Key focus

This objective synthesises all three core Pythagoras moves into one mixed revision task deck. Students encounter problems where they must first decide *what type* of problem they are solving — finding a missing hypotenuse, finding a missing leg, checking whether a triangle is right-angled, or solving a real-world application — and then select the correct Pythagoras move to apply. The problems mix diagram-based triangles with rectangular, ladder, field, and path contexts, reinforcing that Pythagoras recognises all right-angled triangles, not just abstract ones.

Suggested teaching sequence

1. Revisit the three core moves: (1) find a missing hypotenuse using $a^2 + b^2 = c^2$; (2) find a missing leg using $c^2 - a^2 = b^2$ (or $c^2 - b^2 = a^2$); (3) check a right angle using the converse of Pythagoras' theorem.
2. Introduce the "decision tree" for mixed revision: read the problem, identify whether it is asking for a missing side (hypotenuse or leg?) or a yes/no check, then select the move. Use worked examples to model this decision process aloud.
3. Practise the three moves in isolation first using simple right-angled triangles (3-4-5 family triples). Ensure students can quickly compute a^2 and b^2 and add/subtract without a calculator, building fluency for the revision phase.
4. Introduce mixed problems with no diagram. Read aloud: "a right-angled triangle has short sides 8 and 15; find the long side" — emphasise that students must imagine the triangle and draw it lightly if needed.
5. Extend to real-world applications: rectangles with a diagonal, ladders against walls, fields and paths. Model how to spot the right-angled triangle hidden inside each context, name the sides, and then apply Pythagoras.
6. Include problems that test whether a triangle is right-angled by name only (no diagram). Model the check explicitly: "is $10, 24, 26$ right-angled? Let me test: $10^2 = 100$, $24^2 = 576$, $100 + 576 = 676$, $\sqrt{676} = 26$, so yes."
7. Practise decision-making under time pressure (e.g. "I give you 30 seconds to decide which move to use for this problem") to reinforce the pattern recognition.

Core examples to model

- Find the hypotenuse: a right-angled triangle has legs 8 and 15. $8^2 + 15^2 = 64 + 225 = 289$, so $c = \sqrt{289} = 17$.
- Find a leg: a right-angled triangle has hypotenuse 25 and one leg 7. $b^2 = 25^2 - 7^2 = 625 - 49 = 576$, so $b = 24$.
- Check a right angle: is $10, 24, 26$ right-angled? $10^2 + 24^2 = 100 + 576 = 676 = 26^2$, so yes.
- Real-world: a rectangle is 9 m by 12 m; find its diagonal. $d^2 = 9^2 + 12^2 = 81 + 144 = 225$, so $d = 15$ m.
- Ladder problem: a ladder is 13 m long and reaches 12 m up a wall; how far is the base from

the wall? Use $b^2 = 13^2 - 12^2 = 169 - 144 = 25$, so $b = 5$ m.

- Field problem: a square field has side 5 m; find the diagonal corner-to-corner. $d^2 = 5^2 + 5^2 = 50$, so $d = \sqrt{50} \approx 7.1$ m (or $5\sqrt{2}$ m exactly).

Watch for

- Forgetting to name which side is the hypotenuse: the hypotenuse is always the longest side and is opposite the right angle in a diagram. In real-world problems, it is often the diagonal or the slanted part (ladder, tent rope, wire).
- Mixing up the moves: ”find the hypotenuse” uses addition ($a^2 + b^2 = c^2$), but ”find a leg” uses subtraction ($c^2 - a^2 = b^2$). Model the difference repeatedly and have students state it aloud: ”I am finding the hypotenuse, so I add.”
- Failing to decide before calculating: students sometimes compute $a^2 + b^2$ without checking whether the problem actually asks for a hypotenuse. Always ask aloud: ”what am I finding?” before writing any calculation.
- Assuming all rectangles/squares have whole-number diagonals: most do not. Reinforce that $d = \sqrt{a^2 + b^2}$ often leaves a square root or decimal, and that is correct.
- Misplacing the right angle in a real-world problem: in a ladder problem, the right angle is where the wall meets the ground, not at the top of the ladder. Always draw or describe the setup before calculating.
- Rounding too early: if a problem asks for an answer ”to 1 d.p.”, wait until the final step to round, not mid-calculation.