ROYAL CANADIAN ARMY CADETS

GREEN STAR

INSTRUCTIONAL GUIDE

SECTION 5

EO M122.05 – DETERMINE A GRID REFERENCE

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-701/PG-001, *Green Star Qualification Standard and Plan*, 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.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

An interactive lecture was chosen for TP 1 to orient the cadets to grid lines and to the difference between eastings and northings.

A demonstration and performance was chosen for TPs 2 to 5 as it allows the instructor to explain and demonstrate how to determine 4 and 6 figure GR while providing an opportunity for the cadets to practice those skills.

INTRODUCTION

REVIEW

The pertinent review for this lesson from EO M122.04 (Section 4) will include:

Q1. What are the vertical (X-axis) blue lines on a map called?

Q2. What are the horizontal (Y-axis) blue lines on a map called?

Q3. When the writing on a map is the right way up, where is north normally located?

ANTICIPATED ANSWERS

A1. Eastings.

A2. Northings.

A3. At the top of the map.

Unofficial convenience copy of A-CR-CCP-701/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-701-PF-001/A-CR-CCP-701-PF-001.pdf.
Verify against the official publication.

OBJECTIVES

By the end of this lesson the cadet shall be expected to determine four and six figure Grid Reference (GR) (within +/- 1000 and 100 metres accuracy, respectively), for a series of features on a topographical map.

IMPORTANCE

As an army cadet it is important to know how to use the grid system. Since the grid system is the basis of map reading, the concept of a four-figure and six-figure GR will be a stepping stone to becoming a strong map-reader. A GR details the location of a grid square on a map, and prevents confusion about location. Communication about exact locations over the radio is made possible with an understanding of a GR.

Teaching point 1 **Explain the use of grid lines.**

Time: 5 min Method: Interactive Lecture

USE OF GRID SYSTEM

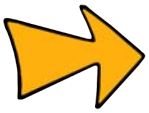
The grid system is a rectangular network of intersecting vertical and horizontal blue lines superimposed on a topographical map. Maps are normally printed so that north is at the top of the sheet when the writing is the right way up. The lines of the grid system are drawn evenly spaced so that one set of lines run north to south (vertically) and the second set of lines run east to west (horizontally). These lines are assigned a sequential number starting in the bottom left corner. The intersecting grid lines at the lower left corner designate a grid square.

EASTINGS

Because the vertical lines are numbered from east to west, they are called **eastings**. Eastings are a series of parallel lines plotted as an overlay to the map sheet, with a two-digit number at the top and bottom end of each line in the margins.

NORTHINGS

Because the horizontal lines are numbered from the equator toward the north, they are called **northings**. Northings are a series of parallel lines plotted as an overlay to the map sheet, with a two-digit number at the left and right end of each line in the margins.



The most southerly point of Canada is Middle Island in Lake Erie, approximately 4 620 000 metres from the equator at latitude 41° 41’ north.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. When the writing on a map is the right way up, where is north normally located?

Q2. What are the vertical blue lines on a map called?

Q3. What are the horizontal blue lines on a map called?

Unofficial convenience copy of A-CR-CCP-701/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-701-PF-001/A-CR-CCP-701-PF-001.pdf.
Verify against the official publication.

ANTICIPATED ANSWERS

A1. At the top of the map.

A2. Eastings.

A3. Northings.

Teaching point 2 **Explain and demonstrate a four-figure GR.**

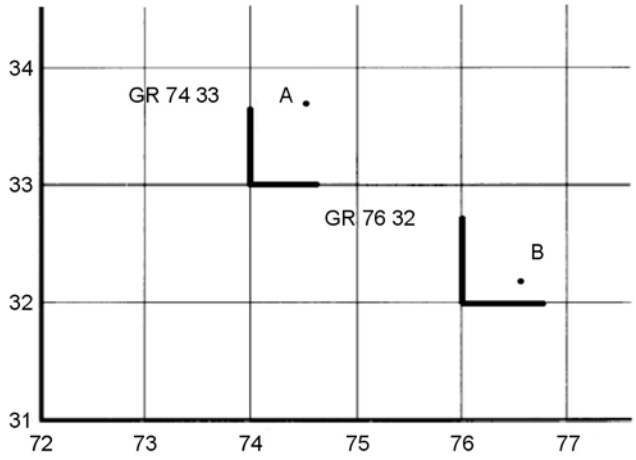
Time: 10 min Method: Demonstration and Performance

GRID REFERENCE

The military traditionally identify grid lines by stating the two-digit number of each grid line. When a location is identified using the grid system it is call a “Grid Reference” (GR). When giving 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.

FOUR-FIGURE GR

A four-figure GR is used to identify a specific 1000 metres by 1000 metres grid square. It will have four numerical digits derived from the numbers assigned to the eastings on the X-axis, and the northings on the Y-axis, where the grid lines intersect at the bottom left corner of the grid square.



B-GL-382-005/PF-001, Military Training, Volume 8, Maps, Field Sketching and Compasses

Figure 1 Four-figure GR



The instructor will provide a minimum of three practice points for the cadets to use in determining a four-figure GR. It is important for the cadet to be equally able to identify a location on a map when given the GR and to determine the GR for a location indicated on a map.

