ROYAL CANADIAN ARMY CADETS

RED STAR

INSTRUCTIONAL GUIDE

SECTION 1

EO M222.01 – REVIEW GREEN STAR NAVIGATION

Total Time: 60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-702/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Using a topographical map of the local area, to identify the objects, land features with grid references (GR) to be used during the activity.

Set up stations for the activity in TP2.

Copy the map folding activity sheet located at Annex A for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP1 to present background material.

A practical activity was chosen for TP2 as it is an interactive way to allow cadets to experience navigation in a safe, controlled environment. This activity contributes to the development of navigation skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson, the cadet shall have reviewed Green Star navigation skills to include:

- maintaining and folding a map;
- identifying marginal information;
- identifying conventional signs;

- identifying types of slopes;
- determining four and six-figure GR; and
- orienting a map by inspection.

IMPORTANCE

It is important for cadets to participate in a review of Green Star navigation training as it provides the building blocks for advanced navigation. This training must be mastered before cadets are taught new navigation skills in Red Star.

Teaching Point 1 **Conduct a Review of Green Star Navigation**

Time: 10 min Method: Interactive Lecture

Do not spend too much time on any one point. Briefly review Green Star navigation. The activity will be used to confirm this lesson.

MAINTAINING AND FOLDING OF A MAP

Although there are waterproof maps of some areas, most maps are printed on regular paper. Paper maps are expensive and easily damaged. Therefore, precautions must be taken to protect them from water, dirt and wind damage.

Waterproofing a Map. When exposed to water, maps become soggy causing them to deteriorate and tear. Preparing a map for the elements is a vital step in prolonging the life of the map. The easiest and cheapest way to protect a map is to put it in a plastic sealable bag.

Drying a Map. If a map gets wet, let it dry completely on a clean flat surface.

Opening a Map. When a map is opened fully in a strong wind, not only is it impossible to read, but it could tear, get dirty, or even blow away. The map should only be opened to the area you are using, and refolded along the original fold lines.

Writing on a Map. Writing on a map should be done only when necessary. Always use pencil to mark your maps and when finished, gently erase all markings. Maps that are protected by plastic can be marked with grease pencils or erasable markers.

Storing a Map. Maps are to be stored in a dry place and should be rolled, folded, or laid flat.

Arrange the cadets so they can see the demonstration and hear the explanation of folding a map as listed below, prior to the cadets practicing this procedure.

Folding a Map. To fold a map:

1. lay the map face up;
2. fold the map in half by bringing the top (north) of the map sheet down to the bottom (south);

3. crease where the bend in the map has occurred, this is the centre of the map;
4. fold back the top half of the map sheet;
5. turn the map sheet over and fold the bottom half to match the top half;
6. fold the ends of the map in half from left to right; and
7. fold the ends back in half again so that the map name and index appear on the outside (the map should look like the letter M).

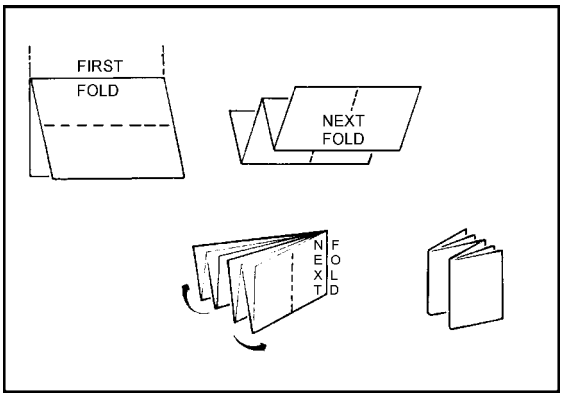

Figure 1 Folding a Map

A-CR-CCP-121/PT-001 (p. 5-5)

IDENTIFYING MARGINAL INFORMATION

Do not spend too much time on any one point. Briefly review Green Star navigation. The activity will be used to confirm this lesson.

A map, like any piece of equipment, has instructions that the user must read. It is important to know how to read these instructions. Marginal information is used to explain and describe the details found in the margins of the map. The common marginal information found on a map includes:

- name of the map sheet;
- number of the map and index of adjoining maps;
- date of map data;
- map scale;
- scale bars or graphic linear scales;
- contour interval;
- military index number (normally found at the top right corner of the map sheet which is used for ordering additional maps);
- declination diagram;

- Universal Transverse Mercator grid system (UTM); and
- legend of conventional signs.

IDENTIFYING CONVENTIONAL SIGNS

A conventional sign is a symbol used to indicate an object or item of detail, such as a building or a road. The meaning of most symbols is obvious. There are tables of conventional signs located in the margins and on the back of most maps. The use of different colours is a way of showing and distinguishing detail of all types of conventional signs.

INTERPRETING CONTOUR LINES

A contour line is a brown line on the map joining points of equal elevation. They are shown at regular vertical intervals. The difference in height between contours lines is called the contour interval. The contour interval is always stated in the margin of the map.

Interpreting contour lines and contour intervals provides a visualization of the shape of the ground. Correct interpretation of the shape of the ground from contour lines on the map will indicate the type of land feature on the ground. Some different types of land features are:

Steep Slope. This slope is identified when the contour lines are spaced closely together.

Gentle Slope. This slope is identified when the contour lines are further apart.

Uniform Slope. This slope is identified when the contours are an equal distance apart. The slope remains constant in its decline, whether steep or gentle.

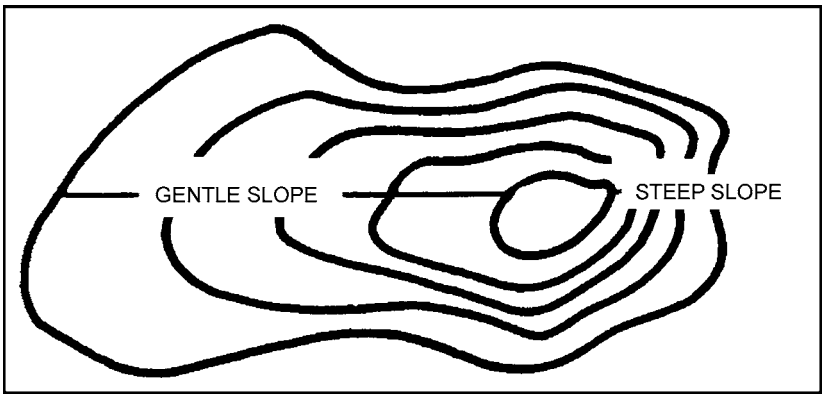

Figure 2 Slopes

D Cdts, Royal Canadian Army Cadets Basic Map Using, Department of National Defence (p. 1-44)

Concave Slope. This slope is identified when the spacing of the contours gets further apart at the bottom. The middle of the slope seems to depress inward – appearing concave.

Convex Slope. This slope is identified when the spacing of contours down a slope gets close together at the bottom. The middle of the slope seems to bulge outward – appearing convex.

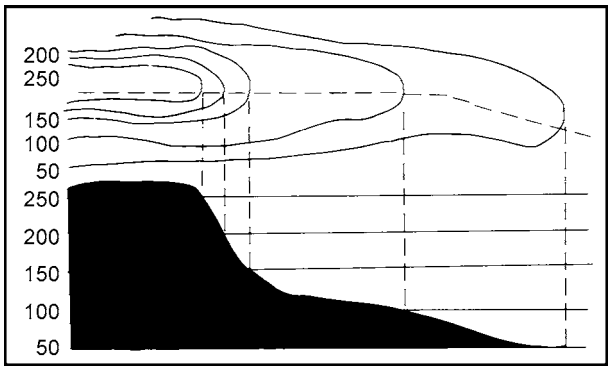

Figure 3 Concave Slope

B-GL-382-005/PT-001, Maps, Field Sketching, Compasses and the Global Positioning System (p. 32)

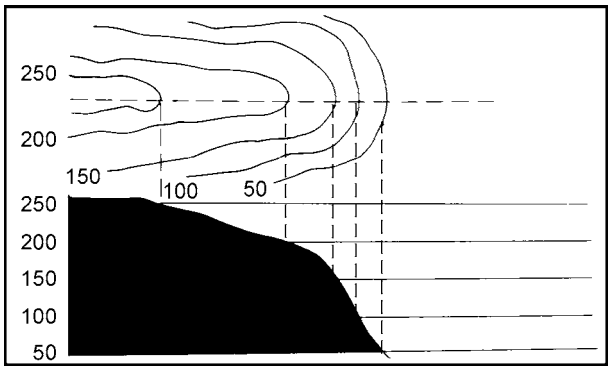

Figure 4 Convex Slope

B-GL-382-005/PT-001 (p. 32)

Spurs. A spur is a contour feature that extends out from a slope.

Re-entrants. A re-entrant is a contour feature that cuts back into a slope.

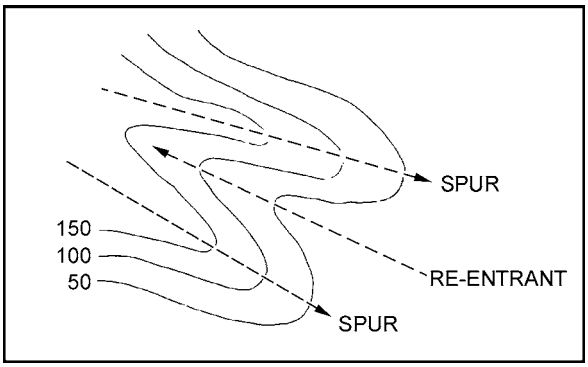

Figure 5 Spur/Re-entrant

B-GL-382-005/PT-001 (p. 32)

DETERMINING A GRID REFERENCE (GR)

Using the grid system, a grid reference (GR) identifies a location on a map. When determining a GR to a square, the reference is always to the southwest (bottom left) corner of the square. GRs are always given with the easting value first, followed by the northing value. A four-figure GR is used to identify a specific 1000 m by 1000 m grid square. A six-figure GR is used to determine a more accurate location within a specific 100 m by 100 m grid square.

