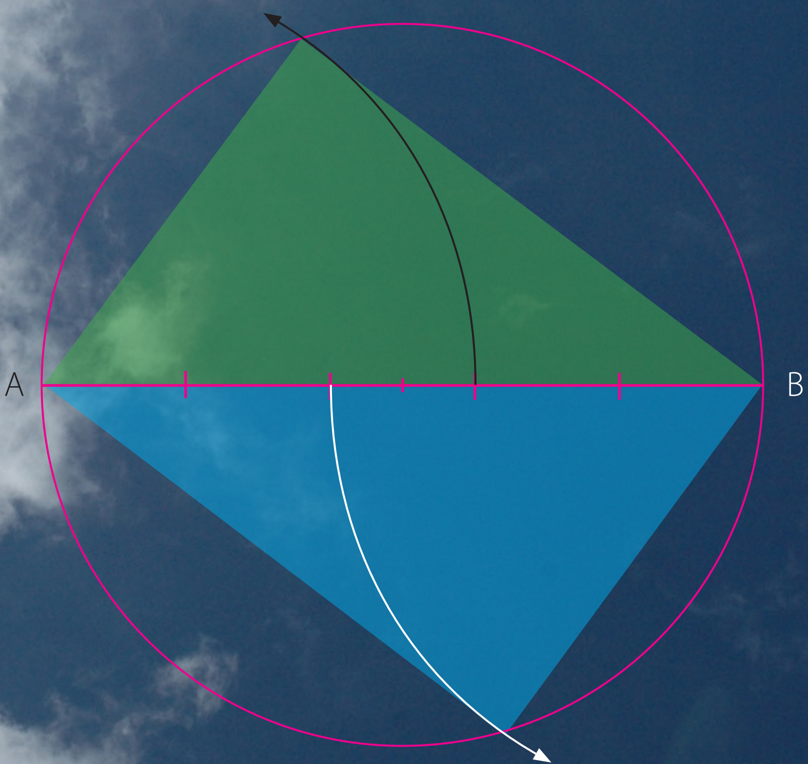
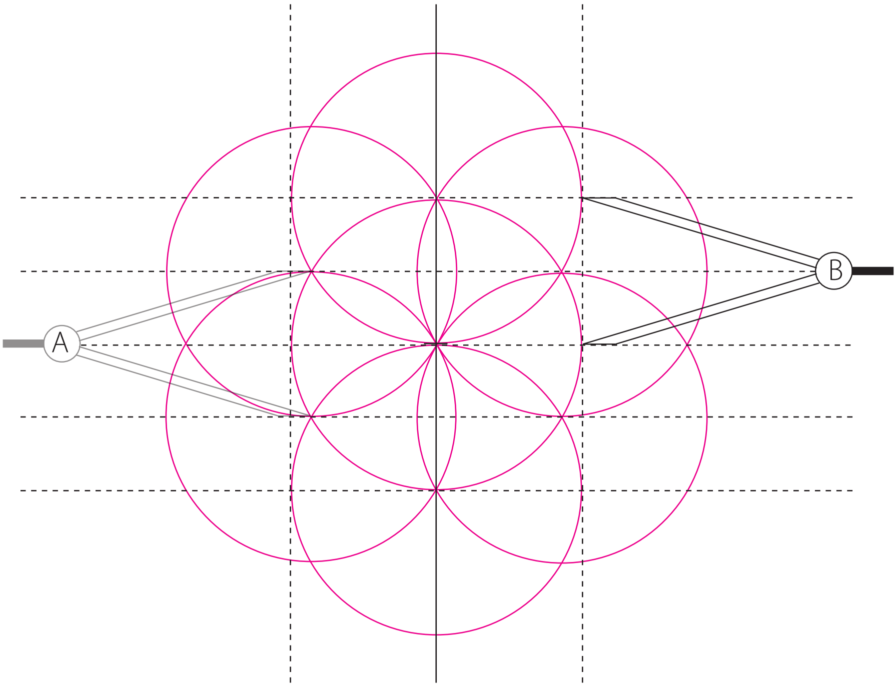
Drawing Pythagoras' 3 4 5 Triangle and Rectangle using Compass Geometry



