Orienteering

Orienteering Unit

Traveling by Compass

CONTENTS:

OBJECTIVES:

The student shall learn:

How to read and use a compass for navigation and travel from one point to another.

To appreciate the value of travel aids such as compasses, maps, street signs, etc. in his\her daily life

To be more self-confident in his/her ability to master a useful skill through an enjoyable and challenging learning experience.

MAJOR CONCEPTS:

~ Importance of visual reference points in safe navigation
~ Parts of a compass and each part's function
~ Determination of compass bearings
~ Declination, and how to correct for the difference between magnetic and true north
~ Travel from one point to another aided by a compass
~ Distance determination by pacing

MATERIALS NEEDED:

- 22 Compasses
- 30 Numbered Poker Chips
- 22 Pencils
- Compass Bearing Cards for Poker Chip Hunt
- Compass Bearing Worksheets for Compass Game
- Mini-Orienteering/Pacing Worksheets
- 1 Teacher's Guide

SUPPLEMENTAL RESOURCES AVAILABLE

Be an Expert with Map and Compass by Bjorn Kjellstrom
Your Way with Map and Compass - Orienteering by John Disley

ORIENTEERING - INTRODUCTION:

We all make use of maps and compass directions in our everyday lives, whether consciously or unconsciously. Whenever you plan to go on a trip — whether you are flying, driving, or walking, you get out maps or charts and try to figure out the shortest way, the easiest way, or the way that will take you past the greatest number of interesting places.

Whenever someone asks you for directions, or you are given directions by another, your brain automatically tries to draw a map of where you are sending someone or going yourself. As students travel to and from school, they plan out their routes and make decisions on directions. If they are late they think about shortcuts they may take. If they have some time on their hands on the way home, they may plan a detour to go by a best friend's house or to a nearby store. Many of these decisions are made almost without thinking when near home or school, and pictures of prominent landmarks come to mind with little or no effort. However, when we travel in unfamiliar territory, particularly in wilderness areas, maps and compasses become extremely valuable tools.

People may ask, "Why bother with maps and compasses when roads and streets and even trails are usually clearly marked?" Some people think that maps and compasses are too difficult to use and are only useful for explorers and surveyors. As the students will find out as they go through this course, traveling by compass can be interesting, rewarding and challenging (but not impossible!). Properly used, a compass will enable a person to safely travel short or long distances in the wilderness without the aid of roads, street signs, or even trails. Exploring can be done much more safely and is more fun if one is properly equipped and trained to do so.

By using maps and a compass together, one could travel to almost any destination in the world — given the time, energy and of course, money. A person could certainly gain a more intimate knowledge of any nearby wilderness area by using a map and a compass as exploration aids.

In "Orienteering" it is our hope to give the students a better understanding of just what a compass is, how to best use it to get where you want to go, and to have a lot of fun learning. We hope that you, the teacher, will enjoy the activities of this learning experience with them. In this particular course we are concentrating on the use of the compass — without maps. The course is designed to be fairly simple and straightforward with the goal of having students feel very competent in the use of compasses by the time they have finished. It would be hard to do either skill (use of compass, map reading) justice by combining them into a single two and one-half hour course.

ORIENTEERING - LESSON PLAN

Activity #1 - Introduction to Compasses

Activity Overview

In this introductory activity, students will discuss being lost, describe visual aids they use in traveling from one place to another, and be introduced to orienteering compasses. They will learn the parts of the compass and each part's function.

Focus Questions

1. How do you go about finding your way from one place to another?
2. What are the parts of a compass, and what are their functions?

Main Ideas

1. Many aids are available to enable us to travel from one place to another without getting lost. Such aids include, but are not limited to: maps and charts; written or oral directions; traveling with companions who know the area; use of visual aids (landmarks); use of a compass.
2. An orienteering compass is a useful tool for navigating if used correctly.
3. It is necessary to know the parts of the compass and the function of each part in order to use the compass correctly.

Activity Organizer

Objectives

By the end of the activity, students should be able to:

1. Explain what visual aids (landmarks) are, and how they can be used to travel from one place to another.
2. Name the three parts of an orienteering compass and describe their features and functions.

Materials

Compasses
Diagram Board: Parts of a Compass and Magnetic North v. True North

Time Required

20 minutes

Location

At the seats by the basketball court or at the recreation field.

Terms

Base Plate: the rectangular plate of an orienteering compass on which the compass housing is mounted. It contains the direction of travel arrows and scales for measuring distances on maps. It is transparent so that a map can still be read when the compass is placed on it.

Bearing: a direction which is stated in compass degrees.

Cardinal Points: the four principal points of the compass: north, south, east, and west.

Compass: instrument for determining directions with the help of a strip of magnetized steel swinging on a pivot.

Compass Housing: the part of the compass that "houses" the needle; on orienteering compasses it is liquid-filled and turnable. The rim is marked with the initials of the cardinal points and graduated in the 360 degrees of a circle.

Declination: difference in degrees between magnetic north and true north direction in any given location. In this central part of California, the declination is approximately **13° east**. That means that the magnetic needle is pointing 13° east of true north.

Direction of Travel Arrow: the line in the base plate directly in front of the Index Pointer which points in the direction of travel when the compass is oriented.

Index Pointer: The white line in the base plate which is used as a reference point to set the bearing with the rotating compass housing.

Landmark: a feature in the landscape that can be easily recognized.

Magnetic Needle: the magnetized piece of steel that spins freely on a pivot point in a compass. It tends to point towards magnetic north.

Magnetic North: direction the magnetic needle on a compass points, which is different than true north.

Orienting Lines of Compass: lines on the inside bottom of the compass housing parallel to the N-S orienting arrow of the compass housing. Used to orient the compass with the north-south lines on a map when the compass is used in conjunction with a map.

What to Do

1. An excellent way to introduce the Orienteering course is to ask students if any of them have ever been lost, and if so, to describe their experiences. In almost every group someone will have experienced being lost or separated from his/her parents either in a mall, large department store, or amusement park like Disneyland or Magic Mountain. Allow several students to share their memories of the experience - what they felt, where and when did the

experience occur, how it was resolved. Then pose the question, "What are some ways that we can prevent ourselves from becoming lost when we travel in unfamiliar places?" **If students have already taken the Survival course, or the GLOBE course, they should be at least slightly familiar with some of the terminology that is going to be introduced here. Reinforce the learning they have had by way of a review discussion of what they already know.

