ES302 Introduction to the Triangulation and Leveling Methods **Name_____**

Ver 3.0 updated spring 2017

Triangulation is the process of locating an unknown position by reference to three known points. This simple technique forms the basis of satellite-based Global Positioning System (GPS) technology.

Task 1: take the attached map, brunton compass, and protractor to the middle of the WOU parking lot, immediately northwest of the "DeVolder" building.

Task 2: Check your compass to make sure the magnetic declination is properly set. Examine the base map and orient yourself. Visually find the water tower on Cupid's Knoll, the northeast corner of the stadium grand stand, and the northwest corner of the "Cottage" building. Locate these positions on your base map.

Task 3: From your unknown position, determine azimuth bearings to and from each of the three known points, record your data below:

Known Location	Azimuth From Unknown Position	Reverse Azimuth From Known Points
Water Tower/Cupid's Knoll	_____	_____
NW Corner Stadium Grand Stand	_____	_____
NW Corner Cottage	_____	_____

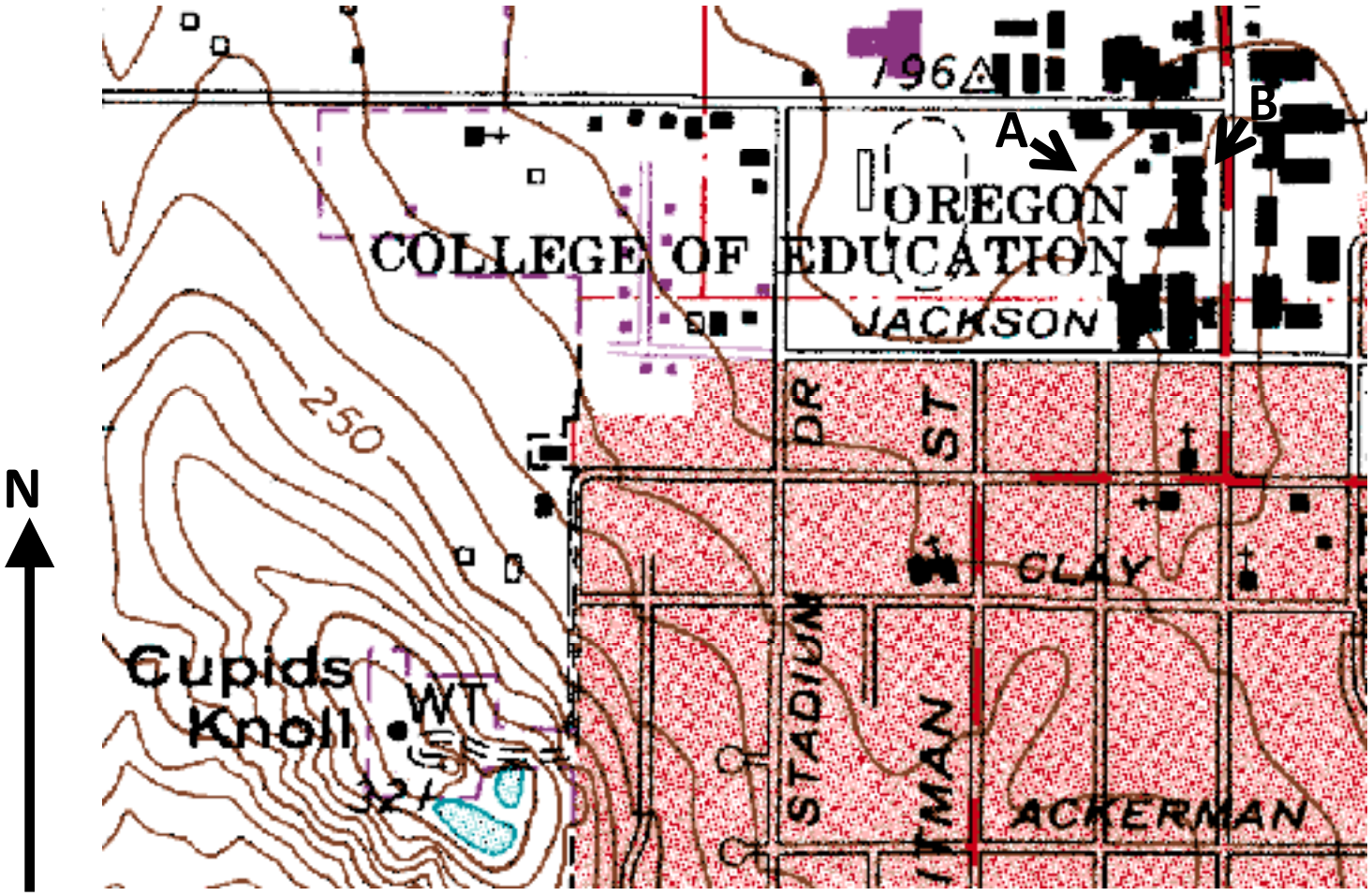
Task 4: Using the protractor and base map, draw the three "reverse azimuth" lines from the known points. Plot your unknown position with a point where the three lines intersect.

Task 5: Using the 1:24,000 scale Monmouth 7.5-minute Topographic map in the lab, determine the fractional scale of your attached base map. Show all of your math work.

Task 6: Using your GPS device, locate your present position in both Longitude-Latitude (decimal degrees) and UTM Zone 10 N meters (Datum NAD1927 Conus)

Longitude _____ Latitude _____

UTM Easting _____ UTM Northing _____



Measuring Elevation Differences Using Compass Leveling

Examine the WOU base map above, locate points A and B. Point A is located on the parking lot pavement immediately west of the Campus Rose Garden / Fountain, behind the Cottage. Point B is located on Monmouth Ave., east of Todd Hall, between Bellamy Hall and Todd Hall.

Read the leveling methodology pasted to the right, examine the figure. Use your Brunton clinometer and the leveling method to determine the elevation difference between Pt. A and Pt. B. Make sure to set your clinometer to "zero" degrees.

Occular Height _____ (ft)
Occular Height _____ (m)
No. of Leveling Shots between Pt. A and B ____
Estimated Remaining Vertical Dist _____ (ft)

Total Elevation Difference _____ (ft)
Total Elevation Difference _____ (m)

2–6. Using the Brunton Compass as a Hand Level

The Brunton compass is converted to a hand level by setting the clinometer exactly at 0, opening the lid 45°, and extending the sighting arm with the sighting point turned up. The compass is held in the same way as when measuring vertical angles. It is tilted slowly until the mirror image of the tube bubble is centered. Any point lined up with the tip of the sighting arm and the axial line of the sighting window is now at the same elevation as the eye of the observer. By carefully rotating the entire instrument with a horizontal motion, a series of points that are at the same elevation can be noted.

Difference in elevation by leveling. The difference in elevation between two points can be measured by using the Brunton compass as a hand level. The measurement is started by standing at the lower of the two points and finding a point on the ground that is level with the eye and on a course that can be walked between the

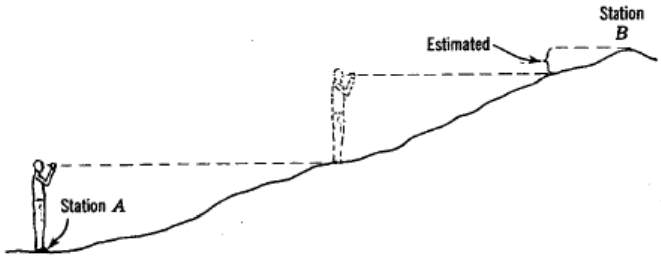


Fig. 2–6. Measuring the difference in elevation between two stations by using a hand level and counting eye-level increments.