MAP AND COMPASS
BASICS

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PART OF THE

AHEIA "O.W.L. SERIES"

OUTDOOR WILDLIFE LEARNING

MODULE #12

Map and Compass Workbook

Learning how to use a map and compass to travel in unknown terrain can be fun and rewarding. It could even save your life if you become lost while out hunting, fishing or just exploring. Using a map and compass to find your way has been done for centuries. However, in the late 1800s it became more than just a method of exploration and became a pastime which eventually developed into an organized sport. There are many orienteering clubs and organizations throughout Alberta that hold regular competitions and teach people of all ages the sport.

AHEIA is more interested in looking at using a map and compass not at the sporting level, but as a valuable survival skill. The use of a map and compass is desirable to only using a GPS simply because a GPS can fail (run out of battery, freeze-up, lose the satellite signals, etc.) and if you are relying on your phone's GPS, you need to understand that a phone GPS is designed for use in a car and in populated areas. Cell phone GPS will not have reliable topographic maps that are required for effective navigation unless downloaded separately. Some people will

argue that any number of apps can be downloaded that will serve to be as effective as a map and compass, but it always comes back to the fact that a map and compass will never run out of battery and leave you stranded.

So, let's learn a bit about how to use a map and compass to find your way!

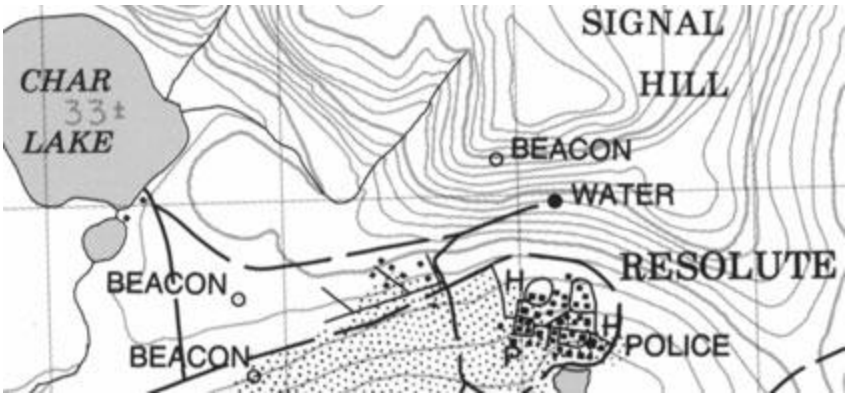
MAPS

First off, let's look at a few different types of maps and which ones might be best for the activity you are undertaking.

Topographic

Probably the most common and most useful maps for outdoors people are topographic maps. These maps show changes in elevation as well as other natural and man-made features, all of which can be used to find your way by confirming visually where you are going. In other words, as you follow your plotted path, you can confirm that you are going the right way by matching what you see on the ground with what you should be seeing on the map. You can use hills, valleys, rivers, towers, buildings or any number of other items indicated on your map to check your progress. For example, in the far north, bush pilots will use the shapes of lakes, islands, bays, etc. to confirm their location on a map while flying from one fishing camp to another or while firefighting, among other duties.

The features on a topographic (also called a topog) map include changes in elevation (relief), hydrography (lakes, rivers, streams), vegetation (wooded areas), transportation (roads, railway tracks, bridges, airfields), culture (buildings, powerlines, urban development, towers), boundaries (provincial, international) and toponymy (place names). The more of these you can use, the better you will be able to navigate.



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Topog maps are available from a variety of sources and generally come in 1:50000 or 1:250000 scale. A 1:50000 scale map will show more detail than a 1:250000 map, but will not cover as much area. The 1:250000 map is great for covering great distances, but again, many details will be lost. Natural and man-made landmarks will be indicated on your map by symbols of various kinds. There will be a legend box somewhere on the map border which will tell you what these symbols mean and will help you determine your location. There are also several different sets of navigation lines on the map that are used for a variety of purposes. The grid lines we are going to use are those that indicate direction based on true north.

Other information on the perimeter of the topog map includes the general location of the map, the year it was published, the declination and the name of the map among other items. Although there are many features and uses for a topog map, the natural and man-made features along with the lines indicating north, south, east and west, and the declination are the most important for our purposes.