In the ensuing discussion about ways to avoid getting lost, strategies that might be mentioned could include using maps, traveling with companions who are familiar with the area, asking for directions, finding out about local landmarks, and possibly even using a compass. You might want to reinforce the concept of our need for visual aids in navigation. Ask the students what some of the visual aids are that they use each day in getting from place to place (home to school, school to a friend's home, etc.). Visual aids might include stores, street signs, large trees, or other easily distinguishable **landmarks**. Have several students orally describe routes from home (or some other place) to school, a business, or a friend's home.

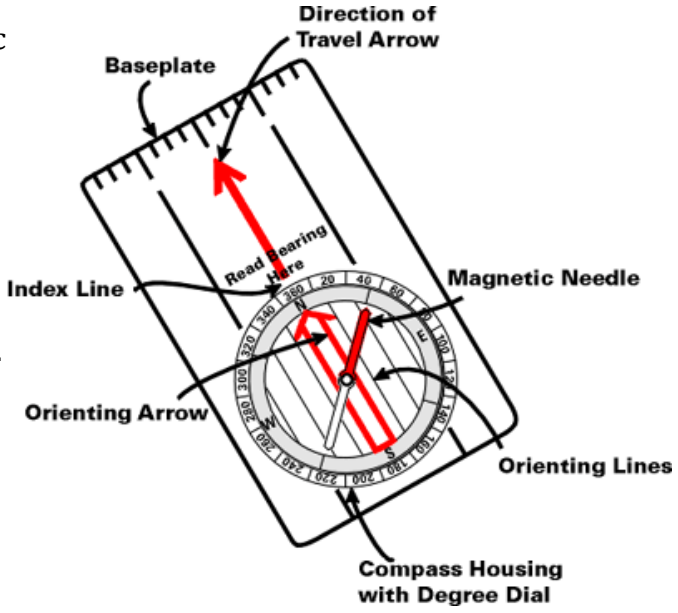
Explain that the focus of this course is to teach students to find their way in an unfamiliar area using only one tool, a **compass.** The compass enables people to achieve two principle goals: 1) determine an exact **bearing** (direction), 2) travel in a straight line from one point to another, even over long distances.

2. The compasses should now be given to the students and described as tools which enables us to travel in a straight line. We can, therefore, potentially travel from any given starting point to any given destination when we know which direction we want to go. It is extremely important to emphasize two key concepts at this point. 1.) **The compass is a tool and not a toy; please use it carefully and do not swing it around or otherwise handle it carelessly.** 2.) **The compass needs to be "worn" correctly at all times during the course. That is, it needs to be hung from the students' necks by the attached cord.**

3. Explain that the orienteering compass consists of 3 basic parts: the **magnetic needle,** revolving **compass housing**, and transparent **base plate** - each with its own special function, but all three must be working together to make an efficient and useful tool. Have students examine their compasses, and watch your use of the compass as you explain the functions of each part.

A. **The Magnetic Needle:** The needle is suspended on a needle-sharp point on which it freely swings. The north end of the needle is painted red - and will point toward magnetic north. (Explanation of the difference between true north and magnetic north follows in the description of the compass housing.)

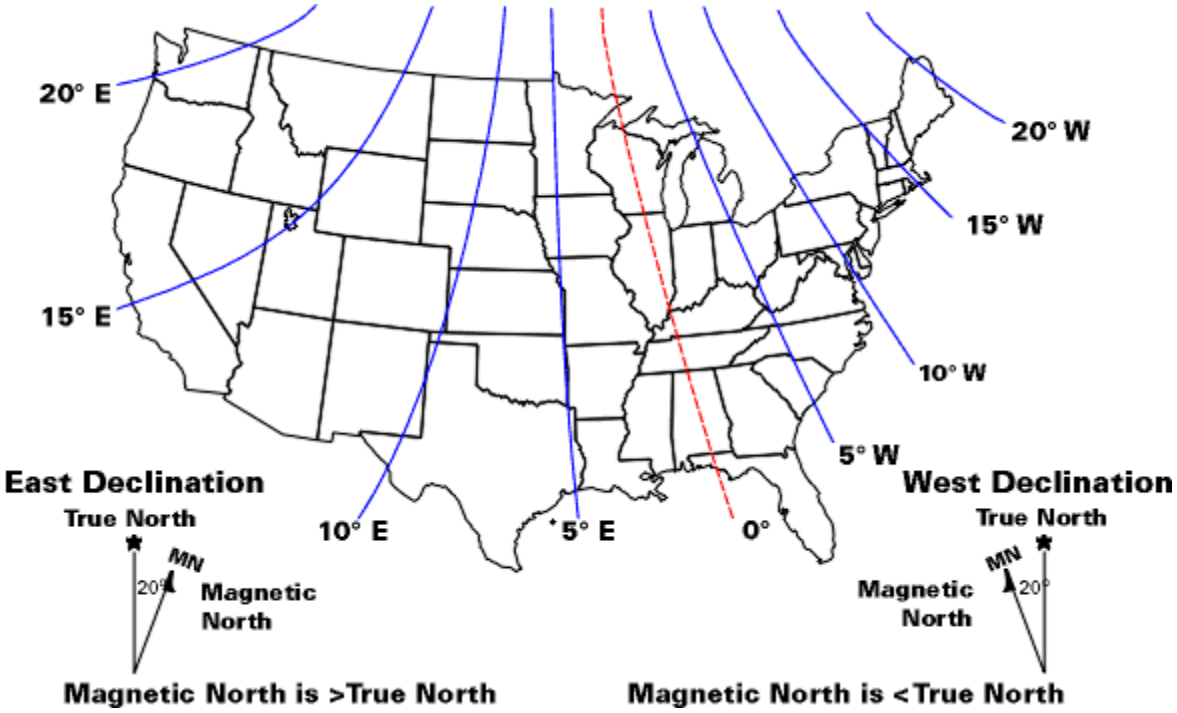
B. **The Compass Housing:** The rim is marked with the initials of the 4 "**cardinal points**" - North, South, East, and West and is divided into degree lines. The lines represent the even-numbered degrees (2°, 4°, 6°, 8°). Each space between the lines on the housing represents 1°. The spaces represent the odd-numbered degrees (1°, 3°, 5°, 7°, 9°). Every 20 degrees is marked by a number (except the points N, S, E, W). The transparent bottom of the compass housing is marked by an arrow that points directly to the housing's 360° N marking. This is the **orienting arrow**. When the compass is used with a map, the orienting arrow is lined up with the north-south meridian lines on the map to help determine direction of travel. Several lines are engraved in the bottom of the compass housing which run parallel to the orienting arrow. These lines are the compass orienting lines.
Declination marks are also imprinted in the bottom of the compass housing. The red marks serve as reference markers for lining up the magnetic needle so that the compass user can be correctly oriented. **Point out that the <u>red</u> north end of the magnetic needle must <u>always be pointed towards 13°</u> <u>to be correctly oriented while the compass is being used in this area.</u>** That is, it is turned so that the orienting arrow on the compass points toward the North Pole (**true north**) while the magnetic needle points towards the **magnetic north** pole. Show the students the diagram of North America which illustrates the difference between true north and magnetic north. Explain that if this difference (**declination**) were not taken into consideration, travelers using a map and compass together would end up