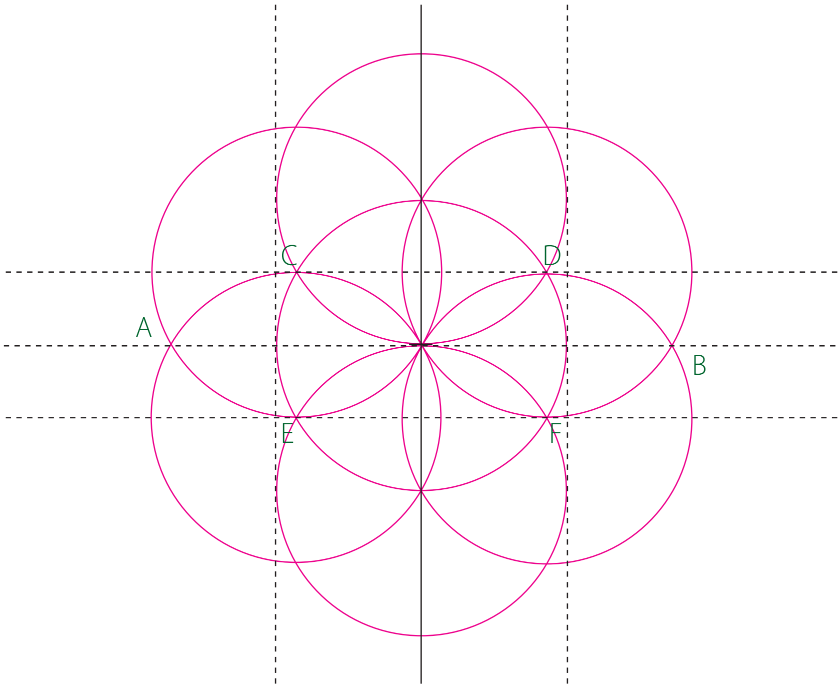
Laurie Smith
THEGEOMETRICALDESIGNWORKS

Laurie Smith is an independent early-building design researcher, specialising in geometrical design systems. Because geometry was part of the medieval educational curriculum he uses geometrical analysis to excavate and recover the design methodologies of the past, a process he thinks of as design archaeology. He lectures, writes and runs practical workshops on geometrical design and publishes his work through his website THEGEOMETRICALDESIGNWORKS.



Drawing Pythagoras' 3 4 5 Triangle and Rectangle using Compass Geometry

It is usually time consuming and often inaccurate drawing Pythagoras' 3 4 5 triangle using set squares, rulers and dimensions. It can be drawn faster and more accurately using compass geometry. The first method develops the 3 4 5 triangle from the daisy wheel and the second from the 5 unit side of the triangle, defined as the circumference of a circle.



1

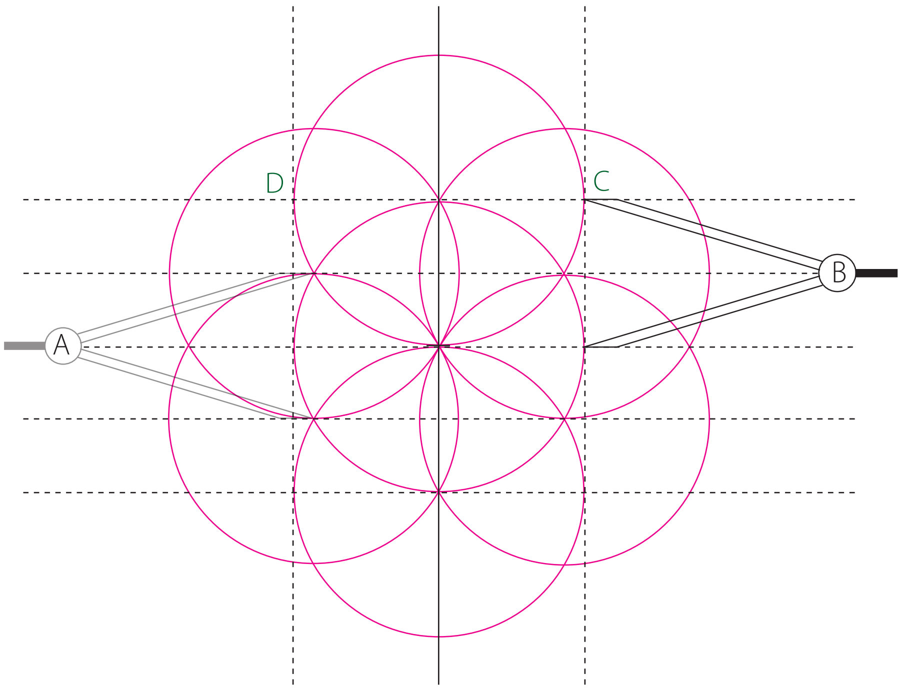
Drawing Pythagoras' 3 4 5 Triangle using Compass Geometry

1 Draw the daisy wheel on a vertical centre line and then draw two parallel vertical lines as tangents to the three central circles. Draw a horizontal line through the intersections at A and B and then two further horizontals through the wheel's petal tips at C D and E F.