Marine Charts

Similar to topographic maps, marine charts indicate direction (north is always up), natural features including islands, bays and reefs, and man-made features such as towers, bridges, dams and others. The difference being that a marine chart is made for a specific body of water or stretch of shoreline where marine traffic is likely to be. There are very few charted waters in the prairie provinces, but if you

are planning to travel on a large body of water (Lake Athabasca, for example) you are wise to obtain a chart if one is available.

A distinguishing feature on a marine chart is a series of depth measurements which tell the mariner where safe passage can be found. These are only useful when charting a safe path through unknown waters, but are of no use when actually navigating on the water. Elevation indicators on a marine chart, however, are the same as on a topographic map and can be used to find a height of land feature that can be used as a navigation aid.

A marine chart contains a lot of information that is valuable to all levels of mariners, but for the purposes of orienteering, we would mostly be looking at features that we could find on the chart and confirm visually when on the water.

A major bonus of a marine chart is that it is usually specific to the area you are in, or the waterbody you are on.

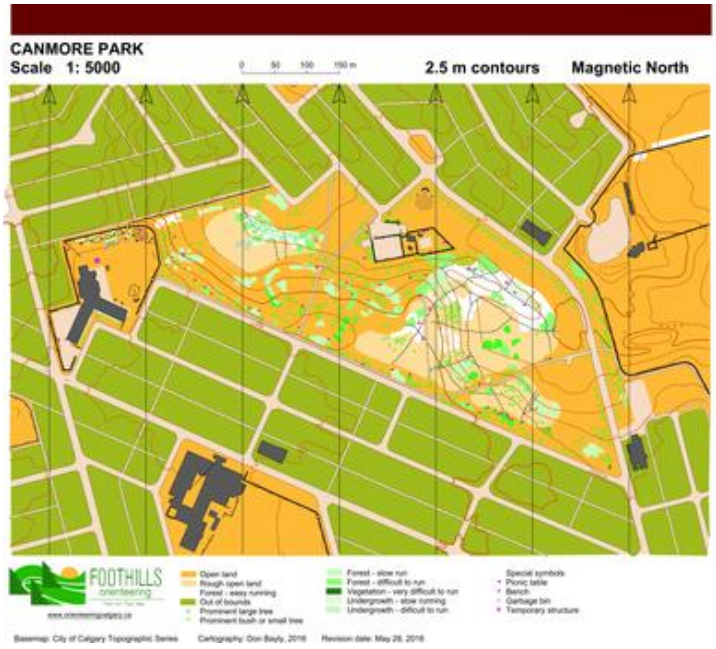
Road or City Maps

These maps are generally used for driving or walking from one urban place to another and may or may not include topographic features and some man-made features irrelevant to its purpose. If, for example, a large hill or a tower could be an aid for someone driving in that map's area, it could be included on the road or city map. Usually the map will be most used to find named roads or streets and can help the viewer find a specific address.

Orienteering Maps

Finally, there are maps that have been designed specifically for the sport of orienteering. These can be based on any other kind of map depending on the area in which the orienteering will take place, and the availability of the maps themselves. For example, an orienteering map designed for a lengthy course in the mountains would most likely be based on a topographical map, while a short course in the city would best be based on a city map. You will note that magnetic

north is indicated on this orienteering map, so setting your compass' declination is not required (more on that later).



Orienteering map – Foothills Wanderers Orienteering Club of Calgary orienteeringcalgary.ca. Used with permission.

