MACCABBEE BUSHCRAFT

Land Navigation Course

LESSON 2 THE GRID

Learning Objectives:

2-1. Understand how to read grid coordinates

2-2. Understand what a 4 digit, 6 digit and 8 digit coordinate are

2-3. Understanding the difference between Magnetic North, True North and Grid North.

2-4. Understanding an azimuth

2-5. Understanding Terrain Features

2-6. Understand the difference between magnetic azimuth, and grid azimuth.

2-7. Understand how to plot a grid azimuth and know how to convert it into magnetic azimuth

2-8. Understand how to plot a magnetic azimuth

2-1. Understand how to read grid coordinates

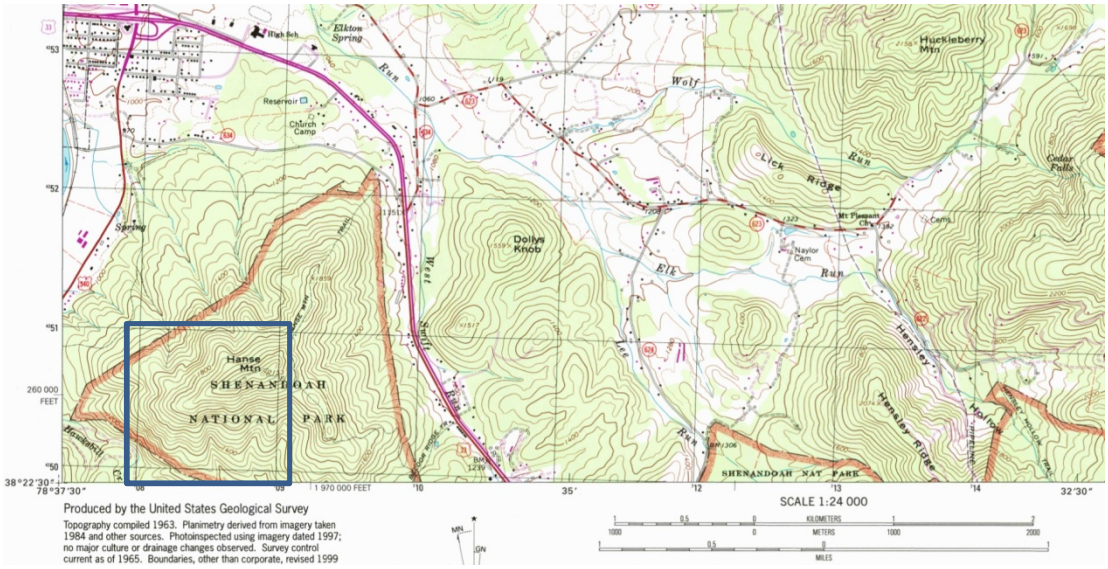
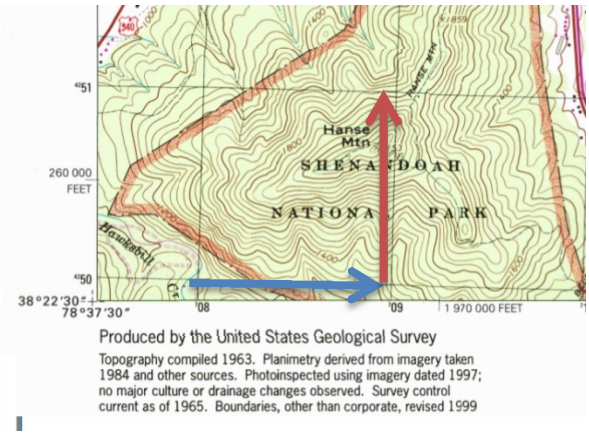


Fig 2.1

Here on this map above the numbers represent the distance from the earth's Equator (or latitude line) to our location as shown on the map. Whereas the numbers on the bottom of the page represent the distance from the Zones center meridian line (or longitude line). The number 708 is simply read 08 which is the Blue Line Across and 4250 is simply read 50 which is the Red Line Going Up. These two coordinates create a grid box which is referred to as 0850 although the others numbers 7 and 42 are present on the grid itself we only use the last two in each coordinate number, the last two of the longitude 08 and the last two of the latitude 50 to make our 4 digit grid.

