

Name: _____

CIE 272 – Civil Engineering Measurements and Analysis

Surveying Examination

October 19, 2009

1. **(15 Points)** A surveyor sets up a total station approximately halfway between a benchmark (El. 1138.78 ft.) and an unknown point. The surveyor reads a vertical distance (VD) of -3.56 ft. on a prism with height 11.09 ft. held at the benchmark. The surveyor then reads a vertical distance of +89.27 ft. on a prism with height 5.12 ft. held at the unknown point. What is the elevation of the unknown point?

2. **(40 Points)** A surveyor has measured the interior angles of the closed polygon shown in the figure at right, with the following results:

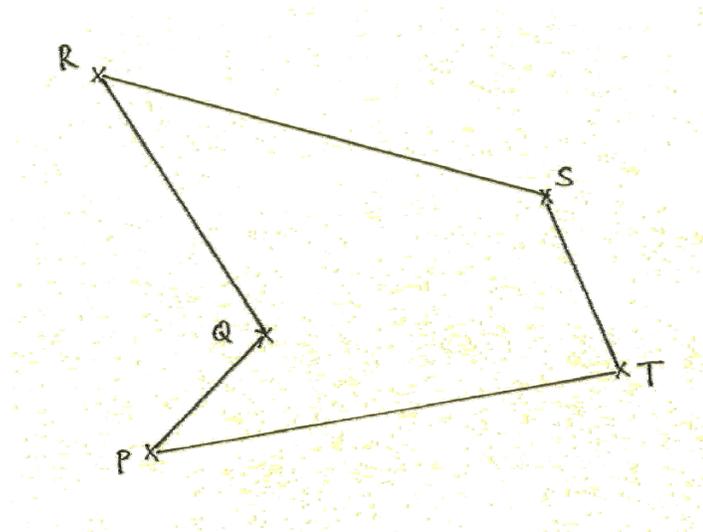
$$\angle P = 37^\circ 31'$$

$$\angle Q = 255^\circ 46'$$

$$\angle R = 41^\circ 49'$$

$$\angle S = 128^\circ 07'$$

$$\angle T = 76^\circ 53'$$



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

- (b) **(10)** The surveyor sets up a theodolite over point **Q**, sights a range pole at point **P**, 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 **R**. What angle should he read?

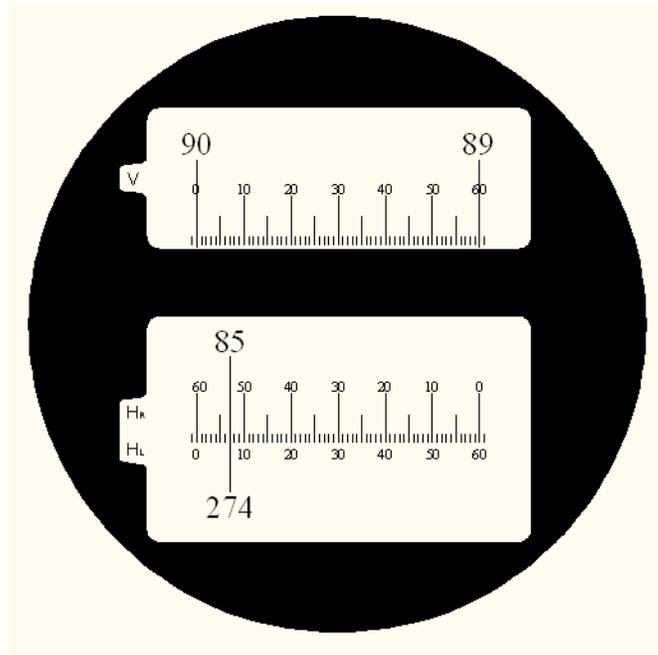
(c) **(10)** The bearing of line **PQ** is known to be N 52° 29' E. Determine the bearing of **QR**.

(d) **(10)** The magnetic declination in the region of this property is 9° 18' East. What is the magnetic bearing of line **PQ**?

3. (25 Points) Measurements for a closed-loop traverse are given in the table below. Compute the length and azimuth of the missing side **BC**.

Side	Azimuth	Length (ft.)
AB	278° 00'	509.22
BC	<i>unknown</i>	<i>unknown</i>
CD	68° 30'	796.22
DA	81° 45'	427.88

4. **(20 Points)** A CIE 272 surveying student has leveled her theodolite. After zeroing the horizontal angle and aligning on her back line, she turned the instrument **clockwise** to the forward line. She saw the scales below in her theodolite:

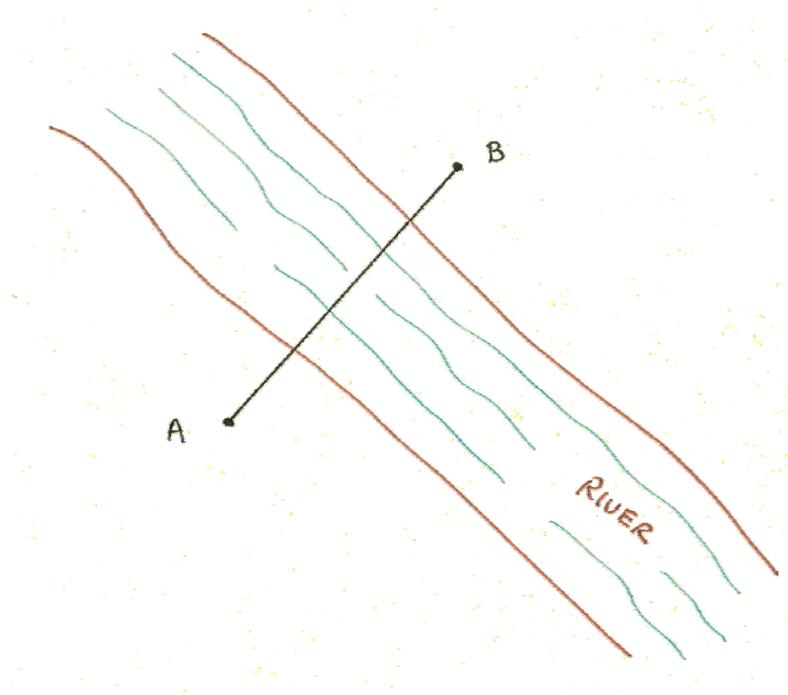


(a) **(10)** What value should she record for this angle?

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

Extra Credit (10 Points)

You need to measure the distance from point **A** to point **B** across a river. You have only a theodolite and a tape. Explain, using the figure below, how to measure the required distance **without crossing the river**.



[P.S. Julius Caesar encountered exactly this situation in 56 BC when, frustrated by incursions into Gaul by the Germanic barbarians, he decided to cross the Rhine River to attack. His engineers constructed a wooden bridge with a span of approximately 250 meters in 10 days (!). In so doing, he became the first Roman commander to cross into Germania. He did not stay long, content to make the point to the barbarians that they were not beyond the reach of Roman power.]