# Advanced Orienteering Post-visit

## Classroom Activities

### Brief Synopsis

***Students will practice using a map to calculate compass bearings, distance, and elevation change. Students will also be able to measure distance by calculating the number of paces between objects on a schoolyard.***

Designed for 5th—8th grade

**Time Considerations:** 30 - 40 minutes per activity

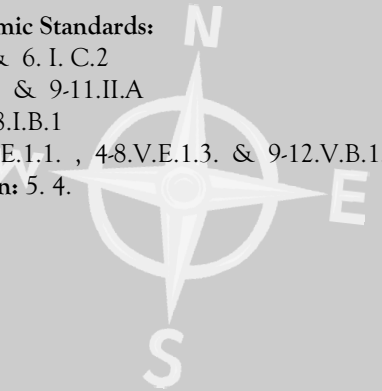
**Materials:** Activity 1: Worksheets, brackets, scissors, pencil; Activity 2: Objects or landmarks, measuring tape, blank paper, pencil

**Vocabulary:** Topographic map, scale, compass rose, parts of a compass (index line, dial, base plate, direction of travel arrow), bearing, elevation, contour lines, declination lines, distance and paces.

**Outcomes:**

1. Students will correctly create a compass model.
2. Students will calculate the bearing between two points.
3. Students will determine the distance and elevation change between two points on a topographic map.
4. Students will measure the distance in paces and feet.

**Minnesota Academic Standards:**
**Science:** 5.I.C.1 & 6. I. C.2
**Math:** 5.I.1 , 5.I.7 & 9-11.II.A
**Language Arts**: 5-8.I.B.1
**Geography:** 4-8.V.E.1.1. , 4-8.V.E.1.3. & 9-12.V.B.1.1.
**Physical Education:** 5. 4.




Revised January 2011

### Set-up

These activities will help reinforce the concepts learned at Eagle Bluff Environmental Learning Center while also enhancing a student's understanding of topographical maps and compasses.

### Activity 1: "Exploring a Topographic Map!"

**Background:** This activity is similar to that conducted during the outdoor portion of the Competitive Orienteering class, except in a written format. The objective of this activity is to calculate the compass bearing, distance and elevation change between two various points on the "Eagle Bluff Competitive Orienteering Map".

**Supplies:** One copy of the "Exploring a Topographic Map!", "Eagle Bluff's Competitive Orienteering Map" and "Compass Model" worksheets to each student, as well as a pair of scissors and one bracket.

**Procedures:**

1. Distribute a copy of each worksheet, scissors and one bracket to every student.
2. Have the students cut out the different compass parts on the "Compass Model" worksheet.
3. Students should attach the dial onto the marked position on the base plate of the compass with a bracket. This should allow the dial to be turned in a circular motion.
4. Students should answer the questions on the "Exploring a Topographic Map!" worksheet by utilizing "Eagle Bluff's Competitive Orienteering Map" and following this sequence of steps:

A. Create a continuous straight line from your starting point to the ending point using the length's edge of the compass. The direction of travel arrow (a.k.a. "Fred") should be parallel to the ending point.

B. Locate the compass rose on "Eagle Bluff's Competitive Orienteering Map". Turn the dial until N (0°) is parallel to the north on the compass rose. Students may use the straight lines inside the dial (declination lines) to ensure these markers are parallel to one another.

C. Record the number located on the index line of the compass. This number is the bearing.

D. Locate the scale on the map and calculate the distance between points. Convert the distance in feet to paces using the key on the map. **Every five feet is one pace.** Record the distance in feet and paces.

E. Calculate the elevation change by subtracting the lower elevation from the higher. The elevation is labeled on the different contour lines. Each line represents a change of 20 feet. Please refer to the teacher tips section. Have the students write down if there was an elevation gain (traveling uphill) or an elevation loss (traveling downhill).

