

Intuitive Theorems

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1 Purpose

In this lab you will learn and become familiar with some basic Geometer's Sketchpad constructions, experiment with the interactive nature of GSK, and gain intuition for and understanding of geometric theorems relating angles.

2 Materials

- computer
- Geometer's Sketchpad

3 Vocabulary

- angle
- congruent
- parallel
- supplementary

The Activity

1. Draw an infinite line. Draw another line intersecting the first line. The two lines should not be perpendicular.
2. Using the construct function, make a point at the intersection of the two lines. To do this, highlight both lines using the pointer, then click on “Construct,” then “Intersection.”
3. Use the display menu to name all of your points (use the pointer to highlight all of your points, then click “Display,” and choose “Label Points”).
4. Use the pointer to highlight three points making an angle, then use the “Measure” menu to measure the angle.

5. Highlight those three points again and, using the “Construct” menu, construct the “interior of the triangle.” This should shade the triangle made by those three points yellow. You can change the color of the yellow triangle to any other color by clicking on the yellow part, then going to the display menu and choosing a color.
6. Now highlight three points making an angle adjacent to the one you just measured, and use the “Measure” menu to measure that angle. The two angles should add up to 180 degrees, since they are supplementary.
7. Color this angle red (or some other color) in the same way that you colored the first one. Now color all four angles made by the two intersecting lines according to their measures - i.e. angles of the same measure should be the same color.
8. Now use the pointer to “grab” your original line. Be careful not to grab it by any of the points. Move the line up and down. So long as you keep the points all on the same side of the line and keep all of the angles the same color, what happens to the angles you measured?
9. Put another point somewhere in the plane. Use the pointer to highlight the point and your original line. Now click on the “Construct” menu and click on “Parallel Line.”
10. Label the intersection of this new line with your second line, and place enough points so that you can measure the angles you would like to measure. Before measuring anything, what do you expect to find as the measure of the angles similar to the ones from the first pair of intersecting lines? Remember what happened as you moved one line from place to place.

Color the angles according to their measure, using the same colors from the first pair of lines if there are any angles that are the same measure as the ones from the first line.

11. Now see if you can guess at other pairs of angles that will be the same, especially comparing the angles made by the first line to those made by the second line. Think about the angles you know to be congruent from the first nine steps and what those angles are supplemental to.
12. Challenge Question — what is the fewest number of angles that you would need to measure to know the size of all eight angles that arise from a line intersecting a pair of parallel lines? Can you think of an alignment where you would need to measure fewer (or more) angles?