

Geometer's Sketchpad

American High School

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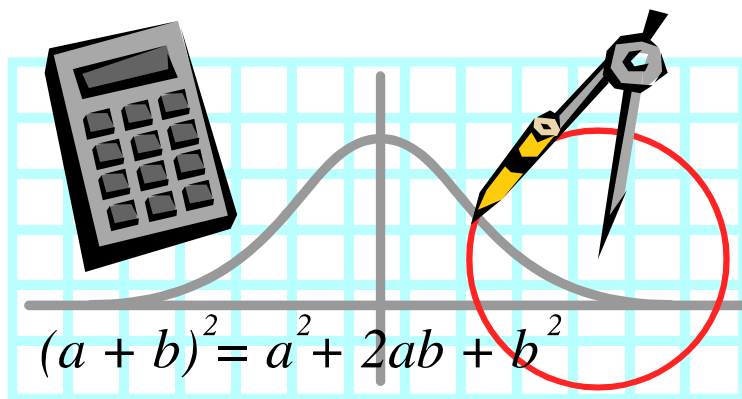
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Visualize **CONJECTURE**
Solve Problems



Generalize



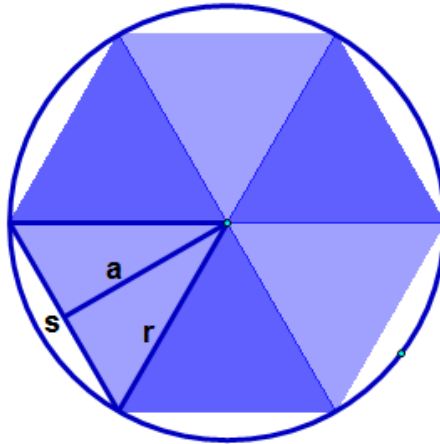


Dynamic Geometry

Geometer's Sketchpad is a dynamic geometry software program, which enables you to manipulate mathematical diagrams without altering the fundamental definition of the image. For example, if you specify two lines to be perpendicular, they will always be perpendicular even if you rotate one.

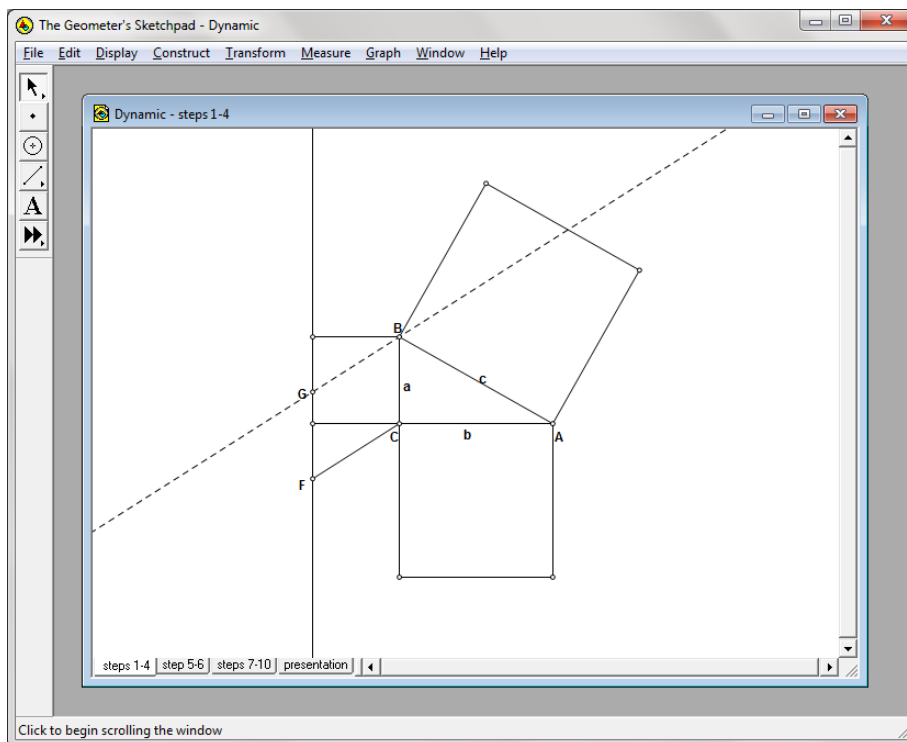
Unlike the static drawings you make with paper and pencil, Geometer's Sketchpad drawings are flexible. You can change aspects of your drawing that are not fixed. For example, if you specify the perimeter of a rectangle, you can manipulate the length and width until you find the dimensions that yield the greatest area for that perimeter.

Knowing how to draw mathematical figures by hand is very important, however, it is a very tedious and time-consuming task. With Geometer's Sketchpad, you won't have to start from scratch when you make a mistake.



Furthermore, some mathematical concepts cannot be explored without drawing for many hours and producing many drawings. With Geometer's Sketchpad, you won't have to construct several drawings just to see a relationship. You can construct one drawing quickly and

easily and then manipulate it to see relationships. This feature will save time so you can spend more time exploring interesting and advanced ideas.



Above: Construction from a lesson on determining the area of regular polygons and circles.