Fig 2.2



2-2. Understand what a 4 digit, 6 digit and 8 digit coordinate are

A 6 digit grid is created when we want to plot a point on the map somewhere within the 1000 meter/1 km square distance and the accuracy of this area we are plotting will cover an area of 100 meters in proximity. The next closet plotting we can create is a 8 digit grid which would leave us with 10 meters in proximity to that position. So to travel for example using the large numbers in $_{7}08$ and in $_{42}50$ we only merely get a grid point which covers a 1000 km square in distance, which to us is a mere point of reference, or a grid box here on our map. Remember the numerical value of $_{42}50$ merely representing the vertical line part of the grid which represent the distance from the location to that of the earths Equator and $_{7}08$ is merely representing the horizontal line on our grid which represent the distance from the zones center meridian line. Thus this whole area is 1000 km. However, if we want to make a point within this 1000 km area we need to create a plotting point inside this grid box and in order to do so we will need a protractor. But before we do this with any map we will need to know two things, the scale and how to us the correct protractor with it. For this example the scale for this map is 1:24,000 and in this area we know each grid box contains 1000 km distance within it. Other scales will change this distance based upon the area the map is covering scale wise. So for this one we need a protractor to convert the information over that is made for 1:24,000 scale. In order to do so we must have the correct tools to do so. Some protractors have up to 14 scales all on one protractor such as made by maptool.com as is seen on the page below.

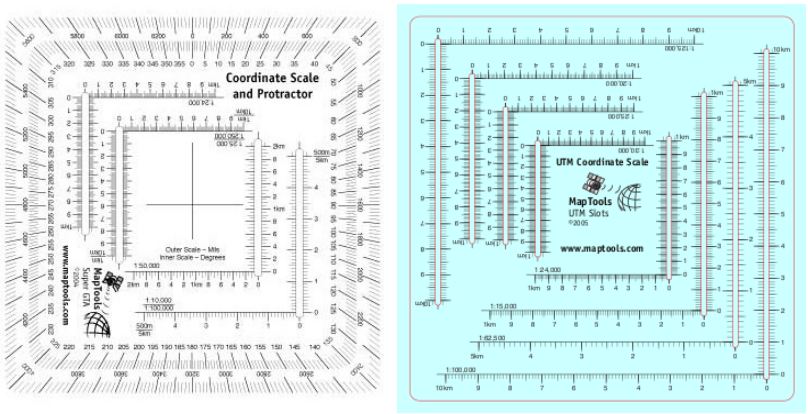


Fig 2.3

Scales: 1:10,000, 1:15,000,1:20,000, 1:24,000, 1:25,000, 1:30,000, 1:62,500, 1:100,000, 1:125,000, 1:150,000, 1:200,000, 1:250,000, 1:300,000, 1:1,000,000

To plot a point we just have to remember the way the numbers work its always RIGHT then UP so the first number to move on the correct grid box will be the 708 as this number is our longitude number which tells us this is the grid line we are working on, the next number 4250 tells us this is the latitude grid line that we are to stop at. Thus the line from 708 to 709 and 4250 to 4251 is our grid box. To simplify it we will only us the large numbers 08 and 50 from this point on. Note there is no single digit numbers in a latitude or longitude point on a map all single digits require a 0 as in 09 before the single digit. However, all other numbers will be added next to a latitude or longitude when plotting a point inside of a grid. Now since we have our longitude number 08 and our latitude number 50 we just need to add two more numbers. These numbers will range from 0 to 10. Thus if we plotted a gird which read 083056 this plotting would look like this.

