📘 Pythagoras' Theorem – Notes

✅ The Theorem

In a **right-angled triangle**, the square of the **hypotenuse** (the side opposite the right angle) is equal to the **sum of the squares** of the other two sides.

🔺 Formula:

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

Where:

- c = hypotenuse (longest side)
- a, b = other two sides

📝 When to Use It

- When the triangle is right-angled (90°)
- To find a missing side length
- In geometry problems, including word problems

📊 Examples

Example 1: Finding the Hypotenuse

A triangle has sides $a = 3$ cm and $b = 4$ cm. Find the hypotenuse c.

$$c^2 = 3^2 + 4^2 = 9 + 16 = 25$$

$$c = \sqrt{25} = \boxed{5 \text{ cm}}$$

Example 2: Finding a Shorter Side

A triangle has hypotenuse $c = 13$ cm and one side $a = 5$ cm. Find the other side b.

$$13^2 = 5^2 + b^2 \Rightarrow 169 = 25 + b^2$$

$$b^2 = 169 - 25 = 144 \Rightarrow b = \sqrt{144} = \boxed{12 \text{ cm}}$$

Example 3: Word Problem

A ladder is leaning against a wall. It reaches 5 m up the wall and its base is 3 m from the wall. How long is the ladder?

Let c be the ladder, and $a = 3$, $b = 5$:

$$c^2 = 3^2 + 5^2 = 9 + 25 = 34$$

$$c = \sqrt{34} \approx \boxed{5.83 \text{ m}}$$

🧠 Key Tips

- Always check that it's a **right-angled triangle**
- The hypotenuse is **always opposite** the right angle
- Square roots can be left as exact answers (e.g., $\sqrt{50}$) or approximated (e.g., ≈ 7.07)