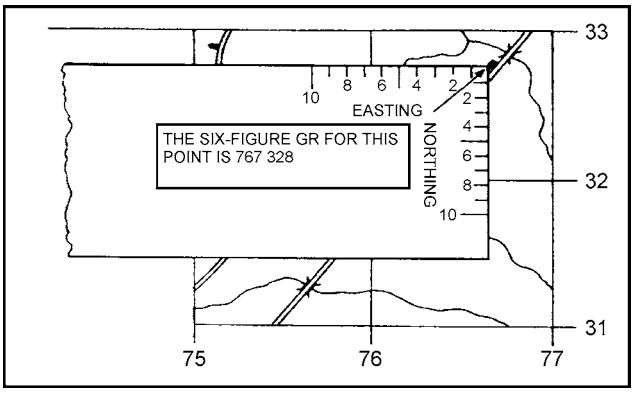

Figure 6 Determine a GR

A-CR-CCP-121/PT-001 (p. 5-20)

ORIENTING A MAP BY INSPECTION

Orienting a map by inspection means to visually pinpoint a location on the ground so that the cardinal directions on the map match directions on the ground. Orienting a map by inspection makes it easier to relate information on the map to features on the ground. To pinpoint a position more accurately, these steps must be followed:

1. Identify one's approximate position on the map.
2. Identify two or three prominent landmarks in different directions on the ground and find them on the map.
3. Rotate the map until all identified objects on the map line up with the direction in which objects are located on the ground. If near a straight stretch of road, orient the map by using the road. Line up the road on the map parallel with the road on the ground.
4. Check all around to verify that the terrain features to the front are in front of the position on the map, and so on. The top of the map now points north.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the navigation round robin activity will serve as the confirmation of this TP.

Teaching Point 2 **Conduct a Navigation Activity**

Time: 40 min Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to confirm navigation training taught during Green Star.

RESOURCES

- 6 foot table (one per station);
- Romer (one per station);
- Topographical map (one per station);

- Map folding activity sheet located at Annex A;
- Land feature sheet located at Annex B; and
- Assistant instructor (one per group).

ACTIVITY LAYOUT

- This round robin activity will have four different stations spaced apart.
- Set up one 6 foot table per station.
- Place a map and a romer at each station.

ACTIVITY INSTRUCTIONS

In teams of no more than five cadets, the group will move through a series of stations to confirm Green Star Navigation material. This is to be conducted as group work, not individual work, meaning the whole group must agree on the final answer given. Groups will have eight minutes to complete the activity at each station and two minutes for debriefing.

- **Station 1 – Conventional Signs and Marginal Information.** Cadets will be asked to select five conventional signs from the legend and identify them on the map sheet. Then identify five items of marginal information and locate them on the map, which may include:
  - name of the map sheet;
  - number of the map sheet and index;
  - map scale and bar;
  - contour intervals; and
  - declination diagram.
- **Station 2 – Contour Lines and Features.** Cadets will identify two land features from the sheet located at Annex B and locate similar features on the map sheet.
- **Station 3 – Grid References (GR)**
  - Cadets will be given one four-figure GR and one six-figure GR and identify what is located at each GR.
  - Cadets will be given two distinct conventional signs on the map sheet. They must locate the object and give the six-figure GR of that object.
- **Station 4 – Orient a Map by Inspection and Fold a Map.** The cadets will be given a six-figure GR of their location and must orient the map by inspection. If this activity is being conducted indoors, draw symbols for some prominent objects, then place them on the walls for the cadets to use as a reference. Then cadets must complete the map folding activity so that the map index is seen.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the navigation round robin activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. Why is it important to maintain and fold a map?

Q2. What corner of the grid square is used when determining a GR?

Q3. How many prominent objects should be used when orienting a map by inspection?

ANTICIPATED ANSWERS

A1. Maintenance is important to prolong the life of the map sheet.

A2. The GR is always to the southwest (bottom left) corner of the square.

A3. When orienting a map by inspection, two or three prominent objects in different directions should be used.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Map reading is a skill, and true proficiency will only be mastered by practice in the outdoors. The skills you have learned during Green Star are the building blocks required before moving on to more complex navigation training. Remember, practice makes perfect!

INSTRUCTOR NOTES/REMARKS

A thorough understanding of Green Star navigation training is required before cadets are taught new navigation skills in Red Star. This EO will provide an opportunity for cadets to practice skills they learned in the corps program.

