
UNITED STATES MARINE CORPS
THE BASIC SCHOOL
MARINE CORPS TRAINING COMMAND
CAMP BARRETT, VIRGINIA 22134-5019

LOCATION
B170241XQ
STUDENT HANDOUT

Location

Introduction The class will cover how to locate unknown positions on a map and create a terrain profile.

Importance A Marine Officer must be able to accurately identify his/her position on a map at all times in order to navigate to an objective, call for fire, execute a casualty evacuation (CASEVAC), etc.

In This Lesson We will discuss methods to locate positions on a map, using the inspection, intersection, and resection methods. Terrain profiling will also be covered.

This lesson covers the following topics:

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Learning Objectives

Terminal Learning Objective

TBS-PAT-1002 Given a military topographic map, protractor, lensatic compass, and objective, navigate with a map and compass, to arrive within 100 meters of the objective.

Enabling Learning Objectives

TBS-PAT-1002e Given a military topographic map, protractor, determine/plot a grid, to within 30 meters

TBS-PAT-1002f Given a military topographic map, protractor, string, and paper, determine distance using bar scale, to within 30 meters.

TBS-PAT-1002g Given a military topographic map, protractor, and two points on a map, determine grid azimuth to within 3 degrees.

TBS-PAT-1002h Given a military topographic map, protractor, a grid or magnetic azimuth, and compass error, convert an azimuth, without error.

TBS-PAT-1002i Given a military topographic map, protractor, and two points on a map, determine a back azimuth to within 3 degrees.

TBS-PAT-1002j Given a military topographic map, lensatic compass, orient a map without error.

TBS-PAT-1002n Given two azimuths from known points, or one azimuth and a linear feature, conduct an intersection to determine location of an unknown point to within 50 meters.

TBS-PAT-1002p Given two azimuths from known points or one azimuth and a linear feature, conduct a re-section to determine your location to within 50 meters.

Locating Positions

The three methods of locating positions are inspection, intersection, and resection.

Inspection

A method of determining your location by matching the surrounding terrain features to the corresponding features on the map. Although this method is fast, it may be inaccurate.

Steps to determine location using the inspection method

Step	Map Orientation/Inspection
1	Open your magnetic compass and lay it on your map.
2	Align the compass to the map with the compass top cover oriented toward grid north, and the graduated edge aligned to the north-south running grid lines.
3	Rotate the map and compass together until the compass reads 360 degrees beneath the black index line. The map and compass are now oriented to magnetic north.
4	Rotate the map and compass together to correct for the GM Angle of your area. (Ex: for Quantico, rotate the map and compass to read 9 degrees). The map is now oriented to grid north.
5	Locate two or more features (specific hill/terrain, building, road intersection, etc.) on the ground which you can <i>definitively</i> identify on the map sheet.
6	Estimate your actual position in relation to the features already identified.

Intersection

The *location of an unknown point* by sighting on the unknown point from one or more known positions. The two ways to locate positions using the intersection method are two-point and one-point intersection. Use one-point intersection if the unknown point is located on a linear feature (i.e. road, draw, telephone line, etc.). The following table lists the steps to determine location using the intersection method.

Steps to determine location using the intersection method

Step	Two-Point Intersection	One-Point Intersection
1	Orient the map sheet.	Orient the map sheet.
2	Identify your known position and mark it on the map.	Identify your known position and mark it on the map.
3	Determine the magnetic azimuth from your known position to the unknown position.	Determine the magnetic azimuth from your known position to the unknown position.
4	Convert the magnetic azimuth to a grid azimuth.	Convert the magnetic azimuth to a grid azimuth.

5	Plot the grid azimuth from your known position to the unknown point.	Plot the grid azimuth from your known position to the unknown point.
6	Repeat this procedure from another known point.	The location of the unknown point is the intersection of the plotted line with the linear feature.
7	With a protractor, read the 8-digit grid coordinate at the intersection of your plotted lines. This indicates the location of the unknown point.	With a protractor, read the 8-digit grid coordinate at the intersection of your plotted line and linear feature. This indicates the location of the unknown point.

Resection

A method of determining *your location* by sighting on one or more known terrain features. Like intersections, resections may be accomplished using either the one-point or two-point methods. Use the one-point resection method if you are located on a linear terrain feature (road, river, power lines, etc.). The following table lists the steps to determine your location using the resection method.

Steps to determine your location using the resection method

Step	Two-Point Resection	One-Point Resection
1	Orient the map sheet.	Orient the map sheet.
2	Identify a known feature on the ground and on the map.	Identify a known feature on the ground and on the map.
3	Determine the magnetic azimuth to the known feature.	Determine the magnetic azimuth to the known feature.
4	Convert the magnetic azimuth to a grid azimuth.	Convert the magnetic azimuth to a grid azimuth.
5	Determine the grid back azimuth.	Determine the grid back azimuth.
6	Plot the grid back azimuth from the known feature on your map.	Plot the grid back azimuth from the known feature on your map.
7	Repeat this procedure from another known point.	Your location is the point at which your plotted line crosses the linear feature.
8	With a protractor, read the 8-digit coordinate at the intersection of your plotted lines. This indicates the location of your position.	With a protractor, read the 8-digit coordinate at the intersection of your plotted line and linear feature. This indicates the location of your position.

