



Perimeter of compound shapes using Pythagoras' theorem

Finding missing sloped edges and calculating total perimeters

Key focus

A compound shape perimeter problem requires students to identify a missing length (such as a sloped roof edge or diagonal), use Pythagoras' theorem to calculate it, and then add all the shape's sides to find the total perimeter.

The two-step process

1. Identify the missing length and the right triangle it belongs to.
2. Use Pythagoras' theorem ($a^2 + b^2 = c^2$) to find that length.
3. Add all sides of the compound shape together to find the perimeter.

Common compound shapes in this LO

Students will encounter:

- A square or rectangle with a triangular roof (isosceles or generic triangle on top)
- A rectangle with a triangle on top
- A parallelogram with a triangular cap
- Simple right triangles where the missing side is not immediately obvious

Example 1: square with triangular roof

A square house base is 10 m with a centred triangular roof 3 m tall.

Each roof edge meets the square corner at the midpoint of a side, so the horizontal distance is 5 m.

Using Pythagoras: $x^2 = 5^2 + 3^2 = 25 + 9 = 34$, so $x = \sqrt{34} \approx 5.83$ m.

Perimeter = $10 + 10 + 10 + \sqrt{34} + \sqrt{34} = 30 + 2\sqrt{34} \approx 41.66$ m.

Example 2: rectangle with triangle on top

A rectangle is 8 m wide by 6 m tall, with a right triangle on top where one leg is the width (8 m) and the other leg is the height (4 m).

Using Pythagoras: $x^2 = 8^2 + 4^2 = 64 + 16 = 80$, so $x = \sqrt{80} = 4\sqrt{5} \approx 8.94$ m.

Perimeter = $8 + 6 + 6 + 8 + 4\sqrt{5} = 28 + 4\sqrt{5} \approx 36.94$ m.

Watch for

Students often calculate the missing length correctly but then forget to add all the remaining sides. Encourage them to label or list every side of the compound shape before adding. The perimeter includes the Pythagoras result plus all the non-sloped edges.

Curriculum content

Foundation: Simple right triangles with whole-number scaled Pythagorean triples (3–4–5 family, 5–12–13 family, etc.). Students find the missing side and then add all three sides. Diagram-led; answers are clean integers.

Proficient: Compound shapes (house, rectangle with triangle, parallelogram with cap). Students apply Pythagoras to find one unknown, then add all edges. Decimal-scaled values; answers may require rounding to 1 d.p.

Excellence: More complex word problems and larger-scale shapes. Some require rounding to 1 d.p.; mix of diagram and text-only problems. Reinforce that the perimeter is the sum of every edge and that intermediate steps must be shown clearly.