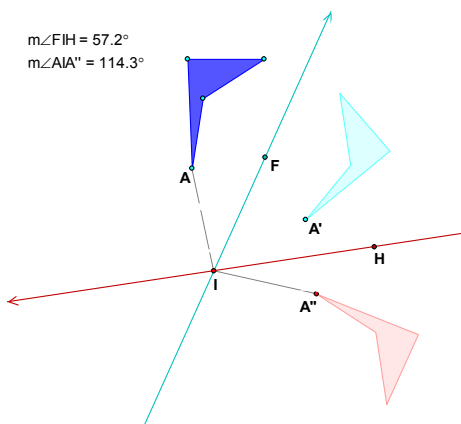
Left: Screen shot of the Geometer's Sketchpad drawing area showing a proof of the Pythagorean Theorem.



How will you use Geometer's Sketchpad?

You will use Geometer's Sketchpad to visualize and generalize mathematical concepts, make mathematical conjectures, and solve problems.

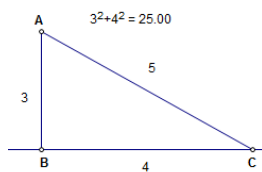
Visualize



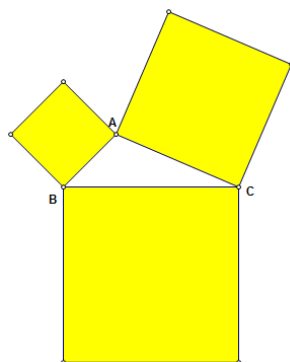
With Geometer's Sketchpad, you can easily visualize what a figure will look like when you reflect it across a line. The figure in the above drawing is reflected over a line and then reflected it again over another line that intersects the first.

Generalize

You know that $\triangle ABC$ is a right triangle and that $3^2 + 4^2 = 5^2$.

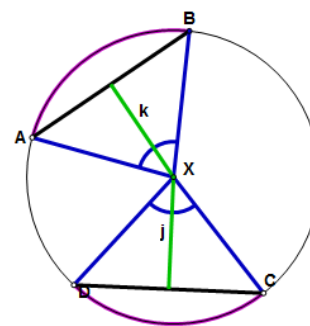


With Geometer's Sketchpad, you can create a visual proof of the Pythagorean Theorem so you can generalize the above equation to $AB^2 + BC^2 = AC^2$ where AB and BC are the legs of the triangle and AC is the hypotenuse.



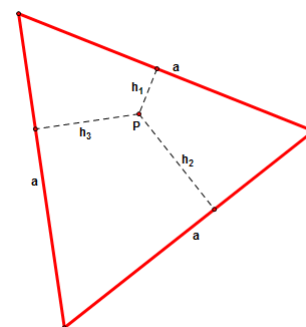
Conjecture

Conjectures are propositions about what appears to be correct but are not proven. In the diagram below, Geometer's Sketchpad was used to demonstrate that if two chords of a circle are congruent, then their intercepted arcs are congruent.



Solve Problems

Where should a shipwreck survivor build a house if she wants to be as close as possible to three different beaches that she frequents? You can use Geometer's Sketchpad to make a conjecture or proposition of what appears to be the best place to build this house. You can also use your diagram to show with certainty, or prove, where she should build her house.



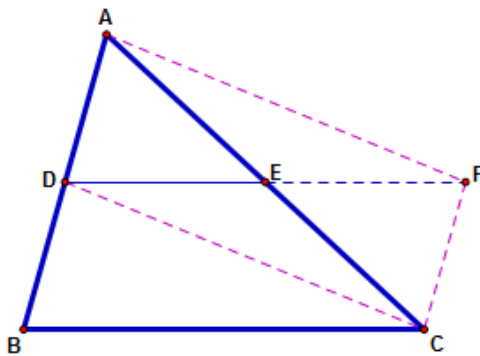
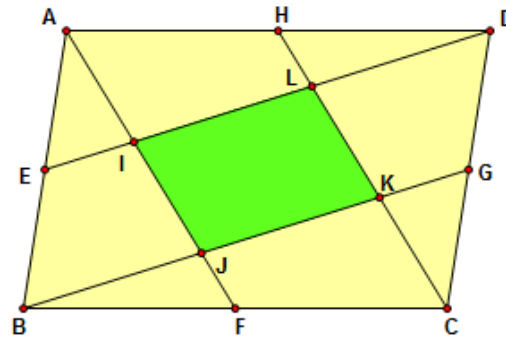


Topics you will Explore

- Discover properties of angle bisectors, perpendicular bisectors, altitudes, and medians of a triangle.
- Compare the area of an entire quadrilateral to the area of a smaller quadrilateral constructed inside the larger one.
- Solve the shipwreck survivor problem. Given an island with three beaches, find the point on the island that, when you sum the distances from the point to each beach, the total is as small as possible.
- Prove the Pythagorean Theorem in two ways: by using the areas of three squares and by Leonardo da Vinci's method.
- Discover properties of the chords of a circle.
- Examine the quadrilateral found by the midpoints of the sides of a kite.

Area ABCD = 25.72 cm²

Area IJKL = 5.14 cm²



- Determine the area of a regular polygon and, from that construction, derive the formula for the area of a circle.
- Reflect a figure over two intersecting lines to visualize the new orientation.
- Discover the sum of the measures of the exterior angles in a convex polygon.

Lesson ideas and diagrams from http://www.dynamicgeometry.com/General_Resources/Classroom_Activities.html.