

# Reconnaissance and Surveillance Leader's Course Map Reading self study worksheet (Tenino, Washington Map)

## General Knowledge

1. Name the five Basic Colors on a map and what they represent?

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

2. Name the five major terrain features:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

3. Name the three minor terrain features:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

4. Name the two supplementary terrain features:

1. \_\_\_\_\_
2. \_\_\_\_\_

5. List the three types of Contour Lines:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

### **Read/Determine Grid Coordinates**

6. Determine the six digit grid of the water tower located in EG0985?

- a. 093853
- b. EG093853
- c. EH093853
- d. EG095851

7. Determine the eight digit grid of the Church located in EH0703?

- a. EH07160359
- b. 07190356
- c. EH07220353
- d. EH07190356

8. What terrain feature is located at grid EG107891?

- a. Saddle
- b. Ridge
- c. Depression
- d. fill

9. What terrain feature is located at grid EG11807885?

- a. Hilltop
- b. Saddle
- c. Cliff
- d. Valley

### **Determine Azimuths**

10. The Back Azimuth of 168 degrees is 348 degrees?

- a. True
- b. False

11. The magnetic azimuth from the water tower in grid square EG1088 to the Church of God in grid square EG0385 is 225 degrees.
- a. True
  - b. False
12. The grid azimuth from the tower in grid square EG1177 to hill 141 in grid square EG0981 is? - \_\_\_\_\_.

### **Determine Elevation**

13. The elevation of the hilltop at grid EG 13908465 is:
- a. 150 meters
  - b. 140 meters
  - c. 160 meters
  - d. 155 meters
14. The elevation at the bottom of depression at grid EG072994 is:
- a. 60 meters
  - b. 80 meters
  - c. 50 meters
  - d. 40 meters

### **Measuring Distance**

15. What is the straight line distance in meters from the lookout tower in grid square EG1887 to the school in grid square EG1082? \_\_\_\_\_.
16. What is the straight line distance, in meters, from the water tower in grid square EG0985 to the mine in grid square EG1582? \_\_\_\_\_.
17. What is the road distance in meters from the intersection in grid square EG1884 to the intersection in grid square EG1586? \_\_\_\_\_.

18. What is the road distance, in meters, from the road junction at EG172775 to the road junction at EG139781? \_\_\_\_\_.

### Convert Azimuths

19. The G-M angle is 30 degrees east, what is the grid azimuth if the magnetic azimuth is 300 degrees?

- a. 300°
- b. 270°
- c. 330°
- d. 300 m

20. The G-M angle is 20 degrees west, what is the grid azimuth if the magnetic azimuth is 254 degrees?

- a. 274°
- b. 234°
- c. 20°
- d. 254°

21. The G-M angle is 10 degrees east, what is the magnetic azimuth if the grid azimuth is 110 degrees?

- a. 100°
- b. 110°
- c. 120°
- d. 90°

## Intersection

22. What feature is located on a magnetic azimuth of 5 degrees from the southern water tower in grid square EG0982 and a magnetic azimuth of 314 degrees from spot elevation 155 in grid square EG1479?

- a. Watermill
- b. Forest Cemetery
- c. Church of God
- d. Mine

23. What object is located on a magnetic azimuth of 21.5 degrees from benchmark 66 in grid square EG 0795 and a magnetic azimuth of 51 degrees from benchmark 60 in grid square EG0798?

- a. Railroads (Multiple track)
- b. Buildings or structures
- c. BM 64
- d. Sheehan Lake

24. You are on hill 83 in grid EG0591. Your recon team is located at EG06319265, when you both see an enemy patrol. You shoot an azimuth of 59 degrees and your recon team shoots an azimuth of 106.5 degrees. What is the eight digit grid coordinates of the enemy?

\_\_\_\_\_.

