

LESSON PLAN
USING THE MAP AND COMPASS
(45 Minutes)

MATERIALS REQUIRED

1 pathfinder compass per Scout
1 topographic map per Scout

1 pencil per Scout

INTRODUCTION

In previous lessons we learned about maps and we learned about compasses. In this period of instruction we will learn how to use the map and compass together to determine our own position on the map by resection and intersection, and to determine the position of objects on the map by triangulation.

PURPOSE AND MAIN IDEAS

The purpose of this period of instruction is to teach how the map and compass are used together to determine positions.

We will do this by covering:

- Taking a bearing on an object,
- Determining back azimuths,
- Determining own position by resection and intersection,
- Determining object position by triangulation.

Upon completion of this period of instruction you will be able to:

1. Determine the magnetic bearing (azimuth) to an object in the field.
2. Determine the bearing from an object in the field to our own position (known as a back azimuth).
3. Determine own position by intersection and resection.
4. Determine the location of an object in the field by triangulation.

BODY

1st Main Idea: Determining the Magnetic Bearing to an Object in the field.

1. Begin by holding the compass close to the chest, with the direction of travel arrow pointing directly away from you.

2. Rotate your entire body until you are squarely facing the object you want to know the bearing to (the direction of travel arrow is pointing directly at the object).
3. Rotate the compass housing until the compass needle is aligned with the orienting arrow (called boxing the needle) and read the *magnetic* bearing to the object at the index mark on the compass base.

We now know the bearing from our location to the object, but for locating our own position what we really need to know is the bearing from a known point to us. This is called a *back azimuth*.

2nd Main Idea: Determining a Back Azimuth

A back azimuth is 180° opposite of the bearing or azimuth to an object. We can determine a back azimuth in two different ways: by mathematics or by direct reading from the compass.

1. To determine a back azimuth by mathematics, we simply add or subtract 180° to the bearing. If the bearing is less than 180° , we add 180° . For example, if the bearing to an object is 25° , the back azimuth is $25 + 180$, or 205° . If the bearing is greater than 180° , we subtract 180° . For example, if the bearing to an object is 245° , the back azimuth is $245 - 180$, or 65° .
2. To determine a back azimuth by direct reading from the compass, do the following:
 - Begin by holding the compass close to the chest, with the direction of travel arrow pointing directly toward you.
 - Rotate your entire body until you are squarely facing the object of interest.
 - Rotate the compass housing until the compass needle is aligned with the orienting arrow (called boxing the needle) and read the *magnetic* bearing to the object at the index mark on the compass base.

So now we know how to determine a back azimuth. What do we do with it?

3rd Main Idea: Determining Own Position by Resection and Intersection

Suppose we know that we are on a particular road, but we don't know exactly where along the road. We can determine our position on the road by a method known as *resection*.

1. First we must look around and find a prominent terrain feature that we can also identify on the map. Let's say we choose a church steeple.

2. The next thing we do is determine the bearing from us to the steeple, for example 166° .
3. Next, we determine the bearing from the steeple to us (the back azimuth). 166 is less than 180 , so we will add 180 . $166 + 180$ is 346 . The back bearing from the steeple to us is 346° magnetic. We rotate the compass housing until 346 is aligned with the index mark.
4. Finally, we determine our own location by placing the compass on the map with the lower left edge touching the steeple and the orienting arrow pointing toward the top of the map and the direction of travel arrow pointing toward the road we are on. We then carefully rotate the compass until one of the orienting lines on the compass is aligned with one of the magnetic north lines on the map. At the point where the edge of the compass crosses the road is our location.

But what do we do if we are not on a road? In that case we need to find two objects that we can see on the ground and identify on the map. If we can do that, we can find our position by a method called *intersection*. Suppose we can see the steeple and we can see a water tank. The bearing to the steeple is 150° and the bearing to the water tank is 220° . With this information we can determine our location.

1. First we figure the back azimuths from each landmark (330° from the church steeple, and 40° from the water tank).
2. Next we draw lines along the back azimuths from each point. The point that they intersect is our location.

We now have learned how to determine our own positions. But suppose we want to determine the location of an object we can see, but which doesn't appear on our map. We do this in a way similar to intersection called *triangulation*.

4th Main Idea: Determining an Object's Position by Triangulation

Triangulation is almost the same as intersection, except bearings from two known locations are used to determine the location of a third object. Each station shoots a bearing to the object and plots the bearing on a map. At the point the two bearing lines cross is the location of the object.

QUESTIONS FROM THE CLASS

QUESTIONS TO THE CLASS