Terrain Profiling

Terrain Profile

A good knowledge of the local terrain is essential to most military operations. For many purposes, a study of the contour lines on a map or a walk over the terrain is sufficient. When more precision is needed, a profile of the terrain may be required. Creating a terrain profile provides a quick and easy method to visualize the lay of the land.

Definition

A terrain profile is defined as an exaggerated side view of a portion of the earth's surface along a line between two points. This can be easily visualized. Imagine yourself on a plain with one hill in the center, and you are looking straight at the hill. If the hill could be cut in half from the top to the bottom perpendicular (90°) to your line of sight, you would be facing a cross section of the hill with its outline visible to you. An accurately scaled drawing of this outline would be a profile of the hill.

Military Application

The military applications of such a profile include:

- Determining the most effective fields of fire for direct fire weapons.
- Determining dead space to be covered by indirect fire weapons.
- Determining visibility and hidden areas from observation posts.
- Various applications for engineers, communicators, and aircrews.

Construction

A terrain profile can be constructed from any contour map. The table following lists the steps to construct a terrain profile.

Terrain Profiling (Continued)

Steps to construct a terrain profile

Step	Action	Sub-Steps
1	Construct a profile chart.	On a blank sheet of paper, draw a series of equally spaced horizontal lines. Each line will represent a different elevation. Draw enough lines to cover all the variations of elevation along the line you wish to profile.
		Label each line by elevation--the top line as the highest elevation and the bottom line as the lowest elevation. Add an extra line on each end of the scale. The raw profile chart is now complete and ready for use.
2	Transfer the information on the map to the profile chart.	Take your map and draw a line along the terrain you wish to profile. Label the ends of this line A and B; note the eight-digit coordinates of points A and B. Now, you will draw an accurately scaled side view of the terrain along line AB.
		Place your profile chart on your map with the uppermost line adjacent to and parallel with the line AB. Secure the profile chart to the map with paper clips, tacks, or a field expedient.
		From every point on line AB where a contour line crosses or touches, drop a perpendicular line to the line on the profile chart that has the same value as the contour line. Interpolate the elevation value of hilltops and draws. Put a tick mark on the profile chart where the perpendicular line crosses.
		Connect the tick marks with a smooth, natural curve.
		If possible, augment your profile by walking along line AB on the ground to accurately measure and draw in by hand minor elevation differences such as holes and depressions.
		Finally, add marginal information to the profile chart. Put the map sheet designator and a scale on the profile chart. Most importantly, put the eight-digit grid coordinates of points A and B on the chart so all personnel with the same map sheet can use the profile.

Review Questions

Requirement 1

Map: New River, North Carolina 1:50,000, Sheet 5553 III, Series V742, Edition 9-NGA

Note: For these problems



represents a tower.

**Section 1:
Question 1**

You have made a practice landing on Onslow Beach. Battalion requests the eight-digit grid coordinate of your position. From your position, you shoot a magnetic azimuth to the bridge in GS 9127 and convert it to a grid azimuth of 50° . Repeating this process with the tower in GS 8725, you determine the grid azimuth to the tower to be 255° . What is the eight-digit grid coordinate of your position?

Answer: _____

Question 2

Moving inland and establishing a position on hill 16 in GS 8627, you observe an aggressor tank column moving along the hard surface road, Route 172. After shooting a magnetic azimuth to the tank column, you determine the corresponding grid azimuth to be 62° . What is the location of the tank column?

Answer: _____

Question 3

Upon landing on Onslow Beach and reaching the first improved light-duty road, you discover that your amphibious assault vehicle driver is confused as to his position. The battalion tactical net has reported a burning enemy tank on a bridge in GS 9127. From your position, you can see a column of smoke on a magnetic azimuth of 53° . What is your location?

Answer: _____

Review Questions (Continued)

**Requirement 1
(Continued)
Section 2: Question 1**

Your convoy is on a road at grid 88922810 and is taking heavy fire from an enemy gunboat in the intercoastal waterway. You spot the boat on a magnetic azimuth of 197° . At what eight-digit coordinate should you call in your fire mission?

Answer: _____

Question 2

A reconnaissance team established at Yopps Church in GS 7926 reports sighting tracked vehicles that are moving inland, parallel to a branch of Everett Creek. The team sights them on a magnetic azimuth of 287° . Another team set up at the major road intersection in GS 7626 sees tracked vehicles on a magnetic azimuth of 64° . What is the location of the tracked vehicles?

Answer: _____

Question 3

You are ordered to send a second patrol out to secure an LZ for reinforcements at the clearing in GS 7724. The squad leader becomes confused as to his location en route. He can see the steeple of Little Zion Church in GS 8026 on a magnetic azimuth of 65° and the bridge in GS 7722 on a magnetic azimuth of 178° . What is the location of the patrol's position?

