

CVEN303 ENGINEERING MEASUREMENT

Lecture 7 – Balancing Traverse (Ch. 7)

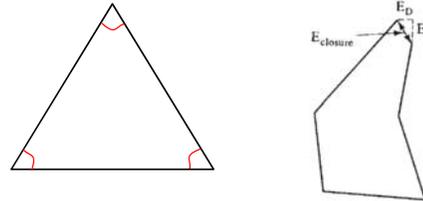
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Properly Closed Traverse

- Summation of traverse interior angles agree with polygon rules
- Traverse ends exactly where it started (ending point = starting point)



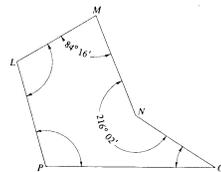
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Checking the Measurements of Interior Angles

For closed traverses,
 $\Sigma \text{ Interior } \angle = (n-2) * 180^\circ$
where n = number of angles in the traverse

Error = $[\Sigma \text{ Measured Interior } \angle] - [(n-2) * 180^\circ]$
Tolerance = $(\text{instrument accuracy}) * \sqrt{n}$

If error \leq tolerance,
Correction = $\pm(\text{Error} \div n)$, or use your
engineering judgment.
If error > tolerance, redo survey.



What should the sum of interior angles in the above traverse be?

Answer: 540°

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Checking the Measurements of Interior Angles-Example

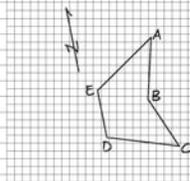
Assume instrument accuracy = $\pm 10''$

Measurement of Interior Angles
Chatoga Farm

NOV 17, 2003
CLEAR, COOL 35°F
ZEISS THEO.#3

J.B.
Red-R

Station	Single	Double	Avg
A	36°44'20"	73°28'40"	36°44'20"
B	225°51'50"	43°43'50"	225°51'55"
C	51°40'20"	103°20'50"	51°40'25"
D	111°06'30"	222°13'00"	111°06'30"
E	124°36'40"	240°13'20"	124°36'35"
			= 530°55'45"



Answers: Error = $\pm 15''$, Tolerance = $\pm 22''$

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Balancing Traverse Angles

- Uniform correction = $\pm(\text{Error} \div \text{number of measured } \angle)$
- Subjective correction: Add or subtract from one or more measurements based on your judgment of where error occurred.
- In our previous example, we can add 3" to each measurements (total would be 15")

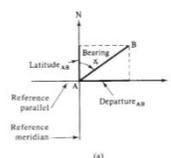
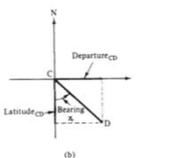
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Balancing a Traverse

- We learned how to balance traverse angles.
- Next, check the locations of starting and ending points of the traverse. To do this, we need to compute the following for each side of the traverse:
 - Latitude
 - Departure
 - Direction

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Latitude and Departure

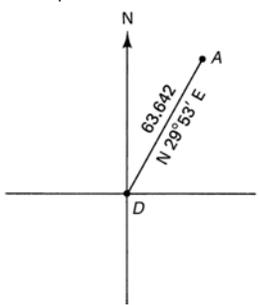
- Latitude of a line: The distance the line extends in a north or south direction
- Departure of a line: The distance the line extends in an east or west direction

Latitude $(\Delta X) = D |\cos B|$
 Departure $(\Delta Y) = D |\sin B|$
 Where, D = length of the line; B = bearing angle
 Lat is (+) in the North direction. Dep is (+) in the east direction.

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Latitude & Departure Example

Compute the latitude and departure for line DA.



Answers: Lat = 55.18ft, Dep = 31.709ft

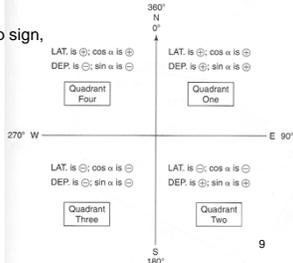
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Latitudes and Departures using Azimuth

Latitude = $D \cos \alpha$
 Departure = $D \sin \alpha$

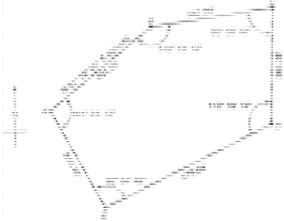
Where, D = length of the line; α = Azimuth

Azimuth angle takes care of lat and dep sign, as shown in this diagram.



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Computing the Directions (Azimuth) of Traverse Sides

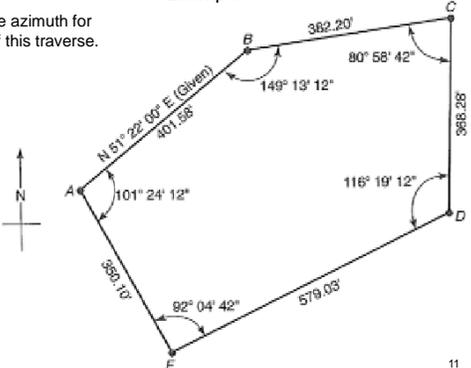


- Clockwise survey:
Az = Azimuth at end point of previous course – Interior angle
- Counter-clockwise survey:
Az = Azimuth at end point of previous course + Interior angle

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Computing the Directions (Azimuth) of Traverse Sides - Example

Compute the azimuth for each side of this traverse.



Answers: Az AB = $51^\circ 22'$; Az AE = $152^\circ 46' 12''$; Az ED = $46^\circ 50' 54''$; Az DC = $1^\circ 10' 06''$; Az CB = $262^\circ 08' 48''$

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