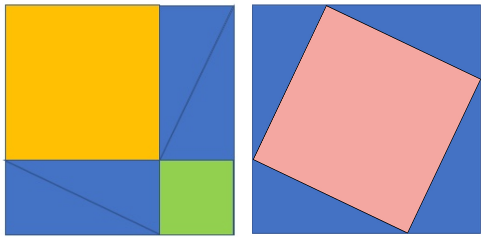
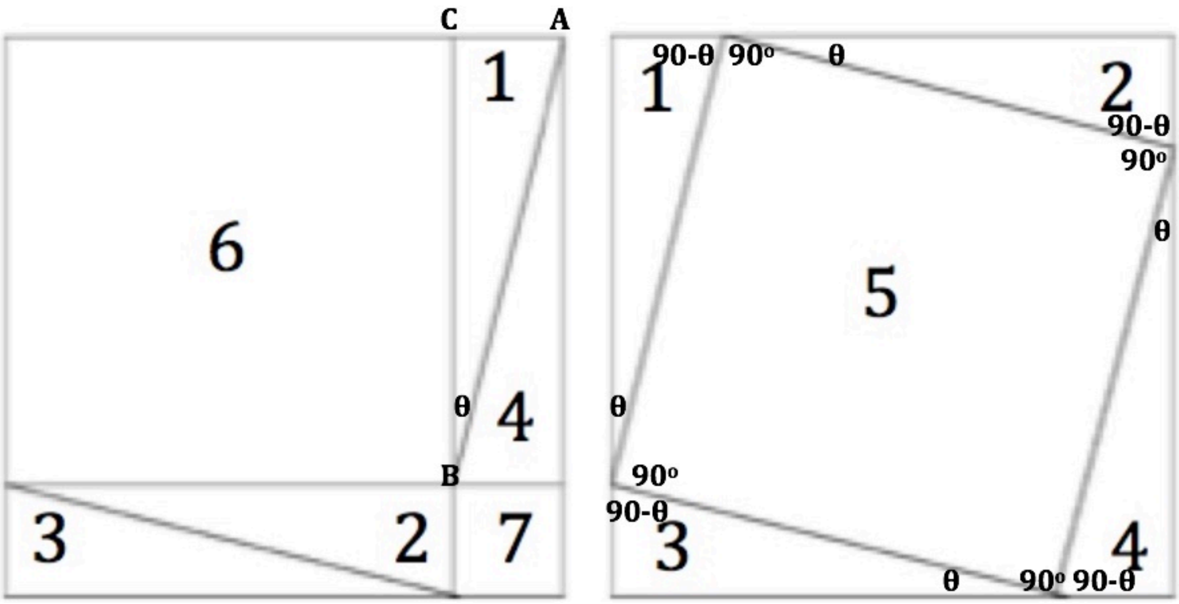
PYTHAGORAS JIGSAW

The diagrams show two different arrangements of pieces of the jigsaw inside a square frame. The right angled triangles numbered 1, 2, 3 and 4 are identical (congruent) copies of each other.

The Make Squares Jigsaw https://aiminghigh.aimssec.ac.za/years-6-12-make-squares-jigsaw/ has 7 pieces and these two solutions.



Here we refer to the edge lengths of the right angled triangle as a and b for the shorter edges and c for the hypotenuse. But a, b and c will have different values for each person who makes their own jigsaw like this choosing their own lengths. The outer frame is a square of edge length $a + b$.



Think about the area inside the outer square frame. How is that area made up in the two different arrangements? Just take away the four identical right angled triangles from each of the two arrangements. What is left?

What do you notice? What is the same? What is different? What can you deduce from the areas?

How can you be sure that the shapes labelled 5, 6 and 7 are squares?

What does this tell you about the area of square 5 compared with the areas of squares 6 and 7?

HELP

Cut out 4 congruent right angled triangles for yourself, choosing your own edge lengths, and arrange them in the first arrangement. Carefully draw the outline frame. Then arrange your 4 triangles in the frame in the second arrangement. Think about areas and answer the questions.

NEXT

1. Prove the algebraic identity $(a + b)^2 = a^2 + b^2 + 2ab$ using the areas in the diagram showing pieces 1, 2, 3, 4, 6 and 7.

2. (a) Choose your own values of lengths *a* and *b*. Carefully and accurately draw a square of edge length $a + b$ measuring the lengths you have chosen and the angles of 90^o. Make 4 identical copies of your chosen right angled triangle. Cut out the 4 triangles and fit them in the square frame in the two different arrangements as shown in the diagrams. Measure length c and, using *a* calculator, check that $a^2 + b^2 = c^2$.

   (b) Why could it be that the calculation may not show this result exactly?

   (c) If you are working with a group or a whole class, make a table on the board with 5 columns headed *a, b, c*, $(a + b)^2$ and c^2. When you share these results what do you notice about columns 4 and 5? What does this tell you about all the right angled triangles that you have tested.