Answer: _____

Review Questions (Continued)

**Requirement 1
(Continued)
Section 3:
Question 1**

The armored column that was previously sighted has halted near Everett Creek. You decide to call for an air strike. The observation post (OP) at Yopps Church (GS 7926) sights the column on a magnetic azimuth of 298° . Another OP, in the building at the road junction in GS 7626, can see the same armored column on a magnetic azimuth of 13° . What is the location of the armored column?

Answer: _____

Question 2

The air strike you requested has been run. You and your patrol are helo-lifted to the area to assess the damage. After you have been dropped in the LZ, you are confused as to your position. You see the water tower in GS 7530 on a magnetic azimuth of 327° . You see the light tower in Stone Bay in GS 7830 on a magnetic azimuth of 55° . What is the eight-digit coordinate of your position?

Answer: _____

Question 3

Your recon patrol was ambushed with four friendly wounded in action (WIA). You are now located on a hard surface road, and you can see hill 16 in GS 8730 on a magnetic azimuth of 283° . What eight-digit grid coordinate would you radio in for a medical evacuation (medevac) pick-up?

Answer: _____

Review Questions (Continued)

Requirement 2

Map: Margarita Peak, California, 1:50,000, Sheet 2550 IV, Series V795, Edition 9-NGA

**Section 1:
Question 1**

From your position on hill 411 in GS 5790, you observe a tank column moving up Interstate 5. After shooting a magnetic azimuth to the tank column, you determine the corresponding grid azimuth to be 208° . What is the location of the tank column?

Answer: _____

Question 2

You are leading a patrol south on an unimproved dirt road. Battalion requests the coordinates of your position. From where you are, you can see the water tank in GS 6189 at a distance of roughly 3000m. After shooting a magnetic azimuth to the water tank, you determine the corresponding grid azimuth to be 249° . What is the location of your position?

Answer: _____

Question 3

From your OP on hill 176 in GS 6393, you observe enemy activity on the unimproved road in GS 6391. After shooting a magnetic azimuth to the enemy, you determine the corresponding grid azimuth to be 175° . What is the location of this activity?

Answer: _____

Question 4

You are located somewhere along an unimproved road east of Margarita Peak (GS 6300). You can see the lookout tower in GS 6302 on a magnetic azimuth of 239° and at a distance of about 2700m. What is the location of your position?

Answer: _____

Review Questions (Continued)

**Requirement 2
Section 2**

During the hours of darkness, your OP on top of hill 236 in GS 6593 observes lights on a magnetic azimuth of 132° . Another OP on hill 201 in GS 6992 also observes the lights on a magnetic azimuth of 216° . What is the location of the lights?

Question 5

Answer: _____

Question 6

From your vantage point at horizontal control point 172 in GS 5786, you see enemy troops digging in on a magnetic azimuth 146° . Moving to a new vantage point at grid coordinate 59908565, you see them on a magnetic azimuth of 226° . What is the location of the enemy?

Answer: _____

Question 7

You are somewhat east of San Onofre Canyon, California (GS 5495 - GS 6299). You decide to pinpoint your location by two-point resection. Using your compass you shoot the following magnetic azimuths:

Margarita Peak	GS 6300	045°
Hill 667	GS 5999	265°

What is the location of your position to the nearest 50m?

Answer: _____

Review Questions (Continued)

**Requirement 2
Section 2 (Continued)
Question 8**

You desire to accurately locate your position. You know that it is somewhere southeast of the target range. You take two compass readings as follows:

Water tower	GS 7493	016°
Hill 269	GS 7393	326°

- a. What is the location of your position?

Answer: _____

- b. What method of location is this?

Answer: _____

Question 9

You are the forward observer for a company located at BM 236.2 in GS 7589. On a magnetic azimuth of 261°, you see a group of enemy soldiers loading munitions onto a train on a main line railroad track. What is the eight-digit grid coordinate which you will use in your call for fire?

Answer: _____

Review Questions (Continued)

Requirement 2
Section 2 (Continued)
Question 10

You are at an unknown location and see enemy troops loading supplies onto a truck. The magnetic azimuth from your position to the truck is 165° . You can also see the following points and have recorded magnetic azimuths to each:

Road junction	59659295	256°
Hilltop	GS 6093	004°

A recon patrol has spotted the same target. They report their location as grids coordinate 58489139. The target is on a magnetic azimuth of 75° from their position.

What are the coordinates of:

- a. Your position?

Answer: _____

- b. The enemy truck?

Answer: _____

Review Answers

Requirement 1

Item	Section 1	Section 2	Section 3
1	8995 2659	8859 2610	7645 2771
2	8792 2834	7675 2717	7686 2893
3	9026 2663	7719 2472	9071 3047

Requirement 2

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1. 5520 8640
 2. 6414 9025
 3. 6370 9185
 4. 6565 0272
 5. 6674 9065
 6. 5807 8455
 7. 6129 9916
 8.
 - a. 7370 9276 \pm 50m
 - b. Two point resection
 9. 7324 8974
 10.
 - a. 6015 9295
 - b. 6017 9141
-