### Resection

25. You are located between a creek and an unimproved road. From your location you can see the water tower in grid square EG 10 88 on a magnetic azimuth of 40 degrees. You can also see the water tower in grid square EG 09 85 on a magnetic azimuth of 90.5 degrees. What is the 6 digit grid to your location? \_\_\_\_\_.
26. You are located somewhere on the secondary all weather road between EG0083 and EG1088. From your location, you shoot an azimuth of 123 degrees to hill 197 in grid square EG0483. What is the eight digit grid coordinate to your location? \_\_\_\_\_.
27. A patrol leader determines the magnetic azimuth from his position to the road junction in grid square EG0196 to be 285 degrees and the magnetic azimuth from his position to the road junction at EG049973 to be 353 degrees. What is the terrain feature at his position?
- Saddle
  - Ridge
  - Draw
  - Hilltop



Based on the military principle for reading maps (RIGHT and UP), locations on the map can be determined by grid coordinates. The number of digits represents the degree of precision to which a point has been located and measured on a map- the more digits the more precise the measurement.

6. EG 093 853 (No error for 6 digit grid coordinates)

Remember in order to locate a point to within 100 meters accurately you must use the coordinate scale protractor. The scale is used on a map with the same scale, (ex. 1:50,000, 1:25,000), to divide the 1000m square into tenths, (100m squares). Remember when using thje coordinate scale protractor, first determine the scale of your map. Place the horizontal scale parallel to and directly on top of the horizontal grid line. Then slide the scale over into the grid suare until the vertical scale intersects the center of mass of the point you are measuring. Then you simply read right and up. Ensure to round off to the nearest 100m digit. If the point is exactly halfway between the two digits, ROUND DOWN.

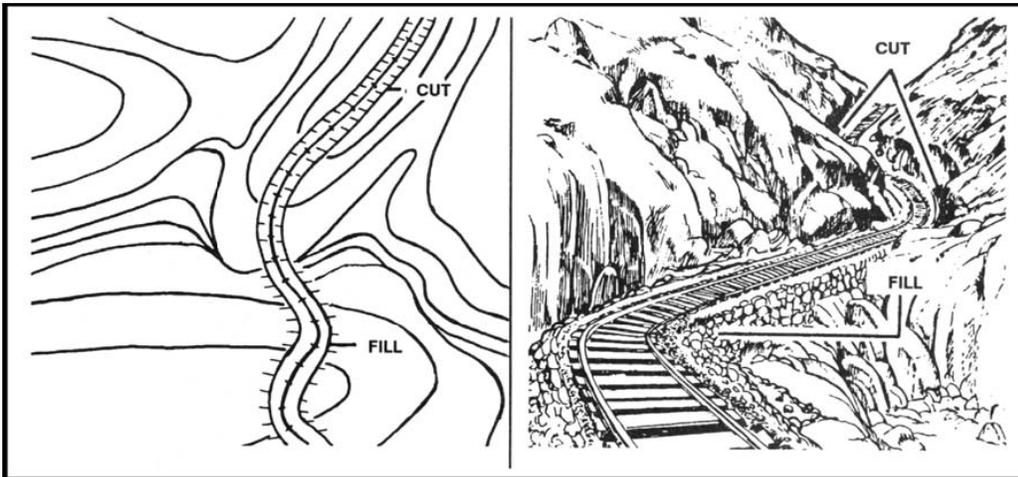
7. EH 0719 0356 (+/- 2 in the 4<sup>th</sup> and 8<sup>th</sup> digits in an 8 digit grid coordinate)

In order for you to find a point within 10m you first must perform the steps on your previous problem, then you must estimate or imagine 10m lines between the 100m lines on your coordinate scale protractor. This will give you another digit right, (fourth digit), and another digit up, (eighth digit).