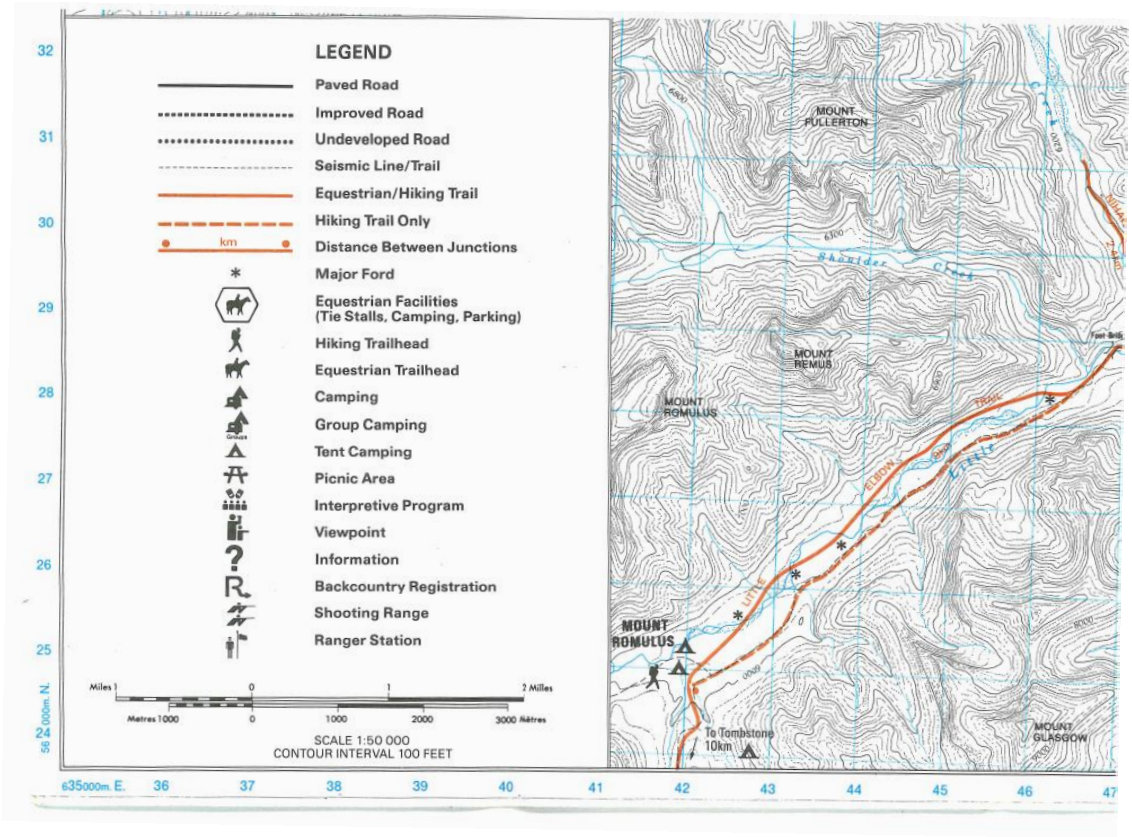
Reading Your Map

In order to use your map to find your way around, you need to know a something about some of the features and how to use them. We will start off with the legend, which tells you what you are looking at on the map, then on to declination and finish with contour lines.

Legend

A legend on a map indicates which symbols are on that map and what they mean. You can use these symbols as line-of-sight targets in the field when you are following the path you have plotted on your map. Good targets would include

towers, tall buildings, church steeples, etc. anything that is high above the ground and could be expected to be seen from quite a distance away.