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

MAP FOLDING ACTIVITY SHEET

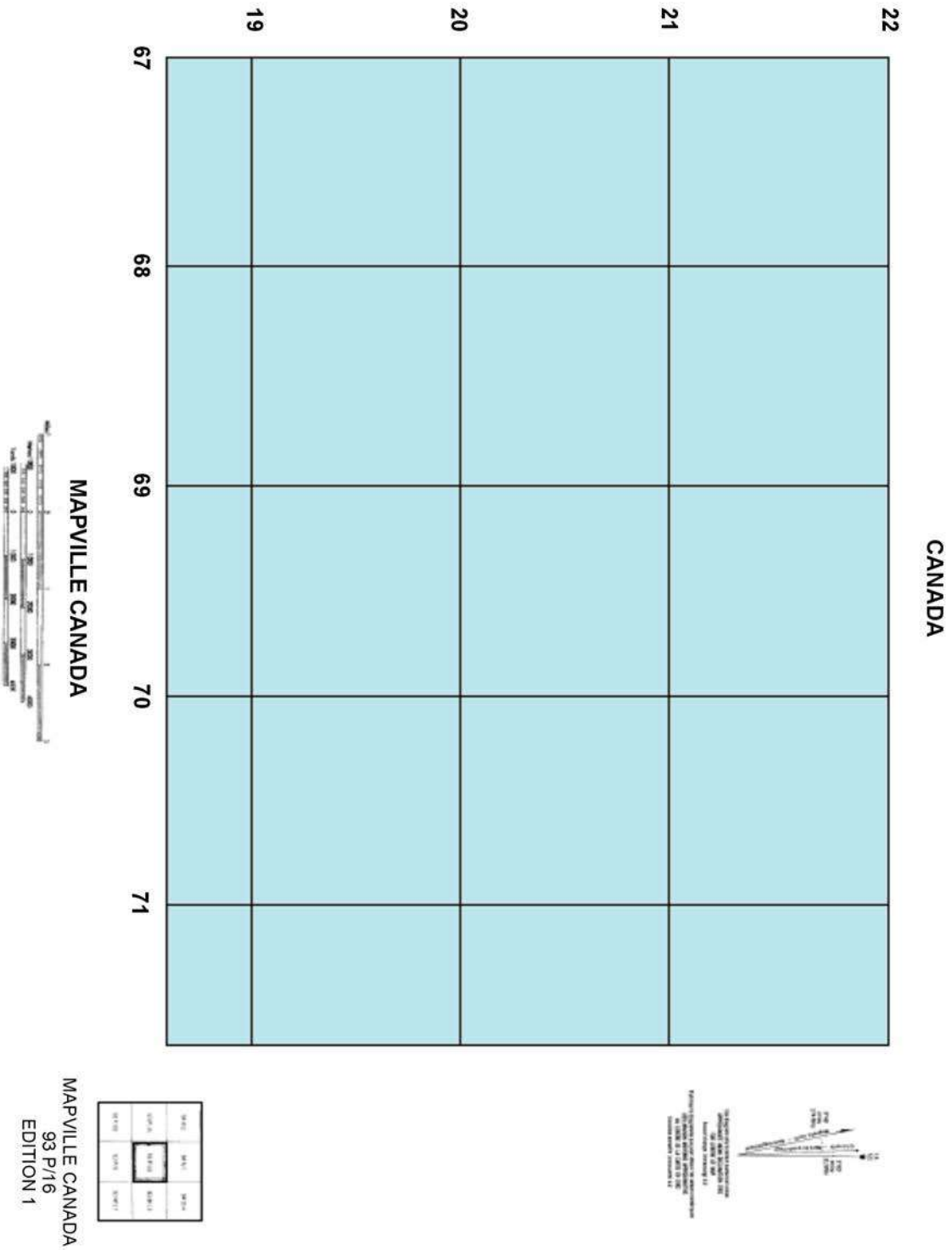

Figure A-1 Map Folding Activity Sheet

D Cdts 3, 2007, Ottawa, ON: Department of National Defence

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LAND FEATURES

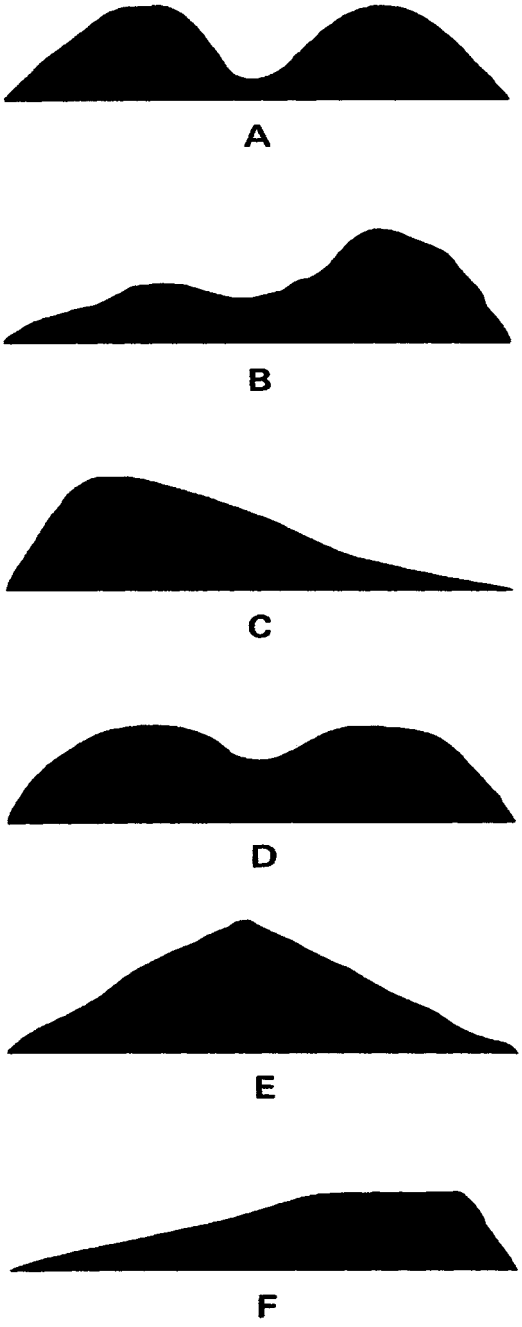


Figure B-1 Contour Features

D Cdts 3, 2007, Ottawa, ON: Department of National Defence

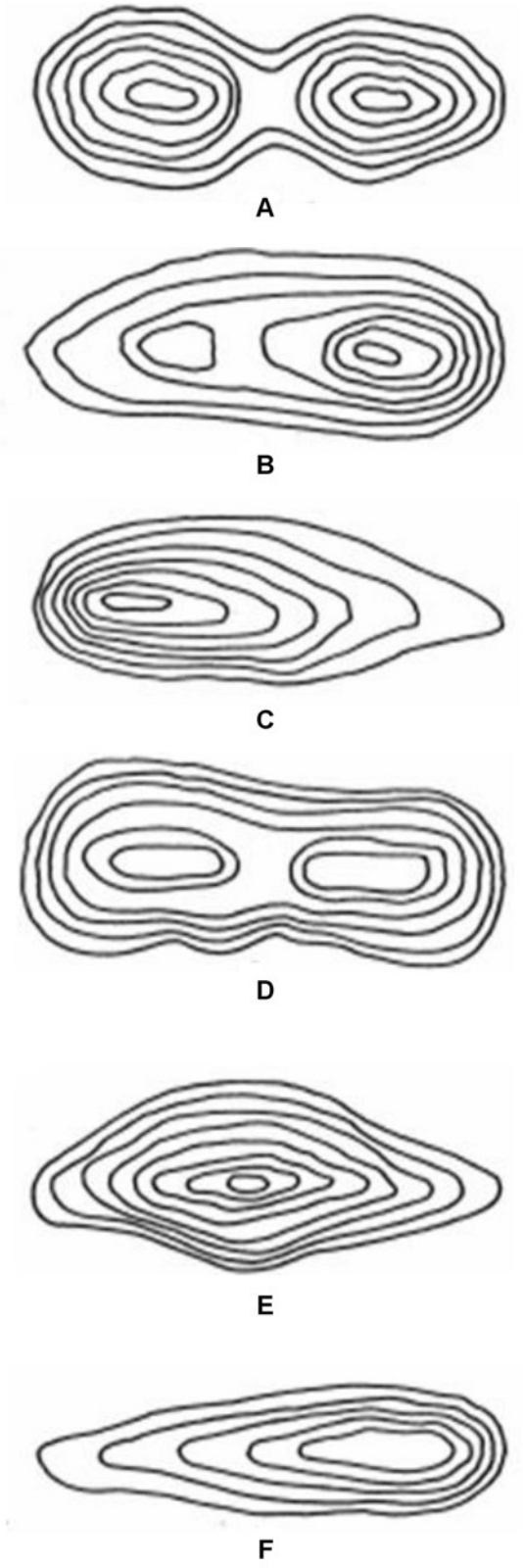


Figure B-2 Contour Features Examples

D Cdts 3, 2007, Ottawa, ON: Department of National Defence

ROYAL CANADIAN ARMY CADETS

RED STAR

INSTRUCTIONAL GUIDE

SECTION 2

EO M222.02 – DESCRIBE BEARINGS

Total Time: 60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-702/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Photocopy the compass rose activity sheet located at Annex A for each pair of cadets.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP1 to TP4 to present basic material, orient the cadets to bearings, and to generate interest.

A practical activity was chosen for TP5 as it is an interactive way to introduce cadets to bearings. This activity contributes to the development of navigation skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to:

- identify the 16 points of a compass;
- define mils and degrees;
- identify true, grid, and magnetic north; and
- describe bearings.

IMPORTANCE

It is important for cadets to describe bearings as this will assist them in finding the direction of identifiable landmarks on a map. Cadets will rely on this skill set throughout navigation and expedition training.

Teaching Point 1 **Identify and Explain the 16 Points of a Compass**

Time: 10 min Method: Interactive Lecture

Draw a compass rose (circle) on the board with the four cardinal points. Draw a new line each time you introduce the inter-cardinal and intermediate points.

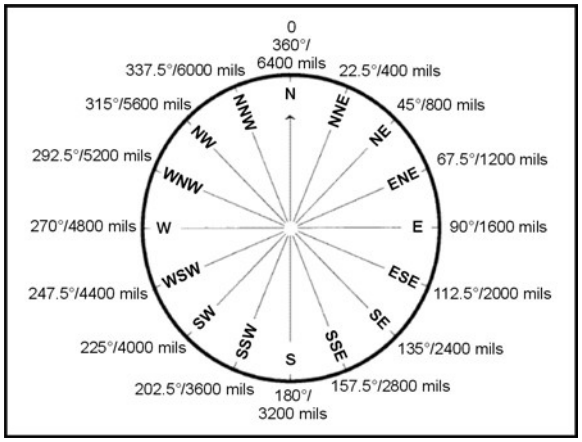


Figure 1 Compass Rose

D Cdts 3, 2007, Ottawa, ON: Department of National Defence

FOUR CARDINAL POINTS

The four cardinal points of the compass, measured at right angles clockwise are north (N), east (E), south (S) and west (W). They can be easily remembered by the using mnemonics, such as “Never Eat Shredded Wheat”.

FOUR INTER-CARDINAL POINTS

The four inter-cardinal points are located halfway between each of the cardinal points. Measured clockwise, they are:

1. north-east (NE);
2. south-east (SE);
3. south-west (SW); and
4. north-west (NW).

EIGHT INTERMEDIATE POINTS

The eight intermediate points are located halfway between each cardinal point and inter-cardinal point. Measured clockwise, they are:

1. north-north-east (NNE);
2. east-north-east (ENE);
3. east-south-east (ESE);
4. south-south-east (SSE);
5. south-south-west (SSW);
6. west-south-west (WSW);
7. west-north-west (WNW); and
8. north-north-west (NNW).

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is a mnemonic used to remember the four cardinal points?

Q2. What are the four inter-cardinal points?

Q3. How many intermediate points are there?

ANTICIPATED ANSWERS

A1. “Never Eat Shredded Wheat”.

A2. North-east (NE), south-east (SE), south-west (SW) and north-west (NW).

A3. There are eight intermediate points.

Teaching Point 2 **Explain the Scales on a Compass**

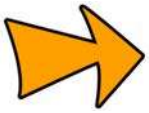
Time: 5 min Method: Interactive Lecture

Using the compass rose from TP1, add the degree and mils values on the outside of the circle for the cardinal points (N, E, S and W).

To express direction in an accurate and precise method, the full circle of the compass rose is divided into equal measures of angle. This measurement starts and ends at north (top) and always moves in a clockwise rotation. There are two main scales used to measure a circle – they are degrees and mils.

Degrees. The most common method of dividing a circle is by degrees. There are 360 equal angles in a complete circle and they are represented by the degree symbol (e.g. 360°). On the compass rose, north is located at 0 and 360 degrees, east is located at 90 degrees, south is located at 180 degrees and west is located at 270 degrees.

Mils. When a more accurate division of the same circle is required, the metric milli-radian (mils) method is used. The mils method has a military background and is based on the metric system with 6400 equal angles in a complete circle. On the compass rose, north is located at 0 and 6400 mils, east is located at 1600 mils, south is located at 3200 mils and west is located at 4800 mils.



There are 22.5 degrees or 400 mils between each point on a compass rose.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. How many degrees make a complete circle?

Q2. How many mils make a complete circle?

Q3. Which are more accurate, degrees or mils?

ANTICIPATED ANSWERS

A1. 360 degrees.

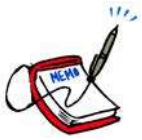
A2. 6400 mils.

A3. Mils.

Teaching Point 3 **Identify and Explain the Three Norths**

Time: 10 min Method: Interactive Lecture

In navigation there are three different norths that are used – true north, grid north and magnetic north. Each north varies a small amount from each other and must be known for use in navigation. A diagram representing the three norths can be found in the margin of the map being used.



Draw Figure 2 on the board and draw the symbol for each north as it is explained to the cadets.

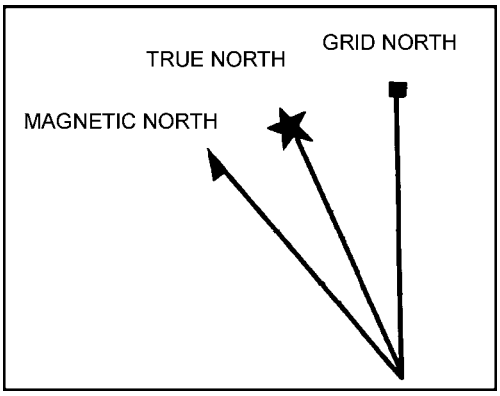


Figure 2 Three Norths

B-GL-382-005/PT-001 (p. 51)

True North. True north is located at the top of the earth where the geographic North Pole is found, and is where all lines of longitude meet. In the diagram on the map, true north is represented by a star (Polaris).

Grid North. Grid north is the north indicated by the grid lines (eastings) on a topographical map. The easting lines run parallel to each other and will never meet at the North Pole; because of this, grid north points off slightly from true north. In the diagram on the map, grid north is represented by a square (map grid).

Magnetic North. Magnetic north is the direction in which the compass needle points. This direction is to the magnetic pole which is located in the Canadian arctic and is slightly different from true north (North Pole). In the diagram on the map, magnetic north is represented by a needle (compass).

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What symbol is used to represent true north?

Q2. What symbol is used to represent grid north?

Q3. What symbol is used to represent magnetic north?

ANTICIPATED ANSWERS

A1. A star, as in Polaris.

A2. A square, as in a grid square.

A3. A needle, as in a compass.

Teaching Point 4 **Explain Bearings**

Time: 10 min Method: Interactive Lecture

Poll the cadets to define an angle as they have learned in school. To represent the cardinal points; stand at the front of the class (N) and have one cadet stand six paces in front of you (S), another three paces in front and three paces to the left (E) and another three paces in front and three paces to the right (W). Using the centre point, ask the cadets what are the angles between you and each cadet.

DEFINITION OF A BEARING

Bearing. A bearing is an angle that is measured clockwise, from a fixed zero line; north is always this zero line. Simply, a bearing is just another name for an angle.

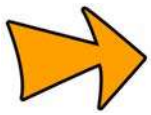
TYPES OF BEARINGS

Grid Bearings. A grid bearing is a bearing that is measure between two points on a map. The ability to measure a bearing from a map allows a map user to plan routes or activities before going into the field, and allows an easy method of communicating information about movement or location.

Magnetic Bearings. A magnetic bearing is a bearing that is measured between two points using a compass. A magnetic bearing is a quick and efficient method of describing a route to take. The bearing alone is usually not enough information to navigate with and must also have distance or a target object.

Back Bearing. A back bearing is a bearing that is in the exact opposite direction of the bearing that has been measured. A back bearing can be useful for different reasons; to return to the start location after a hike, or to calculate the bearing from an object to one's current location. Depending on the compass being used, the steps to calculate a back bearing are:

- If the bearing is less than 3200 mils or 180 degrees, add 3200 mils or 180 degrees.
- If the bearing is greater than 3200 mils or 180 degrees, subtract 3200 mils or 180 degrees.



In the 1920's, it became accepted world wide to indicate direction by a number representing an angle, measured clockwise from True North; called a "bearing".

CONFIRMATION OF TEACHING POINT 4

QUESTIONS

Q1. What is another name for an angle?

Q2. What is a grid bearing?

Q3. What is a magnetic bearing?

ANTICIPATED ANSWERS

A1. A bearing.

A2. A bearing measured on a map.

A3. A bearing measured with a compass.