going the wrong direction. Students can see on the map that the amount of declination changes for different areas. **Demonstrate how to properly line up the magnetic needle with the 13° east declination mark.** The compass housing is attached to a rectangular transparent **base plate** in such a way that it can be turned easily.

C. **The Base Plate**: The rectangular base plate has a white line engraved in the black rim under the compass housing. The white line (on the black background of the compass housing) is called the **Index Pointer**. It shows at what degree number the compass housing is set. Extending from that white line to the front edge of the base plate is a red line with several numbers beside it. The line itself is called the **Direction of Travel Arrow.** This line shows the direction in which the user is facing or traveling. The edges of the base plate have markings for measuring distances in millimeters or inches, depending on the scale being used on the map being used..

4. Review the three parts of the compass and have students name and describe them. Ask students to pick out several landmarks that might be useful to help them travel around the outdoor school. Have them explain why they picked the ones that they did. Remind them that it is always helpful, even if they are traveling with a map and a compass, to notice and use landmarks as they travel.
5. If you introduced the compasses at the basketball court, travel over to the recreation field to do the next activity.



Activity #2 - Using the Compass to Determine Bearings

Activity Overview
In this activity, the students will practice setting bearings and getting properly "oriented" so that they are actually facing the direction they have set on their compasses.

Focus Question
1. How can we use a compass to help us determine our bearings (directions)?

Main Ideas
1. Proper use of the compass will enable a person to establish his/her "bearings" and become correctly oriented in relationship to the compass and the world around him/her.
2. The compass must be held correctly in order for the magnetic needle to swing freely.
3. The compass must not be held near objects containing iron or other metals which cause the magnetic needle to point in the wrong direction.
4. It is necessary to establish a set of procedures, and follow them in order to correctly use the compass.

Activity Organizer

Objectives
By the end of the activity, students should be able to:
1. Hold a compass correctly.
2. Set a compass bearing accurately (within 1°).
3. Turn their bodies so that they are properly oriented.
4. Explain why it is important to stay away from certain metallic objects when using a compass.

Materials
Compasses

Time Required
15 minutes

Location
Recreation Field.

Terms

Orienteering: the skill or process of finding your way in the outdoors with map and compass combined.

Orienting: to correctly face a particular direction in relation to the points of a compass.

What to Do

1. Teach the students how to hold the compass correctly. The compass should be held at waist level in a horizontal position so that the **Direction of Travel Arrow** is pointed straight out in front of them. The magnetic needle will work correctly only when the compass is held properly.
2. **Determine the direction of magnetic north** (remember that it is 13° E in this part of California). When the students are holding the compass properly and are standing still, the magnetic needle will be pointing towards magnetic north. Rotate the compass housing without moving the base plate so that the needle is pointing at 13° on the compass housing. The compass is now oriented. Have the students point toward magnetic north. See if they all agree.
3. **Finding a bearing using a visible landmark**. Have the students face any distant landmark that you choose (for example the high point on Fresno Dome, or the flume [slide] at the far end of the lake, or the north end of the office building). Hold the compass level at waist height, or a little higher, with the direction of travel arrow (in the base plate) pointing straight ahead at the landmark. Orient the compass as before by rotating the compass housing until the magnetic needle points at 13°. Read the bearing (the degrees of the direction) on the rim of the compass housing at the white index pointer. You now have your bearing or direction of travel from you to the object. Repeat the procedure using several different distant objects. **Note: Students will have slightly different readings as they are not all standing in the exact same spot, but they should be fairly close in their readings.**

After the students feel proficient at finding bearings and orienting their compasses proceed to the next activity.

4. **Getting properly oriented when given a bearing**. Give the students a compass bearing (for example 40^{o}).

A. Have the students turn the compass housing so that 40° lines up with the index pointer at the base of the direction of travel arrow). Check to make sure this first step is done correctly by all of the students.

B. While they're holding the compass horizontally at waist level, have them slowly turn to the left or right until the red end of the magnetic needle points at 13°. Do not change the compass bearing by rotating the housing. The bearing must remain lined up with the index pointer. The compass is now oriented.

C. Have students look up. They should be looking in the direction indicated by their compasses — 40°. Anything in a straight line directly in front of them is in line with this bearing and they could travel to that object guided by the compass.

5. Repeat steps A-C several times using various compass bearings, making the bearings a little tougher to find each time. This is done by suggesting a number that is only represented by a line on the compass housing and then by using a number represented by a space between two lines. After the students feel proficient, proceed to the next activity.

Activity #3 - Poker Chip Hunt

Activity Overview

In this activity, students will practice taking degree bearings and following them a prescribed distance. To be successful, students must be accurate in setting bearings, in traveling a straight line, and measuring distances by counting the number of steps taken

Focus Question

1. Can you accurately set your compass, walk a straight line, and travel a required distance?

Main Ideas

1. Proper setting of compass bearings is necessary for determining directions.
2. It is necessary to orient the compass after a bearing has been set in order to face the correct direction.
3. It is extremely important to sight on a distant object in order to facilitate travel in a straight line.
4. It is helpful to count steps or paces as a way of keeping track of distance traveled.

Activity Organizer

Objectives

By the end of the activity, students should be able to:

1. Correctly set bearings on a compass.
2. Orient a compass by turning their bodies while holding the compass correctly.
3. Walk in a straight line using landmark features to guide them.
4. Keep track of distance traveled by counting steps or paces.

Materials

Compasses
Numbered Poker Chips
Compass Bearing Cards

Time Required

20-30 minutes

Location

Recreation Field.