2 Using dividers, set the points exactly on two of the wheel's petal tips at A. Then place the dividers at B with one point on the centre line. Mark point C on the vertical line and repeat on the opposite vertical line at point D.
Draw a horizontal line between points C and D and an identical line through the wheel's lower petal tip.

3 The horizontal lines divide the wheel into four equal bands, three of which give side 3 of Pythagoras' triangle or three quarters of the wheel's diameter, AB. Side 4 equals the full diameter, BC and side 5 runs on the diagonal between A and C.

NOTE To draw the triangle with sides of three, four and five feet, set the compass to a *radius* of two feet so that the central circle has a *diameter* of 4 feet. *The radius is the only dimension needed for the construction and everything follows automatically from it.*



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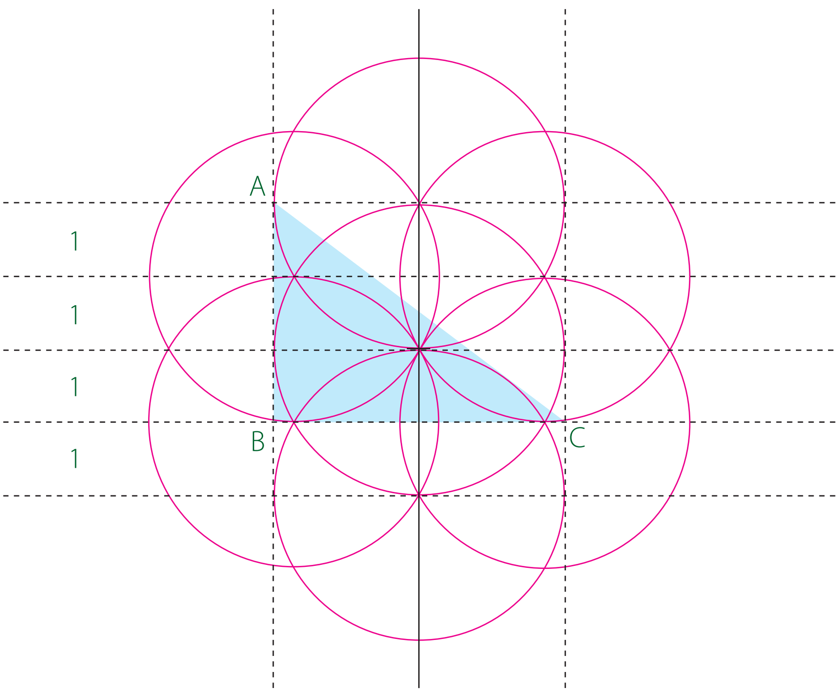

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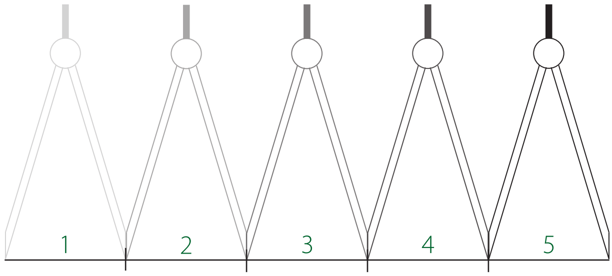

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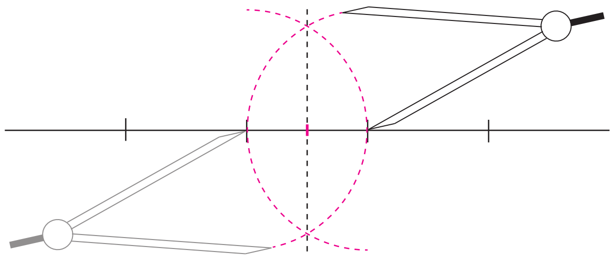

