

Lesson Plan to Prove that the sum of the interior angles in a triangle equal 180 degrees  
by Linda Jackson

- I. Student Objectives: Students will show that the sum of the interior angles in any triangle equal 180 degrees. They will accomplish this using Geometer's Sketchpad and manipulating a scalene triangle.
- II. Student Goals: Students will be able to perform various constructions and manipulations of triangles using Geometer's Sketchpad.
- III. Prior Knowledge: Students will already be familiar with Geometer's Sketchpad. They will know the basic construction procedures and what the individual tools do.
- IV. Content outline
  - A. Construct a scalene triangle
  - B. Find midpoints of the legs of the triangle
  - C. Reflect different portions of the triangle
  - D. Verify that the angles of the new figure formed are congruent to the original triangle and that the sum is 180 degrees.
  - E. Manipulate the triangle.
- V. Activities: (Be sure to label all the points!)
  1. Create 3 points, select all (hold the shift key down while selecting more than one item) and construct line segments.
  2. Measure all the angles and line segments. Calculate the sum of the interior angles.
  3. Click on one line segment to select it, then construct the midpoint.
  4. Repeat step 3 on the remaining legs of the triangle.
  5. Using two legs at a time, select the constructed midpoints and construct a line segment between these two points.
  6. Choose this line segment and mark it "mirror"; pulling down the menu under the transform heading does this. Then choose mark mirror. This becomes the base for a new triangle.
  7. Choose the other two legs of this triangle and reflect them. Again go to the transform heading and choose reflect.
  8. Choose and hide the original line segments (this will just make the picture neater).
  9. Repeat steps 5 through 8 on the remaining line segments. Three times in all.
  10. Verify that the angles in the resulting "envelope" add up to 180 degrees
  11. Manipulate the original triangle to discover what happens to the sum of the angles as the triangle changes.(if there is enough time)

12. For discussion: (if there is enough time) what relationships can you discover about the various line segments and legs of the triangle?

VI. Summary: Students have expanded their knowledge and experience with Geometer's Sketchpad. They have also used inductive reasoning to discover properties of triangles.

VII. Materials needed and resources used:

Materials: computer and Geometer's Sketchpad

Resources used:

1. Lesson plan was created using the text Harper and Row Geometry by Max A. Sobel, et al, copyright 1986, problem number 5 from page 22 adapted to use with Geometer's Sketchpad.
2. WEB sites used for IGO's, and ideas:  
[www.wvde.state.wv.us/igos](http://www.wvde.state.wv.us/igos)  
[www.faldo.atmos.uiuc.edu/cla](http://www.faldo.atmos.uiuc.edu/cla)  
[www.bigchalk.com](http://www.bigchalk.com)

State IGO's met: APG.13

G2

G5

G19,9,10,11

G23

VIII. Evaluation: Students will turn in a printout of their completed "envelope". The work will be saved to a disk and turned in to the teacher.

IX. Assignment and follow up activity: Homework: cut various triangles out of paper, (use an isosceles, an equilateral and a right triangle) tear off the points and place them together to form a straight line. Bring your triangles to class tomorrow. Can you verify the exercise that was done in class? Which way do you prefer?