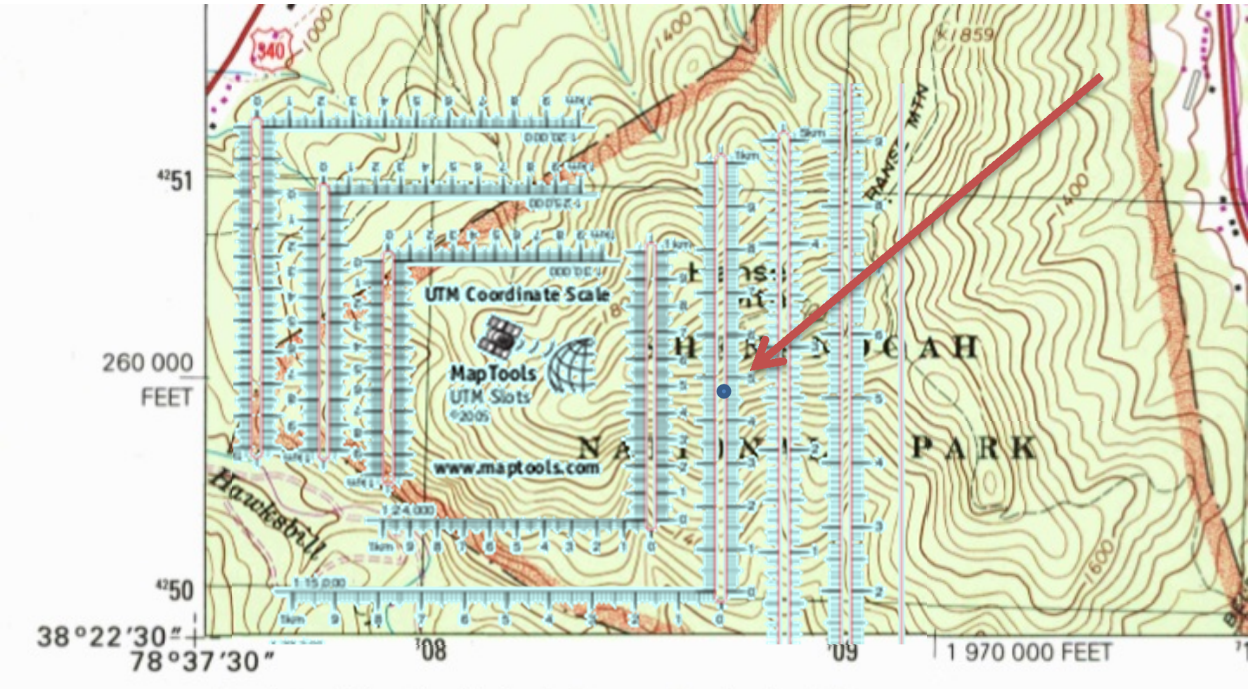
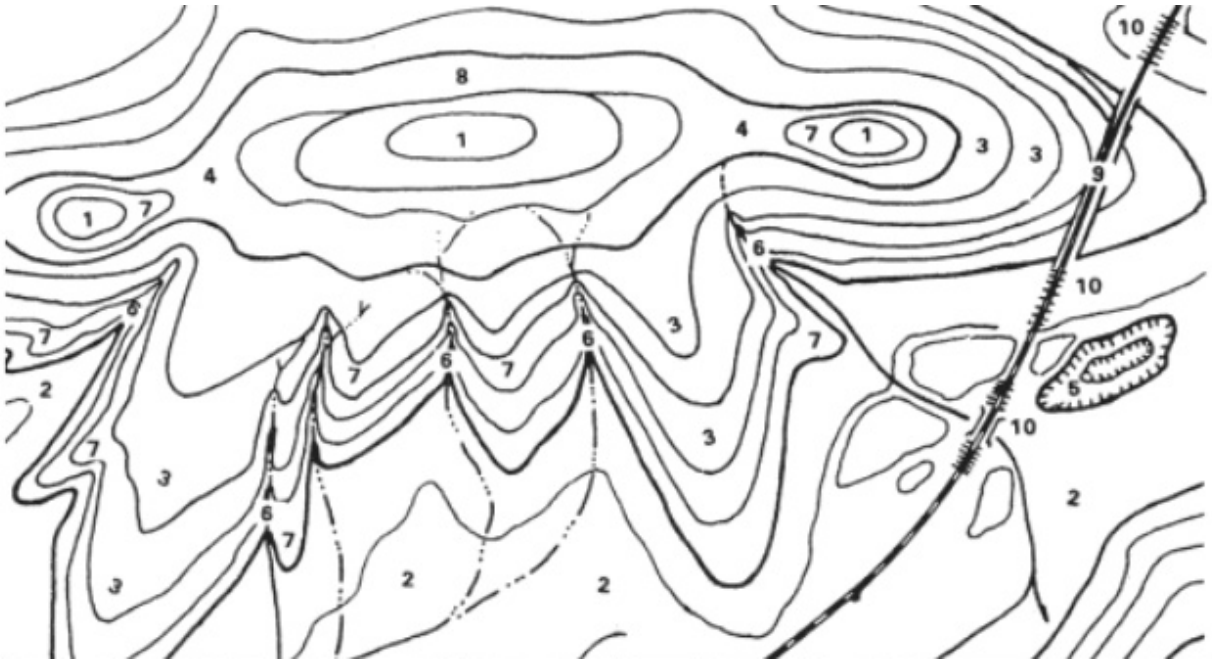


