Pythagorean and Euclidean theorem

fragments of Ancient Mathematics

Task: Say aloud Pythagorean and Euclidean theorem. Prove the theorems with help of some basic tools.

Some facts from history:

Pythagoras of Samos (570 – 510 B.C.)

Pythagoras was born on Samos island. He was a Greek philosopher and mathematician. He is known as „father of numbers ". His students called him „sofos", which means a wise man. It is said, that Pythagoras responded to call him rather „philosofos" (lover of wisdom).

Euclid (325 – 260 B.C.)

Euclid spent most of his life in Alexandria in Egypt. He was a Greek mathematician. Archimedes was one of his students. His main masterpiece is the book Basics (Stoicheia). It contains 13 books written in style "theorem – proof". The books start with ten basic postulates, which defined Euclid's geometry. The book is the most successful mathematical book of all times -in fact, it was used more than 2 000 years.
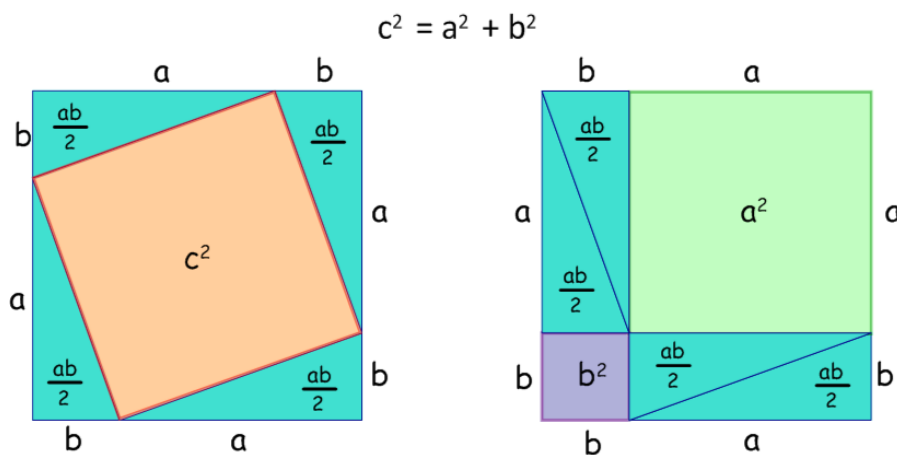
Exercise 1: **Pythagorean theorem**

    a) the version of Pythagoras theorem:

        The sum of the areas of the two squares on the legs (*a* and *b*) equals the area of the square on the hypotenuse (*c*).
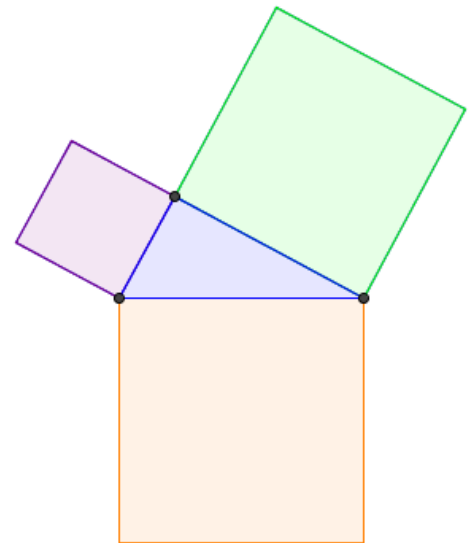
    b) Solution – proof scheme

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

Poznámka: V pravém čtverci je vidět i důkaz vzorce $(a+b)^2 = a^2 + 2ab + b^2$.