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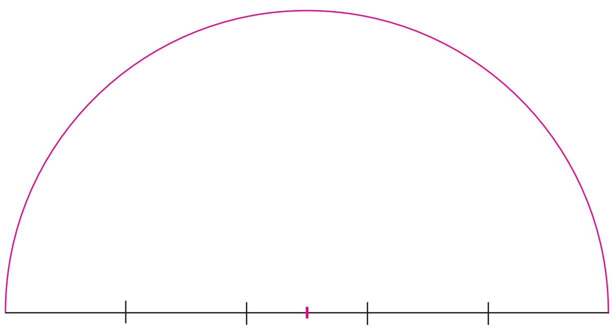


3

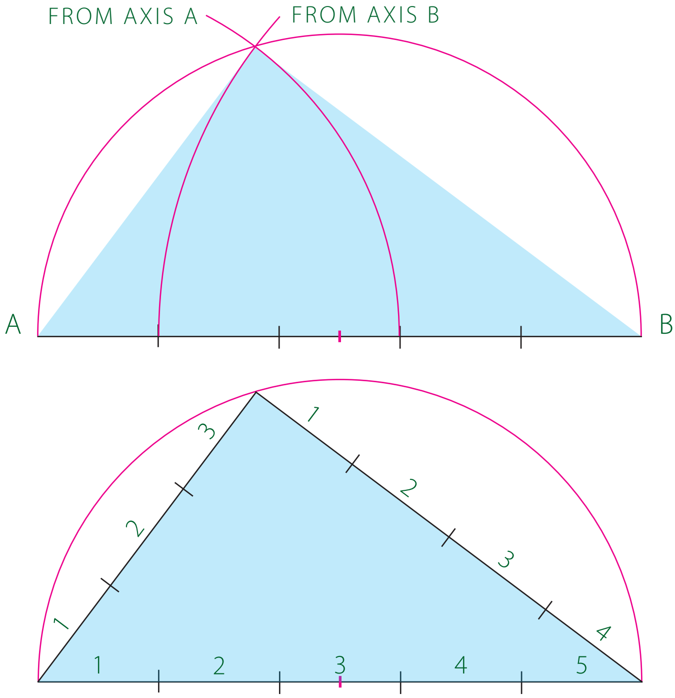
Drawing Pythagoras' 3 4 5 Triangle from the diameter of a circle divided into 5 units

1 Draw a line and divide it into five equal divisions. Using dividers is the simplest way: for a specific line length take the dimension of 1 from a ruler, step it out along the line and mark the points.

2 With the central sector length 3 as a radius, draw arcs from either end so that they intersect. Draw a perpendicular through the intersections to mark the centre of the line.

3 Draw a half circle from the centre of the line.

4 Draw an arc 3 units in from A (or 4 units in from B) to cut the half circle. Connect the cut to A and B to form the 3 4 5 triangle.