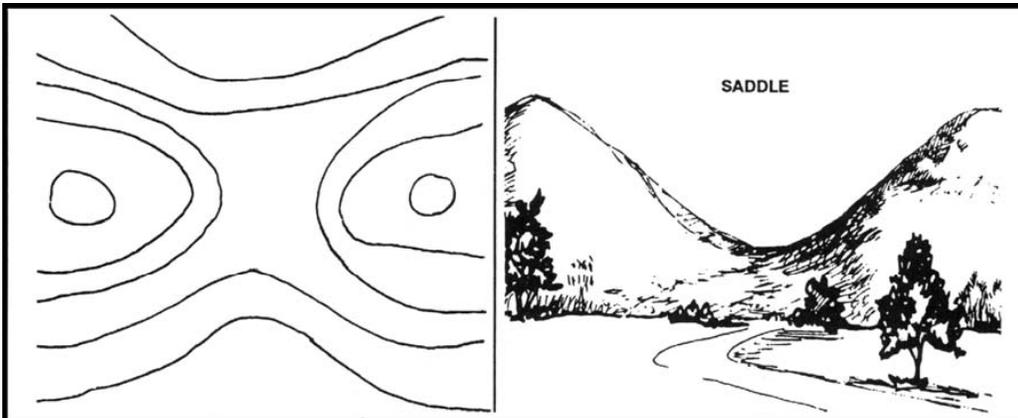
### Terrain Features

(Ref: par 10-6; pg 10-11; FM 3-25.26) Terrain Features

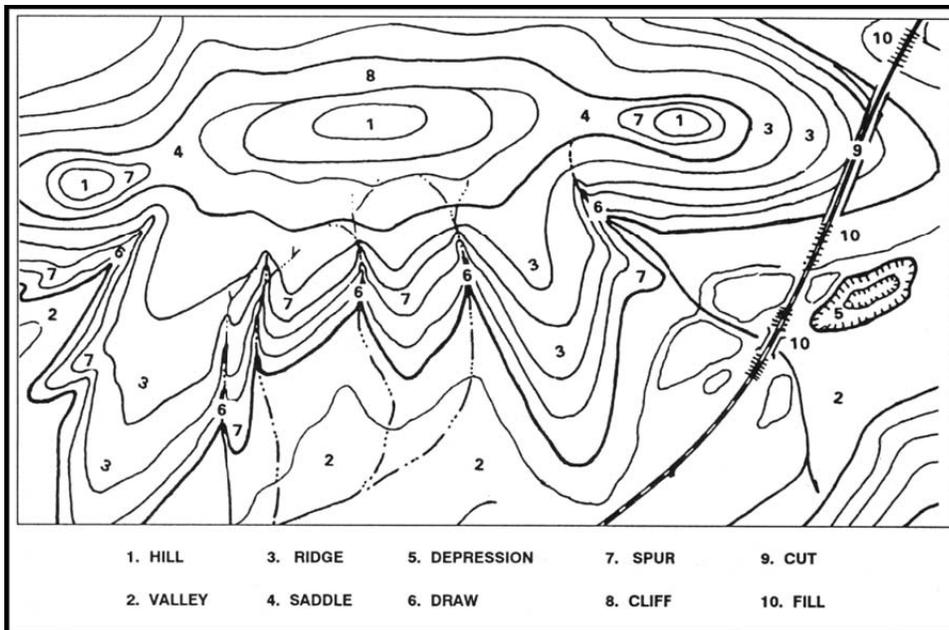
8. Fill



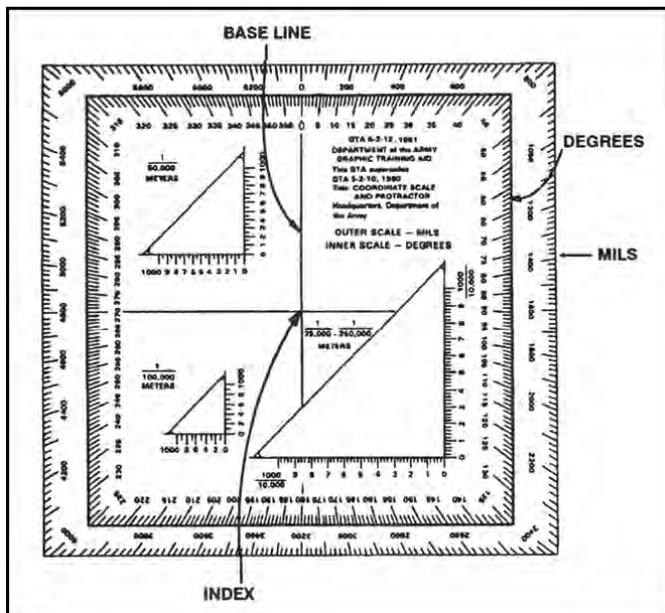
9. Saddle



NOTE: Remember all Terrain Features



### Determine Azimuths



(Ref: par 6-5; pg 6-6; FM 3-25.26)

- (1) To determine the grid azimuth—
  - (a) Draw a line connecting the two points.
  - (b) Place the index of the protractor at the point where the drawn line crosses a vertical (north-south) grid line.
  - (c) Keeping the index at this point, align the 0- to 180-degree line of the protractor on the vertical grid line.
  - (d) Read the value of the angle from the scale; this is the grid azimuth from point A to point B.
  