Module MATHS

Methodology worksheet

Tools for the proof (for two groups):

Students cut shapes with the scissors and they will try to put them into two biggest (grey) squares. Afterwards they write down the equality of areas of both grey squares and they prove the relation for the right-angled triangle ABC.
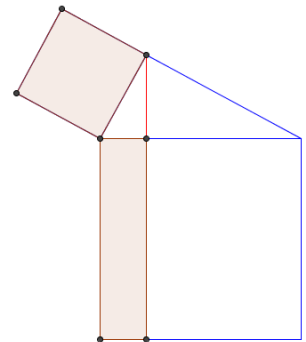
$$c^2 = a^2 + b^2$$
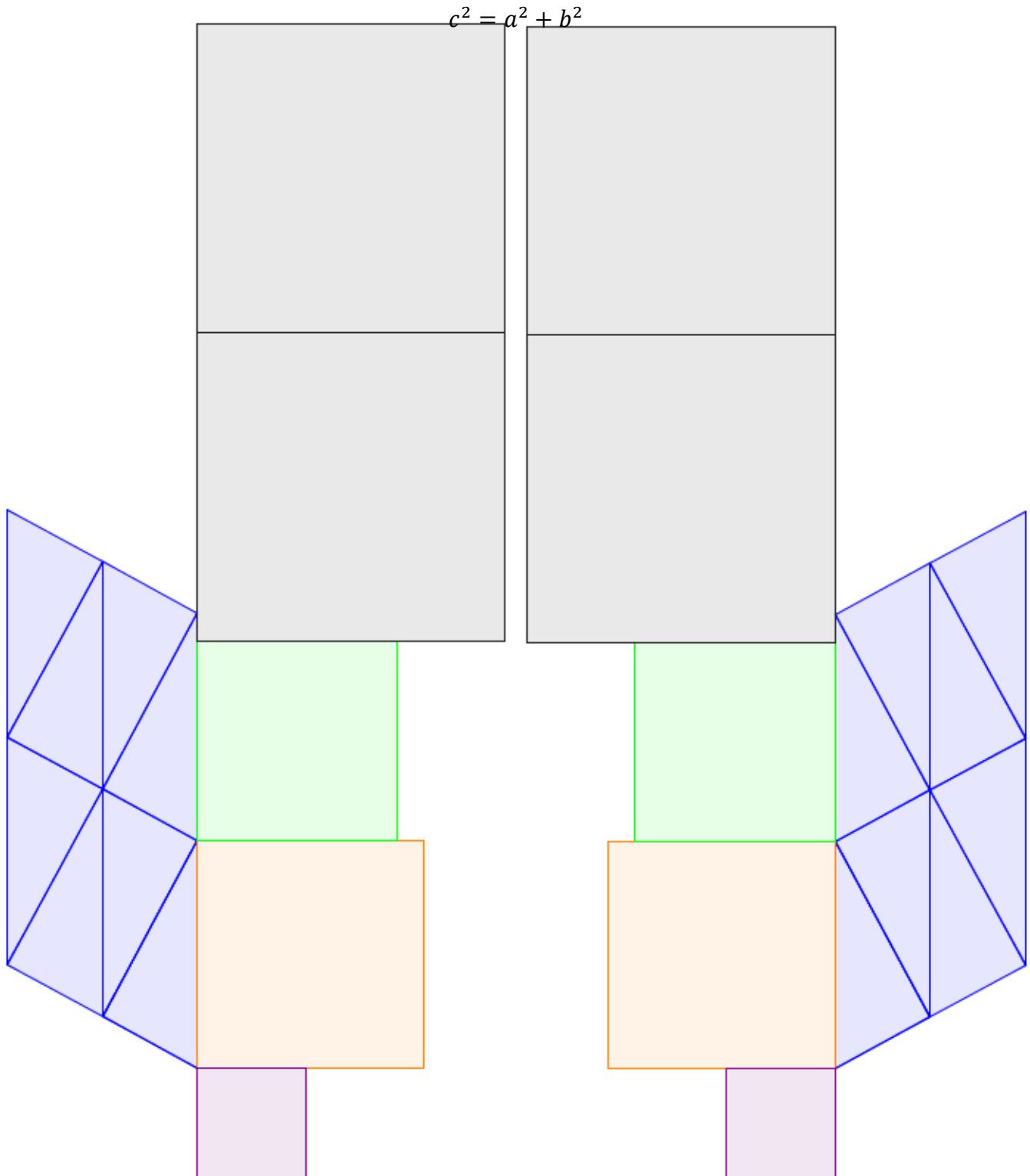
Exercise 2:   Euclidean theorem