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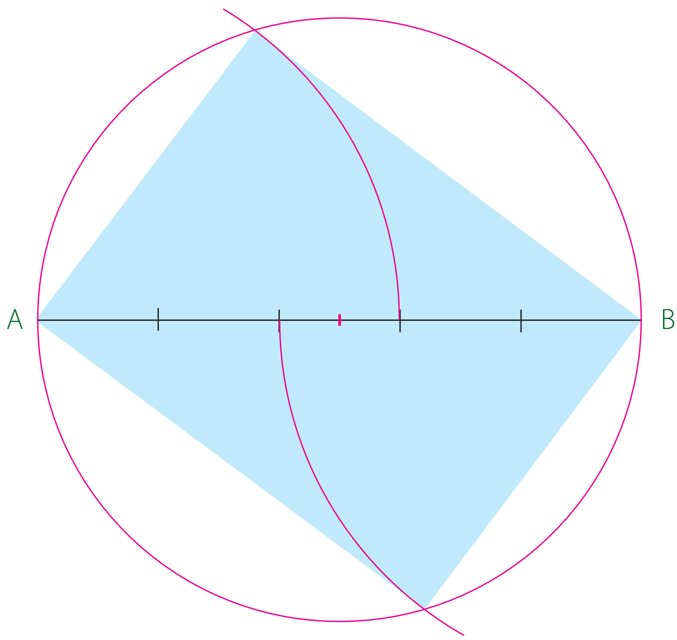
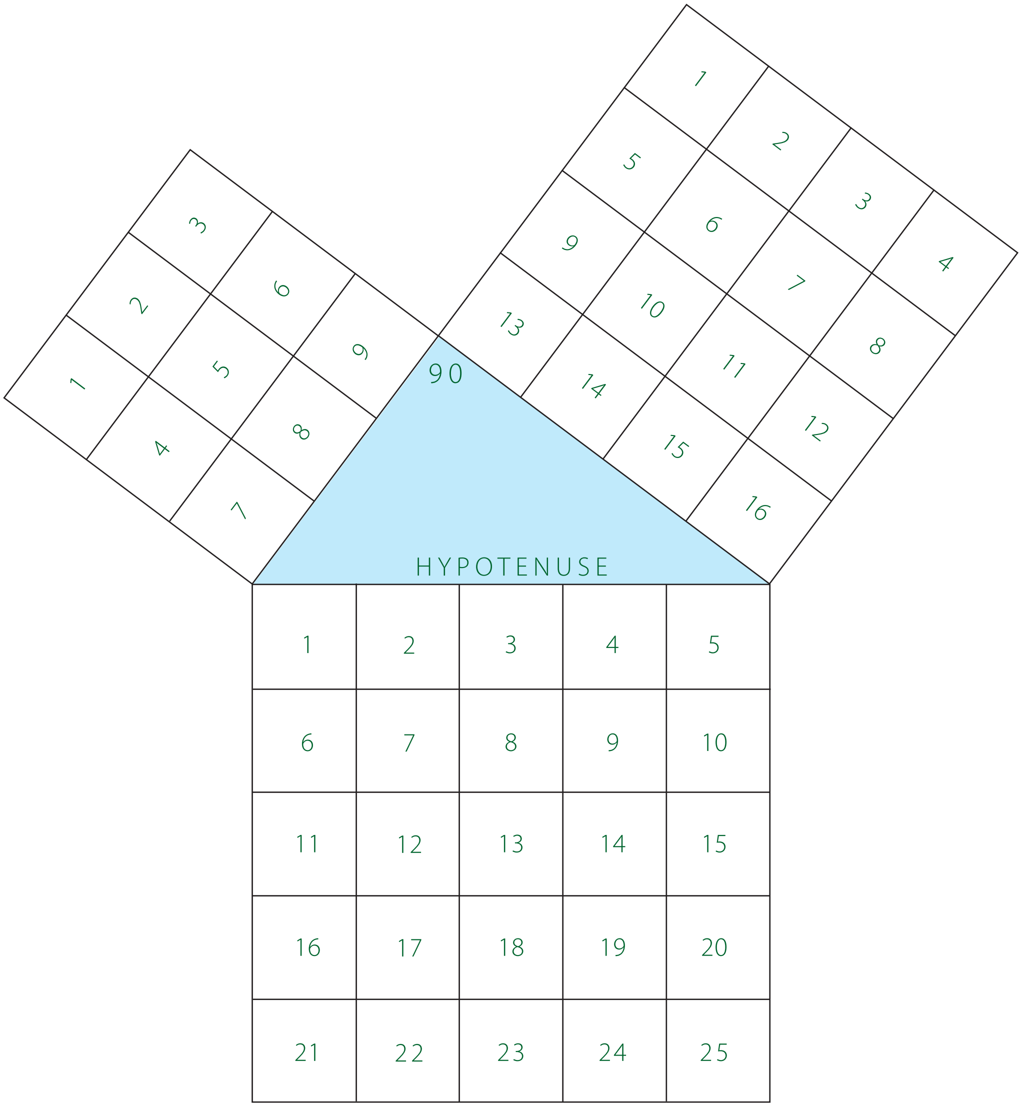


5 To construct the 3 4 5 rectangle draw a full circle with 5 as the diameter. The upper arc is drawn 3 units in from A and the lower arc 3 units in from B. Link the cuts to the ends of the diameter.