Teaching Point 5 **Complete a Compass Rose Activity**

Time: 15 min Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have cadets label a compass rose with the inter-cardinal points and the degrees and mils value for each.

RESOURCES

Compass rose activity sheet located at Annex A of this Instructional Guide.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into pairs.
2. Issue each cadet with a copy of the compass rose activity sheet.
3. Allow cadets five to seven minutes to complete the activity sheet as a team.
4. Review answers starting at north to include compass point name, degrees and mils.
5. Allow cadets to keep activity sheets for future reference.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 5

The cadets' participation in the compass rose activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What is another name for a bearing?

Q2. How many degrees and how many mils make a complete circle?

Q3. What symbols are used to represent the three norths?

ANTICIPATED ANSWERS

A1. An angle.

A2. 360 degrees and 6400 mils.

A3. True north is a star (Polaris), grid north is a square (map grid) and magnetic north is a needle (compass).

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Being able to describe bearings is an important aspect of navigation training, as it allows cadets to identify direction when travelling from one point to another.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

COMPASS ROSE ACTIVITY SHEET

Fill in the missing detail for each point of the compass rose

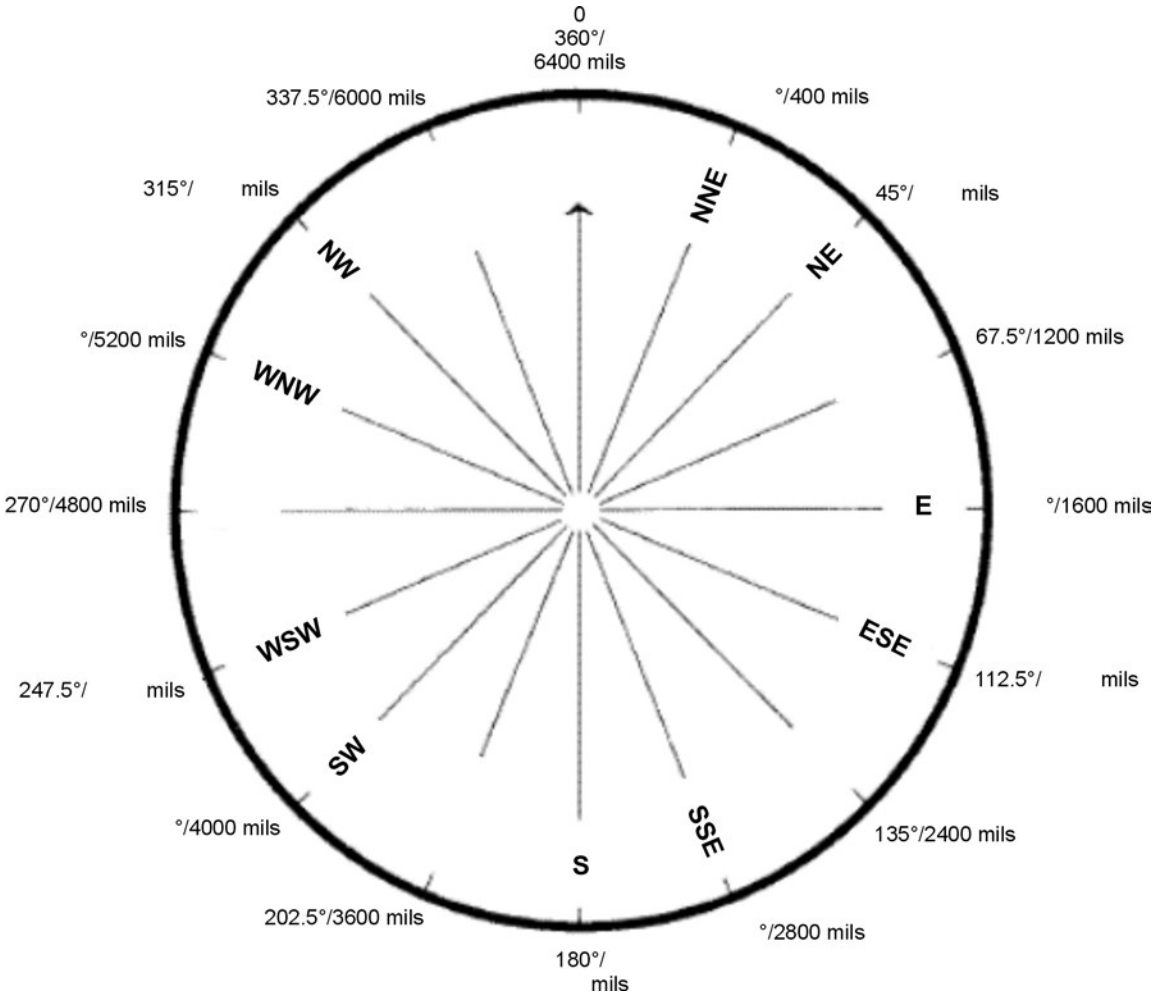


Figure A-1 Compass Rose Activity

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ROYAL CANADIAN ARMY CADETS

RED STAR

INSTRUCTIONAL GUIDE

SECTION 3

EO M222.03 – IDENTIFY COMPASS PARTS

Total Time: 30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-702/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Calculate the magnetic declination for the map being used.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP1 to present basic material, orient the cadets to the compass, and generate interest.

Demonstration and performance was chosen for TP2 as it allows the instructor to explain and demonstrate the navigation skills the cadets are expected to acquire, while providing an opportunity for the cadets to practice navigation under supervision.

INTRODUCTION

REVIEW

The review for this lesson is from EO M222.02 (Describe Bearings).

QUESTIONS

Q1. What are the four inter-cardinal points of a compass rose?

Q2. How many degrees and how many mils make a complete circle?

Q3. What symbols are used to represent the three norths?

ANTICIPATED ANSWERS

A1. North-east, south-east, south-west and north-west.

A2. 360 degrees and 6400 mils.

A3. True north is a star (Polaris), grid north is a square (map grid) and magnetic north is a needle (compass).

OBJECTIVES

By the end of this lesson the cadet shall have identified the parts of the compass.

IMPORTANCE

It is important for cadets to be able to use a compass while navigating during expedition training. Each part of the compass has a specific name used to identify the part and its function. Cadets will rely on this information throughout navigation and expedition training.

Teaching Point 1 **Identify and Describe the Parts of the Compass**

Time: 5 min Method: Interactive Lecture

INTRODUCTION

The compass is an important tool used in wilderness navigation. It is not a replacement for good map techniques, but it is a trustworthy tool to compliment and complete navigation skills. A compass user must take care to be precise in their measurements with the compass. A small error in calculation or measurement can equal a significant error in the field.

A magnetic compass is still viable as a navigation aid, even with the advent of Global Positioning System devices, because it requires no batteries, and remains reliable year after year.

The Chinese discovered the orientating effect of magnetite, or lodestone as early as the 4th century BC. In 101 BC, Chinese ships reached the east coast of India for the first time, possibly with help from a magnetic compass. By the 10th century, they had developed a floating compass for use at sea. Western Europeans had developed one by 1187, Arabs by 1220, and Scandinavians by 1300. Columbus used a magnetic compass on his first trans-Atlantic trip in 1492 (see Figure 1).

CHINESE FLOATING COMPASS

Figure 1 Chinese Floating Compass

A-CR-CCP-121/PT-001 (p. 5-33)

HOW A COMPASS WORKS

Regardless of their intended purpose or the complexity of their construction, most compasses operate on the same basic principle. A small, elongated, permanently magnetized needle is placed on a pivot so that it may rotate freely in the horizontal plane. The Earth's magnetic field which is shaped approximately like the field around a simple bar magnet exerts forces on the compass needle, causing it to rotate until it comes to rest in the same horizontal direction as the magnetic field. Over much of the Earth, this direction is roughly true north, which accounts for the compass's importance for navigation. The Earth has a north and a south magnetic pole. These magnetic poles correspond roughly with the actual geographical poles. The north magnetic pole is located at approximately 78.9°N latitude and 103.8°W, about 1000 km from the geological north pole.

The horizontal force of the magnetic field, responsible for the direction in which a compass needle is oriented, decreases in strength as one approaches the north magnetic pole – the compass starts to behave erratically, and eventually, as the horizontal force decreases even more, the compass becomes unusable.

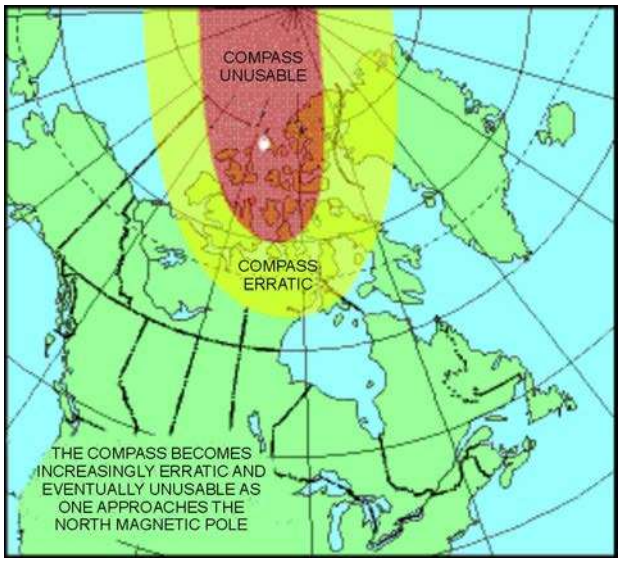


Figure 2 Earth's Magnetic Field

A-CR-CCP-121/PT-001 (p. 5-33)

The nature of the magnetic field allows the magnetic north pole to shift geographic position about 5-10 cm per year. Other natural phenomena, like earthquakes, can change the magnetic field locally.

Teaching Point 2 **Identify and Describe the Parts of the Compass**

Time: 10 min Method: Interactive Lecture

Divide cadets into equal groups according to the number of compasses available. Starting with the compass opened, use the diagram in Figure 3 to identify the parts of the compass from the top (sight) to the bottom (screwdriver).

PARTS OF THE COMPASS

A – Sight. Located at the top of the compass cover, the sight is used to align an objective or bearing.

B – Compass Cover. The compass cover protects the compass dial and houses the sighting mirror.

C – Sighting Mirror. The sighting mirror is used to see the compass dial while setting a bearing.

D – Sighting Line. The sighting line is used when aligning the objective or bearing.

E – Luminous Index Point. The luminous index point at the top of the compass dial is where a bearing is set and read from.

F – Compass Dial. The compass dial houses the magnetic needle, the orienting arrow and the declination scale on the inside and the dial graduations on the outside.

G – Dial Graduations. The compass dial is graduated in 50 mil divisions from 0 to 6400 mils, or 2 degree divisions from 0 to 360 degrees. The dial is rotated by hand.