a) Write down the version of Euclidean theorem about the leg.
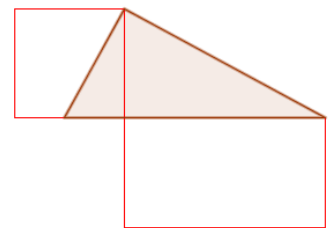
Euclidean theorem about the leg:

If a line is draw from the right angle, perpendicular to the hypotenuse, and down through the square on the hypotenuse, that square is split into two rectangles each having the same area as the squares on the other two sides.

b) Write down the version of Euclidean theorem about the height.

Euclidean theorem about the height:

The right triangle altitude theorem is a result that describes a relation between the altitude on the hypotenuse in a right triangle and the two line segments it creates on the hypotenuse. It states that the geometric mean of the two segments equals the altitude.
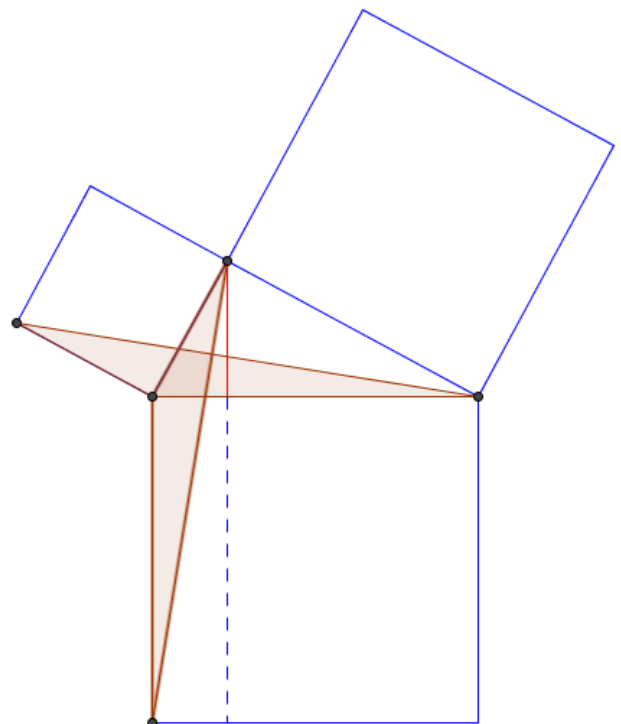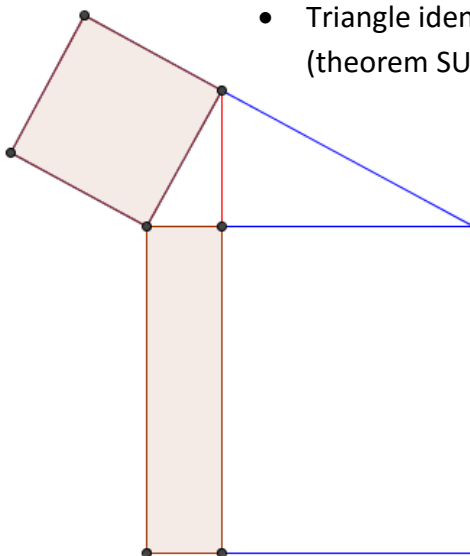
c) Solution – proof scheme - theorem about the leg

Proof:

Theorem about the leg b … $b^2 = c \cdot c_b$

- Triangle identity (theorem SUS)

Tools for the proof (for one group):

Students will try to put the triangles correctly into the scheme of Pythagorean theorem.
They will think about the proof, that triangles are the same in the scheme (SUS theorem) and
the area of triangles is always a half of the area of the square constructed
above the leg.