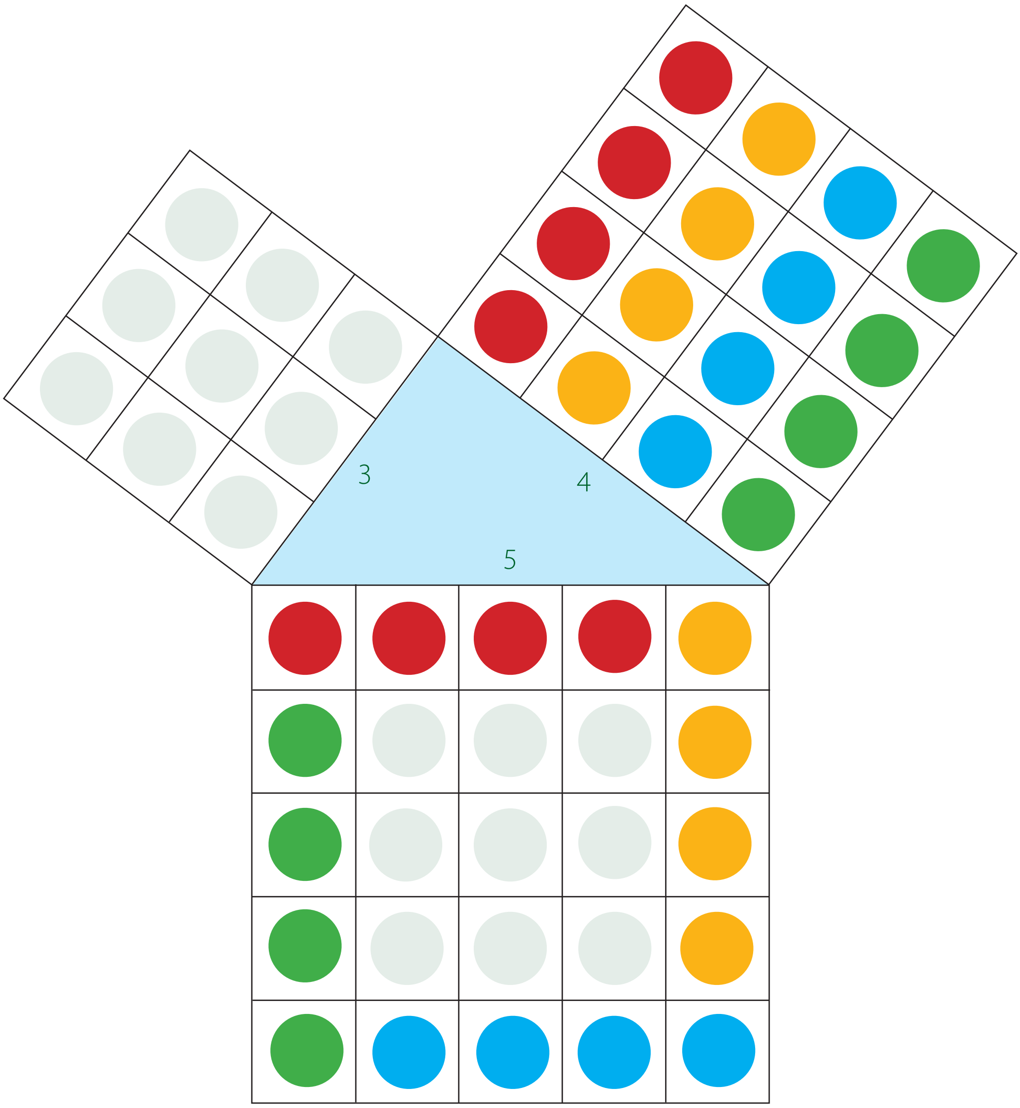


PYTHAGORAS' THEOREM
The square on the hypotenuse is equal to the
sum of the squares on the other two sides

Laurie Smith's proof of Pythagoras' Theorem 1

Proof 1, which is a combination of areas and numbers, draws a square on each side of Pythagoras' 3 4 5 triangle. It follows that, if the sides are 3, 4 and 5 feet long and each square is subdivided into 1 foot squares, they will give 9 squares on side 3, 16 squares on side 4 and 25 squares on side 5. Simple arithmetic gives us 9 + 16 = 25.

The hypotenuse is the side opposite the 90° right angle.



Laurie Smith's proof of Pythagoras' Theorem 2

Proof 2, which is a development from the proof 1, dispenses with numbers and gives a visual proof based on colour coding the squares. It is self evident that the 9 grey squares on side 3 and the 16 red, yellow, blue and green squares on side 4 fit exactly into the 25 squares on side 5.

See Wikipedia for hundreds of other proofs.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