Unofficial convenience copy of A-CR-CCP-701/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-701-PF-001/A-CR-CCP-701-PF-001.pdf.
Verify against the official publication.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. When giving a GR, the reference is always to which corner of the square?

Q2. When giving a four-figure GR, in what order are the numbers given?

Q3. A four-figure GR identifies a grid square of what size?

ANTICIPATED ANSWERS

A1. Southwest or bottom left corner.

A2. Eastings then northings, or X-axis then Y-axis.

A3. 1000 metres by 1000 metres.

Teaching point 3 **Explain and demonstrate how to determine a six-figure GR.**

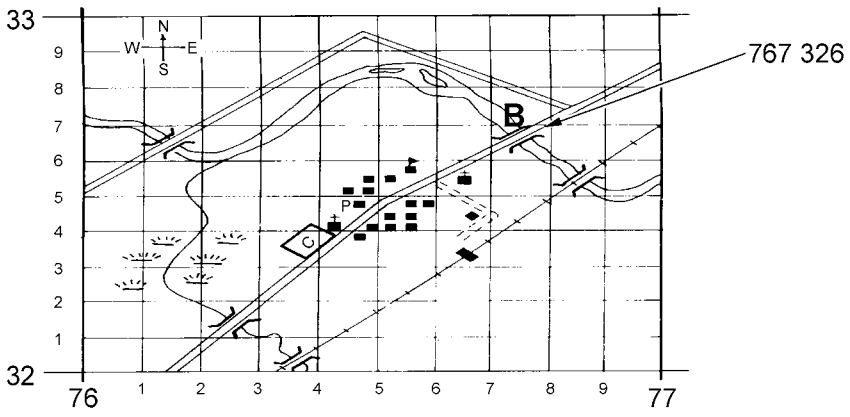
Time: 10 min Method: Demonstration and Performance

ACCURACY OF A GRID REFERENCE

The accuracy of a four-figure GR on a topographical map sheet is 1000 metres. When a more precise location is required, a six-figure GR is used which is accurate to 100 metres.

SIX-FIGURE GR

A six-figure GR is used to determine a more accurate location within a specific grid square. It is necessary to break up the grid square shown on the map into 100 subdivisions (10 in each direction). By creating an imaginary grid inside a grid square, we can use the same principles of the four-figure grid reference to make a more accurate statement of location. Each small easting and northing is numbered 1 to 9, from west to east and from south to north respectively. This imaginary grid inside a square can be estimated, or you can measure accurately using a tool called a “romer”.



B-GL-382-005/PF-001, Military Training, Volume 8, Maps, Field Sketching and Compasses

Figure 2 Six-figure GR

Unofficial convenience copy of A-CR-CCP-701/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-701-PF-001/A-CR-CCP-701-PF-001.pdf.
Verify against the official publication.

Figure 2 shows the detail within the square 7632, which contains Point “B”, a bridge. The centre point of this bridge is in the small square whose southwest corner is 7/10 east of easting 76, and also 6/10 north of northing 32. Its easting is thus 76.7 and its northing 32.6 units. Omitting the decimal points, the GR is thus written as 767 326.



Using Figure 2, the instructor will provide three points for the cadets to use to estimate a six-figure GR and give three six-figure GR cadets can use to locate a point on the map.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. Is a six-figure GR more accurate than a four-figure GR?

Q2. To get a six-figure GR, the grid square is divided into how many smaller squares?

Q3. In what order are the numbers given?

ANTICIPATED ANSWERS

A1. Yes.

A2. 100.

A3. Eastings then northings.

Teaching point 4 **Define a romer and its use.**

Time: 10 min Method: Demonstration and Performance

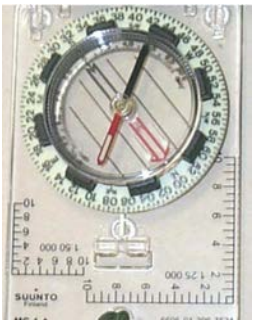
ROMER

A romer is used to accurately measure a six-figure GR. Using a romer provides a more accurate GR, and can be used in place of estimating.

TYPES OF ROMERS

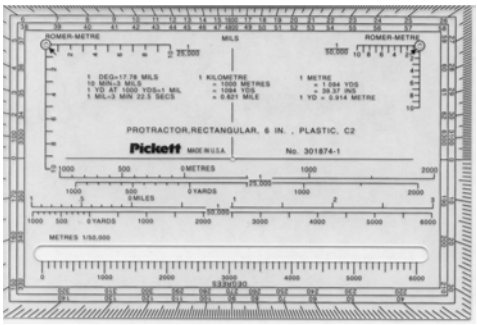
Romers for 1:25 000 and 1:50 000 scales in metres are included on the base plate of the compass and are also found on the Protractor C2. If these romers are not available, one can be easily made from a clean piece of paper with a square edge.

