Pythagorean Theorem Explained

The Pythagorean theorem is a fundamental principle in geometry that helps us understand the relationship between the sides of a right triangle. A right triangle is a triangle that has one angle measuring 90 degrees.

The Formula

The formula of the Pythagorean theorem is expressed as:
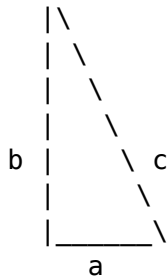
$a^2 + b^2 = c^2$

- **a** and **b** are the lengths of the two legs (the sides that form the right angle).
- **c** is the length of the hypotenuse (the side opposite the right angle, which is the longest side).

Understanding the Terms

- **Legs of the Triangle:** These are the two shorter sides that create the right angle.
- **Hypotenuse:** This is the longest side of the right triangle, opposite the right angle.

Visual Representation

To visualize this, imagine a right triangle:

```
       |\
       | \
       |  \
       |   \
     b |    \  c
       |     \
       |_____\
          a
```

Example Problem

Let's use the theorem in a practical example:

If one leg of the triangle (a) is 3 units and the other leg (b) is 4 units, what is the length of the hypotenuse (c)?

1. Plug the values into the formula:

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

2. Substitute a = 3 and b = 4:

   $3^2 + 4^2 = c^2$

3. Calculate the squares:

   $9 + 16 = c^2$

4. Add them together:

   $25 = c^2$

5. Find the square root to get c:

   $c = \sqrt{25}$

   $c = 5$

So, in this example, the hypotenuse (c) is 5 units long.

Application

The Pythagorean theorem is not just a theoretical concept; it has practical applications in various fields like construction, navigation, and computer graphics. For example, it can be used to determine the correct lengths needed for building projects, ensuring that structures are sound and safe.

Conclusion

Understanding the Pythagorean theorem is essential for building a strong foundation in mathematics. With practice, you will become more comfortable using this theorem in different scenarios. Remember, if you know the lengths of any two sides of a right triangle, you can always find the length of the third side!