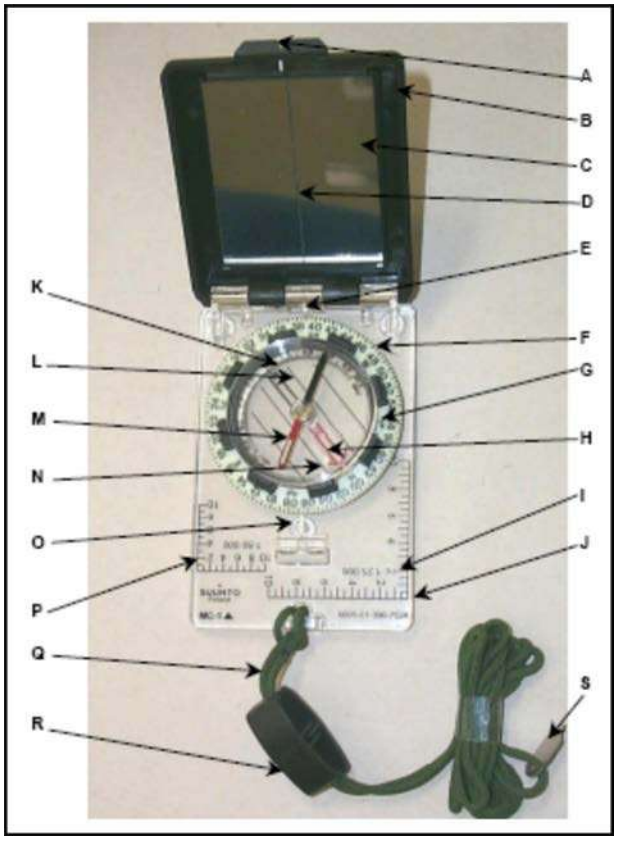


Figure 3 Compass

A-CR-CCP-121/PT-001 (p. 5-33)

This Instructional Guide is good for use with compasses that have dial graduations in either mils or degrees.

H – Orienting Arrow. The red orienting arrow is located inside the compass dial and is used to line up the magnetic needle. The orienting arrow is always set at 00 mils/degrees.

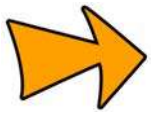
I – Romer 1:25 000. This romer is used to measure GR on maps with a 1:25 000 scale.

J – Compass Base Plate. The compass base plate is a clear piece of flat plastic, to which the cover, dial and lanyard are attached.

K – Declination Scale. The declination scale is used to compensate for the variation of magnetic declination between the compass and the map being used.

L – Compass Meridian Lines. Compass meridian lines are black or red lines inside the compass dial and are used to line up the compass dial with the grid lines on a map.

M – Magnetic Needle. The magnetic needle spins freely and points to magnetic north. The south end of the compass needle is black and the north end, with a luminous patch, is red.



When the magnetic needle is lined up with the red orienting arrows, the mnemonic “Red in the Bed” is used to remember which end of the needle belongs between the arrows.

N – Luminous Orienting Points. There are two luminous orienting points located on either side of the orienting arrow.

O – Luminous Index Point. The luminous orienting point at the bottom of the compass dial is where a back bearing is read from.

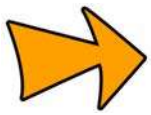
P – Romer 1:50 000. This romer is used to measure GR on maps with a 1:50 000 scale.

Q – Safety Cord or Lanyard. The safety cord is used to fasten the compass to the body.

R – Adjustable Wrist Lock. The adjustable wrist lock is used to attach the compass to the wrist.

S – Screwdriver. The tiny screwdriver at the end of the safety cord is used to turn the screw to adjust the declination scale.

T – Declination Adjustment Screw. The declination adjustment screw is located on the back side of the compass dial and is used to adjust the declination scale (not shown).



When exposed to direct light, all luminous parts of the compass will glow in the dark making operating the compass at night possible.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the maximum number of mils or degrees on the dial graduations?

Q2. What mnemonic is use for putting the magnetic needle between the orienting arrows?

Q3. What direction does the red part of the magnetic needle point?

ANTICIPATED ANSWERS

A1. 6400 mils or 360 degrees.

A2. “Red in the Bed”.

A3. Magnetic north.

Teaching Point 3 **Explain, Demonstrate and Have Cadets Practice Setting Declination**

Time: 10 min Method: Demonstration and Performance

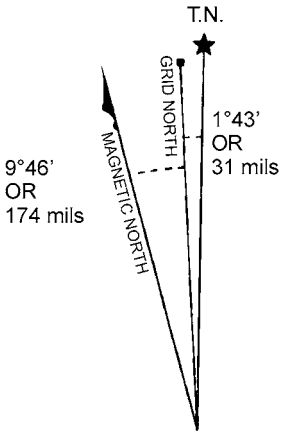
Explain and demonstrate setting declination as listed below, prior to cadets practicing this procedure. Cadets will only learn how to set declination on the compass with a value provided by the instructor. Calculating declination will be taught in Silver Star.

As mentioned in EO M222.02 (Describe Bearings), there is a difference in angle between true and magnetic north.

DECLINATION

Also called magnetic declination, it is the difference in angle measured in degrees and minutes between true north (map) and magnetic north (compass). Declination will change depending on geographic position and it also changes annually due to the shifting magnetic pole.

Declination is further described by stating whether the declination is east or west of true north. The declination for the map being used is calculated using the information in the declination diagram found in the margin of the map.



USE DIAGRAM ONLY TO OBTAIN NUMERICAL VALUES
APPROXIMATE MEAN DECLINATION 1982
FOR CENTRE OF MAP
ANNUAL CHANGE (INCREASING) 4.4’

Figure 4 Declination Diagram

A-CR-CCP-121/PT-001 (p. 5-39)

SETTING DECLINATION ON A COMPASS

The compass's declination scale must be set to compensate for the difference between true north and magnetic north. To do this we must first have the amount of declination in degrees east or west. Then, turn the compass over and look at the back of the dial.

From the zero point, using the screwdriver on the end of the safety cord, turn the declination screw to the right for west and to the left for east declination. Each small black line is two degrees.

When setting declination on a compass, it is easier to hold the screwdriver and turn the compass, especially in cold weather. The declination shall never be turned past 90° on the declination scale.

Figure 5 Declination Screw

D Cdts 3, 2007, Ottawa, ON: Department of National Defence

If you were to follow a compass bearing for 1 km without adjusting for declination, for every 1 degree not accounted for, you would be 178 metres to the left or right of the plotted bearing. This is how important declination is.

CONFIRMATION OF TEACHING POINT 3

Divide cadets into equal groups according to the number of compasses available. Giving a different declination setting each time, have cadets take turns setting the declination on a compass. Verify each setting before continuing to the next setting.

The cadets' participation in setting declination will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What is the screwdriver on the compass used for?

Q2. What two directions are used to describe declination?

Q3. What direction is the declination adjusting screw turned to set an east declination?

ANTICIPATED ANSWERS

A1. To turn the declination adjusting screw.

A2. East and west.

A3. Left.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Compasses are used during navigation and trekking training exercises. Identification of the parts and the proper use of the compass is essential to ensuring accurate navigation.

INSTRUCTOR NOTES/REMARKS

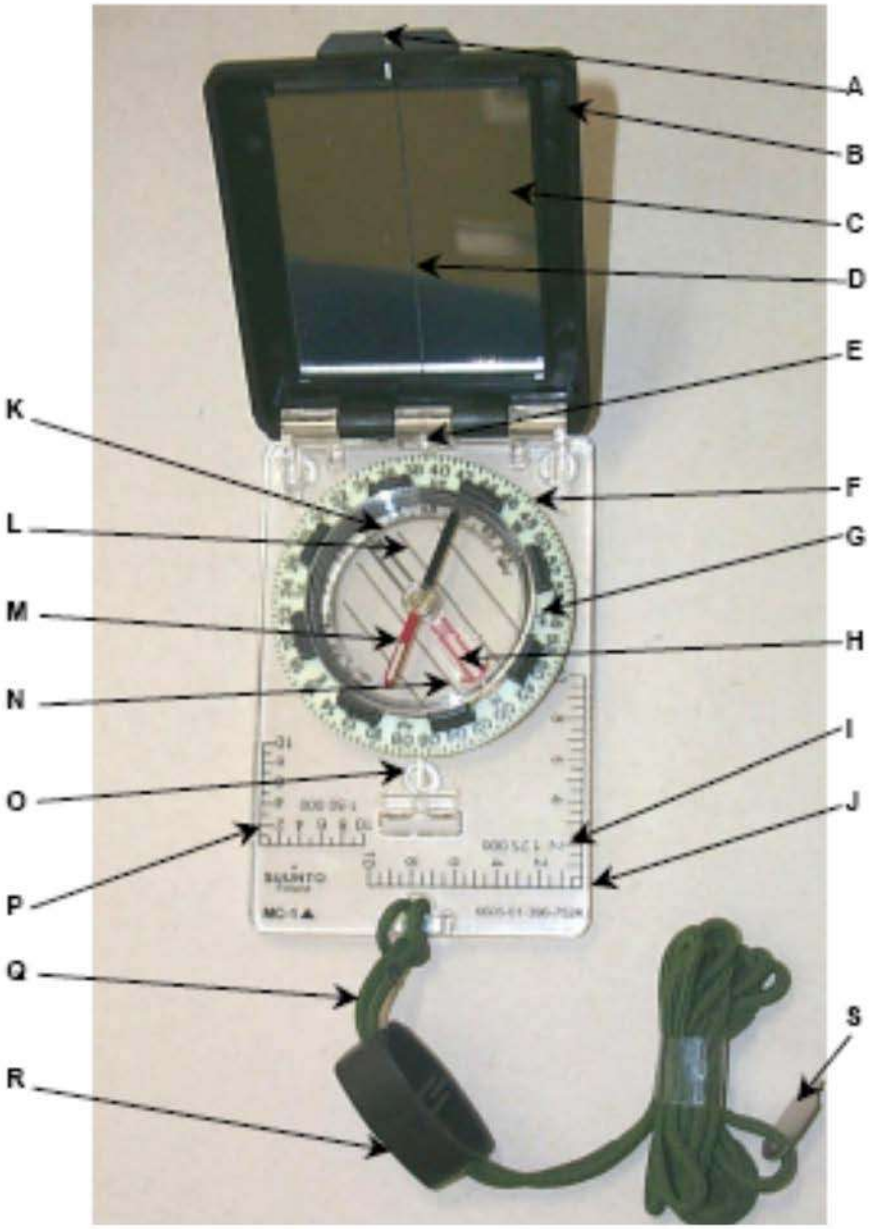
N/A.

