

NAME _____ KEY _____ Score _____

CEEN 113-1 Engineering Measurements Dr. Nelson Exam #1 Fall 1999

OPEN BOOK (not notes and homework) - CALCULATORS REQUIRED

Any answer requiring an angle should be given in Degrees-Minutes-Seconds format.

2 HOUR TIME LIMIT (10 Minutes grace is given before computing a penalty, yes this really makes it a 2 hr 10 minute time limit, but after that the penalty is stiff) - Penalty is 1 pt per 2 minutes over.

You have approximately 6 minutes per problem (some will take a little longer, others much shorter), so be sure to pace yourself. If you can't answer a problem right away move on so that you can be sure to answer as many problems as possible. For the most part these problems are all or nothing so be careful. Clearly identify your answer, but I still suggest you show your work.

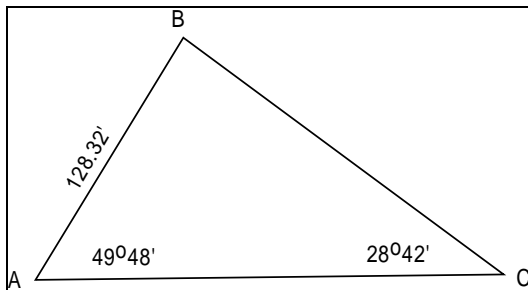
1. A surveying crew tapes distances with an estimated probable error of ± 0.015 ft for each 100-ft distance. What estimated total error should be expected if the total measured distance is 3700 feet?

Answer = 0.091 ft.

2. A distance of 932.27' is measured with a 100' tape that has a calibrated length of 100.03 ft. What is the corrected distance?

Answer = 932.55 ft

3. Find the length of side AC?



Answer = 261.84 ft.

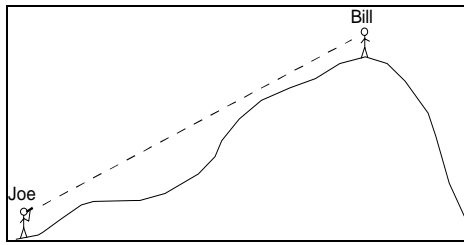
4. You set up a semi-station on the Marriott center floor and measure a vertical angle to the front of the basketball rim of $15^{\circ}38'12''$ (a basketball rim is 10 feet off the floor). If the HI of your semi-station is at 5.21 feet, how far away from the front of the rim (feet) are you?

Answer = 17.11 ft.

5. After zeroing your micrometer while sighting at point A you turn an angle of $112^{\circ}38'20''$ to point B. You then repeat this measurement seven more times (for a total of eight) and the final reading is $181^{\circ}38'48''$. What is the most correct measurement of the angle from A to B?

Answer = $112^{\circ}42'21''$

6. Using a clinometer, Joe measures a 37° vertical angle to Bill standing on top of a nearby hill. It took Bill 587 paces to get to the top of the hill and 575 paces coming back. If Bill's calibrated pace is 2.63 ft/pace, what is the approximate height of the hill Bill climbed from where Joe stands?



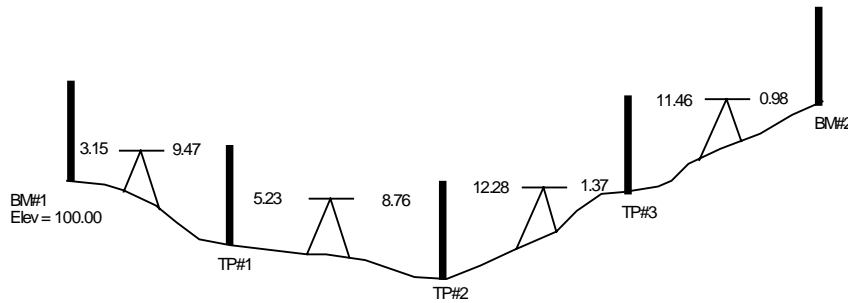
Answer = 920 ft.

7. Complete and check the level notes shown. All units are in meters.

Point	B.S.	H.I.	F.S.	Elev.
BM #1	5.36			1620.86
			7.44	
			5.66	
TP #1	7.40		3.49	
			2.86	
TP #2	3.68		6.73	
BM #2			2.12	

Elev BM#2 = 1624.96

8. Set up and complete the differential level notes for the information shown in the accompanying illustration. All backsights are shown to the left of the instrument diagrams and foresights are shown to the right. All units are feet.



Elev at BM#2 = 111.54

9. During a level circuit you cover a distance of 8732.44 feet and have a vertical error of .135 feet. What classification is your level circuit survey according to the equations in section 7-11 of your book?

Answer = Rough

You are using stadia to make measurements (with a stadia interval factor $K=100$). The upper stadia hair has a reading of 6.32 feet and the lower stadia hair has a reading of 2.82 feet on the distant rod. The zenith angle to the center cross hair measures $97^{\circ}32'48''$ and the center cross hair is on 4.57 feet. (Hint: see the equations on page 249 of your text)

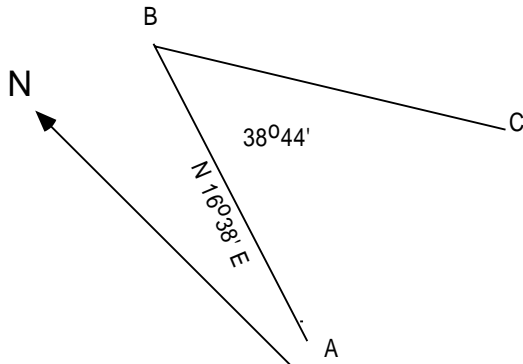
10. What is the horizontal distance between instrument and rod?