F. Follow each step A-F for every problem on the "Exploring a Topographic Map!" worksheet.

**Discussion Questions**

- In what situations would you rely on these map and compass skills? (navigation, backpacking, wilderness first aid, etc.)
- What characteristics of a map are important for navigation? (elevation changes, landmarks, compass rose, scale, etc.)

## Activity 2: "Outdoor Treasure Hunt"

**Background:** This activity measures the students' comprehension of pacing by requiring the students to accurately calculate the number of paces between objects on a schoolyard. In general, **one pace equals 5 feet**. After determining the distance in paces, students should be able to easily convert the number of paces into feet.

**Supplies:** Available space to use on a schoolyard, measuring tape, objects to place on the schoolyard (Frisbee, soccer ball, school supplies, posts, etc) and/or landmarks on the schoolyard (trees, gardens, buildings, playground, etc)

**Procedures:**

1. Set-up objects or posts on a schoolyard or classroom and create a known path between these items. Carefully measure and record the number of feet between these objects.
2. Without providing students the distance between objects, have the students calculate the number of paces between the objects on the designed path. Students should label each object on a piece of paper and record the number of paces between objects. For instance, the number of paces between the tree and slide was 20, or, tree to slide = 20 paces
3. Have the students then convert the number of paces into feet. For instance, tree to slide = 20 paces, 100 feet

**Extension:**

- An alternative way to run this lesson would be to place students in pairs or groups. One student would hide an object on the schoolyard or choose a landmark and, then measure the distance (in feet) between the starting point and the object. The partner/s would then be responsible in measuring that distance in paces when locating the object. The number of paces should correlate to the distance in feet.

**Discussion Questions:**

- Why would measuring distance in paces be useful? (i.e. smaller digits, easier to remember)
- In what scenarios would you rely on measuring distance in paces? (i.e. retracing your steps, when more advanced tools are not available, measuring a small space (i.e. garden))

## Teacher Tips

- For Activity 1, students may need to refer back to the Competitive Orienteering pre-activity worksheet "Parts of a Compass", which labeled the parts of a compass.
- When calculating the elevation changes on the "Exploring a Topographic Map!" worksheet, it may be easiest for students to write down the elevation represented by each contour line and then calculate the change in elevation. The change between each line is 20 feet.
- The answers for a bearing on the "Exploring a Topographic Map!" worksheet should be within a ten degree range. For instance, the bearing in the first problem would be anywhere between 120-130.
- Activity 2 will take additional time setting up the objects on a schoolyard.
- For additional pre and post activities, visit Eagle Bluff's web page and search under Beginning Orienteering pre and post activities. The topics covered include cardinal directions, reading non-topographical maps and identifying the parts of a compass

## Additional Resources

United States Search and Rescue Task Force. *Compass Basics.* Retrieved from http://www.ussartf.org/compass_basics.htm
Explains how to navigate with a compass and topographic map, applications of these skills, parts of a compass and declination. A more advanced resource.

Sobel, David. (1998). *Mapmaking with Children.*
A comprehensive book to help teachers teach map reading skills to students. Hands on activities for a variety of ages.

Kjellstrom, Bjorn. (1955). *Be Expert with Map & Compass*.
Introductory book to map reading and how to use the compass and map together.

http://earth.google.com
Offers maps and satellite images for regional searches.

# Exploring a Topographic Map!

Name: _____ Date: _____

**Directions:** Fill out the chart below by using the skills learned during your Competitive Orienteering Class.

| Starting Point | Ending Point | Bearing | Distance-Feet | Distance-Paces | Elevation Change | Elevation Gain or Loss? |
|---|---|---|---|---|---|---|
| 1 | 5 | | | | | |
| 5 | 10 | | | | | |
| 10 | 2 | | | | | |
| 2 | 8 | | | | | |
| 8 | 3 | | | | | |
| 3 | 4 | | | | | |
| 4 | 7 | | | | | |
| 7 | 9 | | | | | |
| 9 | 6 | | | | | |

**Additional Questions…**

1. What landmark is close to post #7? _____
2. Each topographic line represents an elevation change of _____ feet.
3. When traveling from post 8 to post 9 would you be walking: uphill, downhill or on flat ground? _____
4. What natural landmarks are available to assist with navigation? _____
5. How could you ensure that you're walking in a straight line between posts?

