to construct a nine-point circle. What is meant by the phrase "nine-point circle"?

Steps to construct a nine-point circle:

1. Draw a triangle $\triangle ABC$.
2. Construct the midpoints of the sides $\overline{AB}$, $\overline{BC}$, and $\overline{CA}$, and label them as L, M, and N, respectively.
3. Construct the perpendicular from each vertex to the opposite side of the triangle (each is called an altitude).
4. Label the intersection of the altitude from C to $\overline{AB}$ as D, the intersection of the altitude from A to $\overline{BC}$ as E, and of the altitude from B to $\overline{CA}$ as F.
5. The altitudes are concurrent at a point, label it H.
6. Construct the midpoints of $\overline{AH}$, $\overline{BH}$, $\overline{CH}$ and label them X, Y, and Z, respectively.
7. The nine points, L, M, N, D, E, F, X, Y, Z, are the points that define the nine-point circle.

Example

On a blank white sheet of paper, construct a nine-point circle using a different triangle than you used during the notes. Does the type of triangle you start with affect the construction of the nine-point circle?

Problem Set

Construct square $ABCD$ and square $GHIJ$ so that

a. Each side of $GHIJ$ is half the length of each $ABCD$.

b. $\overline{AB}$ contains $\overline{GH}$.

c. The midpoint of $\overline{AB}$ is also the midpoint of $\overline{GH}$.