

Pythagoras & Trigonometry

RECALL: Pythagorean Theorem & Trigonometric Ratios

Pythagorean Formula

$$a^2 + b^2 = c^2$$

where c is the hypotenuse

Given that you have two sides, you can always find the third side.

Trigonometric Ratios

SOH $\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$

CAH $\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$

TOA $\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$

Combined Pythagoras & Trigonometry

Pythagoras and trigonometry can be used together to solve mixed right-triangle angle problems.

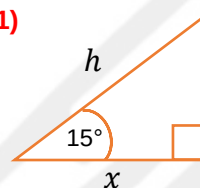
EXAMPLE: Angle of elevation of 15° and vertical height of 12m (y). Find the horizontal distance (x) and hypotenuse length (h).

STEP ONE: Draw a diagram

STEP TWO: Use either Pythagoras or trigonometry to solve the first missing value, given the information you have.

STEP THREE: Solve any other missing values using Pythagoras or trigonometry with the given information and any values you have just found.

1)



where $\theta = 15^\circ$
 $y = 12$ (vertical)
 $x = ?$ (horizontal)
 $h = ?$ (hypotenuse)

2) **TRIGONOMETRY** → Find x

Use $\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}} \Rightarrow x = 44.78\text{m}$

3) **PYTHAGORAS** → Find h

Use $c = \sqrt{12^2 + 44.78^2} \Rightarrow h = 46.36\text{m}$

Key Terminology

Angle of elevation	Angle formed above the horizontal between an object and the horizontal line
Angle of depression	Angle formed below the horizontal between an object and the horizontal line



Instructions: Solve for the unknowns using Pythagoras and trigonometry.

1

Angle of elevation of 18° and vertical height of 8m (y).
Find the horizontal distance (x) and hypotenuse length (h).

2

Angle of depression of 27° and horizontal distance of 4.2m (x).
Find the vertical height (y) and hypotenuse length (h).

3

Horizontal distance of 7.4m (x) and vertical height of 13.2m (y).
Find the angle of elevation (θ) and hypotenuse length (h).



4

Angle of elevation of 57° and hypotenuse length of 24.5m (h).
Find the vertical height (y) and horizontal distance (x).

5

Horizontal distance of 15.2m (x) and vertical height of 9.9m (y).
Find the angle of depression (θ) and hypotenuse length (h).

6

Angle of elevation of 43° and horizontal distance of 36.2m (x).
Find the vertical height (y) and hypotenuse length (h).



7

Horizontal distance of 27.7m (x) and vertical height of 50.2m (y).
Find the angle of depression (θ) and hypotenuse length (h).

8

Angle of elevation of 56.6° and vertical height of 63.8m (y).
Find the horizontal distance (x) and hypotenuse length (h).

9

Horizontal distance of 68.1m (x) and vertical height of 87.4m (y).
Find the angle of elevation (θ) and hypotenuse length (h).

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Given that you have two sides, you can always find the third side.

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Combined Pythagoras & Trigonometry

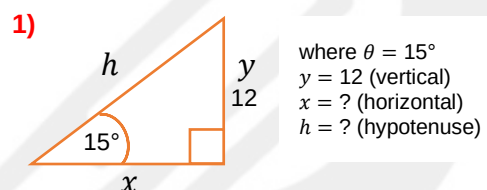
Pythagoras and trigonometry can be used together to solve mixed right-triangle angle problems.

EXAMPLE: Angle of elevation of 15° and vertical height of 12m (y). Find the horizontal distance (x) and hypotenuse length (h).

STEP ONE: Draw a diagram

STEP TWO: Use either Pythagoras or trigonometry to solve the first missing value, given the information you have.

STEP THREE: Solve any other missing values using Pythagoras or trigonometry with the given information and any values you have just found.



2) TRIGONOMETRY → Find x
 Use $\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}} \Rightarrow x = 44.78\text{m}$

3) PYTHAGORAS → Find h
 Use $c = \sqrt{12^2 + 44.78^2} \Rightarrow h = 46.36\text{m}$

Key Terminology

Angle of elevation	Angle formed above the horizontal between an object and the horizontal line
Angle of depression	Angle formed below the horizontal between an object and the horizontal line



Instructions: Solve for the unknowns using Pythagoras and trigonometry.

1

Horizontal distance of 11.6m (x) and vertical height of 8.5m (y).
Find the angle of elevation (θ) and hypotenuse length (h).

2

Angle of elevation of 39° and hypotenuse length of 19.8m (h).
Find the vertical height (y) and horizontal distance (x).

3

Angle of depression of 35.8° and vertical height of 45.7m (y).
Find the horizontal distance (x) and hypotenuse length (h).



4

Angle of depression of 44° and horizontal distance of 57.2m (x).
Find the vertical height (y) and hypotenuse length (h).

5

Angle of elevation of 70° and horizontal distance of 40.5m (x).
Find the vertical height (y) and hypotenuse length (h).

6

Horizontal distance of 87.1m (x) and vertical height of 75.2m (y).
Find the angle of depression (θ) and hypotenuse length (h).



7

Horizontal distance of 94.6m (x) and vertical height of 55.8m (y).
Find the angle of depression (θ) and hypotenuse length (h).

8

Horizontal distance of 88.4m (x) and vertical height of 97.5m (y).
Find the angle of elevation (θ) and hypotenuse length (h).

9

Angle of depression of 34.5° and vertical height of 105.6m (y).
Find the horizontal distance (x) and hypotenuse length (h).