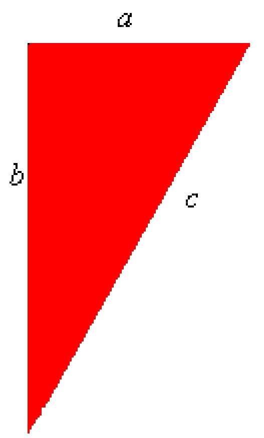
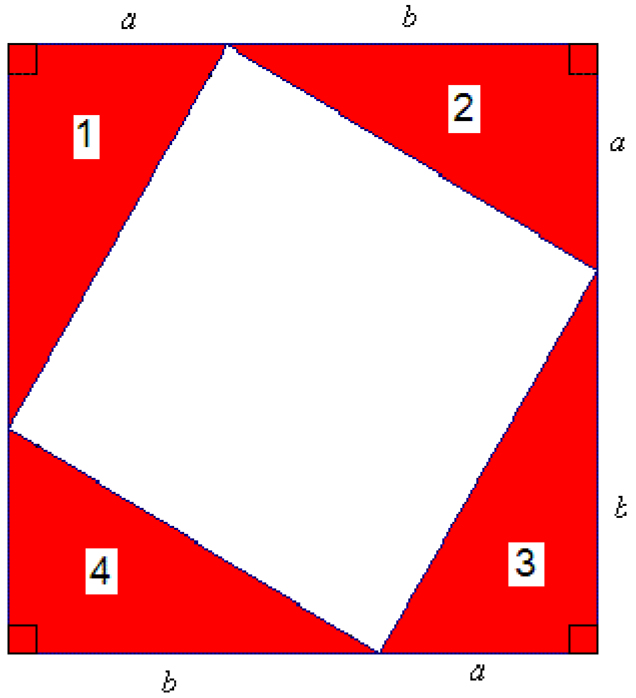
An algebraic proof of Pythagoras' theorem

Start with any right-angled triangle, with sides a and b, and with hypotenuse of length c. We want to find c in terms of a and b.

Make four copies of the triangle, and arrange them at the corners of a square as shown in the diagram.



Arrange 4 copies of this triangle at the corners of a square.



a) Label all the vertices, as shown in the next diagram.

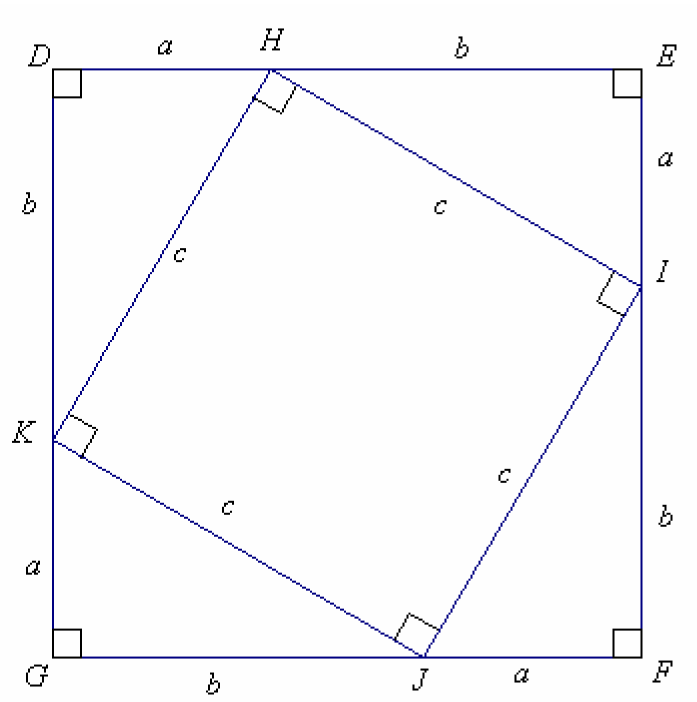
(b) Explain why the space created in the middle of the four triangles (i.e. *HIJK)* is a square. (All sides equal? What about angles? How do you know?)

(c) What is the side length of the large square, *DEFG*, in terms of a and b?

(d) Based on your answer to part c, write an expression for the area of square *DEFG* in terms of a and b:

i in factorised form

ii in expanded form



(e) What is the area of each of the triangles in terms of a and b?

(f) The area of the large square *DEFG* can be written as the sum of the area of the small square *HIJK* plus the areas of the four triangles. Write this area in terms of a, b and c.

(g) In parts d and f, you have found two different expressions for the area of the large square *DEFG*. These two expressions for the area must be equal. Put your expressions from part d ii and part f equal to each other. Simplify the equation as much as possible.

(h) Explain how what you have found proves Pythagoras' theorem.