

Navigating for Scouts

A Self-teaching Guide to Navigation with Map and Compass

Don Burgess, November 2003

Materials

topographic maps 30 M/5 Hamilton-Burlington
 41 I/13 Pogomasing
metric ruler
orienteering compass

Introduction

The ability to navigate with a map and compass gives one the freedom to venture outside of our urban surroundings and is a satisfying skill to master. It also allows one to take part in activities such as orienteering and geocaching.

This guide gives an introduction to using maps and compasses.

The guide is divided into three parts: map reading, map and compass, and travel techniques. Each may be studied on its own. Each part consists of a series of topics with questions that give opportunities to try the ideas. Solutions to the questions are given on a separate page.

The Universal Transverse Mercator (UTM) grid is used throughout to indicate locations on the maps. Directions for using this system are included.

You may use this guide on your own, but you may find it more useful with an experienced navigator on hand to offer help. Make sure that you understand the questions and their answers.

Universal Transverse Mercator (UTM) Grid References

The thin blue lines in a grid pattern on your map are the Universal Transverse Mercator (UTM) grid. It is used to describe locations on the map.

To find the grid reference of a point on a map:

A grid reference is a six-digit number made from two parts: an east-west coordinate, the easting, and a north-south coordinate, the northing.

Easting:

Read the number on the blue grid line immediately to the left of the point. Estimate tenths of a square from this line eastward to the point. A ruler may make this easier.

Write this down as the grid number followed by the number of tenths to get a three-digit number. eg 975

Northing:

Read the number on the blue grid line immediately below the point. Estimate tenths of a square from this line northward to the point.

Write this down as the grid number followed by the number of tenths to get a three-digit number. eg 984

Combine these numbers, easting first, to make a six-digit number. eg 975984 The nearest similar grid reference will be 100 km away.

To find a point on a map given a grid reference:

Break the reference into easting (the first 3 digits) and northing (the last three digits).

Find the intersection of the blue grid lines with the first two digits of the easting and the northing. Now estimate the tenths from both to find the point.

Hamilton-Burlington Map:

What is the grid reference for the end of the pier that sticks out into the lake between Burlington and Oakville? What is at grid reference 860123?

Pogomasing Map:

What is the grid reference for the south end of Halfway Lake, in Halfway Lake Provincial Park? What is at grid reference 392848?

Answers for UTM Grid References

Hamilton-Burlington Map:

043028

The mushroom farm on Guelph Line.

Pogomasing Map:

509920

Kennedy Dam

Answers for Map Reading

1. Most northern: Oakville
Most western: Glenwood Heights
2. About 2.2 km.
3. A canyon.
4. A built-up area, a forest, open country, and a lake.
5. A church, a school, silos, a golf course, a camp, an orchard, a swamp, a sports track (probably for horses), a quarry, and a sand pit.
6. North: a field bordered by woods, with a sports track to the left.
South: a field bordered by woods
West: a field with roads on the other side, a communications tower and some houses
East: a long open slope with a city beyond and a large lake in the distance

Answers for Map and Compass

2. 333 degrees
3. 342 degrees
5. 371966

Answers for Travel Techniques

3. Bear off to Bailey Lake, opposite the island, then travel to Smokefox Lake.
4. Aim to the south of Pogomasing and follow the river northwards to the railway stop.
5. Some possibilities:
The mouth of the Pogomasing River, east of Pogomasing dam.
The railway bridge north of Sheahan.
The cliffs south of Pogomasing.
The cliffs east of Franklin Lake.
The mouth of the Mogo River and the cabins there.

Map Reading

Spread out the Hamilton-Burlington map.

Please read the directions for using the UTM grid now, if you have not already done so.

1. North is at the top of the map and west is at the left side. What is the most northern community shown on the map?

What is the most western?

2. At the bottom of the map is information about the scale of the map. On this map, one unit of distance on the map corresponds to 50,000 units in the real world. Note the handy ruler scale provided.

How far is it between Twiss Road at Camp Manitou (845111) and the south end of Crawford Lake (850132)?

3. Thin brown lines can be seen on the map. These are called contour lines. Every point on a contour line is at the same height above sea level. Some of these have a number that gives the elevation. These numbers are printed so that the top of the numerals is uphill from the bottom.

On this map, each contour line is a height of ten metres away from the neighbouring ones. If contour lines are close together, the land is steeply sloping. If they are far apart, the land is almost level.

Describe the shape of the ground around 860140.

4. Colours are used to show the ground cover: White is for open country, green is for forest, pink is for built-up areas and blue is for water.

What kinds of countryside are at 940020, 830100, 960070 and 900025?

5. Symbols of various sorts show features of the countryside. Red and orange lines show roads and other shapes show such things as swamps and racetracks. The symbols are listed on the back of the map.

