Assignment 2 (Weeks 3 and 4)

INTRODUCTION

In this assignment you will be exploring practical use of the essential skills that have been covered in this course in Weeks 3 and 4. These skills include:

- Essential Skill #5: Compass use,
- Essential Skill #6: GPS,
- Essential Skill #7: Slopes and their measurement, and
- Essential Skill #8: Soils

The assignment is laid out as a series of tasks below, these will increase in complexity as you progress. Students are encouraged to complete as far as possible given their availability of time and access to sites to do the work.

This assignment is not mandatory to complete the program and will not be given a grade, but we invite you to submit whatever tasks you complete for comment and suggestions from an experienced environmental professional.

TASKS

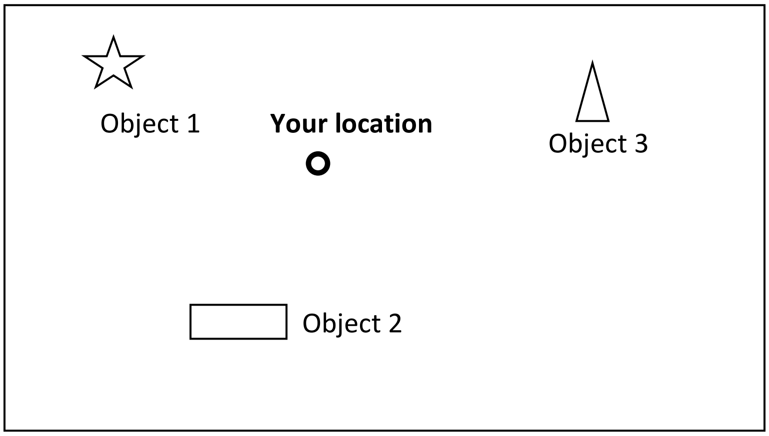
1. Compass Use

Three of the most fundamental skills with a compass are to: (1) determine a front-bearing, (2) determine a back-bearing, and (3) walk a bearing. These tasks will give you practice with these.

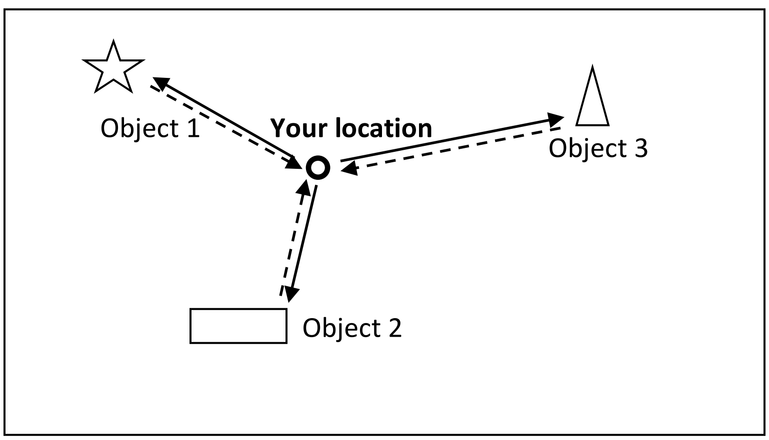
> **Note:** a front bearing is often called a front-sight and back-bearing a backsight; the terms are interchangeable.

Task 1: Determining front-bearing and back-bearing

Go into a field or a yard or a park. In a pinch this activity could be done within the large room of a house. You are looking for an area with three items fairly close together (that is, within 20-50 m of each other), for example a park bench, a car, and a tree. Select a location in the centre of these three items, as shown below.



1. Mark your location on the ground so you can return to it. Place a rock where you are standing or push a stick into the ground, anything to make it easy to re-find your central location.
2. From your location determine the compass bearing to each object (solid arrows in figure below). Record these bearings and what the object is. An example table is provided below to show you one way of organizing these measurements.
3. For each object that you shoot on, walk from the central location to the object, counting your paces or measuring the distance). From the object, shoot a back-bearing (dashed arrows in figure below) back to your central location. Record these back-bearings.



