

Map and Compass Skills

Grade levels: 5-12

In a Nutshell

Given a map and compass, students will be able to find a location on the map, chart a course to that location with the compass, and find that location on site. Additionally, they will find their location on site by triangulation.

Objectives

Students will be able to

- Locate various land features on a map.
- Measure distances between two points on a map.
- Plot a course on a map with their compass.
- Locate points onsite from their course plotted on a map.
- Determine their location onsite by triangulating from recognizable features onsite.

Concepts

- Topographic maps provide specific information on land features associated with an area, including elevation changes, slope, water courses, roads, and vegetation types.
- A compass can be used with a topographic map to determine direction and distance traveled between two points.
- A compass and map can be utilized to determine your location.

Map and Compass Skills Pre-visit Activities

The following materials are aids to help prepare your students for their visit to the Central Wisconsin Environmental Station. The vocabulary list contains terms and concepts your students will encounter in their visit. Please modify the definitions as needed. The activities listed below are merely options – it is not necessary to do them all or follow any particular order. Keep in mind that your students' learning experiences at CWES will be enhanced if they are familiar with these concepts and terms prior to the on-site activities.

Parts of a Compass Vocabulary

(See Supplement A for diagram)

Base plate: The rectangular plate on which the compass housing is mounted.

Direction arrow (direction of travel arrow): The arrow on the base plate of the compass which points in the direction of travel when the compass is oriented properly. Also called the “nose” because it faces the same direction of your nose when being used properly.

Housing: The circular moveable “house” of the magnetic needle which rests upon the base plate. The housing has markings for 0 to 360 degrees around the outer perimeter.

Magnetic needle: A magnetic strip suspended on a pivot that is painted red on the end that points toward Magnetic North (in the northern hemisphere.)

Magnetic North: The direction in which the magnetic needle points due to the earth's magnetic forces. This is not True North. Mineral deposits in the earth cause Magnetic North to fall between 1,200 and 1,400 meters south and west of True North. The result is that Magnetic North falls somewhere north of Hudson Bay.

Orienteering compass: A compass especially designed to simplify the process of directional travel using a map.

True North: The geographic or “true” North Pole is at the geographic top of the earth. True North is indicated on maps.

Map and Compass Skills Pre-visit Activities

Map and Compass Vocabulary:

- Bearing:** (also known as heading). A direction of travel stated in compass degrees, relative to North (0°). For example, taking a bearing of 30° means that you are facing 30 degrees away from North.
- Cardinal Directions:** The cardinal directions are North (0°), South (180°), East (90°), and West (270°).
- Contour line:** Located on a topographic map, contour lines are used to represent elevation. The key at the bottom of the map includes the scale of each contour line. For example, “contour interval 10 feet” means that the distance between each contour line represents 10 feet in elevation.
- Declination:** The angle between the North the compass needle points to and the True North line. This declination is often included on map keys and varies depending on your location.
- Orienteering:** The skill of using a map and compass to find your way from one point to another.
- Pacing:** A simple and relatively accurate method of measuring distance using steps. One pace is equal to two steps. Pacing is used in areas and conditions where measuring distance would be difficult or impossible.
- Scale:** Located on the bottom of a map, scale describes the relationship between distances on the map and actual distance. For example “scale 1:24000” means that one inch on the map represents 24000 inches on the ground and one foot on the map represents 24000 feet on the ground. See Supplement A for diagram.
- Topographic map:** A topographic map illustrates the topography of the land by using contour intervals and symbols to represent certain land features, landmarks, and terrain.
- Triangulation:** This is the process of determining a location by taking multiple bearings on a landmark. It can be used either to determine where you are located, or to determine where a specific landmark is located in relation to you. For example, if you are lost but can see two landmarks, it is possible to use a map and compass to determine where you are located using bearings to each landmark. The second method is how many biologists locate radio-collared animals. This involves taking multiple bearings from different locations, plotting them on a map, and determining where the animal is located using the intersection of those bearings.

Map and Compass Skills Pre-visit Activities

Activity #1

Have students draw maps of their route to school. Include significant landmarks, road names, directional arrows, etc. Compare the maps to one another, noting significant similarities and differences. Discuss whether they feel that these maps are accurate and easy to interpret.

Activity #2

Have students think back to the last time they walked anywhere (to school, on school grounds, to the mall, to a friend's house, etc.) How did they know they were going the right way? What signs and clues did they use? Did they get lost? What if they walked the same path at night – would it be as easy without light? Brainstorm a list of the ways people find their way around.

With your class, explore some of the mapping websites that exist (see Resources.) Point out some of the characteristics of these maps that students are familiar with (i.e. legend, distinct colors, streets, etc.) Explain to the students that at CWES they will be participating in a lesson that involves using maps to find their way.

Activity #3

Examine different types of maps that exist. Some maps the students may be familiar with are a road map, an atlas depicting state boundaries, a street map, and a topographic map. There are also weather maps, climate maps, habitat maps, and historical maps that show how the land used to look, etc. If possible, bring some of these to class so the students can compare them, looking for differences in the types of information they contain, the amount of land they describe, any special features of each type, etc.

