Intersection: Coordinates of a Point from Bearings at Two Stations

Coordinates of an inaccessible point from two known stations and the whole-circle bearings observed from each to the point, with the distances from both stations.

Method: Intersection from two stations (forward intersection)

Input parameters

Unit system: SI

Parameter	Value	Unit
Easting of station A	1,000.0	m
Northing of station A	1,000.0	m
Easting of station B	1,400.0	m
Northing of station B	1,050.0	m
Bearing A to P	52.000	°
Bearing B to P	330.00	°

Calculated results

Parameter	Value	Unit
Easting of P	1,295.6	m
Northing of P	1,230.9	m
Distance A to P	375.06	m
Distance B to P	208.90	m
Angle of intersection at P	82.000	°

Notes for this case

- Rays from A and B on their bearings intersect at P. Accuracy is best with an angle of intersection near 90° and poor below about 30°.

Formula and method

$$D_{AP} = \frac{(E_B - E_A)\cos\theta_{BP} - (N_B - N_A)\sin\theta_{BP}}{\sin(\theta_{AP} - \theta_{BP})}, \quad E_P = E_A + D_{AP}\sin\theta_{AP}, \quad N_P = N_A + D_{AP}\cos\theta_{AP}$$

Variables

E_A	Easting of station A	m
N_A	Northing of station A	m
E_B	Easting of station B	m
N_B	Northing of station B	m
θ_{AP}	Bearing A to P	rad
θ_{BP}	Bearing B to P	rad
E_P	Easting of P	m
N_P	Northing of P	m
D_{AP}	Distance A to P	m
D_{BP}	Distance B to P	m
γ	Angle of intersection at P	rad

Method and standards

Plane intersection.

Assumptions and limits

- Plane coordinates, error-free bearings.

References

Intersection from two stations (forward intersection)

Report details

Report reference	FCC-JN96-9EH5 (the same inputs always give the same reference)
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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/intersection-from-bearings

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.