Compass Rule (Bowditch) Traverse Adjustment

Adjusted coordinates of the stations of a closed traverse of up to five legs by the compass (Bowditch) rule, with the linear misclosure and relative precision.

Method: Compass (Bowditch) rule

Input parameters

Unit system: SI

Parameter	Value	Unit
Northing of starting station A	1,000.0	m
Easting of starting station A	1,000.0	m
Leg 1 length (A→B)	247.20	m
Leg 1 azimuth	32.650	°
Leg 2 length (B→C)	312.62	m
Leg 2 azimuth	118.27	°
Leg 3 length (C→D)	286.43	m
Leg 3 azimuth	209.43	°
Leg 4 length (D→E or back to A)	286.95	m
Leg 4 azimuth	293.12	°
Leg 5 length (E→A, 0 if four legs)	0	m
Leg 5 azimuth	0	°

Calculated results

Parameter	Value	Unit
Linear misclosure	76,829	mm
Relative precision (1 in ...)	14.750	
Adjusted northing B	1,224.9	m
Adjusted easting B	1,132.5	m
Adjusted northing C	1,098.0	m
Adjusted easting C	1,406.7	m
Adjusted northing D	867.90	m
Adjusted easting D	1,264.9	m

Notes for this case

• Latitude = l·cos α, departure = l·sin α. The misclosures ΣL and ΣD are distributed in proportion to leg length: correction to a leg's latitude = −ΣL·l/P, to its departure = −ΣD·l/P (P = perimeter). Coordinates then accumulate from the start station and close exactly. Balance angles first; relative precision P/e_l is compared with the job's standard (for example 1:10,000). Least squares gives a better adjustment for networks. Relative precision shows 0 for a perfect closure.

Formula and method

$$c_{L,i} = -\Sigma L \frac{l_i}{P}, \quad c_{D,i} = -\Sigma D \frac{l_i}{P}, \quad e_l = \sqrt{\Sigma L^2 + \Sigma D^2}$$

Variables

N_A	Northing of starting station A	m
E_A	Easting of starting station A	m

l_1	Leg 1 length (A→B)	m
α_1	Leg 1 azimuth	rad
l_2	Leg 2 length (B→C)	m
α_2	Leg 2 azimuth	rad
l_3	Leg 3 length (C→D)	m
α_3	Leg 3 azimuth	rad
l_4	Leg 4 length (D→E or back to A)	m
α_4	Leg 4 azimuth	rad
l_5	Leg 5 length (E→A, 0 if four legs)	m
α_5	Leg 5 azimuth	rad
e_l	Linear misclosure	m
P/e_l	Relative precision (1 in ...)	-
N_B	Adjusted northing B	m
E_B	Adjusted easting B	m
N_C	Adjusted northing C	m
E_C	Adjusted easting C	m
N_D	Adjusted northing D	m
E_D	Adjusted easting D	m

Method and standards

Compass rule.

Assumptions and limits

- Closed loop traverse returning to A; angles already balanced.

References

Compass (Bowditch) rule

Report details

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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/compass-rule-traverse-adjustment

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.