What to Do

1. Make sure each student has a compass, a numbered poker chip, and a compass bearing card (Appendix A). Each of the compass bearing cards has 3 sets of bearings and distances (i.e. 90° - 40 steps, 210° - 40 steps, 330° - 40 steps). Notice that on each card all the distances are alike for that card, and that the directions start with a compass bearing to which are added 120 degrees for each new compass bearing. Adding 120^{o} each time will cause the students to walk an equilateral triangle if done correctly. **Don't give them this clue!** Scatter the students around the recreation field in a circle (this facilitates finding missing poker chips for those having trouble with this activity).
2. Each student needs to know the number written on his\her poker chip. Have them drop the poker chips at their feet. At your signals each player:
   A. Sets the first bearing, and when done raises his/her hand. (Have students raise their hands when they are ready for the next step. That way you can monitor to see who needs help, as well as know when the entire group is ready to proceed to the next step.)
   B. Gets "oriented" by holding the compass correctly and turning his/her body until the magnetic needle points towards 13°, and when done raises his/her hand.

C. Sights on a distant object in a direct line with the direction of travel arrow, and when done raises his/her hand.

D. While **looking at the landmark, not the compass**, walks the first distance, then stops. When all have stopped, give the same series of signals for the second leg of this triangular journey. Each sets the second bearing indicated on his\her card, gets properly oriented, sights on a target object, travels the second distance - stops. On the third set of signals, all will repeat the previous procedures, walk their third distance and stop.

E. On the 4th and final signal, all bend down and pick up the poker chips - which should be lying at their feet, or at least within sight, if the compass walking has been done correctly.

3. Once everyone has found his/her poker chip, have them exchange compass bearing cards with another student and repeat the process on their own. The success rate will probably increase with this second opportunity.
4. When all have completed the second attempt discuss with them what helped them be successful, or what may have posed difficulties for them. It might be appropriate to have a successful student assist one who may be having difficulty on a third attempt, if time permits.
5. An excellent way to travel to the next activity site would be to have students take several bearings based on your directions, and travel towards the destinations you have chosen for them. Your route could take you from the recreation field up towards the basketball court, past the drinking fountain (they will appreciate this) by the office, and around the back of the office to the flat open area.

Activity #4 - Compass Game

Activity Overview

In this activity, students will practice/review setting compass bearings, getting oriented, sighting on posts which will serve as destinations, and traveling to them. The main purpose of this activity is to reinforce and fine-tune compass skills previously developed.

Focus Question

1. How can we be sure that we are using our compasses correctly?

Main Ideas

1. Proper use of the compass will enable a person to establish his/her "bearings" and become correctly oriented in relationship to the compass and the world around him/her.
2. The compass must be held correctly in order for the magnetic needle to swing freely.
3. The compass must not be held near objects containing iron or other metals which cause the magnetic needle to point in the wrong direction.
4. It is necessary to establish a set of procedures, and follow them in order to correctly use the compass.

Activity Organizer

Objectives

By the end of the activity, students should be able to:

1. Set bearings on a compass.
2. Correctly orient themselves.
3. Successfully complete the Compass Game.

Materials

Compasses
Compass Bearing Worksheets (Appendix B)
Pencils
Staked-out Course

Time Required

20-30 minutes

Location

On the relatively level area (below the "Giant Swing"), approximately 200-250 feet south-southwest of the office.

What to Do

1. Each student (or group of 2-3 students) will need a compass, compass bearing worksheet, and pencil. This game takes place at the staked-out area south-southwest of the office. To get there, walk along the dirt road away from the office (see map), about 250 feet.
2. The compass bearing cards will inform students at which stakes to begin, and direct them to follow 5 compass bearings from marker to marker around the course. As the students proceed around the course they will copy down the

letter that is on each marker onto their cards. As many as eight students can begin at once and more can begin as the first group leaves the first marker. This game provides the students a good opportunity to check on their progress as orienteers. This event, together with the preceding activities, will help pre pare the students for the final activity in the Orienteering Course.

3. When each student (or group) finishes, (s)he turns the worksheet in to you, the teacher, to have it judged. The six letter code word produced, beginning with the starting stake letter, is then checked against the correct code word listed below.

Card				
	#1 - AEOUZP	#7 - ZPEIUL	#13-UPAEIL	#19-IOAULP
	#2 - EIULZA	#8 - PAIOLZ	#14-LPEZAO	#20-OELZAP
	#3 - IOLZAE	#9 - AIZUAE	#15-PELUZE	#21-UEZILO
	#4 - OUZPEI	#10-EOLPEI	#16-ZOPLEU	#22-LOAIZE
	#5 - ULPAIO	#11-IALOEZ	#17-APEZOU	#23-PIZAOA
	#6 - LZAEOU	#12-OEALOZ	#18-EZAPLO	#24-ZIPUOP

Bearings for Stake Markers on Compass Game

A-E	244°	E-A	64°	I-A	85°	O-A	108°
A-I	265°	E-I	287°	I-E	107°	O-E	132°
A-O	288°	E-O	312°	I-O	330°	O-I	150°
A-U	316°	E-U	337°	I-U	358°	O-U	21°
A-L	334°	E-L	354°	I-L	14°	O-L	38°
A-P	356°	E-P	17°	I-P	37°	O-P	61°
A-Z	21°	E-Z	43°	I-Z	65°	O-Z	88°
U-A	136°	L-A	154°	P-A	176°	Z-A	201°
U-E	157°	L-E	174°	P-E	197°	Z-E	223°
U-I	178°	L-I	194°	P-I	217°	Z-I	245°
U-O	201°	L-O	218°	P-O	241°	Z-O	268°
U-L	63°	L-U	243°	P-U	269°	Z-U	295°
U-P	89°	L-P	106°	P-L	286°	Z-L	314°
U-Z	115°	L-Z	134°	P-Z	158°	Z-P	338°

The following activity is pacing, which will prepare students for the activity called the Mini-Orienteering Course. There the students will have the opportunity to put together all of the skills that they have learned in order to navigate safely and successfully through the forest.

Activity #5 - Pacing

Activity Overview

In this activity, students will determine the number of steps and double-steps (paces) it takes them to travel a measured distance over varied terrain. Doing so will help them guesstimate distances they travel by counting the number of steps or paces taken.

Focus Question

1. How can we measure the distance we travel as we walk?

Main Ideas

1. Distance traveled on foot can be estimated by determining one's pace, and then counting paces as one travels.
2. A person's length of stride, or pace, changes as the terrain changes.

Activity Organizer

Objectives

By the end of the activity, students should be able to:

1. Accurately estimate the number of paces it takes them to travel 100 feet over different types of terrain.
2. Explain the reasons for differences in the length of their strides due to terrain features.
3. Explain why a mile is 5,280 feet in length.