- (2) To plot an azimuth from a known point on a map
  - (a) Convert the azimuth from magnetic to grid, if necessary.
  - (b) Place the protractor on the map with the index mark at the center of mass of the known point and the base line parallel to a north-south grid line.

(c) Make a mark on the map at the desired azimuth.

(d) Remove the protractor and draw a line connecting the known point and the mark on the map. This is the grid direction line (azimuth).

10. 348 degrees

In order to get a back azimuth you must add or subtract 180. If the azimuth is  $>180$  you subtract, if the azimuth is  $<180$  you add.

11.  $222^\circ (+ / - 1^\circ)$

12.  $326^\circ (+ / - 1^\circ)$

Remember once you get the grid azimuth from your coordinate scale you must convert it to a magnetic azimuth if asked to do so. You do this by either adding or subtracting the G-M angle, which is located at the bottom right side of your map.

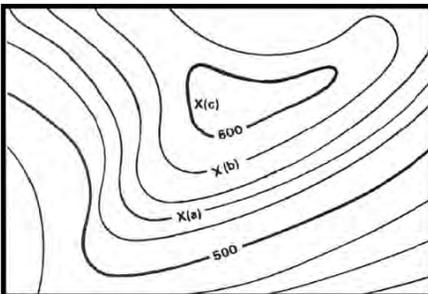
### Determine Elevation

(Ref: par 10-3; pg 10-2; FM 3-25.26) Contour Intervals

13. 150m

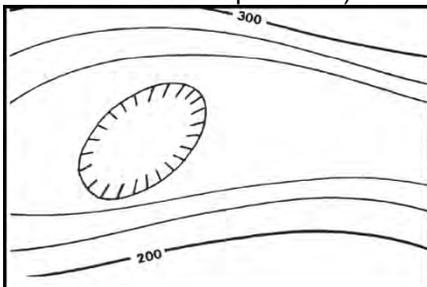
To determine the elevation of a point on a map:

- Determine the contour interval and the unit of measurement, ex. meters, feet, or yards.
- Find the numbered index contour line nearest the point of which you are trying to determine the elevation.
- Determine if you are going from lower elevation to higher, or vice versa. If you are going higher, add the contour interval, if you are going lower, subtract the contour interval.
- To determine the elevation of a hilltop, (that does not have a spot elevation on it), add one-half of the contour interval to the elevation of the last contour line.



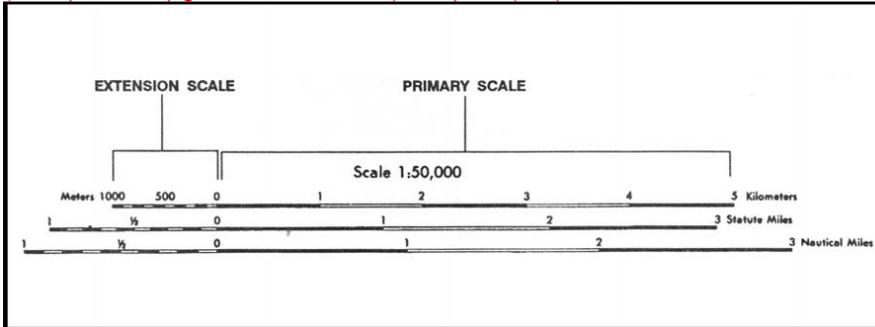
14. 50m

To estimate the elevation to the bottom of a depression, subtract one-half of the contour interval from the value of the last contour line before the depression. NOTE: The outline of the depression is not a contour line. When determining the elevation to the bottom of a depression this line becomes the same value as the nearest ADJACENT CONTOUR LINE. (Current maps make this easier by placing the value of the surrounding ground on the outline of the depression.)