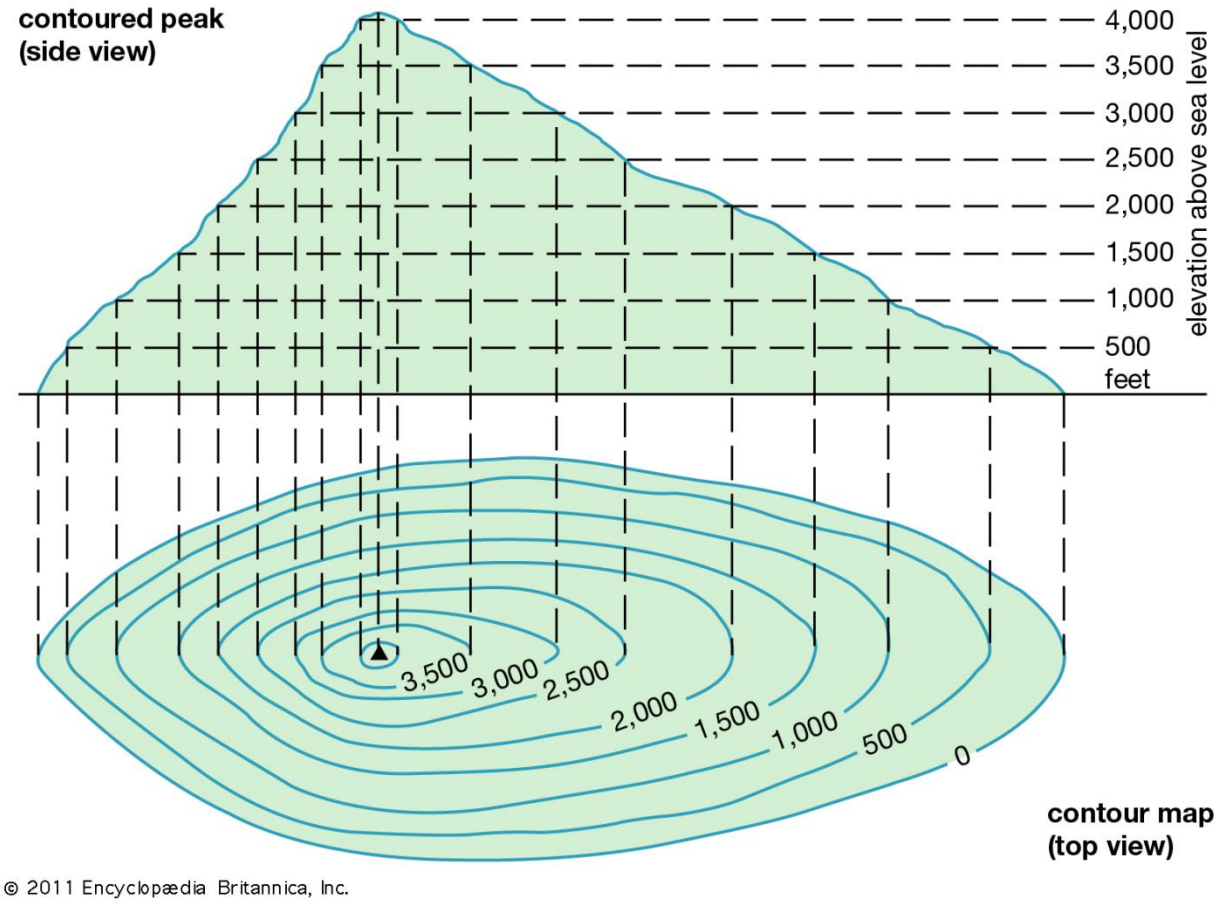
Contour Lines

Contour lines are the squiggly lines you see running through all areas on your map. They show how high each part of the map is above mean sea level (MSL). Contour lines show different variances in relief (height above MSL) in different intervals depending on the map itself. On a 1:50,000 map, the interval between the lines might be 2 meters while the interval on a 1:250,000 might be 10 meters.

Each contour line connects with itself and not only indicates where a hill/mountain is, but also where valleys and depressions are. One interesting feature of contour lines is that the closer together the lines are, the steeper the mountain or valley. It is up to you to figure out whether those lines are indicating a steep up-grade or a steep down-grade. Hint – the top of a hill or mountain is determined by looking for a small circle on the map…

When plotting a course on a map, understanding how contour lines work will give you reference points (tops of hills or mountains) and will also keep you from

plotting a path that will take you through rough terrain…unless, of course, you are looking for rough terrain and in that case, you have found some!



How contour lines are determined and interpreted
Used with permission from Canadian Britannica

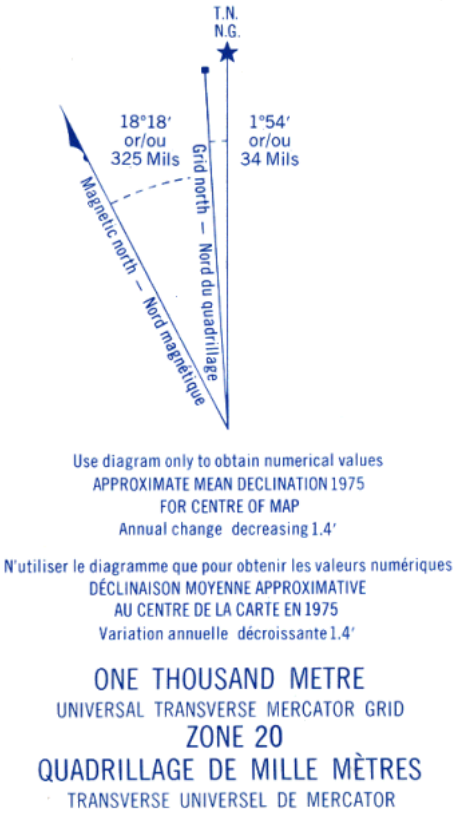
Declination

Declination is the difference between magnetic north and true north. True north is the north axis or pole upon which the earth rotates. It's location in relation to the rest of the world does not change. True north is always true north. Magnetic north however is not at the north pole as some may think. It is off-set from the north pole and depending on where you are, could be east, west or directly in line with the north pole. You can see the significance of this when you realize that your compass' needle will point to magnetic north and most maps are drawn in relation to true north. The reason they are drawn to true north is so that they can

be used anywhere in the world, and additionally, magnetic north is continually changing. These changes are taken into account on most maps, but that discussion is for another day.