Fig 2.4

That is 08 is our longitude line and 3 RIGHT then 50 is our latitude line and 5 UP. Here is now the location you just plotted you are literally on a mountains ridge. This is literally the side portions in which incline and decline exist going up and down the. Now remember this coordinate will only give you a 100 meters rough proximity to this location or let's say about a football field in distance, which generically speaking is quite enough for general navigation.

Terrain Features



1.Hill	3. Ridge	5. Depression	7. Spur	9. Cut
2.Valley	4. Saddle	6. Draw	8. Cliff	10. Fill

Fig 2.5

2-3. Understanding Terrain Features

1. Hill: Is a natural raised area of Land
2. Valley: Is a flat open plain
3. Ridge: Is a narrow elevation of land, or chain of hills, or mountains
4. Saddle: Is the lower part of a ridge between two higher points of elevation or peaks
5. Depression: Is a area of land which sink downward
6. Draw: Is a steep elevated area which sits between two ridges that create a U or V shape
7. Spur: Is a piece of land jutting into a river or stream or a ridge descending from mountains into a valley
8. Cliff: Is a steep and sudden drop off of land
9. Cut: Is a man-made cut out of land used in order to create a road of train track to pass through an area

10. Fill: Is a man-made area of land mass which is used to raise up the elevation for the use of a road or train track.

2-4. Understanding the difference between Magnetic North, True North and Grid North.

Now let's talk about the difference between grid north, magnetic north and true north.

True North- Is a line from any point on the earth surface to the North Pole. This can be found in two manners one in the day using shadows cast by the sun which we will cover later and the other in the evening using the North Star, this when referring to our map is always represented with a star above it on the declination diagram. And true north is almost exclusively sought after when one is navigating without a compass.

Magnetic North- Is the magnetic field which pulls toward the north but is not exactly on the North Pole.

Grid North- Is the direction found on the gird which is used as latitude/or the vertical lines as is found on a map.

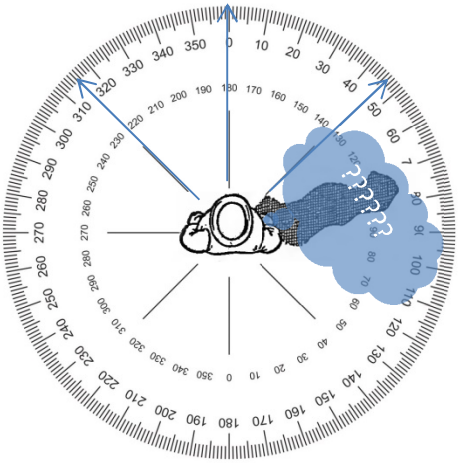
So now that we have this out of the way let's make this short and sweet, if you're not seeking to use a compass for navigation you're only going to be dealing with True North.

Azimuth- Is the degree/angle used to create the direction ones is seeking to travel using either a compass or line plotted on a map.

Grid Azimuth- Is the degree/angle plotted on a map used to create the direction ones is seeking to travel.

Magnetic Azimuth- Is the degree/angle created by using a compass used to create the direction ones is seeking to travel.

Fig 2.6



2-5. Understanding an azimuth

An azimuth is simply a degree we use for direction through the use of a compass in order to specify a direction of movement. So if we want to walk to the right we would say turn 30 degrees rather than merely turn to the right. When making an azimuth the reason for it is because we want to get to a location accurately using degrees as our means of pinpointing where something is and in what direction we are going to travel to get there.

