

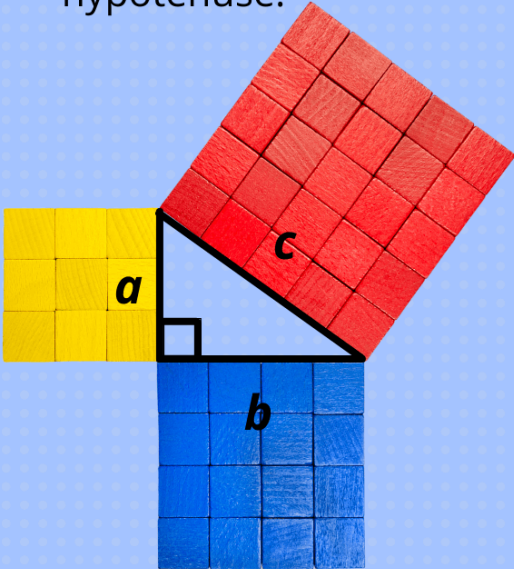
Pythagoras Theorem

Introduction

Pythagoras theorem is a fundamental mathematical principle that relates the sides of a right-angled triangle. It states that the square of the hypotenuse (the side opposite the right angle) is equal to the sum of the squares of the other two sides. This theorem is named after the ancient Greek mathematician Pythagoras, who is credited with its discovery.

Pythagorean Theorem

The sum of the squares of the sides of a right triangle equals the square of its hypotenuse.

$$a^2 + b^2 = c^2$$


The sum of the areas of the squares formed by the sides of a right triangle equals the area of the square whose side is the hypotenuse.

a^2 3^2 9	b^2 4^2 16
c^2 5^2 25	$3^2 + 4^2 = 5^2$ $9 + 16 = 25$

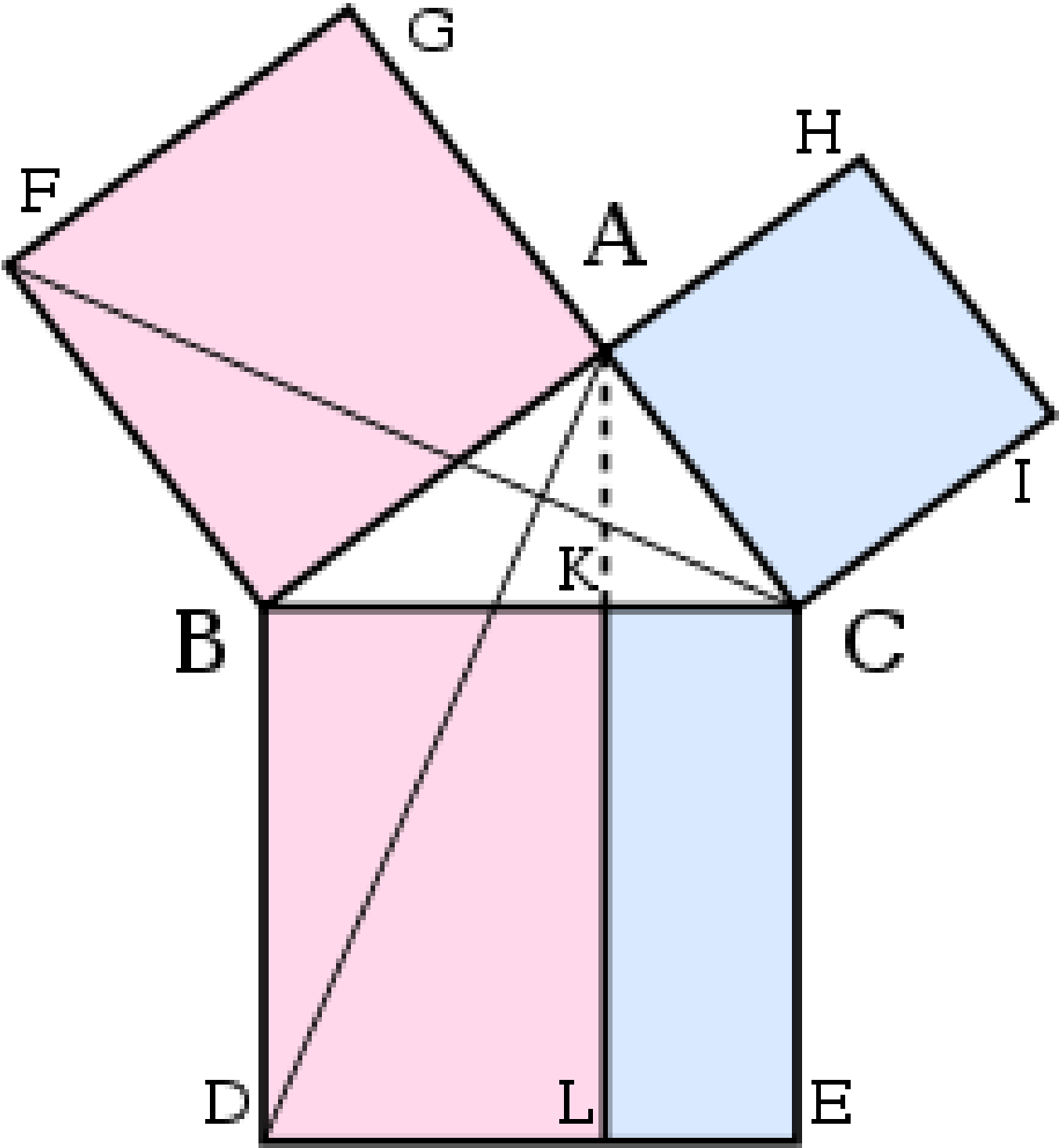
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History

