



Mathematics, English for Sek I and Sek II

Mathematica - The Principles of Math

3. The Secret of the Right Triangle and the Pythagorean Theorem, Part 1

09:29 minutes

00:37 Take a look around and you'll see that we live in a world full of rectangles with ninety-degree right angles.

00:44 But when the world was created, there were no right angles. So how did we come to create and then utilize this shape in so much of our lives?

00:52 Let's take this chance to explore the hidden meaning of the right angle.

01:01 This is a pyramid, the architectural marvel that is the symbol of ancient Egypt. It was built four thousand years ago but includes perfect right angles.

01:16 The secret lies in these strings.

01:19 One would first connect twelve strings of the same length.

01:23 Then a knot would be made after three strings, another after four more strings, and finally after five more strings.

01:30 Connect the beginning and the end point, then pull on those three knots, and you've created a triangle. Amazingly, it's a perfect right triangle.

01:41 The ancient Egyptians were able to make right angles for architecture and measuring land. Those who measured the right angles were considered specialists.

01:54 (caption) mud plate from ancient Babylonia (circa 1900 BC)

01:57 The Babylonians, as well as the ancient Chinese about three thousand years ago, already knew that there were certain rules for the three sides of a right triangle.

02:14 These were simply things they'd found useful in everyday life, but they couldn't explain why they were true.

02:23 (caption) Pythagoras (582 BC? — 497 BC?) ancient Greek philosopher and mathematician

02:21 It was Pythagoras who discovered there were principles behind the right triangle.

02:33 According to legend, Pythagoras discovered the secret of the right triangle while looking at the floor of a temple.

02:42 The key was in the tiles that we so often see but don't think about. Can you find the hidden clue? Tiles like these are all right triangles.

02:56 A square with a side c can be put together from four tiles.

03:04 Two squares with sides a and b , which come together at a right angle, are each made up of two tiles.

03:13 Since each tile has the same size, the combination of the area of the squares with sides a and b is equal to the square with side c .

03:32 To put this altogether, ...

03:35 ... in a right triangle, adding the length of side a squared to the length of side b squared is equal to the length of side c squared.

03:49 Amazingly, this accidental discovery could be applied to every right triangle. The rule was called "the Pythagorean Theorem."

03:53 (caption) Pythagorean Theorem

In any right triangle, the square of the hypotenuse (the side opposite the right angle) is equal to the sum of the squares of the two legs (the two sides that meet at a right angle)

04:03 About five hundred years before the time of Pythagoras, ...

04:13 (caption) Zhou Bi Suan Jing

Chinese mathematics and astronomy text published during the Han Dynasty (25 to 220 AD)

04:06 ... this was discovered in China. In the 11th century AD, a Chinese mathematician and astronomer named Jia Xian uncovered the relationship of the three sides of a right triangle in an ancient text.

04:18 The proof is described in a famous Chinese mathematics text, Zhou Bi Suan Jing.

04:19 (caption) proof of Pythagorean Theorem using Yang Hui's Triangle from ancient Chinese

04:24 In this proof, there is a small square inscribed in a larger square. The small square is surrounded by four congruent right triangles.

04:33 A copy is made of this figure.