

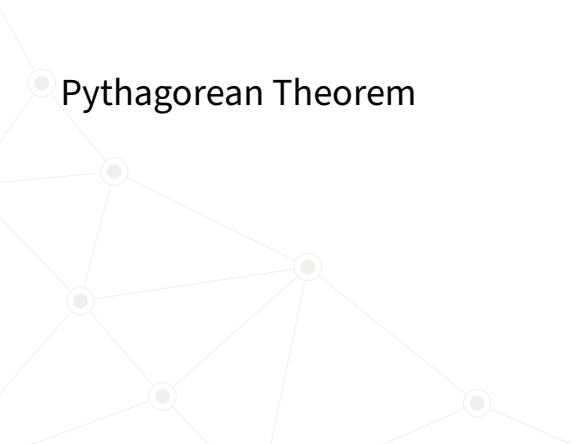


# PYTHAGOREAN THEOREM

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A decorative geometric pattern in the bottom-left corner consisting of several interconnected triangles and lines, with small circles at the vertices.

Pythagorean Theorem

# RIGHT TRIANGLE

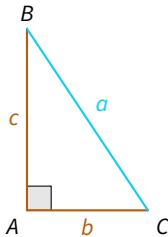
A triangle is called **right**, if one of its angles is a right angle ( $90^\circ$ ).



# RIGHT TRIANGLE

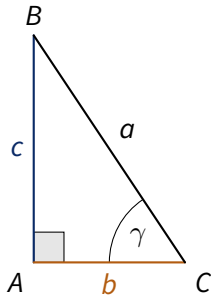
A triangle is called **right**, if one of its angles is a right angle ( $90^\circ$ ).

Right triangles have been of special import in many fields and so their sides have unique names:



The **short sides** are called *catheti* and the **long side** is called *hypotenuse*.

# RIGHT TRIANGLE

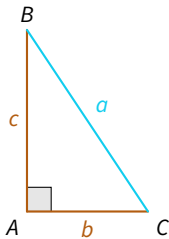


With respect to a chosen angle  $\gamma$ , the side  $c$  is called *opposite* and  $b$  is called *adjacent*.

# PYTHAGOREAN THEOREM

The background of the slide is composed of three large, solid-colored triangles that meet at a central point. A yellow triangle is on the left, a cyan triangle is on the right, and a green triangle is at the bottom. The top portion of the slide is white.

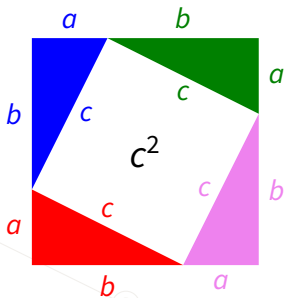
# PYTHAGOREAN THEOREM



Given a right triangle, the **Pythagorean Theorem** says that

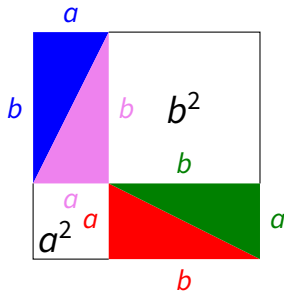
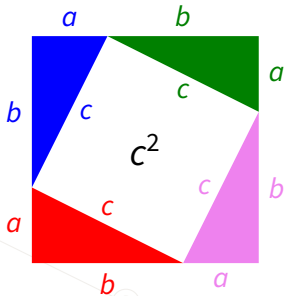
$$a^2 = b^2 + c^2.$$

# PYTHAGOREAN THEOREM – PROOF



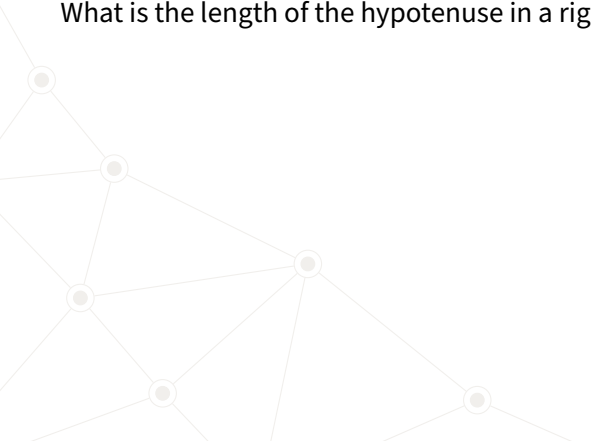


# PYTHAGOREAN THEOREM – PROOF



# PYTHAGOREAN THEOREM – PROBLEM 1

What is the length of the hypotenuse in a right triangle if the catheti are 5 and 12?



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What is the length of the hypotenuse in a right triangle if the catheti are 5 and 12?

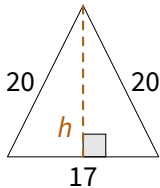
We simply calculate ( $h$  means hypotenuse)

$$h^2 = 5^2 + 12^2 = 169$$

$$h = \sqrt{169} = 13.$$

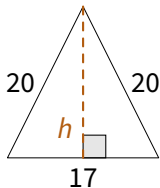
## PYTHAGOREAN THEOREM – PROBLEM 2

Find the height of the following isosceles triangle:



## PYTHAGOREAN THEOREM – PROBLEM 2

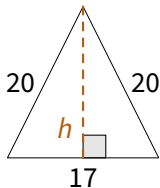
Find the height of the following isosceles triangle:



We have two right triangles next to each other – each one with hypotenuse of length 20 and one cathetus of length  $17/2 = 8.5$ .

## PYTHAGOREAN THEOREM – PROBLEM 2

Find the height of the following isosceles triangle:



We have two right triangles next to each other – each one with hypotenuse of length 20 and one cathetus of length  $17/2 = 8.5$ . So, we know that

$$20^2 = 8.5^2 + h^2,$$

and thus  $h^2 = 20^2 - 8.5^2 = 327.75$  and  $h = \sqrt{327.75} = 18.1$ .