Perpendicular Offset of a Point from a Line (COGO)

Perpendicular offset of a point from a line through two coordinated points, the station (distance along the line) of its foot and the foot's coordinates.

Method: Coordinate geometry: point and line

Input parameters

Unit system: SI

Parameter	Value	Unit
Northing of line point A	1,000.0	m
Easting of line point A	1,000.0	m
Northing of line point B	1,300.0	m
Easting of line point B	1,400.0	m
Northing of point P	1,200.0	m
Easting of point P	1,100.0	m

Calculated results

Parameter	Value	Unit
Offset (+ right of A→B, − left)	-100.00	m
Distance along the line from A to the foot	200.00	m
Northing of the foot	1,120.0	m
Easting of the foot	1,160.0	m
Length A–B	500.00	m

Notes for this case

• With the unit vector of A→B, the along-line distance is the projection of AP and the offset is its cross product: positive to the right looking from A to B. The foot is A plus s times the unit vector. Used for stake-out, as-built checks and for finding where a point lies relative to an alignment or boundary.

Formula and method

$$s = \frac{(N_P - N_A)\Delta N + (E_P - E_A)\Delta E}{L_{AB}}, \quad o = \frac{(E_P - E_A)\Delta N - (N_P - N_A)\Delta E}{L_{AB}}$$

Variables

NA	Northing of line point A	m
EA	Easting of line point A	m
NB	Northing of line point B	m
EB	Easting of line point B	m
NP	Northing of point P	m
EP	Easting of point P	m
o	Offset (+ right of A→B, − left)	m
s	Distance along the line from A to the foot	m
N_F	Northing of the foot	m
E_F	Easting of the foot	m
L_{AB}	Length A–B	m

Method and standards

Point to line.

Assumptions and limits

- Plane coordinates.

References

Coordinate geometry: point and line

Report details

Report reference	FCC-QYHR-J529 (the same inputs always give the same reference)
Generated	23 November 2026, 18:09 UTC
Calculator	Perpendicular Offset of a Point from a Line (COGO)
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/point-to-line-distance

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.