Materials

Distance markers established on posts
Mini-Orienteering/Pacing Worksheets (Appendix C)

Time Required

10 minutes

Location

Back towards the Outdoor Education office from the compass game site, on the left hand side - the course extends towards the back of the climbing wall.

Terms

Mille passus: one thousand paces (average distance covered by a Roman soldier traveling 1,000 paces = 5,280 feet).

What to Do

1. Ask the students how they could tell when they had walked 800 feet, or 1000 feet, or whatever number you might choose. The best way of determining distances in the field is by using your step or your double-step (pace), counting off each time you put down your right foot, or left foot if you prefer. Have you ever wondered why the length of a mile is the peculiar figure of **5,280 feet?** It is because one thousand double-steps of the average Roman soldier at the time of the Caesars covered that distance. Latin for 1000 double-steps, "mille passus" was later abbreviated to our English "mile". The average double-step of a Roman soldier, therefore, was little over five feet.
2. The course is 100 feet long. Divide the group into teams of two. These teams each need a Mini-Orienteering/Pacing Worksheet on which they will record the number of paces each teammate takes to travel the measured distances. Have each student walk from one end of the course to the other, counting each time (s)he steps on his/her right foot. (It is much easier to keep track of this number if students will lightly slap their right thighs, and count the paces aloud as they walk.) This will enable the students to determine the number of double-steps (paces) it takes them to travel 25 feet, 50 feet, 75 feet and 100 feet over varied terrain. How many paces (double-steps) did it take? Have them determine how far they go in one pace. To do this the student needs to divide the number of paces taken in 100 feet - i.e. 20 paces in 100 feet averages 5 feet/pace or 2 ½ feet/step. Ask the students how large their paces are - get answers from all of them. It helps them to know that they don't all have the same size pace. Also remember - it generally takes more paces to travel the distance if you are going uphill and fewer paces to travel the distance if you are going downhill. Tell the students they will need to remember how to count paces and determine distances traveled in order to successfully complete the Mini-Orienteering Course (final activity in this class).

Activity 6 - Mini-Orienteering Course

Activity Overview
In this final activity, students will utilize and test the skills and understanding they have attained as they gain experience in cross-country travel using a compass.

Focus Question
1. Can you and your partner successfully navigate the Mini-Orienteering Course using the skills you have learned?

Main Ideas
1. Successful navigation in an unfamiliar area requires observation skills, correct use of a compass, and the ability to measure distances traveled accurately.
2. Team work is extremely important in ensuring the success of partners' efforts.

Activity Organizer

Objectives
By the end of the activity, students should be able to:
1. Navigate at least one of the Mini-Orienteering routes successfully.
2. Demonstrate the ability to use a compass correctly.
3. Demonstrate the ability to use knowledge of pacing to determine distance traveled.
4. Experience success in the compass course.

Materials
Compasses
Pencils
Mini-Orienteering/Pacing Worksheets
Mini-Orienteering Course

Time Required
30-40 minutes

Location
On the hillside behind the Climbing Wall, and in the immediate vicinity.

What to Do

1. Take the students to the Mini-Orienteering Courses from the Pacing Site. You will notice five different trees, each with a sign listing the first compass information for each of two different courses (total of 10 courses). Each course has 7 markers which must be located.
2. Make sure each team of two students has two compasses, a pencil and a Mini-Orienteering/Pacing Worksheet. The Mini-Orienteering/Pacing Worksheets are the same for all ten courses. On the courses, the markers on the trees give the bearing and distance to the next marker students must find. Students must determine the correct direction and distance to travel in order to find their next markers. Marker 2 is **not visible** from Marker 1 (this is true of all of the markers on each of the courses). The markers must be found by using the compass, and by determining distance correctly. (See below for suggested procedure.) When students reach the next marker, they should write the code word on their Mini-Orienteering/Pacing Worksheets next to the corresponding number line.
3. When teams have finished, check the words on their worksheets against the Mini-Orienteering Course Key (see below). If time allows, you may want to let them try a different course, or allow a successful team to help one that is struggling.

The objective for all of these courses is for the students to find each of the control points for their team's course, in order, and to write down the code at each control point. Students must determine the correct direction and distance from each marker to the next one. The information written on the Mini-Orienteering/Pacing Worksheet regarding each student's pace is very helpful for determining the distances from one marker to the next.

Up to 20 students can start at the same time with each 2-person team going on a different course. Make sure students write the course letter on their Mini-Orienteering/Pacing Worksheet. Allow about 20-25 minutes, after the last group has started, for them to complete the course, but challenge them all to see how quickly they can do it.

The most successful method of doing the Mini-Orienteering Course is to have the students work in teams of two. If there is an odd number of students, the cabin leader can work with a student. A highly successful approach to the Mini-Orienteering Course is as follows: Each of the students has a specific responsibility, one being the navigator, the other being the scout. The navigator gets the compass bearing from the marker, sets the compass to that bearing, orients the compass by turning his/her body until correctly oriented, and determines the direction of travel for the scout. Once this has been done the navigator

remains at the marker while the scout, guided by the navigator's verbal signals, attempts to travel the right distance in the right direction to the next marker. When the marker has been located by the scout (**not until then)**, the navigator joins him\her. They then reverse roles, scout becoming navigator, navigator becoming scout, and proceed to find the next marker.

Two important points to remember:

1. The next marker being sought is always located on the back side of a tree out of sight from the marker where the navigator is standing. (i.e., if they are at marker #1, it is impossible to see marker #2 from there. Any markers visible are not the correct markers!) To find the correct marker, use the compass direction of travel arrow to help sight on a tree in the correct direction that appears to be at a proper distance (given on the marker). The scout heads to that tree. Chances are it will be the right one.
2. It is very important that the navigator remain at the marker until the scout has located the next one. If the navigator fails to do so, they can lose their one reference point and may simply end up wandering around hoping they will find the next marker. This activity should depend upon, and develop, orienteering skills. Blind luck is usually no luck at all.

Helpful hints:

1. Some trees have two markers. Be careful to choose the correct one.
2. Some markers are on stumps. This can prove challenging to the students.
3. The markers from each course are printed on different colored paper (some also have corresponding stickers) to make it easier for students to recognize their markers.

The Mini-Orienteering Course is a very rewarding concluding activity for this unit.