Unofficial convenience copy of A-CR-CCP-701/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-701-PF-001/A-CR-CCP-701-PF-001.pdf.
Verify against the official publication.



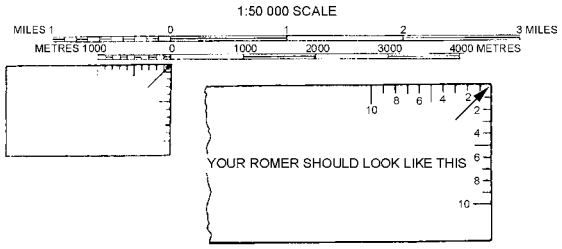
A-CR-CCP-121/PT-001

Figure 3 Compass



A-CR-CCP-121/PT-001

Figure 4 Protactor C2



A-CR-CCP-121/PT-001

Figure 5 Constructing a Romer

CONSTRUCT A ROMER

A romer can be easily constructed for determining a six-figure GR:

- select a clean piece of paper with a square edge;
- starting at the corner of the GR, place the paper along the 100 m map scale;
- mark off 10 equal sub-divisions, starting at the corner and working outward;
- number the markings from zero (at the corner of the paper) to 10; and
- repeat the first four steps on the adjacent edge of the corner of paper.



The instructor shall provide cadets with blank pieces of paper and ensure sharp pencils are available. Stress the importance of always using a sharp pencil when using a map.

CONFIRMATION OF TEACHING POINT 4



Have cadets construct a romer by following the process outlined above.

Unofficial convenience copy of A-CR-CCP-701/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-701-PF-001/A-CR-CCP-701-PF-001.pdf.
Verify against the official publication.

Teaching point 5 **Explain and demonstrate how to determine a six-figure GR with a constructed romer.**

Time: 15 min Method: Demonstration and Performance

DETERMINE A SIX-FIGURE GR

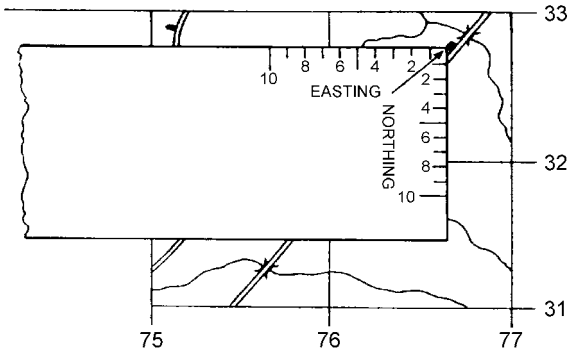


Figure 6 Determining a Six-figure GR with a Romer

A six-figure grid reference can be determined using a constructed romer by following these steps:

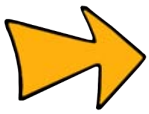
1. place the corner of the constructed romer on the grid square;

2. move the constructed romer IN the number of tenths required to align the romer directly below the conventional sign, or the location for which the GR is being determined;

3. move the constructed romer UP the number of tenths required for the corner of the romer to be positioned on the conventional sign, or location for which the GR is being determined;

4. read the value along the X-axis of the romer where it crosses the easting of the grid square (the value at this intersection becomes the third digit of the six-figure GR); and

5. read the value along the Y-axis of the romer where it crosses the northing of the grid square (the value at this intersection become the sixth digit if the six-figure GR).



When completing Point d and e above, ensure cadets are aware that they will always round down to the closest third digit. Grid references should be written in the format GR XXX/XXX to help illustrate how the first half of the GR relates to the Easting and the second half relates to the Northing.

CONFIRMATION OF TEACHING POINT 5



The instructor shall provide the cadet a minimum of three practice points to use in determining a six-figure GR and three GR to use to locate a prominent object.

Unofficial convenience copy of A-CR-CCP-701/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-701-PF-001/A-CR-CCP-701-PF-001.pdf.
Verify against the official publication.

END OF LESSON CONFIRMATION

1. The instructor shall provide two points for the cadets to use in determining four-figure GRs.
2. The instructor shall provide two points to use in determining six-figure GRs.

CONCLUSION

HOMEWORK/READING/PRACTICE

Nil.

METHOD OF EVALUATION

The cadet will be required to determine a four-figure GR and a six-figure GR using a constructed romer on a topographical map, as part of the confirmation activity for EO M122.CA, Follow a Route Led by a Section Commander (A-CR-CCP-701/PG-001, Chapter 4, Section 11).

CLOSING STATEMENT

Knowing how to determine a four-figure and a six-figure GR is essential for functioning safely in the field, for determining the accurate location of an object or oneself, and for communicating that position to others.

INSTRUCTOR NOTES/REMARKS

Cadets are to be provided with adequate time during field training and day hike exercises to practice this skill.

REFERENCES

A2-004 B-GL-382-005-FP-001 Canadian Forces. (1976). *Maps, Fields, Sketching, and Compasses* (Vol. 8). Ottawa, ON: National Defence.

Unofficial convenience copy of A-CR-CCP-701/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-701-PF-001/A-CR-CCP-701-PF-001.pdf.
Verify against the official publication.