Object	Front bearing	Back-bearing	Distance (m)
1/ Park bench			
2/ Car (Ford Focus)			
3/ Maple tree	70 º	250 º	35 m

Comparison of front-bearing and back bearing

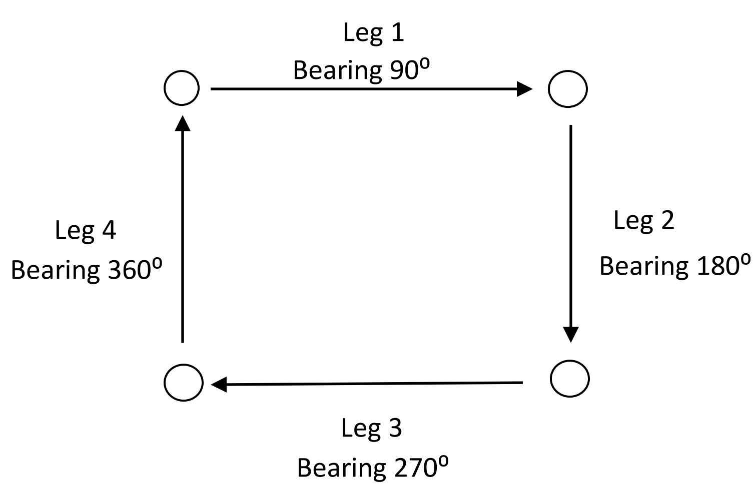
The back-bearing is used to assess whether, as you walked from your original location to the object, you stayed exactly on the bearing that you had shot (that is, you did not "drift off the line"). If you walked a straight line on the precise bearing that you shot then the back bearing will be 180^{o} different from the front bearing. To compare back-bearing and front bearing:

> <u>If the front bearing is <180^{o}</u>, subtract the front bearing from the back bearing. In the example of the table, the maple tree front bearing was 70^{o} and back-bearing 250^{o}. Therefore, $250^{o} – 70^{o} = 180^{o}$. This shows that I have walked a straight line from my original location to the maple tree and am still on my original bearing.
>
> <u>If the front bearing is >180^{o}</u>, subtract the back bearing from the front bearing. In the example above, assume I determined the front bearing to the car (object 2) was 190^{o} and back-bearing 20^{o}. Therefore, $190^{o} – 20^{o} = 170^{o}$. Note, if I was perfectly on the line this would have resulted in 180^{o}; instead it is telling me that I drifted off the line by 10^{o}. My back-bearing should actually have been 10^{o} ($190^{o}-10^{o} = 180^{o}$) if I had remained directly on the line of my front bearing.

Compare your front and back bearings that you measured. Do they indicate that you walked straight on the bearing (i.e., work out to 180^{o}) or that you drifted off the line (i.e., either less than or greater than 180^{o})?

Task 2: Walking a bearing: the four-legged closed traverse

A closed traverse is simply a closed shape and here we will be only doing four legs, so it is a four legged closed traverse as shown in the figure below.



To complete a four legged traverse, you will need to do it in a large field (meadow, playground, soccer pitch, baseball field, large yard, etc.).

Within the field select a starting point and mark it somehow, by placing a couple of rocks, or a piece of clothing, or push a stick in the ground; whatever you can do to **mark your starting location. This is very**

important and we want to know precisely where we started. **For this exercise, try to walk as straight as you can along each bearing and ensure you go exactly 30 paces (or m) on each leg**. From your starting location:

1. Set your compass to a 90º bearing and walk in that direction 30 paces (or measure out 30 m). When you get to the end of 30 paces (or m), stop. This is Leg 1.
2. Set your compass to a 180º bearing and walk in that direction 30 paces (or measure out 30 m). When you get to the end of 30 paces (or m), stop. This is Leg 2.
3. Set your compass to a 270º bearing and walk in that direction 30 paces (or measure out 30 m). When you get to the end of 30 paces (or m), stop. This is Leg 3.
4. Set your compass to a 360º bearing and walk in that direction 30 paces (or measure out 30 m). When you get to the end of 30 paces (or m), stop. This is Leg 4.

