

Essential Question

How can a right triangle help us find lengths and angles?

Parts of a Right Triangle

- Hypotenuse: longest side, across from 90°
- Opposite: across from the angle
- Adjacent: next to the angle

Trigonometry works with **right triangles**, which have one 90° angle.

Labels Depend on the Angle

- Always find θ first
- Switch angles: opp and adj swap
- Hypotenuse never changes

The words opposite and adjacent depend on which angle you are using.

SOH CAH TOA

- Sine: opposite over hypotenuse
- Cosine: adjacent over hypotenuse
- Tangent: opposite over adjacent

The three trig ratios compare two sides of a right triangle: $\sin \theta = \text{opposite} \div \text{hypotenuse}$, $\cos \theta = \text{adjacent} \div \text{hypotenuse}$, and $\tan \theta = \text{opposite} \div \text{adjacent}$.

Finding a Side

- Label what you have and want
- Pick the ratio that uses both
- Solve for the unknown side

To find a missing side, label the side you know and the side you want, then choose the ratio from SOH CAH TOA that uses those two sides.

Finding an Angle

- Know two sides, want the angle
- Undo the ratio with inverse trig
- Press 2nd, then the trig key

When you know two sides and need an angle, set up the ratio, then undo it with an **inverse trig function**: $\sin^{-1}$, $\cos^{-1}$, or $\tan^{-1}$.

Check Degree Mode

- Calculators can use degrees or radians
- We measure angles in degrees
- Test: $\sin(30)$ should give 0.5

Calculators can measure angles in degrees or in radians, and the same input gives very different answers.

Example: Box on a Ramp

Try it first!

A box slides up a ramp that is 4.0 m long and tilted at 25° above the ground. How high does the box rise when it reaches the top?

Diagram: A ramp drawn as a right triangle with a 25 degree angle at the bottom left. The sloped surface is 4.0 meters long with a green box on it. The vertical side is labeled h equals question mark.

Example: Ladder Against a Wall

Try it first!

A 6.0 m ladder leans against a wall. Its base is 1.5 m from the wall. What angle does the ladder make with the ground?

Example: Wheelchair Ramp

Try it first!

A wheelchair ramp must rise 0.75 m to reach a door. The ramp makes a 4.8° angle with the ground. How far out from the door (horizontally) does the ramp start?

Big Ideas

- Find θ first, then label sides
- SOH CAH TOA picks the ratio
- Inverse trig finds an angle
- Always check degree mode