Height of an Inaccessible Object from Two Stations

Height and distance of an inaccessible point (tower, chimney, cliff) from vertical angles at two stations in line with it and the base between them.

Method: Trigonometric heighting from a base in line

Input parameters

Unit system: SI

Parameter	Value	Unit
Base length between stations	50.000	m
Vertical angle at the far station	18.500	°
Vertical angle at the near station	32.250	°
Instrument height	1.5000	m
Ground elevation of the stations	250.00	m

Calculated results

Parameter	Value	Unit
Height above the instrument axis	35.618	m
Horizontal distance from the near station	56.451	m
Height above ground	37.118	m
Elevation of the top	287.12	m

Notes for this case

• With both stations in line with the object and the instrument at the same height: h = d·tan α₂ = (d + b)·tan α₁, giving h = b·tan α₁·tan α₂/(tan α₂ − tan α₁). For different instrument heights or station elevations, reduce both angles to a common axis first. Accuracy falls when the two angles are close; make the base at least about half the distance.

Formula and method

$$h = \frac{b \tan \alpha_1 \tan \alpha_2}{\tan \alpha_2 - \tan \alpha_1}, \quad d = \frac{h}{\tan \alpha_2}$$

Variables

b	Base length between stations	m
α_1	Vertical angle at the far station	rad
α_2	Vertical angle at the near station	rad
h_i	Instrument height	m
E	Ground elevation of the stations	m
h	Height above the instrument axis	m
d	Horizontal distance from the near station	m
$h + h_i$	Height above ground	m
E_{top}	Elevation of the top	m

Method and standards

Inaccessible height.

Assumptions and limits

- Stations and object in one vertical plane; same instrument height; short distances (no curvature).

References

Trigonometric heighting from a base in line

Report details

Report reference	FCC-MSG5-6FNJ (the same inputs always give the same reference)
Generated	23 November 2026, 18:08 UTC
Calculator	Height of an Inaccessible Object from Two Stations
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/surveying/height-inaccessible-object

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.