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LAND NAVIGATION 4

TERMINAL LEARNING OBJECTIVE(S)

1. Given a military topographic map, protractor, and objective, navigate with a map and compass to arrive within 10 meters of the objective. (OCS-PAT-1002)

ENABLING LEARNING OBJECTIVE(S)

1. Given a topographic map, protractor and two plotted points, determine the azimuth to a desired location without error. (OCS-PAT-1002d)

1. **DIRECTION**. Direction is defined as the position of one point in relation to another. Two essential elements are necessary to determine direction.

a. An understood and universal base direction or reference line.

b. An angle measured with respect to that line.

2. **BASE DIRECTIONS**. There are three universal base directions in common usage: True North, Magnetic North, and Grid North.

a. True north is at the North Pole. Lines of longitude on a globe indicate this baseline direction. It is usually used in celestial navigation.

b. Magnetic north is the direction the compass points. There are no magnetic lines shown on the map. The magnetic north pole is located just north of the Hudson Bay in Canada.

c. Grid north lines are a device of mapmakers and enable us to plot direction on the map. They are indicated by the vertical, parallel lines on the map. When the mapmaker interprets the rounded earth surface on a flat map sheet, it is necessary to create this artificial base direction.

d. Magnetic north and grid north lines are used to determine the GM angle.

e. The declination diagram shows the angular relationship between the three north(s).

3. **AZIMUTH**. A horizontal angle measured clockwise from a base line.

a. Grid Azimuth. A horizontal angle measured clockwise from a grid north line. A grid azimuth can be measured directly from a map showing grid north lines.

b. Magnetic Azimuth. A horizontal angle measured clock-wise from magnetic north. A magnetic azimuth can be read directly from a compass but not from a map.

4. **GM ANGLE**. The GM angle will allow you to take an azimuth from a map and convert it to a bearing which can be used with a compass.

a. The GM angle is the difference in a grid azimuth and the magnetic azimuth for a certain area. The magnetic azimuth changes depending on where you are in relation to the North Pole; i.e. different locations will have different GM angles.

b. The Declination Diagram shows the relationship between the local magnetic azimuth and the grid azimuth.

5. **TO MEASURE A GRID AZIMUTH**

a. Plot two eight digit grid coordinates.

b. Connect them with a straight line.

(1) Place the index point of the protractor on the point from which you want to measure the azimuth.

(2) Ensure the grid alignment lines are parallel to the north and south grid lines on the map.

(3) Ensure the square edges of the protractor are aligned with the east or west horizontal gridlines.

(4) Read the value off the protractor where the line crosses the rounded edge. Make sure to read the proper scale.

6. **CONVERTING AZIMUTHS**

a. The **GM Angle** is the key to converting azimuths back and forth between grid and magnetic.

b. On newer maps, the instructions are written out next to the declination diagram.

c. If the map does not contain instructions, there are two simple methods to determine whether the GM Angle should be added or subtracted.

(1) Look at the declination diagram and determine the direction between the line representing grid north and the line representing magnetic north.

(2) Put your finger on the grid north line, now move it to the magnetic north line. If you moved left you should add the angle between grid and magnetic; if you moved right, you should subtract. This concept of **LEFT ADD, RIGHT SUBTRACT** is known as the LARS Rule.

7. **NIGHT NAVIGATION**

a. **Presenting a Compass and Following an Azimuth**. Although different models of the lensatic compass vary somewhat in the details of their use, the principles are the same.

(1) During daylight hours or with a light source.

(2) Hold the compass level in the palm of the hand.

(3) Rotate it until the desired azimuth falls under the fixed black index line (for example, 320 degrees), maintaining the azimuth as prescribed (See figure below).

(4) Turn the bezel ring until the luminous line is aligned with the north-seeking arrow. Once the alignment is obtained, the compass is preset.

b. To follow an azimuth, assume the center-hold technique and turn your body until the north-seeking arrow is aligned with the luminous line. Then proceed forward in the direction of the front cover's sighting wire, which is aligned with the fixed black index line that contains the desired azimuth.

c. During limited visibility, an azimuth may be set on the compass by the click method. Remember that the bezel ring contains 3 degrees intervals (clicks).

