Name: _____

College Geometry Homework #1: Basic Constructions

In this activity you will carry out some basic constructions using Geometer's Sketchpad (GS). If you have never used GS before, don't worry; for what we need it to do, GS is fairly straightforward. If you get stuck, ask for help!

Each of the following problems should be constructed on a separate sketchpad file, and these files should be given descriptive titles **including your name and the homework number**. When you are finished, email the sketchpad files to me. So I should get four files from you, with names like "Nathan Bloomfield - HW1 - construct equilateral triangle.gsp".

Finally, **your constructions must be robust**. Every geometric construction starts with one or more *free elements*; these are points and lines given in the hypotheses of the construction proof. You should be able to **move the free elements around** without destroying your construction.

1. **Construct an equilateral triangle.** Start by placing two free points X and Y in the plane, as well as the segment $\overline{XY}$. Following the proof we gave in class, construct two points Z_1 and Z_2, on the opposite sides of $\overleftrightarrow{XY}$, such that $\triangle XYZ_1$ and $\triangle XYZ_2$ are equilateral.

2. **Copy a line segment.** Start by placing four free points X, Y, O, and P in the plane, as well as the segment $\overline{XY}$ and the ray $\overrightarrow{OP}$. Following the proof we gave in class, construct a point Z on $\overrightarrow{OP}$ such that $\overline{OZ} \equiv \overline{XY}$.

3. **Copy an angle.** Start by placing five free points A, O, B, P, and X in the plane, as well as the rays $\overrightarrow{OA}$, $\overrightarrow{OB}$, and $\overrightarrow{PX}$. Following the proof we gave in class, construct two points Y_1 and Y_2, on opposite sides of $\overleftrightarrow{OX}$, such that $\angle XPY_1 \equiv \angle AOB$ and $\angle XPY_2 \equiv \angle AOB$.

4. **Construct a midpoint.** Start by placing two free points X and Y in the plane, as well as the segment $\overline{XY}$. Construct a point $Z \in \overline{XY}$ such that $\overline{XZ} \equiv \overline{ZY}$. Can you prove that the point you constructed has this property?