Now, as you finished you may find that you are not exactly at your starting location, but are likely offset a bit from where you started (unless you consciously aimed for your starting location when you walked Leg 4). This difference between where you actually ended up and where you started is known as the **closing error**. Pace or measure this difference between where you ended and where you started.

My closing error was _______________________________paces (m)

Closing error is almost inevitable as we drift slightly off of our bearing or the distances measured on each leg differ slightly. The error of our bearing walk or length of leg accumulates over the entire travers and gets magnified. The more legs, the more turns, and the more complex the topography, the greater the error introduced.

2. GPS

There are no field exercises for GPS use. Instead, the exercises are in Essential Skill #6 of the online course.

3. Slopes and Their Measurement

Task 3: Determine stride length on a slope

Stride length is different when walking uphill or downhill compared to when you are walking on a flat piece of ground. It is worthwhile to know how your stride length changes on a slope relative to flat ground. For this activity you'll need to find a slope that you can walk up and down; this can be a gentle rise or a steep hill, whatever you have in your neighborhood.

Using the same method as we did in Assignment 1 for finding your average stride, follow the same steps to determine your average stride on a hill slope. You may walk either up slope or down slope to complete this task. To remind you, the instructions from Assignment 1 are repeated here in the context of doing this on a slope.

To determine stride length on a slope:

i) On a slope measure and mark out a straight line 30 m long. Mark the start and end by placing an object there (sticks in ground, rocks, even pieces of litter).

ii) Walk the distance of the line and count each step. Record the number of steps in your notebook.

iii) Repeat this two more times for three trials. You will have three separate measurements of the number of steps to walk 30 m

iv) For each of the three trials, calculate your stride length as: distance ÷ number of steps taken. In this exercise, if you measured 30 m, your stride will be 30 ÷. number of steps.

v) Determine the average (mean) of the three trials by adding all three stride lengths you calculated in step (iv) and divide by 3. This is your average stride length on a hill slope.

On flat ground my average stride length is: ______ metres per step (from Assignment 1)

On a slope my average stride length is: ______ metres per step

How does your stride length on a slope compare with that stride length of level ground?

4. Soils

To complete the two tasks in this section you will need to find an area of exposed soil to sample. For example, where a road has cut through a roadside, a river has eroded a bank, a tree has uprooted, along a ditch line exposing the soil.

You will also need to bring a bag or jar with you to collect a soil sample to bring back to your.

Task 4, hand texturing, is to be done in the field; Task 5, the Jar Test, will require you to take a soil sample and complete the test at home.

Task 4: Hand Texturing

While in the field, complete the following tests with the soil sampling using your hands. This will help you estimate the relative abundance of sands, silts, or clays are present in your sample. <u>These tests are described in detail in *Lesson 3: Soil Classification* of Essential Skill #8: Soils.</u>

i) **The graininess test:**
Rub the soil between your fingers and feel how 'grainy' or abrasive is it. The more grainy it feels, the more sand is present in the soil.

Estimate what percent of graininess it is with very grainy being 100% and not grainy at all being 0%
Graininess test (Sand) estimate: _____

ii) **The moist cast test:**
For this test your soil must be moist; if your soil is dry, wet it with some water.
Compress the moist soil in your hand by squeezing it with your fist. If the soil holds together, in a 'cast', toss it gently from hand to hand. The longer the cast holds together, the more clay is present. If you can't form a cast or if it falls apart quickly, there's little clay present.