The concept of the Pythagorean theorem has been known for thousands of years across various cultures. However, Pythagoras, along with his followers, formalized and proved the theorem around 500 BCE. The theorem's discovery is often attributed to Pythagoras himself, although there is evidence of earlier civilizations, such as the Babylonians and the Chinese, having knowledge of this mathematical relationship.

Working Principle


The Pythagorean theorem can be stated using the equation $a^2 + b^2 = c^2$, where 'a' and 'b' represent the lengths of the legs of a right-angled triangle, and 'c' represents the length of the hypotenuse. This theorem holds true for all right-angled triangles, regardless of their sizes. It forms the basis for solving various geometric and real-world problems involving triangles.



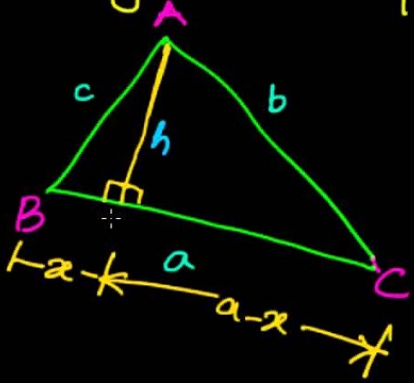
Proof of Law

There are numerous proofs of the Pythagorean theorem, with different mathematicians offering different approaches. One of the most famous proofs is Euclid's proof, which involves constructing squares on each side of the triangle and examining their areas. The proof demonstrates that the areas of the squares built on the legs of the triangle add up to the area of the square built on the hypotenuse.

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Pythagoras Theorem - Law of Cosines proof

$$\begin{aligned}a^2 &= b^2 + c^2 - 2bc \cos A \\b^2 &= c^2 + a^2 - 2ac \cos B \\c^2 &= a^2 + b^2 - 2ab \cos C\end{aligned}$$


Advantages

The Pythagorean theorem has immense practical applications in various fields, including engineering, architecture, and physics. It allows for accurate calculations of distances, angles, and relationships within right-angled triangles. This theorem serves as the foundation for trigonometry, enabling the development of advanced mathematical concepts and problem-solving techniques.

Disadvantages

While the Pythagorean theorem is powerful and widely applicable, it only applies to right-angled triangles. It cannot be used directly for non-right triangles or shapes other than triangles. Additionally, real-world scenarios may involve factors like measurement errors, imprecise values, or

non-ideal conditions, which can introduce inaccuracies into calculations based on the theorem.

Conclusion

The Pythagorean theorem remains one of the fundamental pillars of geometry and mathematics. Its simplicity and elegance make it accessible to learners of all levels, while its wide-ranging applications make it indispensable to professionals in various fields. Understanding and applying the Pythagorean theorem opens the door to exploring the intricacies of shapes, measurements, and spatial relationships.