REFERENCES

A2-036 A-CR-CCP-121/PT-001 D Cdts (2003). *Royal Canadian Army Cadet Reference Book*. Ottawa, ON: Department of National Defence.

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

COMPASS PARTS



LEGEND

A - Sight	**B** - Compass Cover	**C** - Sighting Mirror	**D** - Sighting Line
E - Luminous Index Point	**F** - Compass Dial	**G** - Dial Graduations	**H** - Orienting Arrows
I - Romer 1:25,000	**J** - Compass Base Plate	**K** - Declination Scale	**L** - Compass Meridian lines
M - Magnetic Needle	**N** - Luminous Orienting Points	**O** - Luminous Index Point	**P** - Romer 1:50,000
Q - Safety Cord or Lanyard	**R** - Adjustable Wrist Lock	**S** - Screwdriver	**T** - Declination Adjusting Screw (not shown)

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ROYAL CANADIAN ARMY CADETS

RED STAR

INSTRUCTIONAL GUIDE

SECTION 4

EO M222.04 – DETERMINE DISTANCE ALONG A ROUTE

Total Time: 90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-702/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Using a topographical map of the local area, identify at least three different sets of points (A to B) to be measured during the activity in TP1.

Measure and identify 100 m to be used for establishing individual pace during TP2.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

Demonstration and performance was chosen for TP1 and TP2 as it allows the instructor to explain and demonstrate determining distance along a route while providing an opportunity for the cadets to practice these skills under supervision.

An interactive lecture was chosen for TP3 to clarify and emphasize the limitations of individual pacing.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

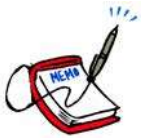
By the end of this lesson, the cadet shall be expected to determine distance along a route.

IMPORTANCE

It is important for cadets to be able to determine the distance along a route and pace a route as it allows them to calculate the distance between two points and to estimate the amount of time required to reach an objective or destination.

Teaching Point 1 **Explain, Demonstrate and Have Cadets Practice Determining Distance on a Map**

Time: 25 min Method: Demonstration and Performance



For this skill lesson, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be used to monitor cadet performance.

DETERMINING DISTANCE ON A MAP

Cadets can use their maps to measure the distance between two points (A and B) on the ground. All maps are drawn to scale; therefore, a specified distance on a map equals a specified distance on the ground. The scale of a map is printed at the top and bottom of each map (e.g. Scale 1:50 000). This means that one cm on the map equals 50 000 cm (500 m) on the ground.

There are two ways to determine distance on a topographical map – point to point and along a route.

Measuring Point to Point

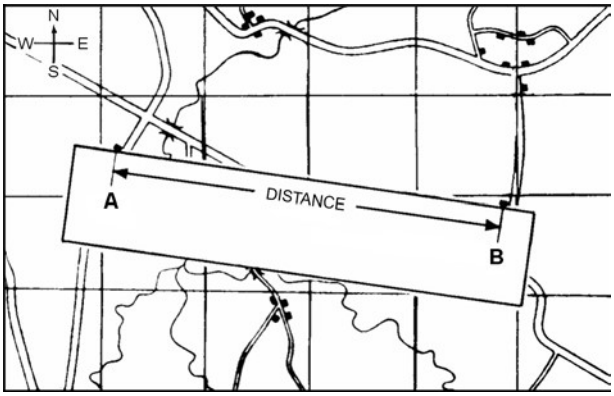


Figure 1 Measure Distance Point to Point

A-CR-CCP-121/PT-001 (p. 5-24)

To measure a distance point to point:

1. lay the straight edge of a piece of paper against the two points;
2. with a sharp pencil, mark the paper at the A (start) and B (finish) points;
3. lay the paper just under the scale bar (metres) and move the B mark backwards to each thousands mark until the A mark falls within the sub-divided thousands (hundreds) to the left of the zero; and
4. to calculate the total distance, add the number of thousands where the B mark is, plus the number of sub-divided thousands where the A mark is to the left of the zero.

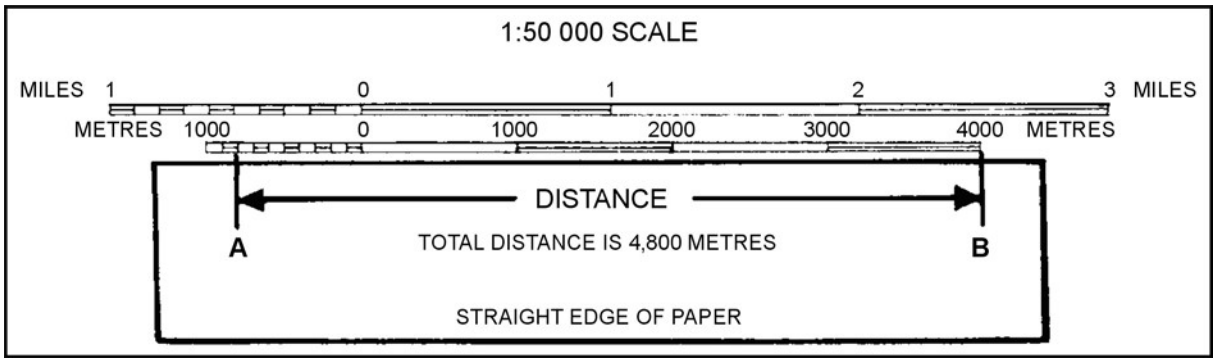


Figure 2 Calculate Distance

A-CR-CCP-121/PT-001 (p. 5-25)

For a distance that is longer than 5000 m, measure the first 5000 m and mark the paper with a new line and label it '5000 m'. Place the new mark at the zero or thousands mark until the A mark fits within the sub-divided thousands bar. Add the total of that distance to the 5000 m and that will be the total distance.

Measuring Along a Route

Sometimes cadets need to find the distance between A and B around curves in a road or along a planned route.

To measure a distance along a route between two points:

1. lay the straight edge of a piece of paper against point A;
2. with a sharp pencil, mark point A on the paper and the map;
3. line up the paper with the edge of the road until you come to a curve and make another mark on the paper and on the map;
4. pivot the paper so that it continues to follow the road edge. Repeat until you reach point B;
5. mark your paper and the map at point B;
6. lay the paper just under the scale bar (metres) and move the B mark backwards to each thousands mark until the A mark falls within the sub-divided thousands to the left of the zero; and
7. add the number of thousands where the B mark is, plus the number of sub-divided thousands where the A mark is to the left of the zero, will determine the total distance.

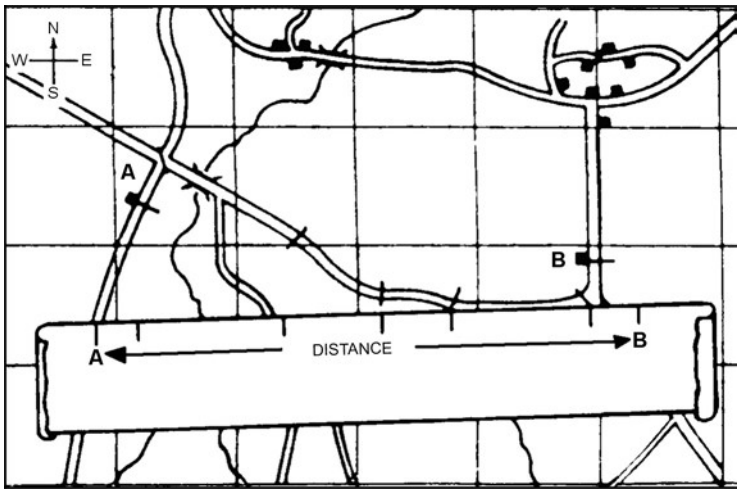


Figure 3 Measure Distance Along a Route

A-CR-CCP-121/PT-001 (p. 5-25)

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What are the two methods of measuring distance on a map?

Q2. What is the distance on the ground, for every cm measured on a 1:50 000 scale map?

Q3. What scale bar must be used when calculating the distance measured?

ANTICIPATED ANSWERS

A1. The two methods are point to point and along a route.

A2. One cm on the map equals 50 000 cm (500 m) on the ground.

A3. The metres scale bar is used when calculating distance.

Teaching Point 2 **Explain, Demonstrate and Have Cadets Practice Determining Distance Using Individual Pacing**

Time: 40 min Method: Demonstration and Performance

On a pre-measured 100 m course, arrange the cadets so they can see a demonstration and hear the explanation of individual pacing.

PACE COUNTING METHOD

The pace counting method (pacing) is used for measuring a given distance by counting every other step. Two steps equal one pace. Pacing is a very important skill in navigation, as each person has a different pace and needs to establish their pace before it can become a useful measurement tool. Pacing varies between individuals as it uses a natural stride – an average adult will pace about 60 to 70 paces in 100 m.

To determine an individual pace, practice taking uniform, comfortable steps over a measured distance (100 m) counting every second step of the dominant foot. Do this three to five times to get an average. This will be the individual's pace number and should be remembered.

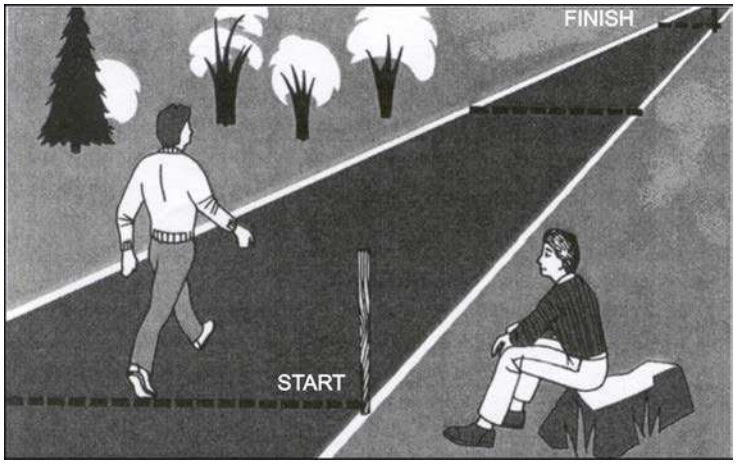


Figure 4 Determining Distance Using Pacing

Kjellstrom, B., Be Expert With Map & Compass, Hungry Minds, Inc. (p. 53)

Remember, pacing is an approximation. A margin of error of 1–2 percent is considered reasonable (e.g. 10-20 m for every one km walked).

ACTIVITY

Time: 30 min

OBJECTIVE

The objective of this activity is to have cadets determine an individual pace.

RESOURCES

- Pre-measured 100 m, and
- Pen and paper.

ACTIVITY LAYOUT

Have defined start and finish lines clearly marked.