Estimate what range of clay is present within the soil holding the cast together. A handful of clay would be 100% clay and soil not holding together at all being 0% clay.
Moist cast test (Clay) estimate: _____

iii) **The worm test:**
Roll some moist soil between the palms of your hands and try to flatten it out into a 'worm'. You likely did this with clay or putty as a young child; we're doing the same thing now. The longer and thinner you can make the worm, the more clay it holds. If you can't make a worm, there's little clay present.

Estimate what range of clay is present with the soil holding together to make a long 'worm' being 100% clay and soil not holding together at all being 0% clay.
Moist cast test (Clay) estimate: _____

iv) Now that you have estimates of both sand and clay you can use the soil triangle to estimate the soil classification of your sample.

To do this, use your percentage or range of percent along the edge

reading clay and sand. Follow this in a direct line in from your number until the two lines meet. Where the lines intersect will be the estimated soil type.

Estimated soil type from hand tests:

____

Task 5: Jar Test

While in the field collect some of the soil in a bag or jar to take home with you. Once at home, complete the following steps with your soil sample. This will help you more rigorously measure how much of sands, silts, or clays are present in your sample than the hand texturing, and allow you to classify your soil.

i) Place some of the collected soil from the field into a glass or clear plastic jar, adding enough to fill the jar to at least the 1/3 point. Add water to fill the jar at least ½ to 3/4 full. Put a lid on the jar and shake vigorously. Then give it 4-5 minutes for everything to settle. The organic matter will have floated to the top and you now, using a spoon, can scoop that off the surface of the water.

ii) After having removed the organic material, set a timer for one minute (60 seconds), then re-seal the jar and shake vigorously again. Place on table of flat surface.

iii) Your soil will start to settle to the bottom of the container. When your timer goes off at one minute, use a marker to draw a line on your container at the top of any material that has settled. This are your sands which settle out first and usually entirely within one minute.

iv) Now, at two minutes since you shook up the jar, draw a second line on your container indicating the top of the accumulated material. This level is both the sands which settled in the first minute and the silts that have settled in the second minute. Do you see a clear, distinct border in the material between the sands and silts?

v) Now leave the jar undisturbed for 24 hours (the silts take a long time to settle out). After 24 hours, draw yet another line on your container, this time at the top of all of the material that has settled. This third line marks the top of your column of accumulated sands (first minute), silt s(first two minutes), and clays (up to 24 hours).

To calculate the percentage of each sands, silts and clays from your sample, you will need to measure using a millimeter ruler the following:

1. From the bottom of the container to your first drawn line (height of sands): _____ mm
2. From the first drawn line to the second drawn lines (height of silts): _______mm
3. From the second line to the top of all settled materials (height of clays): _____ mm
4. Lastly from the bottom of the container to the top of all the settled materials (total height of column of soil in jar): _____ mm

To calculate the percentage of each of the sand, silt, and clay, we divide the height of each component by the total height of all of the material that has accumulated, and multiply that value by 100.

For Example:

I have a height of 16mm of sand in my jar and the total measurement of all settled material is 32mm.

From this, my percentage of sand is:

16 mm ÷ 32 mm x 100 = 50%

For your jar:

1. Calculate the total percentage for each sands, silts, and clays from your sample.

   The estimate percentage sand in my sample is:____________________%

   The estimate percentage silt in my sample is:_____________________%

   The estimate percentage clay in my sample is:_____________________%

2. Use the soil triangle above to accurately classify your soil sample.

Based upon my estimate percentages above, I classify my soil as:__________________

Briefly describe how your calculated percentages of sand, silt, and clay, and resulting soil classification using the soil triangle, compare with the jar method. Are they similar or quite different? Which approach do you think provides more accurate results? Which takes longer?

Assignment Submission

Please submit those tasks that you have chosen to complete. We will accept submissions as hand written notes and documents, or typed in a word processing program, whichever you prefer.

You may send these as a word document or take photos of your assignment to submit. Please attach to an email and send to: amazon@nrtraininggroup.com

In the email subject line please include course name and assignment number.
For Example: **EFS Assignment 2**

Please send in your work in **one email only** with as few attachments as possible.