Mini-Orienteering Course Key

	Bearing	Distance	Code
Course A			
Beginning	65 degrees	65 ft.	
#1	110 degrees	70 ft.	Listening
#2	189 degrees	90 ft.	Initiative
#3	179 degrees	89 ft.	Responsible
#4	80 degrees	81 ft.	Community
#5	315 degrees	68 ft.	Communicate
#6	295 degrees	100 ft.	Leadership
#7			Cooperation
Course B			
Beginning	193 degrees	78 ft.	
#1	285 degrees	86 ft	U´macha
#2	199 degrees	84 ft.	Black oak
#3	141 degrees	87 ft.	Obsidian
#4	62 degrees	93 ft.	Mortar
#5	15 degrees	69 ft.	Pestle
#6	6 degrees	98 ft.	Miwok
#7			Acorn
Course C			
Beginning	286 degrees	57 ft.	
#1	196 degrees	91 ft.	Compass
#2	296 degrees	63 ft.	Bearing
#3	151 degrees	94 ft.	Magnetic needle
#4	206 degrees	53 ft.	Magnetic north
#5	64 degrees	120 ft.	True north
#6	18 degrees	137 ft.	Degrees
#7			Orienteering
Course D			
Beginning	13 degrees	57 ft.	
#1	78 degrees	73 ft.	Incense cedar
#2	76 degrees	69 ft.	Sugar pine
#3	148 degrees	109 ft.	Giant sequoia
#4	190 degrees	58 ft.	Ponderosa pine
#5	214 degrees	145 ft.	White fir
#6	329 degrees	137 ft.	Clinometer
#7			Undercut
Course E			
Beginning	229 degrees	67 ft.	
#1	294 degrees	53 ft.	Sequoia
#2	247 degrees	76 ft.	Redwood
#3	131 degrees	85 ft.	General Sherman
#4	130 degrees	54 ft.	Seed
#5	126 degrees	112 ft.	Spongy bark
#6	3 degrees	110 ft.	Tannin
#7			Nelder

Mini-Orienteering Course Key

	Bearing	Distance	Code
Course F			
Beginning	138 degrees	23 ft.	
#1	180 degrees	72 ft.	Solar still
#2	126 degrees	60 ft.	Shelter
#3	268 degrees	49 ft.	Fire
#4	153 degrees	28 ft.	Edible plant
#5	111 degrees	65 ft.	Water
#6	356 degrees	60 ft.	Survival
#7			Matches
Course G			
Beginning	258 degrees	51 ft.	
#1	268 degrees	71 ft.	Observation
#2	121 degrees	69 ft.	Riparian
#3	230 degrees	45 ft.	Nature
#4	149 degrees	57 ft.	Habitat
#5	90 degrees	86 ft.	Erosion
#6	319 degrees	114 ft.	Meadow
#7			Web of life
Course H			
Beginning	207 degrees	93 ft.	
#1	299 degrees	67 ft.	G.P.S. unit
#2	184 degrees	76 ft.	Weather
#3	161 degrees	61 ft.	Pixel
#4	128 degrees	73 ft.	Measurement
#5	13 degrees	97 ft.	Ground cover
#6	352 degrees	125 ft.	Canopy
#7			Satellite image
Course I			
Beginning	107 degrees	52 ft.	
#1	137 degrees	92 ft.	Scat
#2	46 degrees	56 ft.	Tracks
#3	181 degrees	70 ft.	Plants
#4	264 degrees	25 ft.	Wildlife
#5	333 degrees	66 ft.	Plaster cast
#6	315 degrees	93 ft.	Homes
#7			Sightings
Course J			
Beginning	311 degrees	34 ft.	
#1	141 degrees	31 ft.	Water temperature
#2	251 degrees	79 ft.	Pond
#3	200 degrees	57 ft.	pH
#4	296 degrees	54 ft.	H_2O
#5	167 degrees	101 ft.	Watershed
#6	57 degrees	193 ft.	Microscope
#7			Surface film

Optional Activity - Blindfold Walk

Activity Overview

In this supplementary introduction activity, students will learn the difficulty of traveling a straight line without landmarks. This is a fun, and interesting way to bring home the value of having a traveling aid (such as a compass) that enables one to walk a straight line.

Focus Questions

1. What things are necessary to help you walk a straight line from one point to another?
2. What difficulties occurred when your landmarks were removed?

Main Ideas

1. Landmarks are very helpful for traveling from one place to another.
2. In the absence of landmarks, some form of guidance, such as a compass, makes travel in a straight line possible.

Activity Organizer

Objectives

By the end of the activity, students should be able to:

1. Explain why it is difficult to travel in a straight line without landmarks.
2. Be able to laugh at themselves, as they realize the difficulty of traveling blindfolded.
3. Understand the importance of being a helpful, safe guide.

Materials

1 Blindfold/2 Students

Time Required

20 minutes

Location

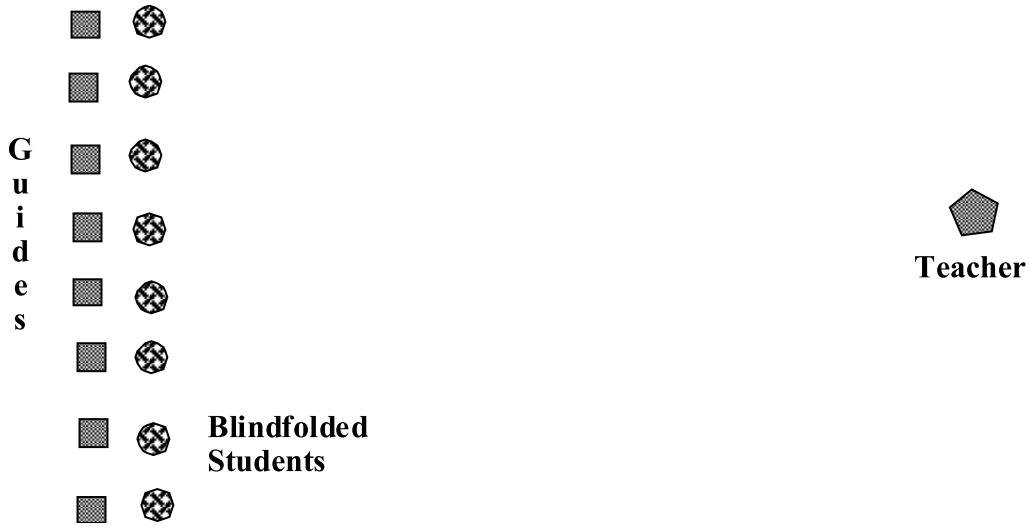
In the dirt parking lot by the office, or on the recreation field.

