Proof of the Pythagoras theorem.

Computer tools in mathematican's work

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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

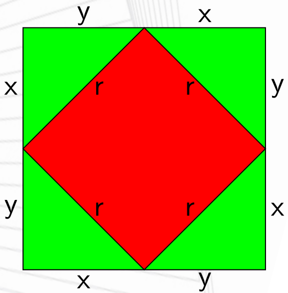
Suppose we have a square of side **r** and on each of its sides we place a right triangle of legs **x** and **y**. As in this situation the hypotenuse of each of the triangles is **r** we want to prove that:

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:

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

- 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:

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