What do you find at: 933024, 935020, 846923, 896052, 892033, 850068, 820974, 908115, 902070, and 860128?

6. When considering a location on the map, you should be able to form a picture in your mind by interpreting the markings on the map..

If you were standing at 924008, what would you see if you were facing to the north, to the south, to the east and to the west of yourself?

Map and Compass

Spread out the Pogomasing map.

Please read the directions for using the UTM grid now, if you have not already done so.

1. Locate these parts of the orienteering compass.
the base plate, the rotating bezel (the ring with degree markings), the direction of travel arrow, the bearing marker (in the bezel, next to the direction of travel arrow), the compass needle, and the lines and arrow on the bottom of the arrow housing

2. **To find the bearing for a journey:**

A bearing is a direction and is expressed as an angle from north.

Place the compass on the map with a long edge of the baseplate along the line from your start to your destination and the direction of travel arrow pointing to your destination.

Holding the baseplate firmly, rotate the bezel until the arrow on the bottom points to the top of the map and the lines on the bottom are parallel to the light blue grid lines.

Read the bearing at the bearing marker.

What is the bearing for a paddle from the east shore of North Narrows on Pogomasing Lake, at 370010, to the south end of Picnic Island, at 354042 ?

3. **To convert a map bearing to a magnetic bearing:**

The compass needle points to earth's magnetic north pole. Since the magnetic pole is not at the geographic pole, a correction is needed. This correction is called declination.

Look at the right margin of your map. You will see a diagram that shows the difference between true (geographic) north, magnetic north and grid north. Grid north is usually very close to true north.

If magnetic north is east of true north, we have east declination. If it is west of true north, we have west declination. Note that the declination changes with time and that your map shows how to calculate the current declination. Note that degrees are divided into minutes and seconds, as hours are.

The declination must be added to or subtracted from the map bearing to make the compass point to your destination. The rule is "Declination east, declination least. Declination west, declination best." This means that you subtract east declination, and add west declination.

The direction of travel arrow will then point to your destination when you line up the arrow on the bottom of the housing with the compass needle.

What is the magnetic bearing for the journey you looked at in part 2.?

4. **To find the bearing to an object:**

Point the direction of travel arrow at the object you are interested in.

Rotate the bezel until the arrow on the bottom of the housing lines up with the compass needle. Read the bearing at the bearing marker. This is the bearing from magnetic north.

Correct for declination in the opposite way from part 3 to get the bearing from true north.

5. **To find your position:**

Find at least two features in the countryside that you can identify with confidence, then find their bearings from true north.

Draw a line on the map through each feature along its bearing. You are at the spot where the lines cross each other.

Suppose that you are standing on the west shore of Pogomasing Lake and can see an island at a bearing of 19 degrees, magnetic, and some buildings across some water, the most northern of which is at 113 degrees, magnetic. What is the map reference of your position? Use the photocopy of the map for drawing. Do not mark the map.

Travel Techniques

Spread out the Pogomasing map.

Please read the directions for using the UTM grid now, if you have not already done so.

1. **To walk a bearing:**

Set the bearing marker at the correct magnetic bearing.

Hold the compass flat in front of you, away from knives, metal zippers etc, and with the direction of travel arrow pointing straight ahead.

Rotate your whole body until the compass arrow lines up with the arrow on the bottom of the compass housing. Look straight ahead and find some object that you can clearly identify. The further away, the better.

Try this for a few bearings of your choice.

Walk to the object and repeat these two steps until you reach your destination.

2. **To walk a bearing in bad visibility or when you cannot see a distinctive object :**

Have a companion walk ahead and direct them with gestures until they are far away and on your bearing.

Walk up to your companion and repeat this procedure.

3. **To avoid an obstacle:**

Find a location that you can easily identify and that is to one side of the obstacle. Travel to that location, then to your destination. This is called “bearing off”.

Suppose that your wish to travel from the bridge where highway 144 enters Halfway Lake Provincial Park at 517901 to the northeast corner of Smokefox Lake at 500890. How would you go?

4. **To travel to a destination that is on a long feature:**

As you travel, errors will add up so that you cannot be certain of arriving exactly where you intend. If your destination is on some long feature, such as a river, road or shoreline, you can recognize the feature but not know which way to go to your destination.

If you intentionally aim to one side of your destination, you will know which way to turn when you reach the long feature. This is called “handrailing”.

To travel from Trapper Lake at 468954 to the railway stop called Pogomasing at 411954, how would you go?

5. **To keep track of your position:**

Before you can set a course to a destination, you must know where you are now. While you travel, you should frequently check your position on the map by noting features of the landscape. This will also let you judge your progress, decide where to camp etc.

The Spanish River runs from the top of your map to the bottom. Find some places you could recognize to check your position.