Discuss the benefits and drawbacks to each type, and the best possible uses for each. For example, a road or street map is best to use if you are driving from location to another, but would be impractical in most cases for hiking or determining climate zones. A habitat map is useful when trying to determine possible habitats for reintroduction of animals, or to predict the location of an animal. However, this map would be impractical for most everyday uses. Historical maps, while interesting to compare to present day, would be unsafe to rely on when hiking or traveling, as they do not accurately portray current land.

Map and Compass Skills Post-visit Activities

A visit to the Central Wisconsin Environmental Station can be a school-year highlight for both students and their educators. We feel the knowledge and concepts gained during a Station visit apply outside the Station as well. The following activities will allow students to expand their knowledge and help them incorporate those lessons into their everyday life. Feel free to pick from and modify the activities as best suits your group.

Activity #1

Have small groups of students plot a map of school grounds, using the methods they learned while at the Station. They can measure distance by pacing, designate symbols for each landmark, and use contour lines to represent the elevation changes of the area. Compasses can be used to take accurate bearings between objects, and to check placement once the map is constructed. Compare their final products to each other, noting any similarities and differences. If possible, compare to an actual map of the grounds.

Activity #2

Revisit the maps that students drew during the pre-visit activities. Discuss how these maps compare to the topographic maps that they used at the Station. Did they use similar symbols? Is there anything that they would change now that they have gained more experience with maps and compasses? Have them recreate the same maps using whatever techniques they feel most appropriate.

Activity #3

To help the students understand how the compass works, have them build their own. You will need a straightened paper clip (or needle), a magnet, a bowl or non-metal pie plate filled with water, and a plastic milk cap (or other plastic item that will float.) Have the students place the milk cap in the water. Color one end of the clip red, and rub a magnet on that end several times. Then place the clip on top of the milk cap. The red end of the clip should point North. Check this with a compass.

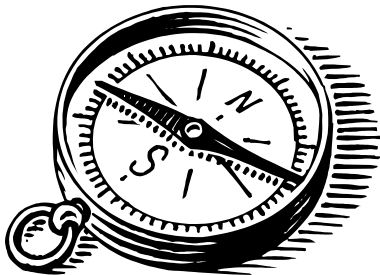
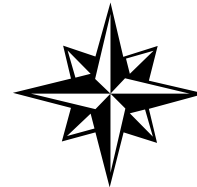
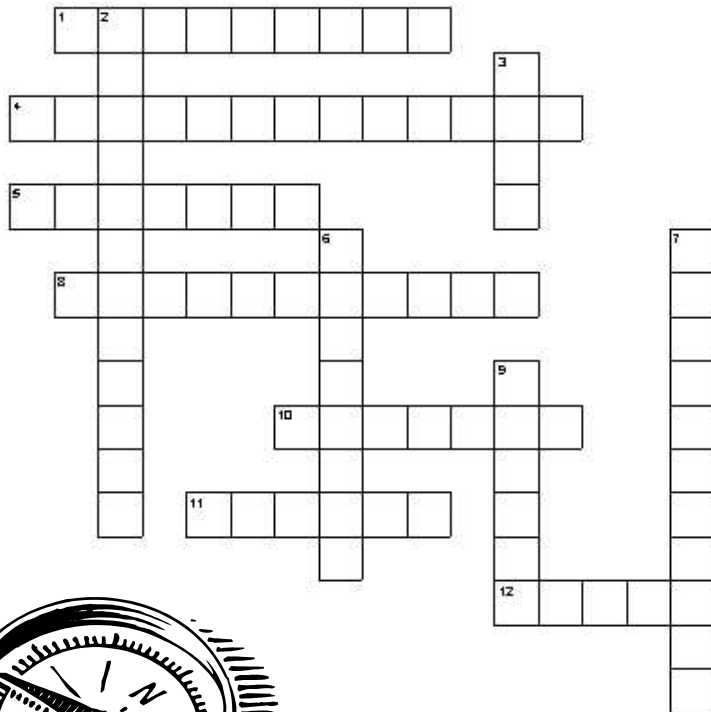
If the needle does not point North, discuss with the students what might have caused this. Are there metal objects nearby? Do they think rubbing the magnet on the clip more would help? Experiment to see how the clip reacts to metal, plastic, etc. This will help students to understand the effect of metal on their compass.

Activity #4

Use the attached crossword puzzle to review vocabulary and concepts learned in this lesson. An answer key is included on the Resource page.

Map and Compass Skills Post-visit Activities

Map and Compass Crossword Puzzle



- | Across | | Down | |
|---|---|---|---|
| 1. The most accurate of nature's compasses. | 10. A direction stated in compass degrees. | 2. The skill of using a map and compass to find your way from one location to another. | 7. A type of map that includes elevation, landmarks, and other features of the terrain. |
| 4. A method of determining location by taking multiple sightings on a landmark. | 11. A simple but accurate method of measuring distance. | 3. Often thought to be an accurate natural compass by growing on the north side of a tree, though its often inaccurate. | 9. A scale of 1:24000 means that one inch on the map represents 24000 _____ on land. |
| 5. A _____ line represents a change in elevation. | 12. The black end of the magnetic arrow is the end that points _____. | 6. _____ North is the direction that the compass needle points. | |
| 8. The angle between the direction of true north and that of magnetic north. | | | |

Central Wisconsin Environmental Station

University of Wisconsin ~ Stevens Point

10186 County Road MM ~ Amherst Junction, WI 54407