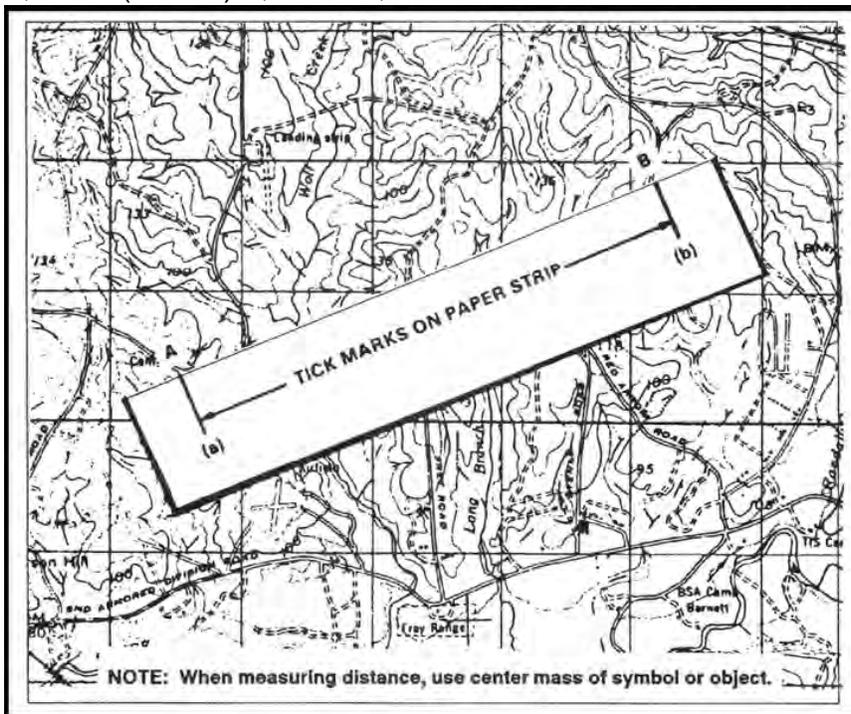
## Measuring Distance

(Ref: par 5-2; pg 5-3; FM 3-25.26) Graphic (bar) Scales



15. 8910m (+/- 2%) 8732m – 9088m

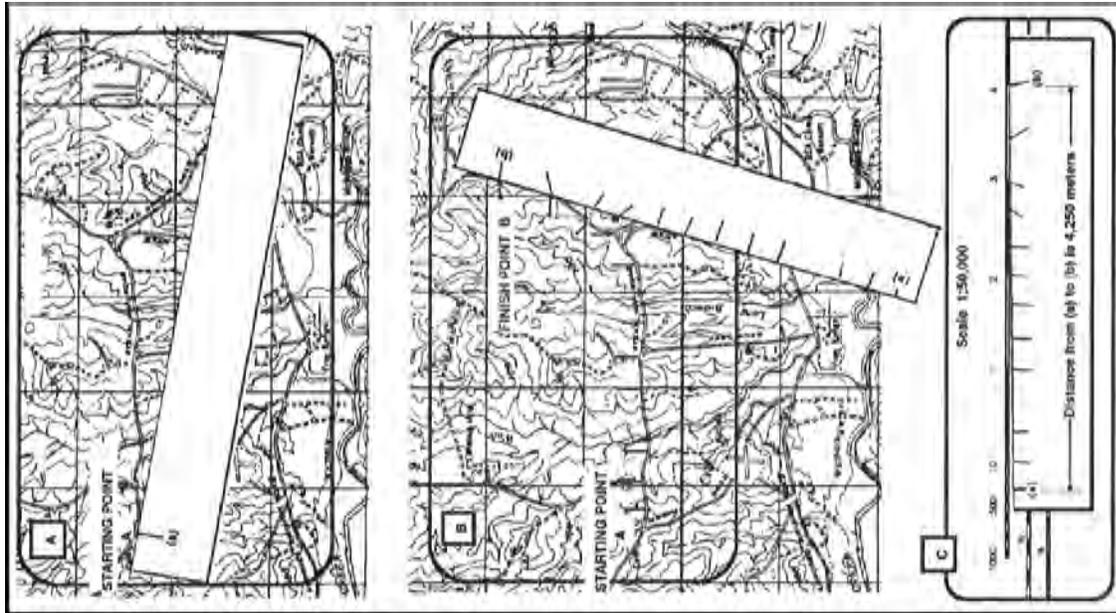
16. 7,240m (+/- 2%) 7,095m-7,385m



To determine straight-line distance between two points on a map, lay a straight-edged piece of paper on the map so that the edge of the paper touches both points and extends past them. Make a tick mark on the edge of the paper at each point

