Behold!

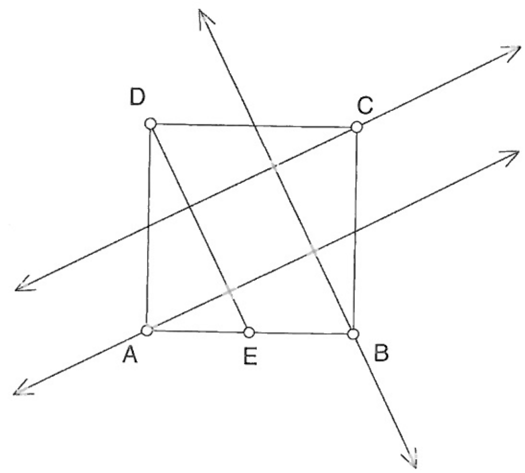
Name(s): ____________________

The title of this activity comes from the text of the twelfth-century Hindu scholar, Bhaskara. In fact, "Behold!" was the *only* text that accompanied a figure demonstrating the Pythagorean theorem. Bhaskara must have felt the figure spoke for itself! In this activity, you'll construct this figure. Perhaps it does speak for itself, but you can gain deeper understanding by constructing the figure and working out a proof similar to the proof outlined in the activity The Tilted Square Proof. Incidentally, this figure is also found in an ancient Chinese text, making it another candidate for being a proof known to Pythagoras.

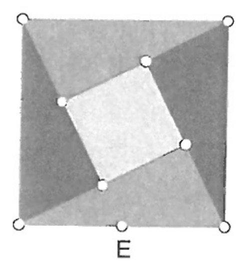
The figure in the Chinese text shows a 3-4-5 right triangle, but the figure works for any right triangle.

Sketch and Investigate

1. Construct a square *ABCD*.



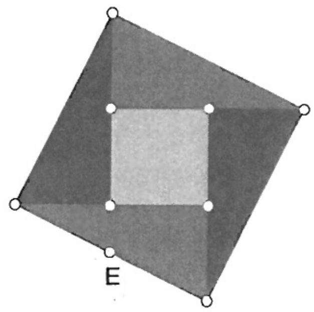
2. From point *D*, construct a segment *DE* to side *AB*.
3. Construct a line parallel to $\overline{DE}$ through point *B* and lines perpendicular to $\overline{DE}$ through points *A* and *C*.
4. You should have a small, tilted square inside your original square. Construct its vertices at the points of intersection of the lines, then hide the lines and $\overline{DE}$.
5. Construct the sides of the tilted square, then construct interiors of the right triangles surrounding it, as shown.

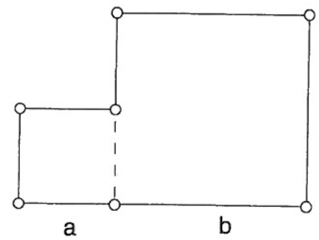


6. Drag point *E* and observe what happens to the right triangles and the tilted square.

Q1 Write a paragraph about what you observe: Do the right triangles stay right triangles? Does the square stay a square? Can you make the interior square fill the figure? If so, what kind of triangles do you get in this case? Can you make the interior square disappear? What kind of triangles will do this?

7. Using this figure for a dissection demonstration can be tricky. First, tilt the original square so that the legs of the right triangles are horizontal and vertical. The illustration below shows an outline into which the pieces can be fit to demonstrate that $c^2 = a^2 + b^2$. *Note:* Use the **Translator** tool to get movable pieces, and try to form the shape below right. Your pieces may overlap the dashed line.





Prove

This figure can be used to create an algebraic proof similar to the one you might have done in the activity The Tilted Square Proof. A possible plan follows. Read it if you want, or try it on your own.

Q2 Write an expression for the area of the whole square in terms of c.

Q3 Write an expression for the sum of the areas of the four right triangles in terms of a and b.

Q4 The tricky part is writing an expression for the area of the tilted square. (And if you want to be very thorough, you should prove it really is a square.) The length of a side of this square can be written in terms of a and b. Write an expression for the area of the tilted square in terms of a and b.

Q5 You should now be able to write an equation involving a, b, and c. You're on your own from here.