

3D Shapes: Two-Step Diagonal



Key idea

In a 3D shape, find a **face diagonal** first, then use it as one side of a second right triangle.

Method

1. Find the face diagonal.
2. Use it in the next right triangle.
3. Keep values exact till the end.

Example: space diagonal

Cuboid $6 \times 8 \times 24$.

Face: $6^2 + 8^2 = 100 \Rightarrow d = 10$.

Space: $10^2 + 24^2 = 676 \Rightarrow D = 26$.

Common mistake

Only combine edges that truly meet in one right-angled triangle — not edges from different faces.

3D Shapes: Angles and Heights



Key idea

Once the right triangle is clear, use SOH-CAH-TOA. For an angle **to the base**, the floor distance is the adjacent side.

Example: angle to the base

A line is 20 m long and rises 12 m.

$$\sin \theta = \frac{12}{20} = 0.6, \text{ so } \theta \approx 36.9^\circ.$$

Example: height from an angle

A support is 18 m long at 50° to the base.

$$\text{height} = 18 \sin 50^\circ \approx 13.8 \text{ m}.$$

Common mistake

Angle *to the base*: base is adjacent. Angle *to the vertical*: the roles switch. Read the angle carefully.

