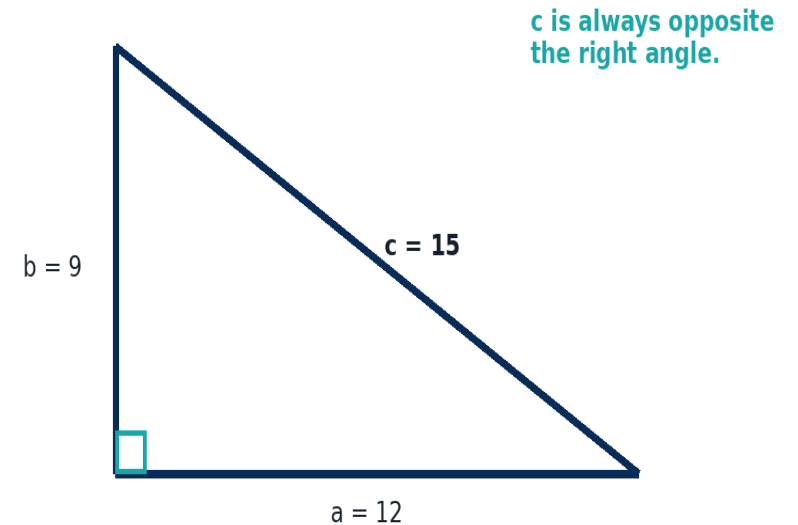


PYTHAGORAS IN TWO DIMENSIONS

GCSE Mathematics 1MA1 · L038 · 60 minutes

Week 13 · Reach for the Star Gold Standard

Pythagoras: $a^2 + b^2 = c^2$ for a right-angled triangle



If c is missing: add squares. If a shorter side is missing: subtract squares.

Objective and lesson route

Connect & Check

By the end you will:

- identify the hypotenuse reliably
- use $a^2+b^2=c^2$ for a missing length
- subtract squares when a shorter side is missing
- check whether a triangle is right-angled

Running order

- Connect & Check · 5 min
- Share · 5 min
- Present · 12 min
- Apply · 25 min
- Recall & Review · 8 min

Core square-number examples may be non-calculator; calculator questions are labelled C. Round only when requested.

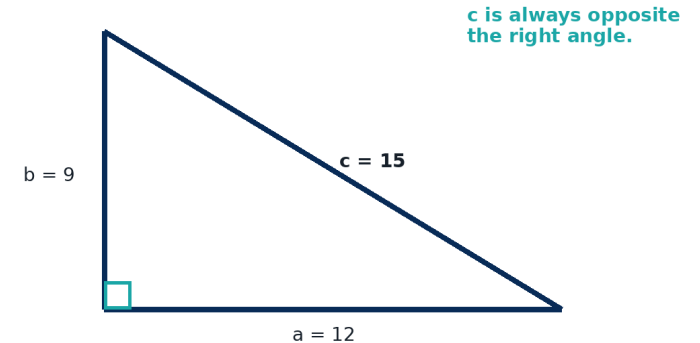
Baseline: what do you already know?

Connect & Check

Work independently · 5 minutes

- Which side is the hypotenuse in a right-angled triangle?
- Calculate 9^2 , 12^2 and $\sqrt{225}$.

Pythagoras: $a^2 + b^2 = c^2$ for a right-angled triangle



If c is missing: add squares. If a shorter side is missing: subtract squares.

Keep this response for distance-travelled comparison.

Choose your route

[Share](#)

Same destination. Different journey.

A · Visual

Annotate the triangle and square each relevant side.

B · Method

Use a structured $a^2+b^2=c^2$ template.

C · Explain

Explain whether to add or subtract squares and why.

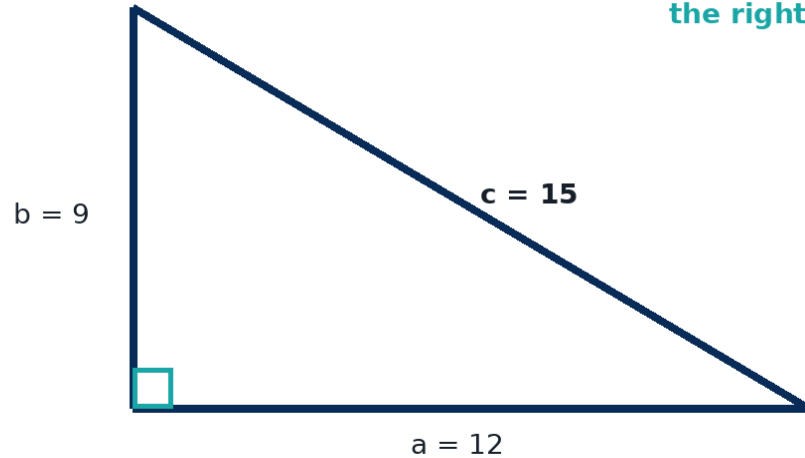
Compare evidence with a partner before you continue.

Model: identify c first

Present

Pythagoras: $a^2 + b^2 = c^2$ for a right-angled triangle

c is always opposite the right angle.