_____

_____

# Exploring a Topographic Map! (answer sheet)

Name: _____ Date: _____

**Directions:** Fill out the chart below by using the skills learned during your Competitive Orienteering Class.

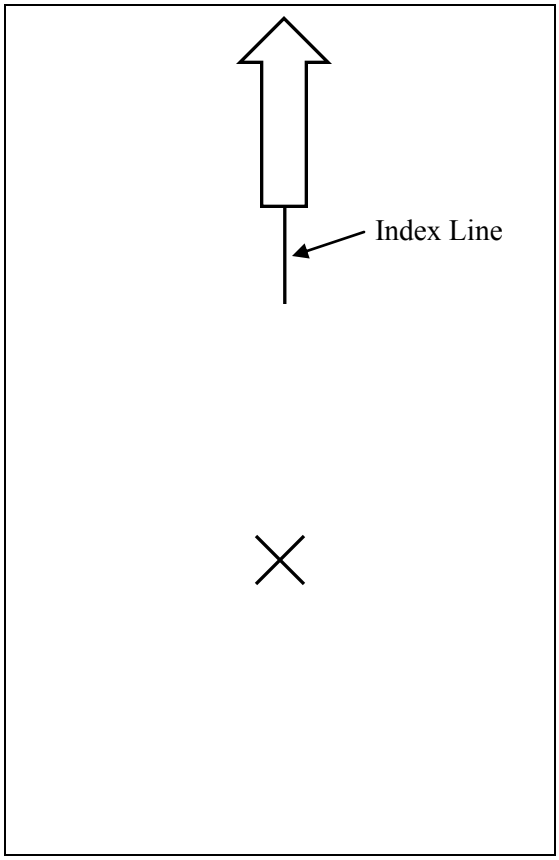
| Starting Point | Ending Point | Bearing | Distance-Feet | Distance-Paces | Elevation Change | Elevation Gain or Loss |
|---|---|---|---|---|---|---|
| 1 | 5 | 124 | 850 | 170 | 40 | Loss |
| 5 | 10 | 130 | 1225 | 245 | 40 | Loss |
| 10 | 2 | 304 | 1800 | 360 | 120 | Gain |
| 2 | 8 | 115 | 1400 | 280 | 100 | Loss |
| 8 | 3 | 312 | 1325 | 265 | 20 | Gain |
| 3 | 4 | 167 | 410 | 82 | 40 | Gain |
| 4 | 7 | 110 | 790 | 158 | 80 | Loss |
| 7 | 9 | 152 | 625 | 125 | 20 | Gain |
| 9 | 6 | 324 | 900 | 180 | 20 | Loss |

**Additional Questions…**

1. What landmark is close to post #7? Boot Shed
2. Each topographic line represents an elevation change of 20 feet.
3. When traveling from post 8 to post 9 would you be walking: uphill, downhill or on flat ground? Flat ground since there is no elevation change
4. What natural landmarks are available to assist with navigation? Streams, Pond and a River
5. How could you ensure that you're walking in a straight line between posts? You can look for identifiable landmarks ahead that are in a straight path and walk towards them while counting out your paces.

