Wilderness Navigation Workshop: Student Problem Set

Student Name: _____ Date:_____ Instructor Name(s): _____

A completed worksheet is required at the end of the night for credit. Be sure to learn your instructor's name.

7:00 pm _____

The Day Lead will brief you on the evening's activities and your preparation for the field trip. At some point your instructor will demonstrate the proper method for taking or following a bearing in the field with the compass held at arm's length. Compasses with adjustable declination are **required** for the field trip. Your instructor will tell you if the compass you have is suitable for the field trip. The Day Lead will pause for several table work group exercises with your instructors.

#1 Identify at least Summit, Ridge, Valley and Pass/Saddle natural topographic features.

#2 Identify at least Hwy 2, Paved Road, Dirt Road, Trail, Power Line and RR Tracks cultural features.

#3 Measure and plot bearings on your map using your compass as a protractor.

#4 Find Datum and Zone, then determine UTM Coordinates (Easting and Northing).

8:00 pm _____

Working **individually** (not as a group) read the narratives and answer the following questions by using the USGS 7.5' Baring quadrangle, NAD 27.

1. You and a group of friends have planned an overnight trip to Paradise Meadow and Eagle Lake via the Barclay Lake Trailhead. The WTA website instructions include "head east on US-2 to the town of Baring. Turn left (north) on 635th Pl NE" (a forest road in Baring). You stop at the town of Baring, set an altimeter, then drive a little over 2 miles on the forest road to the end of the pavement. You continue on the dirt road for 2.2 miles as it heads north to Barclay Creek and then east along Barclay Creek to find the trailhead where the old Barclay Lake Trail touches the road at an elevation of 2200 feet. The road past this point is overgrown and closed.

   Q1.Mark the trailhead on the map with an "X". Show it to your instructor.

2. On the trail to Barclay Lake your party encounters some grandparents taking young children up the trail. They ask you how much farther it is to the lake. One person pulls out a compass and shoots bearings to Peak 5842 (344°) and 6113 (42°). Another person gets GPS UTM NAD27 coordinates Zone 10, 616450E, 5293950N. Use one bearing and the trail shown on the map to get a position. Verify with the second bearing or GPS coordinates.

   Q2. Where are you? How much further is it to Barclay Lake?

3. The group has reached the structure at the east end of Barclay Lake. After a break, you get ready to ascend to Paradise Meadow.

   Q3a. What are two routes from the lake to the meadow that a mountaineer might follow (draw paths on the map)? What handrail feature(s) and terrain features shown on the map would you follow? Discuss your routes with a partner and with your instructor.

   Q3b. What locations would you save in your GPS so you can easily find your route back to Barclay Lake if it's foggy or dark?

4. You arrive at Eagle Lake at the location of the structure and set a GPS waypoint. You want to confirm the waypoint is correct.

   Q4. Using the map, find the UTM coordinates.

5. The next morning you prepare to break camp and scramble to the summit of Mt Townsend. Since your altimeter elevation may have drifted overnight due to barometric changes, you want to reset it to the known lake elevation.

   Q5a. What is that elevation?

   Q5b. What is the elevation gain from the camp to the summit?

Your instructor will at some point take your group to look at the panoramic photograph (somewhere in the room on a table) taken from the outlet creek at the southeast end of Eagle Lake. It covers 270º. You can see Merchant Peak and Townsend Mountain. Try to identify each peak and saddle by comparing the photo to the map.

6. Heading towards the ridge line from Eagle Lake you realize being in the forest has reduced the brush, but also reduced your view. Your altimeter gives an elevation of 4190 feet and your compass shows the bearing straight downhill is 168 degrees.

Q6. Approximately where are you? Mark with an "X" and describe in relation to a nearby terrain feature.

7. Once you gain the ridge you find clouds have rolled in and you can see about 200 ft. You check your GPS and the position now shows you at NAD27 Zone 10, 618750E, 5295300N. Your altimeter elevation is 4795 feet and the bearing along the ridge line is 75º. You want to set a GPS waypoint for your later descent.