If c is missing: add squares. If a shorter side is missing: subtract squares.

- c is opposite the right angle.
- If c is missing, add squared short sides.
- If a short side is missing, subtract from c^2 .
- Take the square root at the end.

the hypotenuse must be the longest side.

Worked example

Present

A rectangle measures 9 cm by 12 cm. Find its diagonal.

- The diagonal is the hypotenuse.
- $d^2 = 9^2 + 12^2 = 81 + 144 = 225$.
- $d = \sqrt{225} = 15$ cm.

Check: 15 is longer than both 9 and 12; $9^2 + 12^2 = 15^2$.

Misconception check

Present

A learner solves $c=\sqrt{(9+16)}$ for sides 3 cm and 4 cm.

- What should be squared?
- What does the theorem actually say?
- Compare with the known 3-4-5 triangle.

Repair: $c=\sqrt{(3^2+4^2)}=5$ cm.

Supported practice

Apply

Find the hypotenuse of a right triangle with legs 6 cm and 8 cm.

Scaffold: mark c , write $a^2+b^2=c^2$, substitute, then solve.

A right triangle has hypotenuse 13 cm and one shorter side 5 cm. Find the other side.

Remove the scaffold before the next slide.

Independent practice: scaffold removed

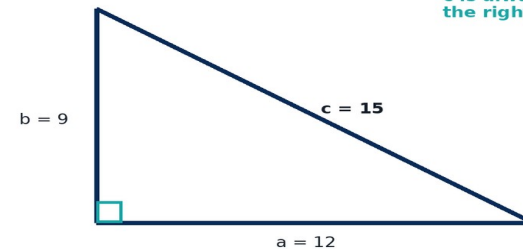
Apply

- A ladder reaches 6 m up a wall and its foot is 2.5 m from the wall. Find the ladder length.
- A rectangle is 9 cm by 12 cm. Find its diagonal.

Show a separate check or justification.

Pythagoras: $a^2 + b^2 = c^2$ for a right-angled triangle

c is always opposite the right angle.



If c is missing: add squares. If a shorter side is missing: subtract squares.

Exam-style practice

Apply

A rectangular field is 30 m by 40 m. Find the straight-line distance between opposite corners.

A triangle has side lengths 7 cm, 24 cm and 25 cm. Show that it is right-angled.

Exam tip: the equation is evidence; do not give only a calculator answer.

Stretch and deep challenge

Apply

Stretch

A 9 cm by 12 cm rectangle is cut along a diagonal. Find the perimeter of one resulting triangle.

Deep challenge

A triangle has sides 8 cm, 15 cm and 17 cm. Prove it is right-angled and find its area.

For a “prove right-angled” question, compare the sum of the two smaller squares with the largest square.

Self-mark and repair

Apply

Identify the first decision that went wrong.

- Did you identify the side opposite the right angle?
- Did you square each side length?
- Did you add/subtract in the correct direction?
- Did you take the final square root?
- Is the answer a sensible length?

Repair one answer, then solve a fresh matched question without prompts.

Independent exit evidence

Without notes · 5 minutes

**A right triangle has hypotenuse 10 cm and one shorter side 6 cm.
Find the other side and show a check.**

- Identify c .
- Form the equation.
- Find the length.
- Substitute back as a check.

Fresh evidence against the objective.

Distance travelled

Compare your baseline with the exit evidence.

WWW What is now more accurate, complete or clearly explained?

EBI What one action will improve your next answer?

Record the next-practice target in the workbook.

Core answers

Teacher check

- C2 81, 144, 15
- P1 15 cm
- A1 10 cm
- A2 12 cm
- A3 6.5 m
- A4 15 cm
- E1 50 m
- E2 right-angled
- Exit 8 cm



L038 teacher notes

- Insist on identifying c before calculation.
- Equation before calculator.
- Use subtraction for a missing short side.
- Check by substitution and magnitude.

Next: L039 Trigonometry in right triangles

L038 Recall & Review

Pythagoras in two dimensions



Fresh evidence: prove the objective

Solve a new question without prompts. Explain one check, then correct one error in your working.

Objective: Use Pythagoras to find a missing length in a right-angled triangle.

Write the next practice step before you leave. It must test the method again, not simply copy today's example.

Feedback language

Use the full phrases before the abbreviations.

What Went Well (WWW)

I selected the correct geometric fact, theorem, formula or transformation and used a clear diagram with appropriate labels and units.

Identify the mathematical method, representation, reasoning or check that improved.

Even Better If (EBI)

I will name the fact or theorem, show the substitution or construction step and check whether the size, direction and units of the result are reasonable.

Set one precise next-step action and test it on a fresh question.

Extension route

Choose this route only after the core evidence is secure.

Stretch

A rectangle is 9 cm by 12 cm. Find its diagonal and the perimeter of one of the right triangles formed by that diagonal.

Deep challenge

A triangle has sides 8, 15 and 17 cm. Prove it is right-angled and find its area.

Explain your reasoning clearly enough that another learner could check it.