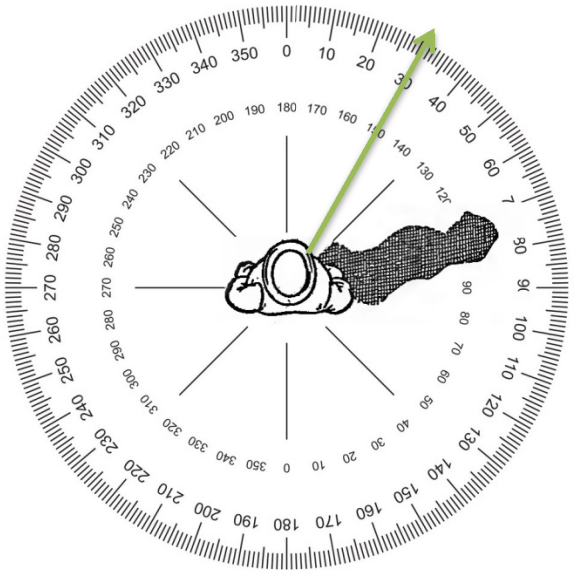


Fig 2.7

2-6. Understand the difference between magnetic azimuth, and grid azimuth.

A magnetic azimuth is the direction we use to travel when using a compass where as a grid azimuth is the direction we use when referring to our map for the location and direction of an object or area we are seeking to travel to, by means of the areas degree variance. The difference between them is that the grid azimuth requires us to use the declination chart degree variance of north through adding or subtracting that degree from our compass in order to orientate our compass to read grid north. This is because our compass north is using the magnetic pull toward the north magnetic field. Whereas the map tells us what variance in degree north is located in reference to the maps area location in reference to the vertical lines used for grid north.

2-7. Understand how to plot a grid azimuth and know how to convert it into magnetic azimuth

So let's focus now about making a grid azimuth. The purpose in which we would make a grid azimuth is used when we want to plot a point somewhere on our map, and we know where on our map we are currently located, and based upon the known region or grid box were are at, we plot from that position to our new desired location in order to calculate both the distance as well as the direction we will need to travel, to get there. But before we begin to talk about distance let's just focus on direction first. So in order to do this we need to know two things what is the maps declination for that area and where is our current location. So let say we are located at (A) near the river shoreline. And we want to travel to location (B) here we would draw a line long enough so that the points are connected, and so that the protractor degrees can be read on both ends of the protractor this will give us our grid and back azimuth for both directions. First we have to make sure our protractor is in alignment with our maps Grid North.