Answer = 344

11. What is the difference in elevation between the ground under the instrument and the ground at the base of the rod (the instrument height is 5.68 ft.)?

Answer = 44.5

12. The bearing of line AB and the interior angle at B is given in the diagram below. What are the bearings BA and BC?



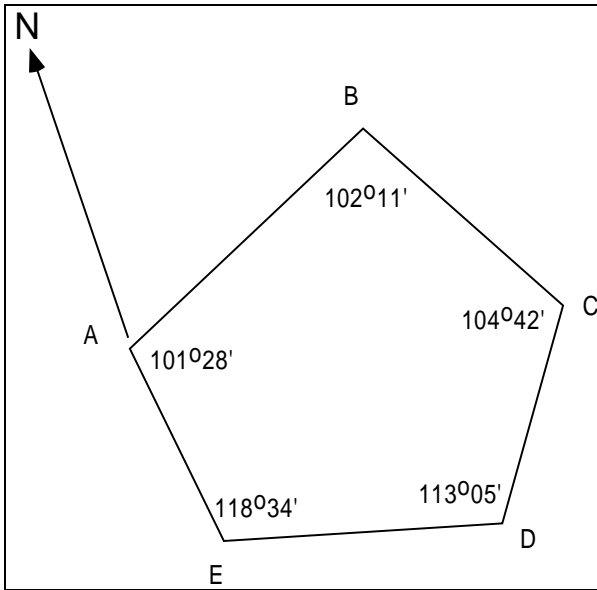
Answer = S22°06'E

13. The magnetic bearing of an angle is $S88^{\circ}16'W$ and the magnetic declination at the time the angle was measured is $2^{\circ}30'$ East. What is the true bearing of the angle? If the magnetic declination changes to 1° West, what will the magnetic bearing be?

True Bearing = $N89^{\circ}14'W$

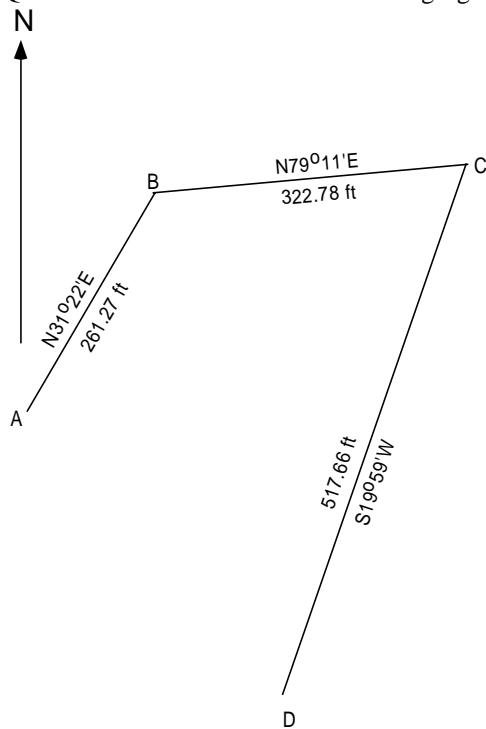
New Magnetic Bearing = $N88^{\circ}14'W$

14. If the Azimuth of line AB is $75^{\circ}27'$, compute the azimuth of CD.



Answer = $228^{\circ}34'$

Questions 15 to 18 refer to the following figure



15. What are the interior angles at B and C?

Answers = $132^{\circ}11'$, $59^{\circ}12'$

16. Compute the Latitudes and Departures for AB, BC, and CD

Lat AB=223.09, BC=60.58, CD=-486.49

Dep AB=135.99, BC=317.05, CD=-176.91

17. Compute the latitude and departure for DA (there is no need to balance departures here, you can't because it is not a closed traverse)?

Answer Lat = 202.82, Dep = -276.13

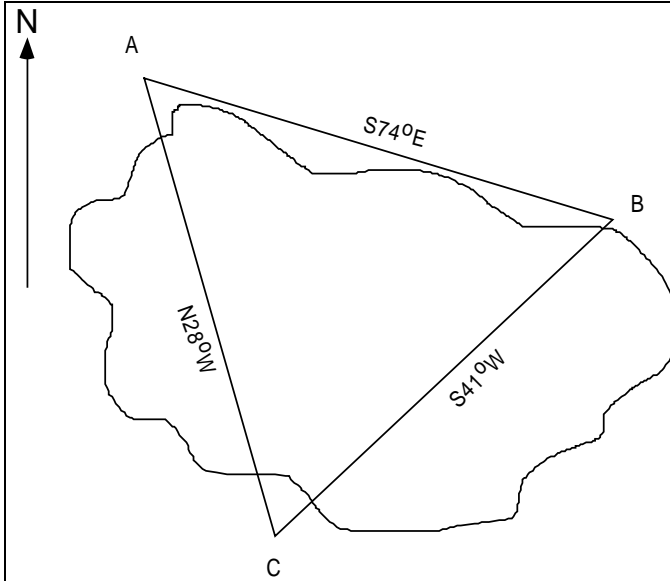
18. What is the bearing of DA?

Answer = $N53^{\circ}42'W$

19. What is the precision of a traverse if your linear error of closure is .63 feet and the perimeter of the traverse is 1382.61 feet?

Answer = 1/2200

20. Given the bearings AB, BC, and CA shown on the diagram below, and that you measure the distance AB to be 100 yards, find the distance (in yards) across the pond from B to C?



Answer = 77 yards