17. 3800m (+/- 4%) 3648m – 3952m

18. 4,400m (+/- 4%) 4,224m-4,576m



To measure distance along a road, stream, or other curved line, the straight edge of a piece of paper is used. In order to avoid confusion concerning the point to begin measuring from and the ending point, an eight-digit coordinate should be given for both the starting and ending points. Place a tick mark on the paper and map at the beginning point from which the curved line is to be measured. Align the edge of the paper along a straight portion and make a tick mark on both map and paper when the edge of the paper leaves the straight portion of the line being measured

NOTE: Use the Bar Scale, located bottom center of the map.

### Convert Azimuths

(Ref: par 6-6; pg 6-8; FM 3-25.26) Declination Diagram

19.330°

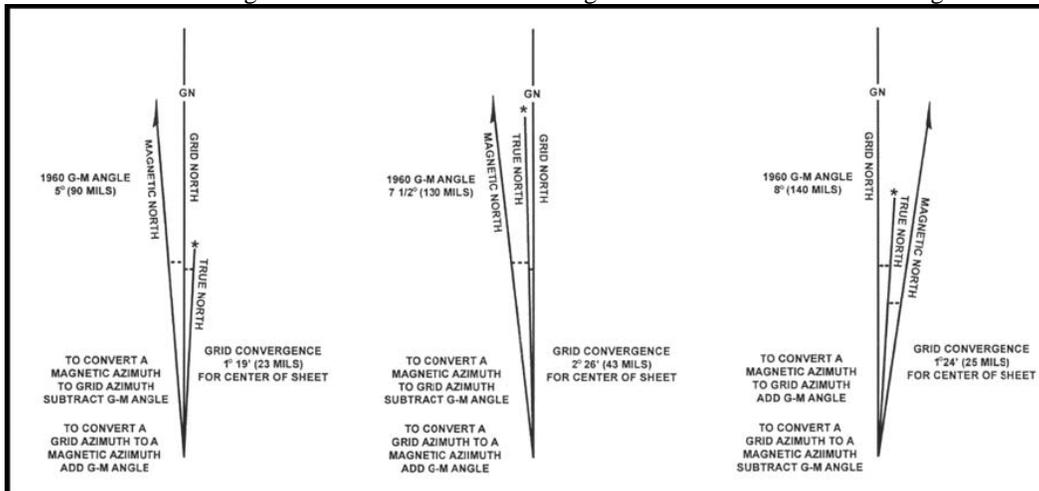
20.234°

21.100°

West G-M angle:

West G-M angle:

East G-M angle:



**Conversion.** There is an angular difference between the grid north and the magnetic north. Since the location of magnetic north does not correspond exactly with the grid-north lines on the maps, a conversion from magnetic to grid or vice versa is needed.