Q7. Using the altimeter and compass info, is the current GPS coordinate likely to be correct and good for a waypoint?

8. The group makes it to the top of Mount Townsend. While you're sitting on the summit, you consider traversing the ridge through the saddle to Burley Mountain.

Q8a. What is the bearing from Mount Townsend to Burley Mountain?

Q8b. How many round trip miles would you have to travel?

Q8c. How much round trip elevation gain would there be?

9. Due to deteriorating weather conditions, the group decides to descend to camp and then return to the trailhead. When you get to Stone Lake you can only see 100 feet in the fog and drizzle, so you reset your altimeter to 3875 feet (3875 ft is the elevation of the lake), anticipating that you may need to use it. You descend from Stone Lake toward Barclay Lake on a direct heading that will take you to the end of the trail (the trail ends at the shelter on the east end of Barclay Lake). Direction finding is difficult in the fog, because you cannot see any landmarks.

Q9. Partway down, you stop to take an altimeter reading in dense fog, and find you are at an elevation of 3195 ft. You want to be sure to intercept the trail, even though you cannot see it. What heading could you follow to ensure that you don't miss the end of the trail in the fog due to cumulative small navigational errors?

If time allows (finish time is 9:25 pm), then learn how to calculate the slope of a hillside using the accompanying handout on calculating slope and try a triangulation problem. [Students who do not have time to complete these problems will not be penalized]. You should be able to visually recognize 30° and 45° slopes.

1. Using the scale at the bottom, determine how long a 400-foot distance is horizontally on the map.
2. Determine how many **dark** topographic lines represent a 400-foot elevation change.
3. Find four distinct locations with 45° slopes (where 400-feet of elevation occur in 400-feet of distance).
4. Find four distinct locations with ~27° slopes (where 200-feet of elevation occur in 400-feet of distance).

Two bonus questions:

5. You are on the ridge headed to Mt Townsend in the fog at a local rocky summit. Your altimeter gives an elevation of 5520 and the bearing of the ridge line is 120 degrees. You decide to check your position with your GPS as well. Your GPS coordinates are NAD27 Zone 10, 619700E, 5295160N. Where are you according to your altimeter and compass? Does your GPS confirm that?
6. Where are you if you have the following bearings: Gunn Peak 350º, Peak 5831 at 46º, Mt Baring 160º.

You must get your instructor to fill out your grade card <u>before</u> 9:30 pm and sign it. Be sure to print your name (make sure it is legible) and your email address (if you have one). It is the student's responsibility to turn the completed grade card in for credit before leaving (there will be a box near the door). No grade card, no credit. You may keep this sheet and continue to work on it.

Read the Pre-Trip Plan: Wilderness Navigation Fieldtrip sheet before you leave. Complete at home and bring a hard copy with you to the field trip to satisfy the "Prepares for class or outing—completes tasks" requirement.

UTM Coordinate System

UTM=Universal Transverse Mercator, a worldwide system for exact determination of location.

Grid is not to scale. Squares are 1 km (1000 meters) per side..

Zone 10   **Zone 11**
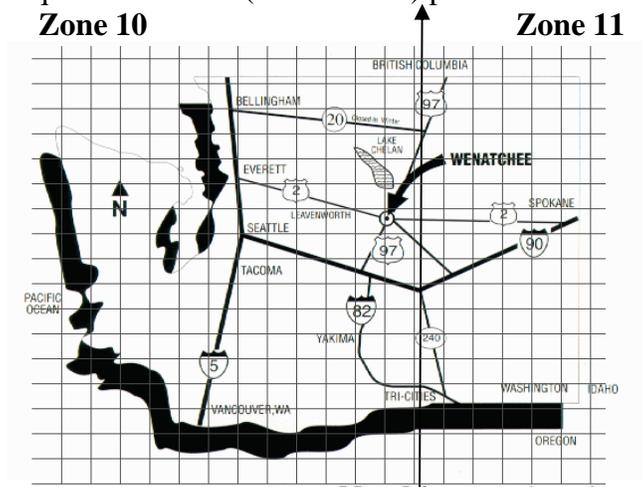
Easting numbers increase as you move East. **Northing** numbers increase as you go North. The last 3 digits, not given on the map, are 000. These last three digits can be used to estimate location between the lines. For example, halfway from one Northing line to the next is 500. There are simple plastic overlay devices to give even more accurate numbers.


