

Proof of the Pythagoras theorem.

Computer tools in
mathematican's work

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A decorative background consisting of a large, light gray triangle that is composed of many smaller, overlapping triangles of varying shades of gray, creating a textured, layered effect. The triangles are arranged in a way that they appear to be stacked or overlapping, with some being more prominent than others. The overall shape is a large triangle pointing downwards, with its base at the top and its apex at the bottom.

1 Introduction

2 Proof of the Pythagorean theorem

3 Demonstration



Introduction objective

In this presentation we try to show a proof of the Pythagorean theorem. There are many demonstrations, but this one is one of the simplest.



Concept

Suppose we have a square of side r and on each of its sides we place a right triangle of legs x and y . As in this situation the hypotenuse of each of the triangles is r we want to prove that:

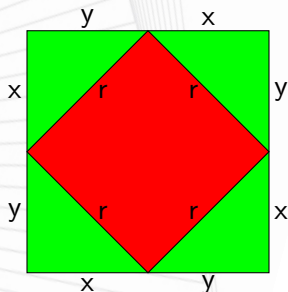
Formula

$$x^2 + y^2 = r^2$$



The figure

The figure that is obtained is the following:



$$x^2 + y^2 = r^2$$



Conclusions

- ▶ Each side of the **green square** is the sum of x and y . Therefore, the area of the square is:

$$(x + y)^2$$

- ▶ For the same reason, the area of the **red square** is:

$$r^2$$

- ▶ The area of each of the **green triangles** (y , x and r) is:

$$\frac{x + y}{2}$$



Demonstration

- ▶ The green square is formed by the red square and the four green triangles, so the sum of all the areas is:

$$(x + y)^2 = r^2 + 4\left(\frac{x + y}{2}\right)$$

- ▶ We develop the left part of equality:

$$(x + y)^2 = x^2 + 2xy + y^2$$

- ▶ We substitute in the first formula:

$$x^2 + 2xy + y^2 = r^2 + 2xy$$

- ▶ $2xy$ is eliminated on both sides of the equality, and we obtain the desired result:

$$x^2 + y^2 = r^2$$