Terms

Landmark: a distinctive feature on the landscape that is useful for determining location.

What to Do

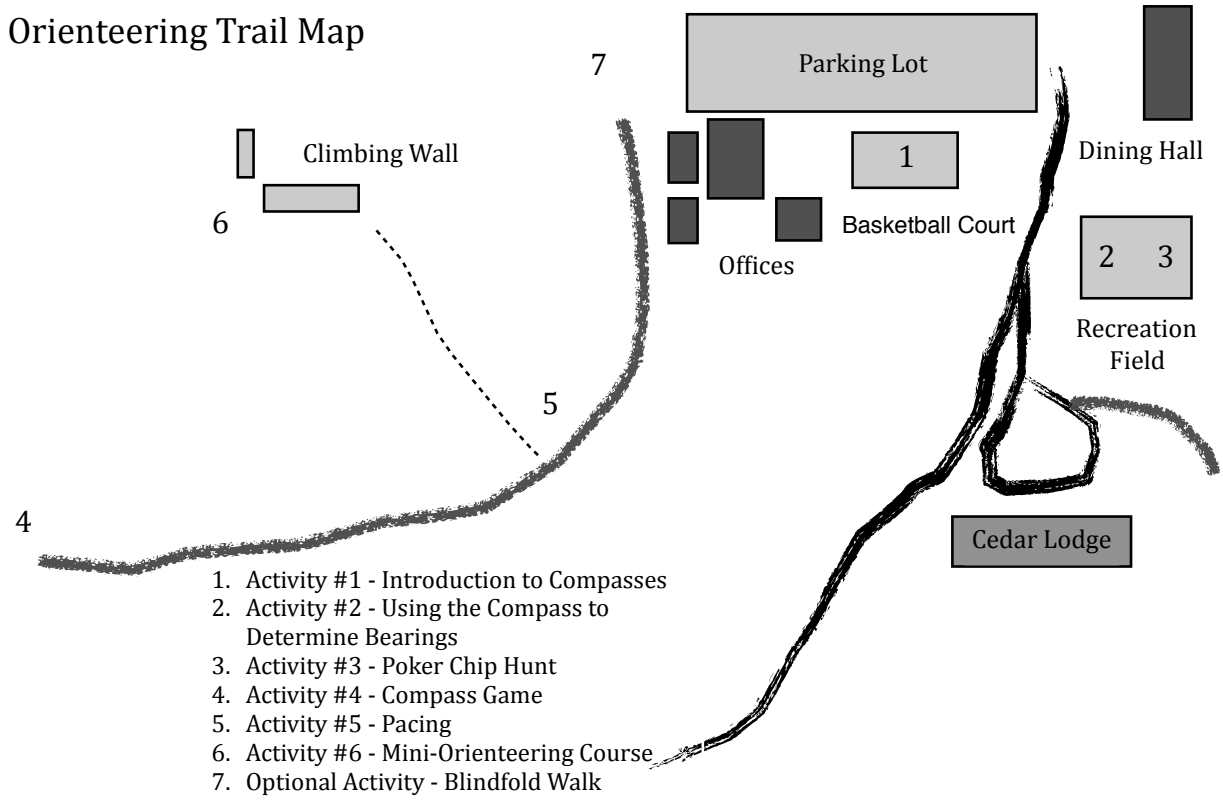
1. Have all the students get together at one end of the parking lot or recreation field.
2. Ask for 1-2 students to describe how to get from their home to school. As they describe the route, listen for key landmarks they might use in their descriptions. If none are given, ask for some.
3. Make sure everyone understands what landmarks are, and explain that we all use them to travel from place to place, even if we are not conscious of doing so.
4. Ask students how many of them think they could walk from the end of the parking lot, where they're standing to the other end, and run into you if you were standing down there. They should all be able to say they could do so.
5. Explain that that is exactly what you want them to do, however, you want to make it a little more challenging by removing all the landmarks.
6. Have students pick a partner, and have partners line up one behind the other so as to form a line as shown below: (You will end up down at the other end of the parking lot shortly.)



7. Explain that one partner will travel blindfolded towards you while his/her partner travels **behind** him/her to make sure travel is done safely.
8. The guides can give **NO HELP AT ALL**, other than to say, "Stop," if the blindfolded student will run into anything or anyone, or go over the edge of a bank, etc. When the blindfolded student hears "Stop," (s)he must do so before taking another step. Then (s)he must make some change in direction before proceeding. The guide cannot help make the decision as to which direction to go. When the traveler has changed directions (s)he should ask, "Can I go now?" to which the guide replies, "Go," if it is safe **even if it is the wrong direction**.

9. The guide must not touch or offer guidance in any way, other than ensure safety.
10. The only thing that a guide can allow the blindfolded student to run into is you. If that happens, you say nothing, the guide says nothing, and the blindfolded student says nothing, as none of you wants to give away your position.
11. Walk to the other end of the parking lot and have the students see where you are. Then have the students in the front row put on the blindfolds. Do not move once they have done so. When each student is ready, and the blindfold is securely in place, have him/her raise a hand to show readiness. Have your cabin leader(s) check to make sure all blindfolds are secure, and that no one can see. When all are ready, signal for them to start by saying "Go!" That is the last thing you should say until you say, "Stop! Remove your blindfolds and see where you are." Allow them about 2 minutes to "find" you.
12. Switch roles so that the guide now becomes the blindfolded student and repeat the activity.
13. Discuss the activity, and the difficulty they experienced traveling blind.