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A =   E 612 500
      N5291 500

B=    E 611 500
      N5290 200

C=    E 610 200
      N5289 750
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All are Datum 1927 (NAD27), Zone 10
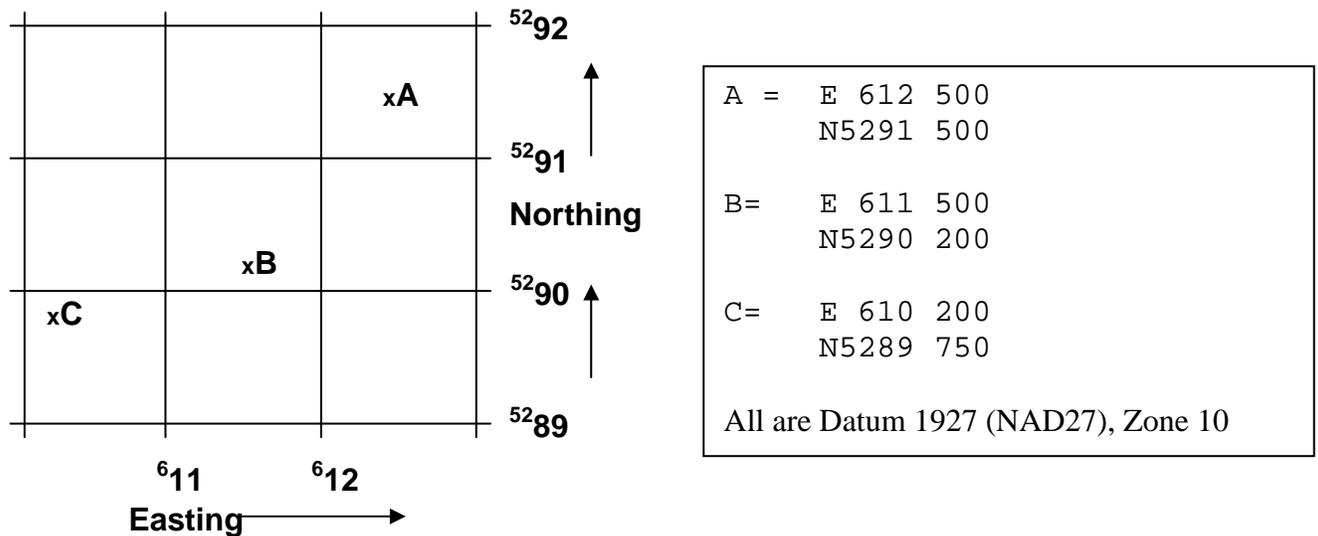
UTM can be used to identify a location for Search and Rescue. To identify your location, give information in the following order

1) Datum (usually NAD27 in USA)
2) Zone (10)
3) Easting
4) Northing

UTM is used increasingly in guidebooks for hiking and climbing to describe waypoints on routes and exact locations of landmarks.

UTM coordinates can be used to navigate with a GPS.

Estimating Slope
on a Topographic Map

Rules of thumb:
- On a 30 ° slope, avalanche danger is significant
- Most 45 ° slopes are technical terrain (rope use likely)

1000   0   1000   2000 FEET

'MER 30-Jan-2001

200 feet

400 feet

2:1 slope = ~27°

~27°

200 feet of elevation (gap between dark contours)

400 feet measured on map

1:1 slope = 45°

45°

200 feet of elevation (gap between dark contours)

200 feet measured on map