Visual Demonstration of the Pythagorean Theorem

Description: Students investigate a visual demonstration of the Pythagorean theorem based on Euclid's proof. They use shearing to modify the squares on the sides of a right triangle to create congruent shapes without changing the areas of the original squares, and then explain why these shapes demonstrate the Pythagorean theorem.

Technology Strength: By dragging vertices of the squares on the sides of a dynamic right triangle to create congruent shapes without changing the areas of the original squares, students can easily do and explain a visual demonstration of the Pythagorean theorem.

Objectives: Use shearing to create congruent shapes without changing the areas, and explain why these congruent shapes demonstrate the Pythagorean theorem

Prerequisites: None

Suggested Grade Level: 9 to 10

Sketchpad Level: Beginning

Suggested Duration: 20 minutes. You can present this as a 10-15 minute demonstration with a single projector, and consider combining with another Sketchpad activity on the Pythagorean theorem.

Suggested Classroom Setting: Whole Class, Student Pairs. This activity, designed for use by student pairs, can be easily modified for whole-class use.

Preparation: Review the Activity Notes. Preview the student sketch. Work through the steps on the worksheet and make a copy of the worksheet for each student.

Materials: None

Student Worksheet(s): Visual Demonstration of the Pythagorean Theorem

Student Sketch: Shear Pythagoras.gsp

Presentation Sketch: None

Vocabulary: Shearing, area, parallelogram, congruent, hypotenuse, legs

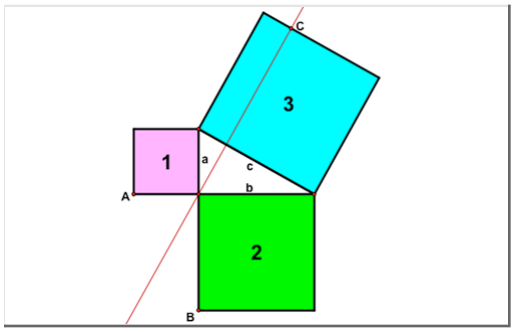
Sketchpad Version: GSP5

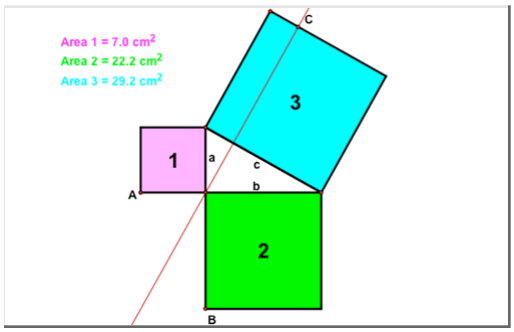
Using the Sketch:

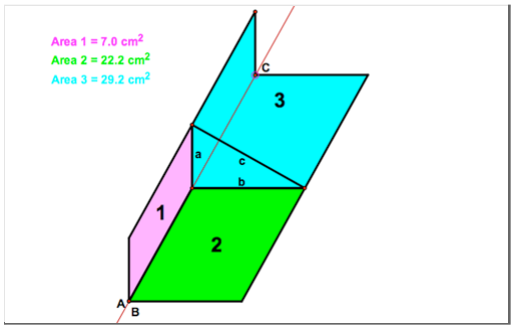
Students are given an arbitrary right triangle *ABC* with a square constructed on each of its sides. They are also given a line that is perpendicular to the hypotenuse. They measure the area of each square.

Students drag a vertex of each of the smaller squares so that it lies is on the perpendicular line; each of the smaller squares becomes a parallelogram with area equal to that of the original square. Students then drag point *C,* the intersection of the perpendicular line with the side of the large square opposite the hypotenuse, so that the large square deforms to fill the triangle, but maintains the same area.

Students use the sketch to explain why the areas stayed constant, why the two parallelograms together are congruent to the shape formed by dragging point *C,* and why these congruent shapes demonstrate the Pythagorean theorem.







Sketch Tips:
Sketch Tips show skills needed in this activity, and the step at which the skill is first used.

Sketch Tip	**Tip Sheet or Tip Video**
Step 2: Measure an area using **Measure | Area**	Measuring Area, Perimeter, and Circumference