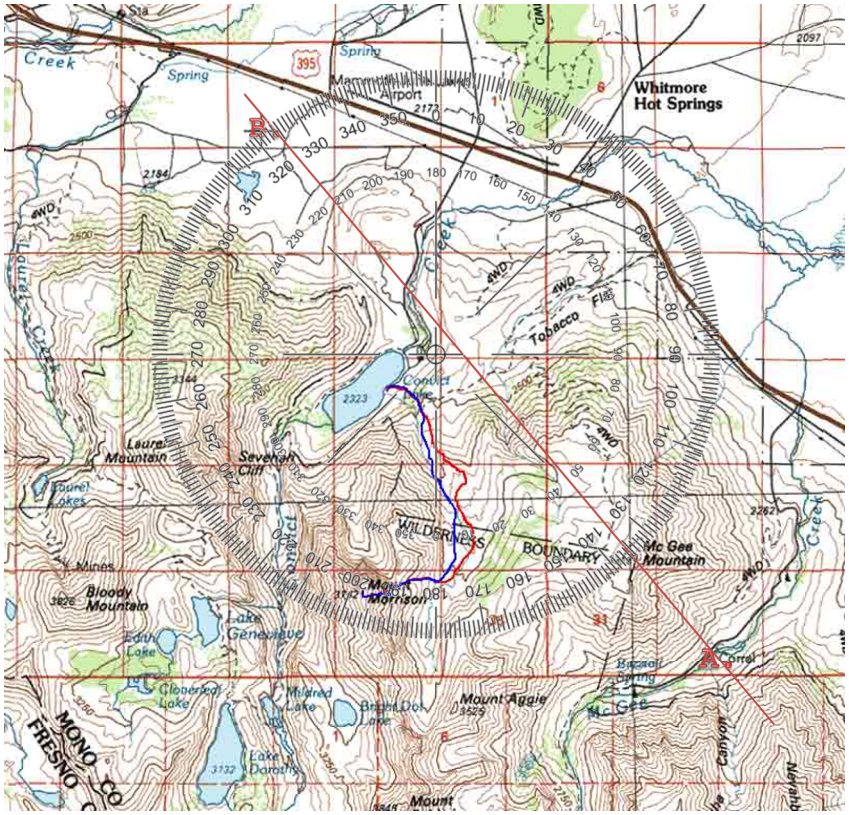


Fig 2.8

From point (A) to point (B) is 320 degrees and from point (B) to point (A) is 140 degrees. This degree from point (B) to point (A) is 180

degrees and we call this a back azimuth because this degree tells us how to get back to the location we initially left from. When we want to convert this degree reading from our map back to our compass we have to add or subtract the necessary degrees based upon the declination chart so that our compass will be in line with the maps plotted course. (See Fig 1-7&8)

Let's put it plainly this way we can understand this better. Let's say we want to travel to the river which on my compass reads 125 degrees but I want to figure out what obstacles I could be facing first so in order to do so I want to check out my map for details. But when I do so, I have to use the declination chart which says 15 to the right. This basically means in order to align my compass with that maps I have to add 15 degrees to my compass reading in order for it to be in sync with my map. This is called converting your compass's magnetic azimuth to grid azimuth. But when I am ready to travel I have to subtract the 15 degrees from my compass in order for my grid azimuth to be converted over to my magnetic azimuth.

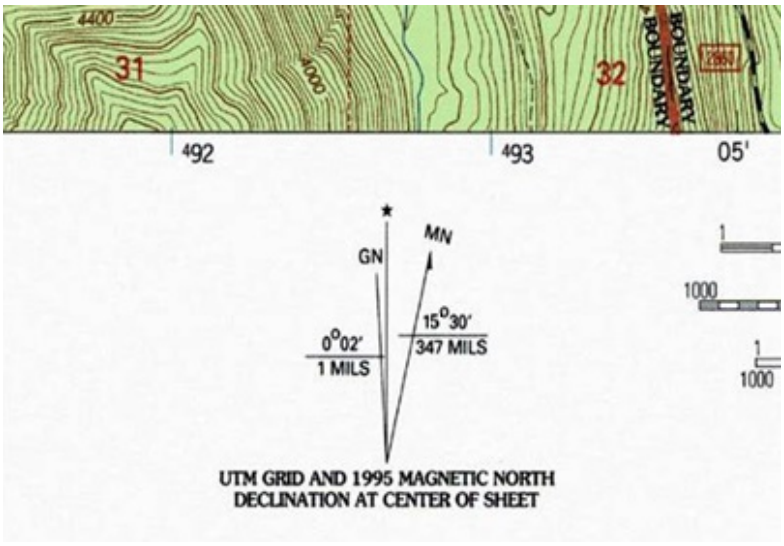


Fig 2.9

So depending upon the declination chart direction will determine what you have to do either to add or subtract 15 degrees when you convert your grid azimuth to read correctly on your magnetic azimuth when using your compass to travel.

2-8. Understand how to plot a magnetic azimuth

Now let's learn how to plot a magnetic azimuth. As appose to using a map for direction and land layout when using a map, a compass on the other hand requires the use of visual markers. This is done through the use of the sight wire on the front cover portion of the compass while we align our compass facing the direction of choice and using land features which are visible as a means to mark visually where it is we are seeking to travel. When doing this it's obvious the distance might be unknown to us however since we are using the compass the degree or angle will be our source of absolute information for direction of movement. Note we will cover making a magnetic azimuth in the evening later.

