Introduction and Constructions GSP Warm Up
✓ Partner work required
✓ Lab name: Introduction (name example: Wiebe_Burton_Introduction.gsp)
✓ Save your work frequently. Sometimes the network crashes your application.

I. Introduction

1. Drag your mouse over each picture on the toolbar; you'll see what each tool is called.

2. Click the *Point Tool*. Move and click the pointer anywhere in the sketch plane to make one point. Click a second point in the plane.

3. Click on the *Selection Arrow* and use it to select each point. Something is selected when it has a thick pink border around it.

4. Connect the points with a segment. You can do this in three ways, try all three!
   a. One is to use the shortcut, which is Ctrl-L (after both points are highlighted).
   b. You may also try selecting the two points and using "Construct / Segment."
   c. The other way is to click the *Straightedge Tool* (You have options for what the ends of the line segment look like. For our purposes, we'll usually use the dots, not arrowheads). Move the mouse until the crosshair pointer is centered on one of the two points. Hold down the mouse button and then drag the mouse to the other point and release.

5. You may also use the *Line Segment Tool* to draw a new line segment (that does not already have its end points on the worksheet).

Using the method of your choice; create a triangle.

6. Highlight every part of the triangle. (This means you'll have to use the *Selection Arrow.*) You can either click on each part individually (the long way!) or you can highlight the entire triangle by dragging your mouse over it (like you were selecting text in Word) Move the whole (selected) triangle around the sketch plane by grabbing a segment with your mouse. Click any blank spot in the sketch plane and all objects will be deselected. (Note that you can also Ctrl-C {copy} and Ctrl-V {paste} a selected object.)

7. With the *Selection Tool*, select just one vertex of the triangle. Hold down the mouse button and drag this vertex around. Change the triangle from acute to obtuse to isosceles to equilateral to right.

8. With the *Selection Tool*, select just one edge of the triangle. You should see the position of the segment change but not the length or slope of the edge.

II. Constructing parallel lines
Before you start, use File > Document Options > Add > Blank Page to add a new tab numbered 2. Do the following on tab 2.

1. Use the *Line Tool* in the left toolbar and create a line.

2. Use the *Point Tool* in the left toolbar and create a point that is not on the line you just drew.

3. Select the line and the point and use Construct > Parallel Line to create a pair of parallel lines.

III. Constructing a line segment of a fixed length
Before you start, use File > Document Options > Add > Blank Page to add a new tab numbered 3. Do the following on tab 3.

1. Drop a point, select the point and use Transform > Translate to move the point (select the *Rectangular Translation Vector* in the translate pop up menu and then enter a value for the horizontal distance and 0 for the vertical distance to move the point horizontally). Connect the two points with a line segment to finish creating your fixed length line segment.

2. **Constructing a right triangle**
    You can draw a line segment that looks vertical at either end of the horizontal line segment by selecting the line segment tool, selecting an endpoint of your line segment, holding down the Shift key and dragging the mouse up; HOWEVER, this will not assure a perpendicular relationship between the two line segments as you can move the segment endpoints.

    a. Select the horizontal segment and the right endpoint from part 1), (but not the left endpoint). Use Construct > Perpendicular Line to construct a perpendicular line. The perpendicular line will be highlighted.

    b. Use Construct > Point on Object to create a new point on the perpendicular line. Move the point if needed.

    c. Select this new point and the original right endpoint on the line segment and use Construct > Segment to create a (perpendicular) line segment. Hide the perpendicular line by right clicking on just the perpendicular line and choosing *Hide Perpendicular Line*

    d. Select the two endpoints and construct a segment to create the third edge of a right triangle. Note: The top vertex of the right triangle may now be moved and will change the triangle, but the triangle will still remain a right triangle. Grab a line segment edge to move the entire triangle on the workspace.

IV. Constructing a flexible square on a line segment
Before you start, use File > Document Options > Add > Blank Page to add a new tab numbered 4. Do the following on tab 4.

1. Start with a line segment of any length that you wish to be one of the edges of your square. Double click on one endpoint. A "target" animation will show indicating the point is selected as the Center of Rotation.

2. Select the segment and the other endpoint (the first endpoint is not needed).

3. Use Transform > Rotate to open the Degree box. By default, this is usually set at 90 degrees. If not, for a square, set it at 90 degrees. Before hitting OK, look at the sketch. Is the line segment in the correct spot? If not you may need to adjust the degree measure to -90 degrees.

4. After rotating the first line segment, reselect the Center of Rotation to a new endpoint, select a new edge and endpoint to move, and then rotate the next square edge and end point. Repeat until you have a square.

5. Notice you can move the various endpoints and the square remains a square.

V. Constructing the interior of a polygon
Before you start, use File > Document Options > Add > Blank Page to add a new tab numbered 5. Do the following on tab 5.

There are two methods to construct a polygon with a polygon interior

1. Select the interior and edges option on the *Polygon Tool*. Click once on the workspace to start the polygon, and then keep clicking until you are almost done. When you are on your last vertex, double click to complete the polygon. Notice you can click on the interior, edges and vertices of the polygon.

2. Make a regular hexagon by starting with a line segment and then rotating it as with the square, until you create a regular hexagon. Click on the vertices of the hexagon, in order, while holding down the Shift key and then use Construct > Polygon Interior to create the interior region. If you select three points the menu will say "Triangle Interior," four points "Quadrilateral Interior," etc.

VI. Measuring in GSP

Before you start, use File > Document Options > Add > Blank Page to add a new tab numbered 6. Do the following on tab 6.

1. **Length (1)**

   Create a line segment. Select the line segment and use Measure > Length to determine the length of the segment. Notice when you move the vertices of the line segment the length changes.

2. **Length (2)**

   Create a second line segment. Select both endpoints of the line segment and use Measure > Distance to determine the length of the segment.

3. **Angles**

   Create an angle by drawing two connected line segments. Select the three vertices of the angle, in order, and then use Measure > Angle. Notice when you move the vertices of the angle the angle measure changes.

4. **Area**

   To measure area, you must first create the interior region of an object.

   Create a triangle and the interior of the triangle (see V). Select the three vertices and look at the Measure menu; note it will only let you measure the angle you have selected. Select the three line segments and look at the Measure menu; note you will not be able to measure anything with this selection.

   To measure the area of the triangle, Select the interior of the triangle and use the Measure menu to measure the area of the triangle. Notice when you move the vertices of the triangle the area changes.

➢ Email the completed lab work portion of the GSP lab to your instructor as the turn in directions on the "Geometer's Sketchpad Directions" say.