

Homework #1: Basic Constructions**College Geometry**

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

Each of the following problems should be constructed on a separate file, and these files should be given descriptive titles **including your name and the activity number**. When you are finished, email the files to me. So I should get four files from you, with names like "Nathan Bloomfield - A1 - construct equilateral triangle.ggb".

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.

Make a GeoGebra tool which constructs an equilateral triangle from two of its vertices.

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 $\overline{OZ} \equiv \overline{XY}$.

Make a GeoGebra tool which copies a line segment onto a ray.

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 $\angle XPY_2 \equiv \angle AOB$.

Make a GeoGebra tool which copies an angle onto a ray.

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?

Make a GeoGebra tool which constructs the midpoint of a given segment.