MTH 338 **LAB 1** Spring 2012

Exploring Hyperbolic Geometry Using Geometer's Sketchpad

1. GETTING STARTED

Refer to the instructions in the previous lab if you experience difficulty with any of these steps.

- Browse to `\\poole\ClassFolders\Math-Dray` .

2. HYPERBOLIC GEOMETRY

- Copy the sketch named `Hyperbolic` to your ONID directory, then open ***the copy***.

  The filename is `Hyperbolic.gsp` . Double-clicking on a sketch does ***not*** always work, so you may need to open this file from within Geometer's Sketchpad. Opening my copy of this file may prevent others in the class from accessing it.
  If `poole` is unavailable, you should be able to download a similar version at:
  `http://www.dynamicgeometry.com/documents/advancedSketchGallery/Poincare_Disk.gsp`.

This sketch not only shows the Poincaré disk, but also adds custom tools to the last icon on the left, below the text icon. To access one of these tools the first time, click on the icon, then select the tool you want. To access the same tool again, after having selected another tool, simply click on the icon again. ***To get the list of tools back, click on the icon and hold the mouse button down until the list reappears.***

3. ASSIGNMENT

- Construct a hyperbolic triangle. Use the custom tools (not the `Measure` menu!) to measure all of its sides and angles.

  Geometer's Sketchpad can not easily handle hyperbolic lines which are diameters of the unit circle, nor are measurements very accurate for points near the origin. Try to avoid such lines and points in all your constructions.

- Construct another triangle such that two corresponding sides as well as the included angle are congruent.
- Check SAS congruence in this case by measuring the remaining sides and angles.
- (Optional) Use a similar construction to check whether SSS congruence holds.
- ***Save your work!*** Print a copy now or later to submit as part of your writeup.

  Make sure you save your work to your ONID account, not the local machine!

  You can save your figure as a `PostScript` file by choosing the "printer" labeled `PostScript File`.

- Write a paragraph describing your construction, and what conclusions you reached.

  You can in principle complete this assignment "by eye", using the measurement tools to get the sides and angles approximately correct. Geometer's Sketchpad will help you by, for instance, assuming you want to put a point on a line if you are close enough. You can improve the accuracy of your measurements, thus checking for roundoff error, by changing the precision in the `Edit -> Preferences` menu.

  However, it is better to let Geometer's Sketchpad do the work where possible. Can you come up with a process for duplicating triangles? For example, right angles can be drawn accurately by constructing perpendicular (hyperbolic) lines. And hyperbolic circles turn out to be Euclidean circles as well (but not with the same center!), which provides an accurate way to duplicate lengths. (There are two custom tools for constructing hyperbolic circles.)