

Name: _____

CIE 272 – Civil Engineering Measurements and Analysis

Surveying Examination

October 17, 2008

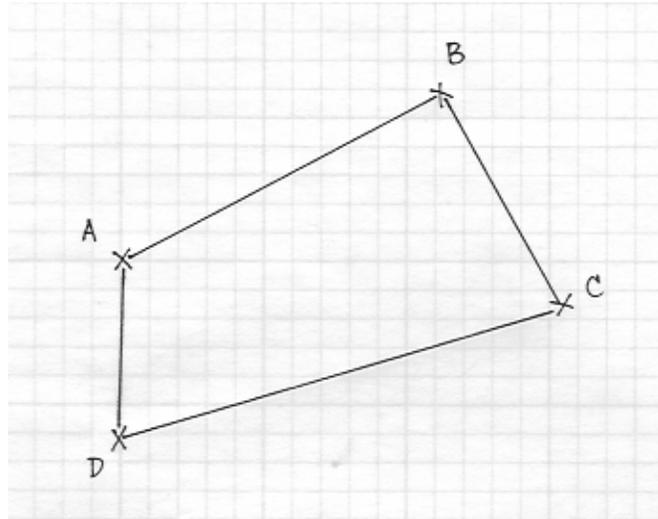
1. **(20 Points)** A surveyor has measured the interior angles of the closed polygon shown in the figure at right, with the following results:

$$\angle A = 123^\circ 12'$$

$$\angle B = 92^\circ 46'$$

$$\angle C = 75^\circ 37'$$

$$\angle D = 68^\circ 33'$$



- (a) **(10)** Compute the angular misclosure and adjust the angles as necessary.

- (b) **(10)** The surveyor sets up a theodolite over point **B**, sights a range pole at point **A**, and zeroes the horizontal angle. He then plunges the scope and turns the theodolite to the left until it is aligned on a pole at point **C**. What angle should he read?

2. **(15 Points)** A total station was used to determine the elevation of a new benchmark. With the prism at 6.00 ft, a backsight reading of -4.15 ft. was made on a benchmark with known elevation of 1589.44 ft. For the foresight on the new marker, the prism was raised to 10.70 ft. and the foresight reading was -24.69 ft. What is the elevation of the new benchmark?

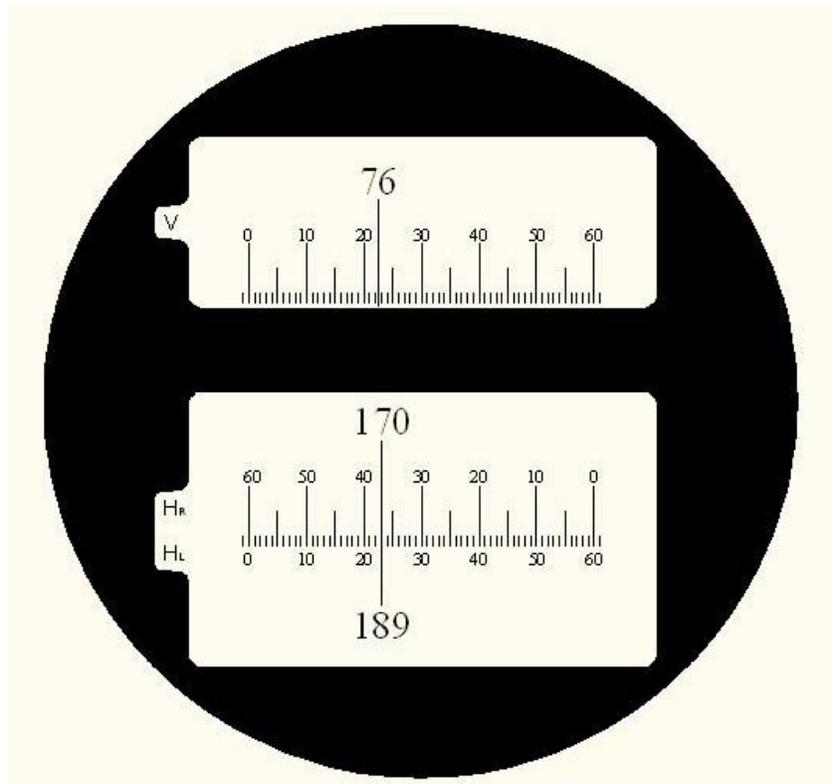
[**Note:** Negative readings indicate that the prism was below the scope.]

3. **(15 Points)** Profile elevations for three stations on a road project are given in the table below.

Station (ft.)	Elevation (ft)
6 + 00	900.205
27 + 46.14	989.164
50 + 00	936.842

Determine the ground slope between station 27+46.14 and 50+00. Express your answer in % **and** in degrees/minutes.

4. (20 Points) A CIE 272 surveying student used the **double-angle technique** to measure the interior angle of a traverse. She turned the instrument **counter-clockwise** while making the measurement. When she completed the work, she saw the scales below in her theodolite:



(a) (10) What should she report in her field book as the angle for this corner of the traverse?

(b) (10) If she measures the deflection angle for this corner, what angle should she find?

5. **(30 Points)** An open traverse is defined as follows:

- Starting at **A**, proceed N $57^\circ 18'$ W 400.00 ft. to **B**.
- Turn left $23^\circ 51'$ and proceed 600.00 ft. to **C**.
- Turn left $72^\circ 31'$ and proceed 800.00 ft. to **D**.
- Turn left $31^\circ 18'$ and proceed 600.00 ft. to **E**.

(a) **(20)** Compute the coordinates of points **B**, **C**, **D**, and **E** if the coordinates of **A** are ($x_A = 2000.00$; $y_A = 1000.00$).

(b) **(10)** If an instrument is set up on point **C**, what is the angle to the right between line **CB** line **CD**?

Extra Credit (10 Points)

[Note: You do not need to know anything about GPS to answer this question.]

A surveyor set up a compass over point **P** and directed an assistant to mark a point **Q** that was directly magnetic north from **P**. Later, the surveyor used a high-quality GPS system to determine the geodetic coordinates of **P** and **Q**:

$$(x_P = 2118.745 \text{ m} ; y_P = 8891.087 \text{ m})$$

$$(x_Q = 2051.073 \text{ m} ; y_Q = 9787.604 \text{ m})$$

What is the magnetic declination at **P**?