(1) Rotate the bezel ring until the luminous line is over the fixed black index line.

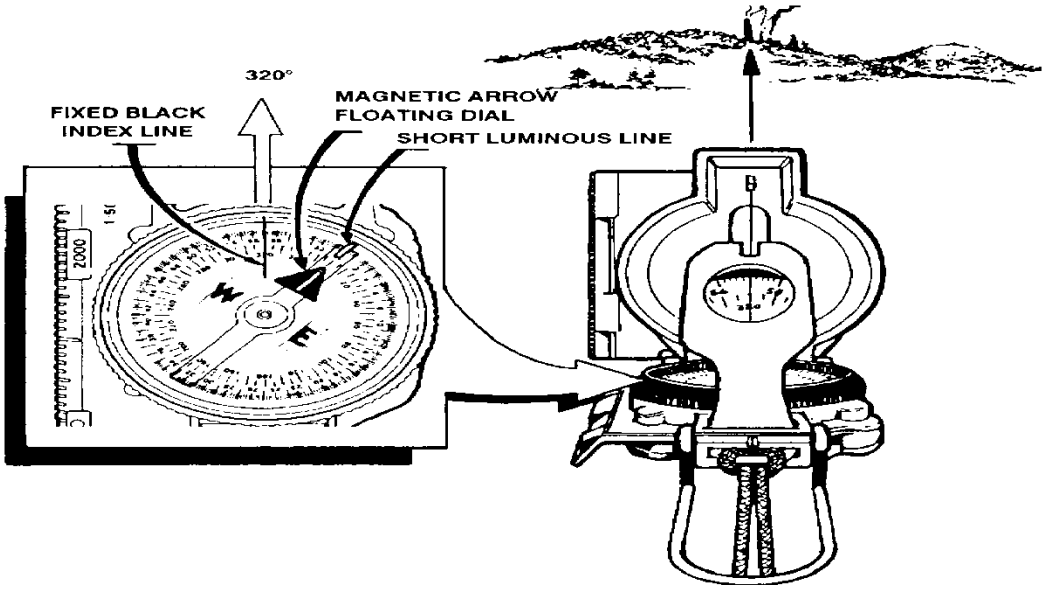
(2) Find the desired azimuth and divide it by three. The result is the number of clicks that you have to rotate the bezel ring.

(3) Count the desired number of clicks. If the desired azimuth is smaller than 180 degrees, the number of clicks on the bezel ring should be counted in a counterclockwise direction. For example, the desired azimuth is 51 degrees. Desired azimuth is 51 degrees 3=17 clicks counterclockwise. If the desired azimuth is larger than 180 degrees, subtract the number of degrees from 360 degrees and divide by 3 to obtain the number of clicks. Count them in a clockwise direction. For example, the desired azimuth is 330 degrees; 360 degrees-330 degrees=30. 3=10 clicks clockwise.

(4) With the compass preset as described above, assume a center hold technique and rotate your body until the north-seeking arrow is aligned with the luminous line on the bezel. Then proceed forward in the direction of the front cover's luminous dots, which are aligned with the fixed black index line containing the azimuth.

(5) When the compass is to be used in darkness, an initial azimuth should be set while light is still available, if possible. With the initial azimuth as a base, any other azimuth that is a multiple of three can be established through the use of the clicking feature of the bezel ring.

<u>NOTE</u>: Sometimes the desired azimuth is not exactly divisible by three, causing an option of rounding up or rounding down. If the azimuth is rounded up, this causes an increase in the value of the azimuth, and the object is to be found on the left. If the azimuth is rounded down, this causes a decrease in the value of the azimuth, and the object is to be found on the right.



NOTES:

REFERENCE:

1. Map Reading and Land Navigation FM 21-26