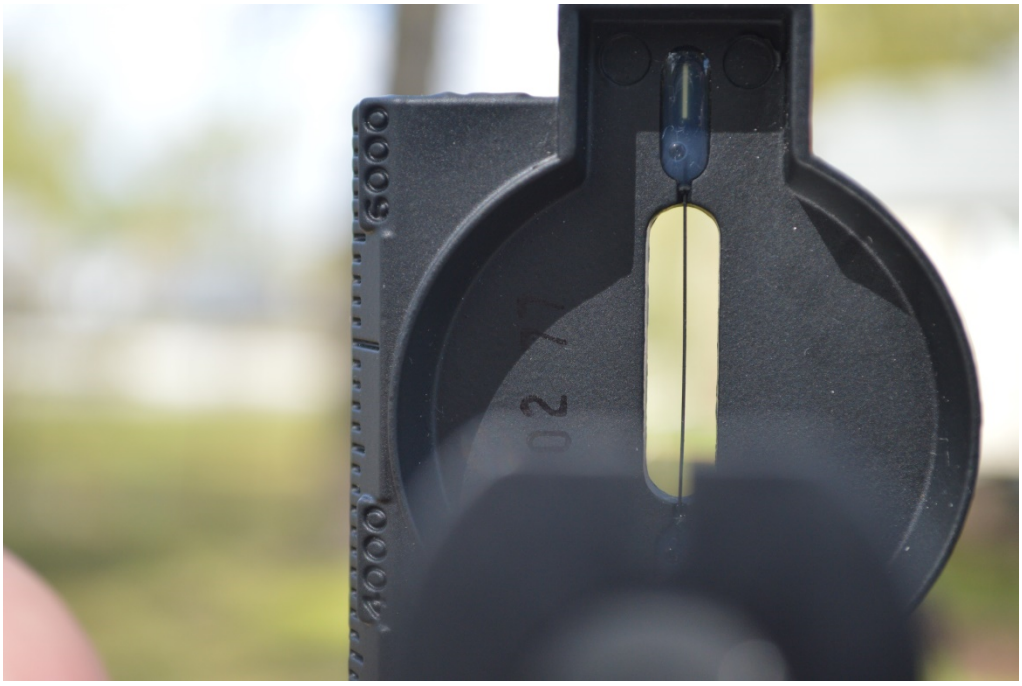


Fig 2.10

Because we are using a magnetic compass we have to keep in mind metal and electrical things we want to keep away from our compass so as to not interfere with our readings.

High-tension power lines	55 meters/
Vehicles	10 meters
Wires	10 meters
Large Portable Metal Objects	2 meters
Steel Rim Glasses	1/3 meters

How to hold a compass

Open the cover all the way till it's completely flat move the sight in the rear as far as possible so that the dial moves freely

Place your thumb through the loop and form a stead base with your third and fourth fingers and extend both index fingers along the side of the compass.

Place the thumb on the other hand between the lens and the bezel ring and place the remaining fingers around the fingers of the other hand.

Pull your elbows firmly into your sides turn your entire body until you reach your desired point of reference and the black magnetic azimuth is under the fixed black index line.

Presetting a compass

Hold the compass level in the palm of your hand

Rotate your body until the desired azimuth falls under the fixed black index line.

Turn the bezel ring until the short luminous line is aligned with the north seeking arrow. Once the alignment is obtained, the compass is present.

Note: When moving make sure the short luminous line and the north seeking arrow are aligned. This will ensure the proper azimuth is being maintained.

Fig 2.11

Compass to cheek technique

Open the compass so that the cover is vertical forming a 90 degree angle with the base

Move the rear sight to the rear most position to release the dial, then fold it slightly forward

Turn the thumb loop all the way down and insert your thumb. Form a loose fist under the compass, steady it with your other hand, raise it to the eye level

Look through the rear sight notch and center the front sighting wire in the rear sight notch

Keeping the compass level and the sights aligned rotate your entire body until the sighting wire is lined up on a distant object

Glance down through the lens and read the degree which is directly under the black index line. The azimuth you read is the magnetic azimuth from your position to the direct object.

Once you have done the above and you know your degree of angle you can now move toward your objective just keep your degree under the black index line and continue heading in that direction till you have arrived. If need be keep looking at your compass and make sure the correct reading is under black index line and continue heading in that direction. You now know how to make a magnetic azimuth.

Fig 2.12