ACTIVITY INSTRUCTIONS

- Have the cadets start at one end of the course and pace to the other end.
- Have the cadets record their paces after each length of the course.
- After three to five lengths (approx. 25 min), have the cadets calculate the average of their pace (total paces divided by the number of times they paced).

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is pacing used to measure?

Q2. How many steps equal one pace?

Q3. What foot should be used to count paces?

ANTICIPATED ANSWERS

A1. It is used to measure distance.

A2. Two steps equal one pace.

A3. The dominant foot should be used to count paces.

Teaching Point 3 **Discuss Factors That Affect Pacing**

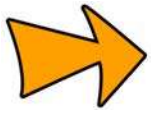
Time: 15 min Method: Interactive Lecture

Have cadets draw on personal experience to identify the factors that affect pacing.

FACTORS AFFECTING PACING

Pacing can be affected by different factors and numbers may vary. Some of the factors and the affect on individual pacing are:

- **Topography.** This is the most common factor. Walking through mud, thick bush and tall vegetation can shorten the paces.
- **Slopes.** Walking uphill will shorten the paces, while walking downhill can lengthen the paces.
- **Fatigue.** Pacing may change from natural in the morning, when cadets are rested, and shorter in the afternoon as they start to get tired.
- **Equipment.** Equipment could affect pacing, such as the wrong type of footwear. Too much or too little clothing and the amount of equipment being carried can shorten the paces.
- **Weather.** Heavy rain, wind velocity, temperature and snow can shorten the paces.



Pacing beads can be used to keep track of the distance walked. One bead is moved for every 100 m walked. If pacing beads are not available, stones can be used by moving them from one pocket to another to count every 100 m.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What is the most common factor affecting pacing?

Q2. What effect does walking downhill have on pacing?

Q3. How can fatigue affect pacing from morning to afternoon?

ANTICIPATED ANSWERS

A1. The most common factor affecting pacing is topography.

A2. Walking downhill will make the paces longer.

A3. Pacing will be natural in the morning and shorter in the afternoon.

END OF LESSON CONFIRMATION

The cadets' participation in the pacing activity will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Being able to determine distance along a route is an important aspect of navigation training as it allows cadets to have an idea of distance travelled, distance to be travelled and a general sense of their location at all times while navigating.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

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ROYAL CANADIAN ARMY CADETS

RED STAR

INSTRUCTIONAL GUIDE

SECTION 5

EO M222.05 – ORIENT A MAP USING A COMPASS

Total Time: 30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-702/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Calculate the declination for the map being used prior to delivering this lesson.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

Demonstration and performance was chosen for this lesson as it allows the instructor to explain and demonstrate orienting a map using a compass while providing an opportunity for the cadets to practice this skill under the supervision of an instructor.

INTRODUCTION

REVIEW

The review for this lesson is from EO M222.04 (Determine Distance Along a Route).

QUESTIONS

Q1. What are the two methods of measuring distance on a map?

Q2. How many steps equal one pace?

Q3. What is the most common factor affecting pacing?

ANTICIPATED ANSWERS

A1. Point to point and along a route.

A2. Two steps equal one pace.

A3. Topography.

OBJECTIVES

By the end of this lesson the cadet shall be expected to orient a map using a compass.

IMPORTANCE

It is important for cadets to know how to orient a map using a compass so they can accurately align features found on the map with true north when navigating a long distance.

Teaching Point 1 **Explain, Demonstrate and Have Cadets Practice Orienting a Map Using a Compass**

Time: 25 min Method: Demonstration and Performance

Arrange the cadets so they can see the demonstration and hear the explanation of orienting a map using a compass as listed below.

As previously taught during Green Star navigation, orienting a map by inspection means turning the map so that, visually, the map directions and map detail correspond with details on the ground. When you are unable to identify details on the map with those on the ground (e.g. you are in a hilly area), or you need to orient the map more accurately when navigating a long distance, a compass must be used.

Figure 1 Set Declination

D Cdts 3, 2007, Ottawa, ON: Department of National Defence

Figure 2 Set Compass to 00

D Cdts 3, 2007, Ottawa, ON: Department of National Defence

Figure 3 Red in the Bed

D Cdts 3, 2007, Ottawa, ON: Department of National Defence

For this skill lesson, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be employed to monitor cadet performance.

To orient a map using a compass:

1. set the current declination on the compass;
2. set the compass dial to read 00 (zero) mils or 0 degrees (north);
3. lay the compass flat on the map with the cover open;
4. point the mirror to North (top of the map);
5. align one side of the base plate with an easting line; and
6. turn the map and compass together until the red end of the magnetic needle is over the orienting arrow.

The mnemonic used to remember putting the magnetic needle over the orienting arrow is "Red in the Bed".

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. When would you orient a map by compass instead of by inspection?

Q2. What number is the compass dial set to read?

Q3. What is the mnemonic for putting the magnetic needle over the orienting arrow?

ANTICIPATED ANSWERS

A1. When unable to identify details on the map or a more precise oriented map is required.

A2. The compass dial is set to 00 mils or 0 degrees.

A3. Put red in the bed.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What is the first step to orienting a map using a compass?

Q2. What direction is the compass mirror to be pointed on the map?

Q3. How is the map aligned with the compass?

ANTICIPATED ANSWERS

A1. Set the declination on the compass.

A2. It is to be pointed to the top of the map or north.

A3. Line up one side of the compass base plate with an easting line.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Knowing how to orient a map using a compass is important as it enables you to accurately align the map with true north. It also aids cadets in having a general idea of their location during expedition training.

INSTRUCTOR NOTES/REMARKS

This lesson will be conducted with PO M223 (Participate in a Two Day Hike with Some Class 2 Terrain and Obstacles).

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

ROYAL CANADIAN ARMY CADETS

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INSTRUCTIONAL GUIDE

SECTION 6

EO M222.06 – FOLLOW A MAGNETIC BEARING POINT TO POINT

Total Time: 60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-702/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Prior to this lesson, using a topographical map, prepare a navigation route, consisting of a minimum of six legs no greater than 100 m apart.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

Demonstration and performance was chosen for TP1 and TP2 as it allows the instructor to explain and demonstrate following a magnetic bearing point to point while providing an opportunity for the cadets to practice following a bearing point to point under supervision.

A practical activity was chosen for TP3 as it is an interactive way to allow cadets to experience following a magnetic bearing point to point in a safe, controlled environment. This activity contributes to the development of navigation skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

The review for this lesson is from EO M222.05 (Orient a Map Using a Compass).

QUESTIONS

Q1. What is the first step to orienting a map using a compass?

Q2. What direction is the compass mirror to be pointed on the map?

Q3. How are the map and compass aligned together?

ANTICIPATED ANSWERS

A1. Set the declination on the compass.

A2. The top of the map or north.

A3. Line up one side of the compass base plate with an easting line.

OBJECTIVES

By the end of this lesson the cadet shall be expected to follow a magnetic bearing point to point.

IMPORTANCE

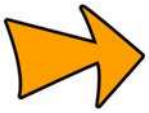
It is important for cadets to know how to determine the magnetic bearing of a prominent object, take a magnetic bearing on a map and follow a magnetic bearing so they will be able to navigate a route during orienteering and expedition training.

Teaching Point 1 **Practice Determining the Magnetic Bearing of a Prominent Object**

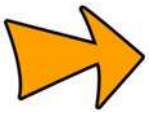
Time: 10 min Method: Demonstration and Performance

Divide cadets into equal groups according to the number of compasses available. Arrange the cadets so they can see the demonstration and hear the explanation of determining the magnetic bearing of a prominent object as listed below.

A compass can be used to identify the cardinal points such as north and south, the direction of travel and the bearing from one's current location to a prominent object. However, the ability to take a magnetic bearing of a prominent object and to use that information to help identify one's general location can save hours when trekking. A magnetic bearing is a quick method for describing the direction of travel.



To build navigation skills, it is useful to have cadets approximate their bearings prior to taking a bearing with the compass.



A prominent object is something that is large and easily seen (e.g. church or hilltop).

For this skill lesson, it is recommended that instruction take the following format:

1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be employed to monitor cadet performance.

Figure 1 Determining a Magnetic Bearing

A-CR-CCP-121/PT-001 (p. 5-42)

To determine the magnetic bearing of a prominent object:

1. Check and set the pre-determined declination on the compass.
2. Hold the compass at eye level, at arms length, and face the prominent object.
3. Aim at the object using the compass sight, ensuring the sighting line is in line with the index pointer.
4. Adjust the compass cover so the compass dial is seen in the sighting mirror.
5. Look in the mirror and turn the compass dial until the magnetic needle is over the orienting arrow (red in the bed).
6. Read the number on the compass dial at the luminous index pointer. The magnetic bearing of the prominent object is read at the luminous index pointer.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What is a magnetic bearing?

Q2. Where must the magnetic needle be when looking in the mirror and turning the compass dial?

Q3. From where is the magnetic bearing of the prominent object read?

ANTICIPATED ANSWERS

A1. A magnetic bearing is a bearing that is measured between two points using a compass.

A2. The magnetic needle must be over the orienting arrow (red in the bed).

A3. The magnetic bearing is read from the luminous index pointer.

Teaching Point 2 **Explain, Demonstrate and Have the Cadets Practice Taking a Magnetic Bearing on a Map**

Time: 15 min Method: Demonstration and Performance

The ability to measure a bearing from a map allows cadets to plan routes or activities before going into the field, and allows an easy method of communicating information about movement or location. When a compass is adjusted to compensate for declination, it will provide the equivalent of a magnetic bearing. Magnetic bearings may be set on the compass without further conversions.

For this skill lesson, it is recommended that instruction take the following format:

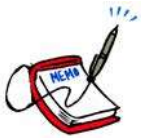
1. Explain and demonstrate the complete skill while cadets observe.
2. Explain and demonstrate each step required to complete the skill. Monitor cadets as they imitate each step.
3. Monitor the cadets' performance as they practice the complete skill.

Note: Assistant instructors may be employed to monitor cadet performance.

Figure 2 Measuring a Magnetic Bearing on a Map

D Cdts 3, 2007, Ottawa, ON: Department of National Defence

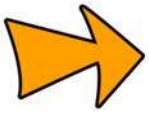
To measure a magnetic bearing on a map:



Prior to measuring a magnetic bearing on a map it is good practice to first estimate the bearing by drawing a quick compass rose and looking at where the bearing would be on the compass rose. This serves as a good check to ensure the cadet has not accidentally measured the back bearing.

1. Set the pre-determined declination on the compass.
2. Identify and mark the start (point A) and finish (point B) points on a map.
3. Draw a plotting ray from point A to point B.
4. Lay the fully opened compass with the edge of the compass base plate along the plotting ray, in the direction of travel (point A to point B).
5. Hold the compass in place, rotate the compass dial so that the compass meridian lines align with the easting lines on the map, ensuring north on the dial indicates north on the map.
6. Read the number on the compass dial at the luminous index pointer.