Orienteering Map



Appendix A: Compass Bearing Cards

Bearing	Distance	Bearing	Distance	Bearing	Distance
1. 150°	18 steps	1. 160°	26 steps	1. 170°	29 steps
2. 270°	18 steps	2. 280°	26 steps	2. 290°	29 steps
3. 30°	18 steps	3. 40°	26 steps	3. 50°	29 steps

Bearing	Distance	Bearing	Distance	Bearing	Distance
1. 180°	20 steps	1. 190°	30 steps	1. 200°	24 steps
2. 300°	20 steps	2. 310°	30 steps	2. 320°	24 steps
3. 60°	20 steps	3. 70°	30 steps	3. 80°	24 steps

Bearing	Distance	Bearing	Distance	Bearing	Distance
1. 220°	27 steps	1. 230°	21 steps	1. 240°	28 steps
2. 340°	27 steps	2. 350°	21 steps	2. 360°	28 steps
3. 100°	27 steps	3. 110°	21 steps	3. 120°	28 steps

Bearing	Distance	Bearing	Distance	Bearing	Distance
1. 250°	18 steps	1. 260°	33 steps	1. 270°	25 steps
2. 10°	18 steps	2. 20°	33 steps	2. 30°	25 steps
3. 130°	18 steps	3. 140°	33 steps	3. 150°	25 steps

Bearing	Distance	Bearing	Distance	Bearing	Distance
1. 280°	21 steps	1. 290°	23 steps	1. 300°	26 steps
2. 40°	21 steps	2. 50°	23 steps	2. 60°	26 steps
3. 160°	21 steps	3. 170°	23 steps	3. 180°	26 steps

Bearing	Distance	Bearing	Distance	Bearing	Distance
1. 90°	30 steps	1. 210°	30 steps	1. 330°	30 steps
2. 210°	30 steps	2. 330°	30 steps	2. 90°	30 steps
3. 330°	30 steps	3. 90°	30 steps	3. 210°	30 steps

Bearing	Distance	Bearing	Distance	Bearing	Distance
1. 20°	25 steps	1. 30°	25 steps	1. 40°	25 steps
2. 140°	25 steps	2. 150°	25 steps	2. 160°	25 steps
3. 260°	25 steps	3. 270°	25 steps	3. 280°	25 steps

Bearing	Distance	Bearing	Distance	Bearing	Distance
1. 50°	20 steps	1. 60°	20 steps	1. 70°	20 steps
2. 170°	20 steps	2. 180°	20 steps	2. 190°	20 steps
3. 290°	20 steps	3. 300°	20 steps	3. 310°	20 steps

Bearing	Distance	Bearing	Distance	Bearing	Distance
1. 80°	27 steps	1. 100°	23 steps	1. 110°	31 steps
2. 200°	27 steps	2. 220°	23 steps	2. 230°	31 steps
3. 320°	27 steps	3. 340°	23 steps	3. 350°	31 steps

Bearing	Distance	Bearing	Distance	Bearing	Distance
1. 120°	19 steps	1. 130°	22 steps	1. 140°	32 steps
2. 240°	19 steps	2. 250°	22 steps	2. 260°	32 steps
3. 360°	19 steps	3. 10°	22 steps	3. 20°	32 steps

Appendix B: Compass Bearing Worksheet

1. Start at stake marked A.

Travel:	Markers Reached: **A**
244°	_____
312°	_____
21°	_____
115°	_____
338°	_____

2. Start at stake marked E

Travel:	Markers Reached: **E**
287°	_____
358°	_____
63°	_____
134°	_____
201°	_____

3. Start at stake marked I

Travel:	Markers Reached: **I**
330°	_____
38°	_____
134°	_____
201°	_____
244°	_____

4. Start at stake marked O

Travel:	Markers Reached: **O**
21°	_____
115°	_____
338°	_____
197°	_____
287°	_____

7. Start at stake marked Z

Travel:	Markers Reached: **Z**
338°	_____
197°	_____
287°	_____
358°	_____
63°	_____

8. Start at stake marked P

Travel:	Markers Reached: P
176°	_____
265°	_____
330°	_____
38°	_____
134°	_____

9. Start at stake marked A

Travel:	Markers Reached: **A**
265°	_____
65°	_____
295°	_____
136°	_____
244°	_____

10. Start at stake marked E

Travel:	Markers Reached: **E**
312°	_____
38°	_____
106°	_____
197°	_____
287°	_____

5. Start at stake marked U

Travel:	Markers Reached: **U**
63°	_____
106°	_____
176°	_____
265°	_____
330°	_____

6. Start at stake marked L

Travel:	Markers Reached: **L**
134°	_____
201°	_____
244°	_____
312°	_____
21°	_____

13. Start at stake marked U

Travel:	Markers Reached: **U**
89°	_____
176°	_____
244°	_____
287°	_____
14°	_____

14. Start at stake marked L

Travel:	Markers Reached: **L**
106°	_____
197°	_____
43°	_____
201°	_____
288°	_____

11. Start at stake marked I

Travel:	Markers Reached: **I**
85°	_____
334°	_____
218°	_____
132°	_____
43°	_____

12. Start at stake marked O

Travel:	Markers Reached: **O**
132°	_____
64°	_____
334°	_____
218°	_____
88°	_____

19. Start at stake marked I

Travel:	Markers Reached: **I**
330°	_____
108°	_____
316°	_____
63°	_____
106°	_____

20. Start at stake marked O

Travel:	Markers Reached: **O**
132°	_____
354°	_____
134°	_____
201°	_____
356°	_____

15. Start at stake marked P

Travel:	Markers Reached: **P**
197°	_____
354°	_____
243°	_____
115°	_____
223°	_____

16. Start at stake marked Z

Travel:	Markers Reached: **Z**
268°	_____
61°	_____
286°	_____
174°	_____
337°	_____

17. Start at stake marked A

Travel:	Markers Reached: **A**
356°	_____
197°	_____
43°	_____
268°	_____
21°	_____

18. Start at stake marked E

Travel:	Markers Reached: **E**
43°	_____
201°	_____
356°	_____
286°	_____
218°	_____

21. Start at stake marked U

Travel:	Markers Reached: **U**
157°	_____
43°	_____
245°	_____
14°	_____
218°	_____

22. Start at stake marked L

Travel:	Markers Reached: **L**
218°	_____
108°	_____
265°	_____
65°	_____
223°	_____

23. Start at stake marked P

Travel:	Markers Reached: **P**
217°	_____
65°	_____
201°	_____
288°	_____
108°	_____

24. Start at stake marked Z

Travel:	Markers Reached: **Z**
245°	_____
37°	_____
269°	_____
201°	_____
61°	_____

Appendix C: Mini-Orienteering/Pacing Worksheet

Names of Team Members:

1. _____ 2. _____

Pacing

Number of paces to travel 100 feet:

1. _____ 2. _____

Distance traveled in one pace:
(100 ÷ number of paces in 100 ft)

1. _____ 2. _____

Mini-Orienteering Course

Write the code word at
each control point you reach.

Course #: _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Names of Team Members:

1. _____ 2. _____

Pacing

Number of paces to travel 100 feet:

1. _____ 2. _____

Distance traveled in one pace:
(100 ÷ number of paces in 100 ft)

1. _____ 2. _____

Mini-Orienteering Course

Write the code word at
each control point you reach.

Course #: _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____