Trigonometric Levelling: Height of an Inaccessible Point

Horizontal distance and height of an inaccessible point (chimney top, tower) from vertical angles at two instrument stations in line with it and a measured base.

Method: Trigonometric levelling; base inaccessible; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Distance between the two stations	30.000	m
Vertical angle from the near station	40.000	°
Vertical angle from the far station	25.000	°
Reduced level of the instrument axis (both stations)	100.00	m

Calculated results

Parameter	Value	Unit
Horizontal distance from the near station	37.526	m
Height above the instrument axis	31.488	m
Reduced level of the point	131.49	m

Notes for this case

- Stations and object in one vertical plane, instrument axis at the same level at both stations. For sights beyond about 300 m add the curvature and refraction correction.

Formula and method

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

Variables

b	Distance between the two stations	m
α_1	Vertical angle from the near station	rad
α_2	Vertical angle from the far station	rad
RL_i	Reduced level of the instrument axis (both stations)	m
D	Horizontal distance from the near station	m
h	Height above the instrument axis	m
RL	Reduced level of the point	m

Method and standards

Trigonometry.

Assumptions and limits

- Same instrument level; short sights.

References

- Trigonometric levelling
- base inaccessible
- stations in line (Punmia, Surveying, vol. 1–2 (Laxmi), vol. 2)

Report details

Report reference	FCC-7QJ7-67BV (the same inputs always give the same reference)
Generated	17 November 2026, 19:46 UTC
Calculator	Trigonometric Levelling: Height of an Inaccessible Point
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/trigonometric-levelling

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.