## Intersection

(Ref: par 6-7; pg 6-14; FM 3-25.26) Intersection

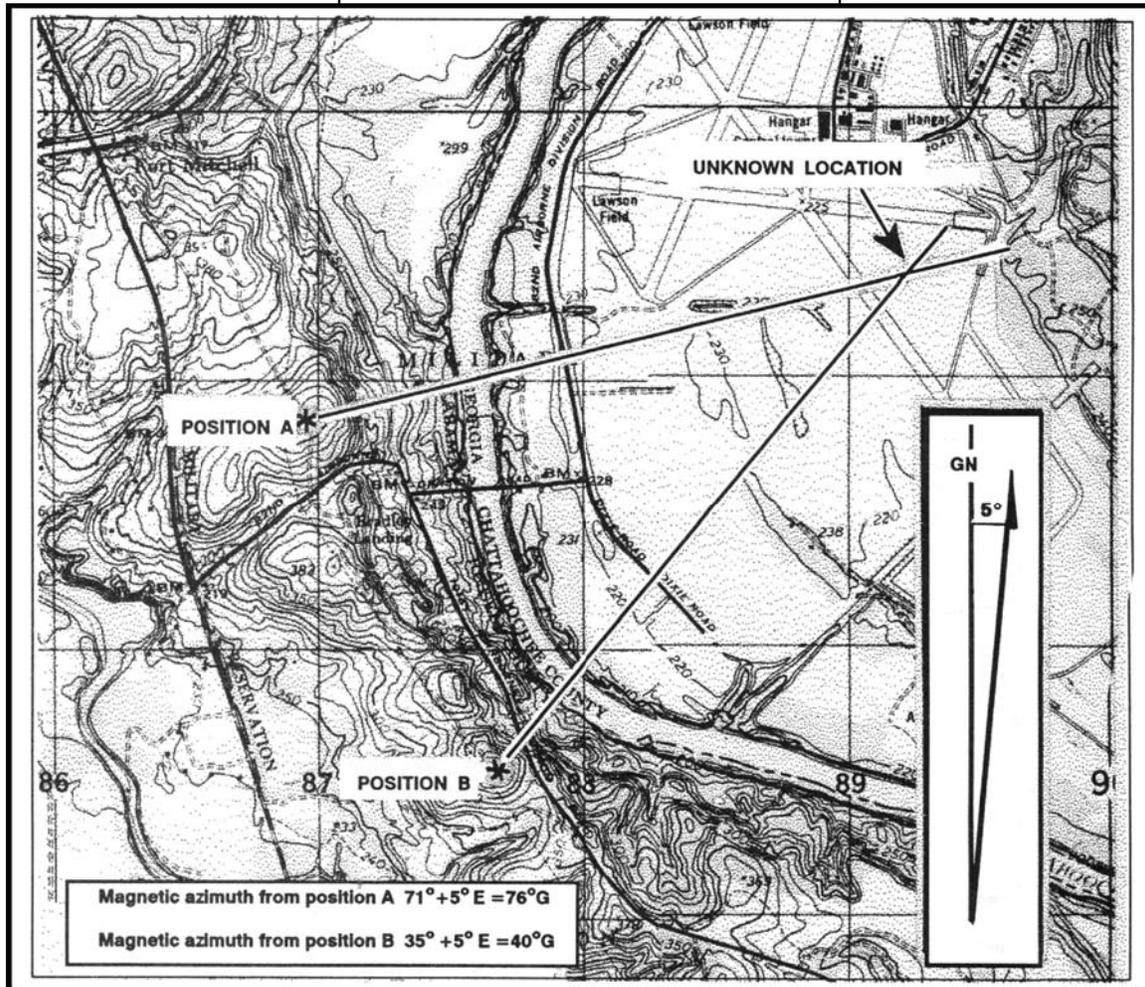
22. Forest Cemetery

23. Sheehan Lake

24. EG 0704 9205 (+/- 2 in the 4<sup>th</sup> and 8<sup>th</sup> digits in an 8 digit grid coordinate)

Locating an unknown position by Intersection :

- (1) Orient the map using the compass.
- (2) Locate and mark your position on the map,
- (3) Determine the magnetic azimuth to the unknown position using the compass.
- (4) Convert the magnetic azimuth to grid azimuth.
- (5) Draw a line on the map from your position on this grid azimuth.
- (6) Move to a second known point and repeat steps 1, 2, 3, 4, and 5.
- (7) The location of the unknown position is where the lines cross on the map. Determine



Intersection, using map and compass.

## Resection

(Ref: par 6-8; pg 6-16; FM 3-25.26) Resection

25. EG 061 865 (No error for 6 digit grid coordinates)

26. EG 0309 8527 (+/- 2 in the 4<sup>th</sup> and 8<sup>th</sup> digits in an 8 digit grid coordinate)

27. Hill / Hilltop

Locating your position by Resection:

- (1) Orient the map using the compass.
- (2) Identify two or three known distant locations on the ground and mark them on the map.
- (3) Measure the magnetic azimuth to one of the known positions from your location using a compass.
- (4) Convert the magnetic azimuth to a grid azimuth.
- (5) Convert the grid azimuth to a back azimuth. Using a protractor, draw a line for the back azimuth on the map from the known position back toward your unknown position.
- (6) Repeat 3, 4, and 5 for a second position and a third position, if desired.
- (7) The intersection of the lines is your location. Determine the grid coordinates to the desired accuracy.