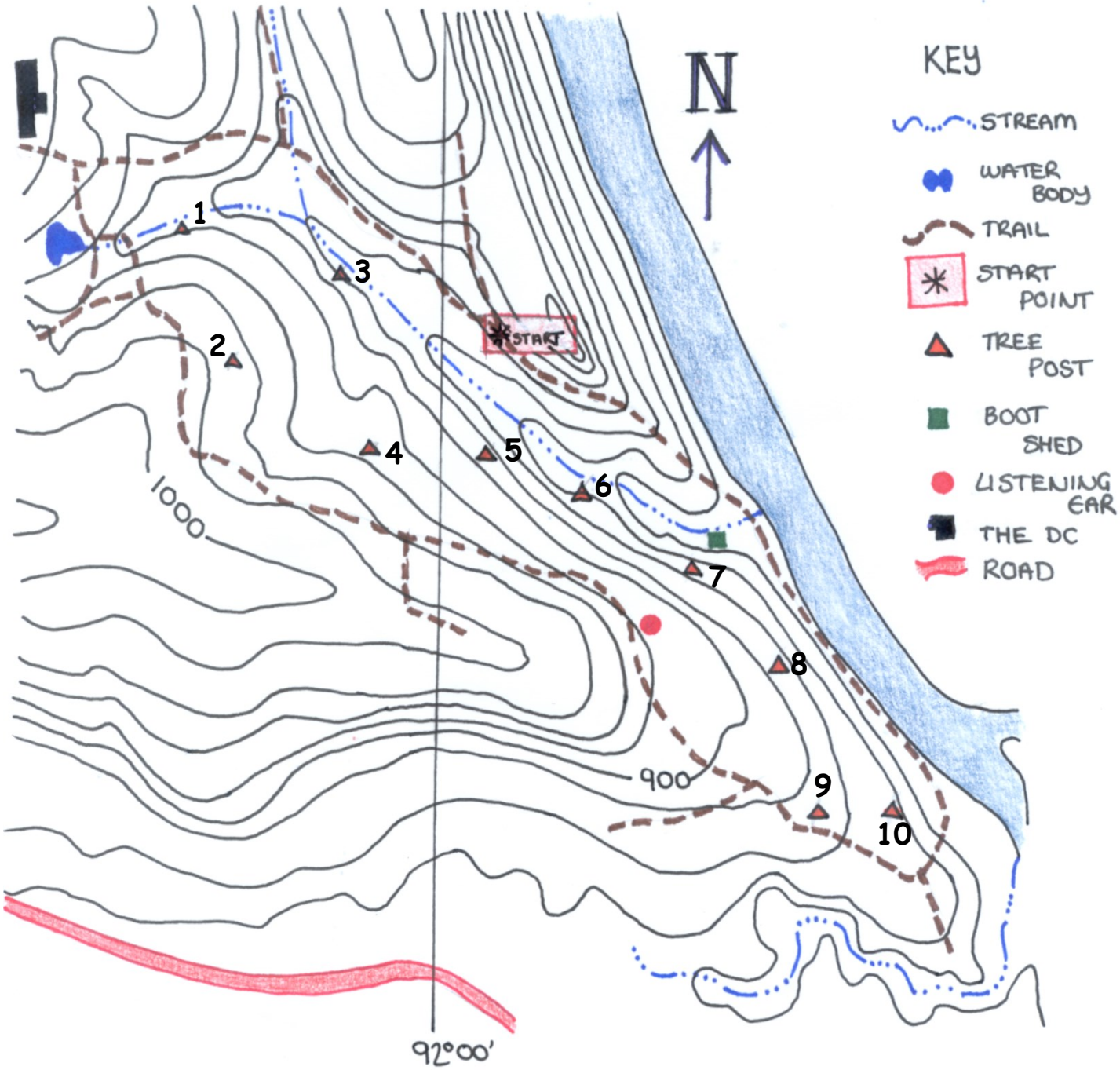
# Compass Model

**Directions:** Cut out both the base plate and the dial of the compass. Use the bracket to attach the dial to the base plate at the location marked "x". The arrow on the base plate represented the direction of travel arrow (also known as Fred).

## The Advanced Orienteering Course

Do not cross any trails, The Competitive Orienteering Course is contained within the trail system. However, if you find yourself disoriented walk around the trail until you find the start point intersection.




Distance Scale: 100ft is equal to about 20 paces. The average pace is equal to about 5 feet. The contour intervals are 20 feet.