Key focus

This is the introductory right-angled-triangle trigonometry objective. It is deliberately scoped to just one skill – using a known angle and a known side to find a missing side (SOH CAH TOA) – so students master choosing and applying the correct ratio before the separate objective on finding a missing angle (which needs the inverse trig functions) is introduced. Students first label the hypotenuse, opposite, and adjacent sides relative to the marked angle, then decide which pair of sides they are working with (opposite/hypotenuse, adjacent/hypotenuse, or opposite/adjacent) to choose sin, cos, or tan, before substituting and solving.

Suggested teaching sequence

1. Label the three sides of a right-angled triangle relative to the marked angle: the hypotenuse (always opposite the right angle), the opposite side (opposite the marked angle), and the adjacent side (next to the marked angle, not the hypotenuse). Practise this in triangles drawn in different orientations.
2. Introduce SOH CAH TOA as a memory aid for the three ratios: $\sin(A) = \dfrac{O}{H}$, $\cos(A) = \dfrac{A}{H}$, $\tan(A) = \dfrac{O}{A}$.
3. Practise choosing the correct ratio from a diagram before calculating anything: identify which two sides are involved (the unknown side and the one given value), and pick the ratio that connects them.
4. Model finding a missing side: write the ratio, substitute the known angle and side, then rearrange to solve for the unknown – for example $x = 10\sin(25°)$ or $x = 6/\sin(35°)$, not just $\sin(25°) = x/10$ left unsolved.
5. Practise with a calculator in degree mode. Emphasise checking the calculator is in degrees, not radians, before starting.
6. Introduce a stated rounding accuracy (3 significant figures, or a given number of decimal places) and model writing the unrounded value before rounding the final answer only.
7. Extend to real-world contexts: ladders, ramps, kite strings, and guy-wires where the marked angle and one side are given and a length must be found.
8. Introduce angle of elevation (measured up from the horizontal at the observer) and angle of depression (measured down from the horizontal at an elevated observer) as specific real-world framings of the same right-angled-triangle skill.

Core examples to model

- Finding the opposite side: hypotenuse 10 cm, marked angle $25°$. $x = 10\sin(25°) \approx 4.23$ cm (3 s.f.).
- Finding the adjacent side: hypotenuse 14 cm, marked angle $52°$. $x = 14\cos(52°) \approx 8.62$ cm (3 s.f.).
- Finding the hypotenuse: opposite side 6 cm, marked angle $35°$. $x = 6/\sin(35°) \approx 10.5$ cm

(3 s.f.).

- Angle of elevation: from a point 55 m from a landmark's base, the angle of elevation to a drone is 38°. Height $= 55\tan(38^\circ) \approx 42.97$ m.
- Angle of depression: from the top of a 60 m cliff, the angle of depression to a boat is 21°. Distance $= 60/\tan(21^\circ) \approx 156.31$ m.
- Two-step problem: a ladder at 70° to the ground reaches 5.8 m up a wall. Ladder length $= 5.8/\sin(70^\circ) \approx 6.17$ m; distance from the wall $= 6.17\cos(70^\circ) \approx 2.11$ m.

Watch for

- Choosing the wrong ratio: the most common error is picking sin, cos, or tan without first correctly identifying which two sides (relative to the marked angle) are actually involved.
- Confusing opposite and adjacent when the triangle is rotated or mirrored: both are defined relative to the marked angle, not to the page orientation.
- Leaving the answer as an unrearranged ratio (e.g. writing $\sin(25^\circ) = x/10$ and stopping) instead of solving for x.
- Calculator in the wrong mode: an answer that is wildly too large or too small (or negative for an acute angle) usually means the calculator is in radian mode, not degree mode.
- Rounding too early: rounding an intermediate value before the final step can shift the last significant figure or decimal place of the answer.
- For elevation/depression problems, measuring the angle from the wrong reference line: elevation is measured from the horizontal at the lower (ground-level) observer; depression is measured from the horizontal at the higher (elevated) observer – not at the object being sighted.

Checks for understanding

- Can students correctly label hypotenuse, opposite, and adjacent relative to a marked angle in any triangle orientation?
- Can they choose the correct ratio (sin, cos, or tan) from a diagram before calculating?
- Can they set up and solve for a missing opposite, adjacent, or hypotenuse side, including when the unknown is in the denominator?
- Can they round a final answer to a stated accuracy without rounding intermediate steps?
- Can they apply the skill to a real-world elevation or depression scenario, correctly identifying where the marked angle sits?
- Can they work through a two-step problem where a first missing side must be found before it can be used to find a second?