Your notes

GCSE Maths: revision notes

Pythagoras' theorem

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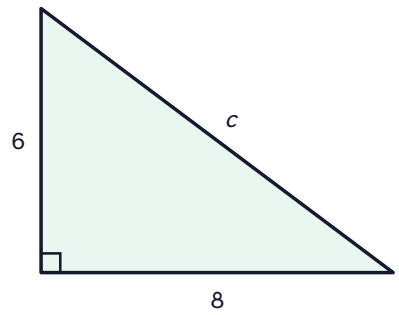
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The theorem

- In a right-angled triangle, $a^2 + b^2 = c^2$.
- c is the **hypotenuse**: the longest side, opposite the right angle.

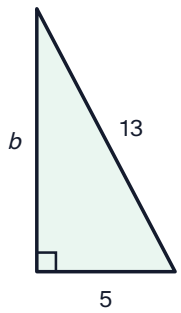
Finding the hypotenuse

- Square the two shorter sides, add them, then **square root**.
- Sides 6 and 8: 36 + 64 = 100, so c = √100 = 10.



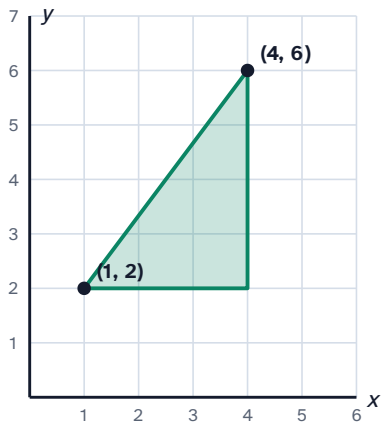
Finding a shorter side

- Square the **hypotenuse** and the known side, subtract, then **square root**.
- **Hypotenuse** 13, side 5: 169 – 25 = 144, so the side is 12.



Useful facts

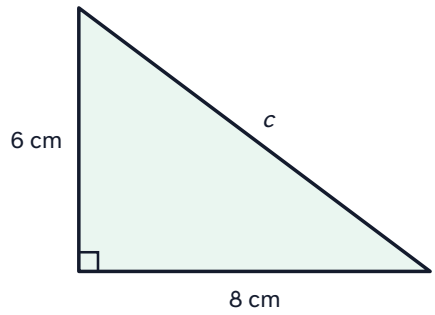
- **Pythagorean triples** are whole-number sets such as 3, 4, 5; 5, 12, 13; and 8, 15, 17 (and multiples, like 6, 8, 10).
- To find the distance between two points, use the difference in x and the difference in y as the two shorter sides.
- If $a^2 + b^2 = c^2$ for a triangle's sides, the triangle is right-angled.



Your notes

Worked examples

A right-angled triangle has shorter sides of 6 cm and 8 cm. Find the hypotenuse.



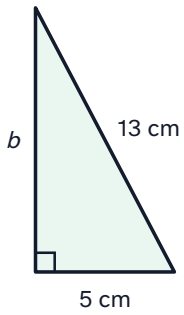
Use $a^2 + b^2 = c^2$, where c is the longest side. **$6^2 + 8^2 = c^2$**

Square and add. **$36 + 64 = 100$**

Square root to find c. **$c = \sqrt{100} = 10$**

Answer: 10 cm

The hypotenuse is 13 cm and one side is 5 cm. Find the other side.



For a shorter side, subtract the squares. **$b^2 = 13^2 - 5^2$**

Work it out. **$169 - 25 = 144$**

Square root. **$b = \sqrt{144} = 12$**

Answer: 12 cm

Key terms

Hypotenuse	The longest side of a right-angled triangle, opposite the right angle.
Pythagoras' theorem	In a right-angled triangle, $a^2 + b^2 = c^2$.

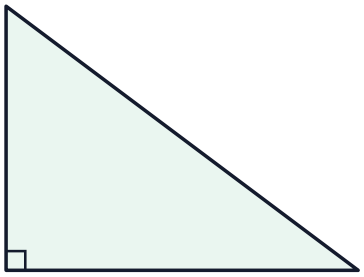
Your notes

Pythagorean triple	Three whole numbers that fit $a^2 + b^2 = c^2$, such as 3, 4, 5.
Square root	The number that multiplies by itself to give a value: $\sqrt{144} = 12$.

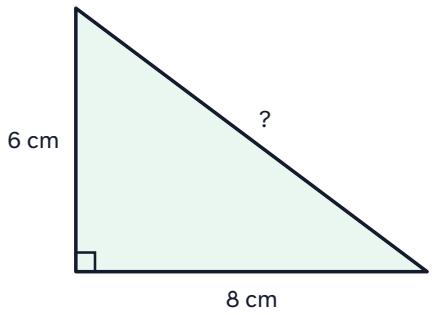
Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

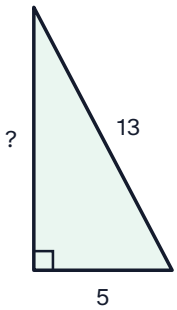
1. Which side of a right-angled triangle is the hypotenuse?



2. The shorter sides are 6 cm and 8 cm. How long is the hypotenuse?



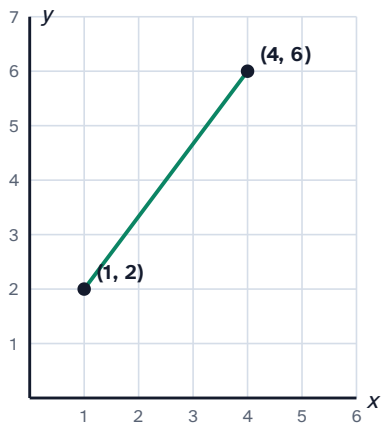
3. The hypotenuse is 13 and one side is 5. How long is the other side?



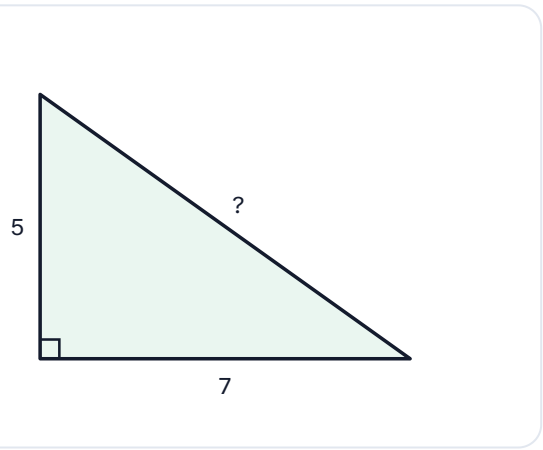
4. Which of these is a Pythagorean triple?

Your notes

5. Is a triangle with sides 7, 24 and 25 right-angled?
6. What is the distance between (1, 2) and (4, 6)?



7. Pythagoras' theorem works for which triangles?
8. The shorter sides are 5 and 7. What is the hypotenuse to 1 decimal place?



Answers

1. The longest side, opposite the right angle
2. 10 cm
3. 12
4. 5, 12, 13
5. Yes, because 49 + 576 = 625
6. 5
7. Right-angled triangles
8. 8.6

What to do next

Practise 10 questions on this topic

Try 6 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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