The magnetic bearing is read at the luminous index pointer.



If the bearing is taken from point B to point A, the compass will be pointing 180 degrees or 3200 mils in the exact opposite direction of travel wanted. This is also called a back bearing.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the first step to measuring a magnetic bearing on a map?

Q2. What direction along the plotting ray must the compass be laid?

Q3. With what lines on the map must the compass meridian lines align?

ANTICIPATED ANSWERS

A1. Setting the pre-determined declination on the compass.

A2. In the direction of travel – point A to point B.

A3. The compass meridian lines must align with the map easting lines.

Teaching Point 3 **Follow a Magnetic Bearing Point to Point**

Time: 25 min Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have cadets follow a magnetic bearing point to point.

RESOURCES

- Topographical map (one per group), and
- Compass (one per group).

ACTIVITY LAYOUT

Navigation route consisting of a minimum of six legs, no greater than 100 m apart in distance.

ACTIVITY INSTRUCTIONS

1. Divide cadets in groups of four to six.
2. Issue each group with a map and compass.
3. Have a different cadet in each group take a magnetic bearing on a map during daylight.
4. Have each cadet take a turn leading the group, while following a magnetic bearing point to point.

SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in following a magnetic bearing point to point will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What is the definition of a prominent object?

Q2. What is the definition of a magnetic bearing?

Q3. What numbers indicate the magnetic bearing?

ANTICIPATED ANSWERS

A1. A prominent object is something that is large and easily seen (e.g. church or hilltop).

A2. A magnetic bearing is a bearing that is measured between two points using a magnetic compass.

A3. The numbers shown at the luminous index pointer indicate the magnetic bearing.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Being able to determine the magnetic bearing of a prominent object, take a magnetic bearing on a map and follow a magnetic bearing will assist the cadets in navigating a route during orienteering and expedition training.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

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INSTRUCTIONAL GUIDE

SECTION 7

EO C222.01 – PRACTICE NAVIGATION USING A MAP AND COMPASS

Total Time: 90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-702/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Review the activities in TP2 to confirm local resources required and prepare the route to be used to include GRs and bearings.

If assistant instructors are not available, determine a safety bearing to a known location.

Prepare brain teaser clues/puzzle navigation pieces (word, picture or phrase) for each checkpoint.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP1 to give direction on procedures and to illustrate the application of rules for the navigation exercise.

A practical activity was chosen for TP2 as it is an interactive way to allow cadets to experience navigation in a safe, controlled environment. This activity contributes to physical fitness and to the development of navigation skills and knowledge in a fun and challenging setting.

A group discussion was chosen for TP3 as it allows the cadets to interact with their peers and share their knowledge, experiences, opinions, and feelings about navigation training.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have practiced navigation using a map and compass.

IMPORTANCE

It is important for cadets to practice navigation using a map and compass as it is a skill set that must be practiced in order to build confidence and accuracy. Participation in these activities contributes to the development of navigation skills and knowledge in a fun and challenging setting. Cadets will rely on this skill set throughout navigation and expedition training.

Teaching Point 1 **Conduct a Safety Briefing**

Time: 10 min Method: Interactive Lecture

Arrange the cadets so they can see any demonstrations and hear the safety briefing prior to participating in the activity.

This briefing is being conducted to pass on vital information and to answer any questions regarding the safe conduct of a navigation activity, to include:

- actions that can be taken if they become lost, may include:
  - returning to the previous checkpoint;
  - using a radio if available; or
  - following a safety bearing to a known location;
- a time limit for the activity of 55 minutes;
- boundaries set for the conduct of the activity;
- rules and safety procedures for the activity; and
- a narrative of the specific activity being conducted.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. What actions shall be taken if a group becomes lost?

Q2. What is the time limit for this activity?

Q3. What are the boundaries for this activity?

ANTICIPATED ANSWERS

A1. If a group becomes lost, they should return to the previous checkpoint or follow a safety bearing to a known location.

A2. This activity will last no more than 55 minutes.

A3. The answers to this question will vary based on the local area being used.

Teaching Point 2 **Participate in a Navigation Activity**

Time: 55 min Method: Practical Activity

Select one of the following activities to be conducted in the time allocated. If time permits, try more than one activity. Prepare for each activity in advance using resources available.

NAVIGATION BRAIN TEASER

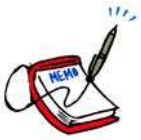
Using a map and compass, cadets will navigate to a predetermined point on the map. The course will consist of a minimum of six legs, approximately 100 to 200 m in length. At each point the cadets will be given simple clues (magnetic bearing, GR, or distance) directing them to the next checkpoint. The team that locates the most checkpoints and has the fastest time is the winning team.

COMPASS WORK AND PACING

Using a map and compass, cadets will follow a predetermined bearing on the map. The course will consist of a minimum of six legs, approximately 100 to 200 m in length. Following the bearing provided, each team will determine the number of paces and distance between each checkpoint. The team with the most accurate measurements of distance between each checkpoint and the fastest time is the winning team.

PUZZLE NAVIGATION

Using a map and compass, cadets will navigate along a predetermined route. At each checkpoint on the route, cadets will collect a puzzle piece. The puzzle could be a picture, word or phrase. The first team to collect all puzzle pieces, cross the finish line and solve the puzzle is the winning team.



This sample word puzzle when unscrambled will spell “CADET”:

- at checkpoint 1 the group collects a “D”;
- at checkpoint 2 the group collects a “T”;
- at checkpoint 3 the group collects a “A”;
- at checkpoint 4 the group collects a “C”;
- at checkpoint 5 the group collects a “E”;

An example of a picture puzzle can be found at Annex A, to be completed as follows:

1. photocopy one picture for each team;
2. cut the picture into pieces equal to the number of checkpoints;
3. label each piece of the puzzle with the same team number;
4. at each checkpoint the group will collect the same numbered puzzle piece; and
5. at the end of the navigation the group will assemble the puzzle.

ACTIVITY 1

OBJECTIVE

The objective of the Navigation Brain Teaser activity is to have the cadets, as members of a team, participate in point to point navigation.

RESOURCES

- Topographical map (one per team);
- Compass (one per team); and
- A predetermined navigation route.

ACTIVITY LAYOUT

- Have defined start and finish lines clearly marked.
- Position a clue at each point directing groups to the next point.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of four to six.
2. Issue each group a map and compass.
3. Give the clue for the first checkpoint to the cadet leading the group.
4. Start groups at two-minute intervals and record start times.
5. On a sheet of paper, have cadets record each clue in the order they complete each checkpoint.
6. Collect sheets and record the finish time for each group.

If available, use an assistant instructor at each checkpoint to give cadets the next clue, answer questions and to prevent groups from following each other or sharing answers.

SAFETY

N/A.

ACTIVITY 2

OBJECTIVE

The objective of the Compass Work and Pacing activity is to have cadets, as members of a team, participate in pacing and determining distance during navigation.

RESOURCES

- Topographical map (one per team);
- Compass (one per team); and
- A predetermined pacing/navigation route.

ACTIVITY LAYOUT

Have defined start and finish lines clearly marked.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of four to six.
2. Issue each group a map and compass.
3. Have cadets transfer the course to be followed onto the maps.
4. Start groups at two-minute intervals and record start times.
5. On a sheet of paper, have cadets record paces and distance for each leg they complete.
6. Collect sheets and record the finish time for each group.

If available, use an assistant instructor at each checkpoint to answer questions and to prevent groups from following each other or sharing answers.

SAFETY

N/A.

ACTIVITY 3

OBJECTIVE

The objective of the Puzzle Navigation activity is to have the cadets, as members of a team, participate in point to point navigation.

RESOURCES

- Topographical map (one per team);
- Compass (one per team);
- Puzzle pieces (one per team, per checkpoint); and
- A predetermined navigation route.

ACTIVITY LAYOUT

- Have defined start and finish lines clearly marked.
- Position identical puzzle pieces at each checkpoint.

ACTIVITY INSTRUCTIONS

1. Divide the cadets into groups of four to six.
2. Issue each group a map and compass.
3. Start groups at two-minute intervals and record start times.
4. Have the cadets collect one piece of the puzzle from each checkpoint.
5. Once across the finish line, cadets will solve the puzzle and give the answer to the instructor.

If available, use an assistant instructor at each checkpoint to give cadets the puzzle piece, to answer questions and to prevent groups from following each other or sharing answers.

SAFETY

N/A.

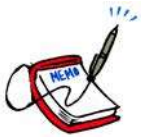
CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the navigation activities will serve as the confirmation of this TP.

Teaching Point 3 **Conduct a Debriefing**

Time: 15 min Method: Group Discussion

GROUP DISCUSSION



TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Establish ground rules for discussion, e.g. everyone should listen respectfully; don't interrupt; only one person speaks at a time; no one's ideas should be made fun of; you can disagree with ideas but not with the person; try to understand others as much as you hope they understand you; etc.
- Sit the group in a circle, making sure all cadets can be seen by everyone else.
- Ask questions that will provoke thought; in other words avoid questions with yes or no answers.
- Manage time by ensuring the cadets stay on topic.
- Listen and respond in a way that indicates you have heard and understood the cadet. This can be done by paraphrasing their ideas.
- Give the cadets time to respond to your questions.
- Ensure every cadet has an opportunity to participate. One option is to go around the group and have each cadet answer the question with a short answer. Cadets must also have the option to pass if they wish.
- Additional questions should be prepared ahead of time.

SUGGESTED QUESTIONS

Q1. What navigation skills were required to complete the activity?

Q2. What was the hardest part of the activity to complete?

Q3. What was the most exciting part of this activity?

Q4. How will the activity help you with navigation in the future?

Other questions and answers will develop throughout the group discussion. The group discussion should not be limited to only those suggested.

Reinforce those answers given and comments made during the group discussion, ensuring the teaching point has been covered.

CONFIRMATION OF TEACHING POINT 3

The cadets' participation in the group discussion will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the navigation activities as well as the group discussion will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Navigation using a map and compass is a skill that can also be used in situations outside the Cadet Program. True proficiency in the skill used during these activities can only be achieved by practicing. These activities allow the cadets the opportunity to develop their navigation skills and knowledge in a fun and challenging setting.

INSTRUCTOR NOTES/REMARKS

The intent of this activity is to give the cadet experience navigating with a map and compass, determining distance and following a bearing from point to point.

This activity may be conducted using any available map (topographical, orienteering or locally produced).

REFERENCES

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

PUZZLE NAVIGATION

Figure A-1 Puzzle Navigation

D Cdts, 2007, Ottawa, ON: Department of National Defence