Declination changes by location and over time. Be sure to look at your map for an indication of the declination in your area. Magnetic north is located somewhere north of Hudson's Bay, so we in Alberta will always be setting an "east" declination because magnetic north is east of true north from our perspective. The change in declination over time is small, so you probably won't have to worry about it, unless you are using a very old map. If your map is very old, there is another calculation provided on the map that will give you the correct declination. This information can also be found on a quick Google search.

This is what you may see on your map and it tells you what the declination is for that map so you can set your compass. This shows the declination to be 20° 12‘ (add 18° 18‘ to 1° 54’).



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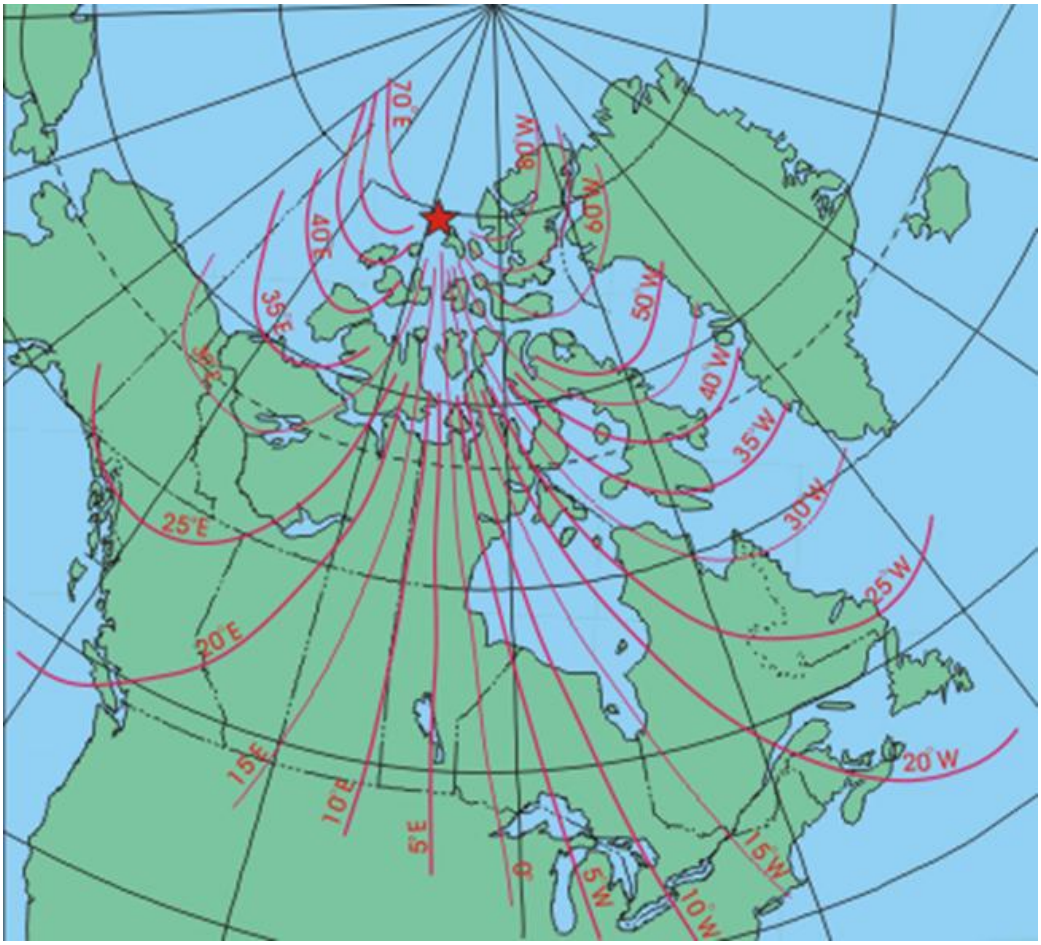
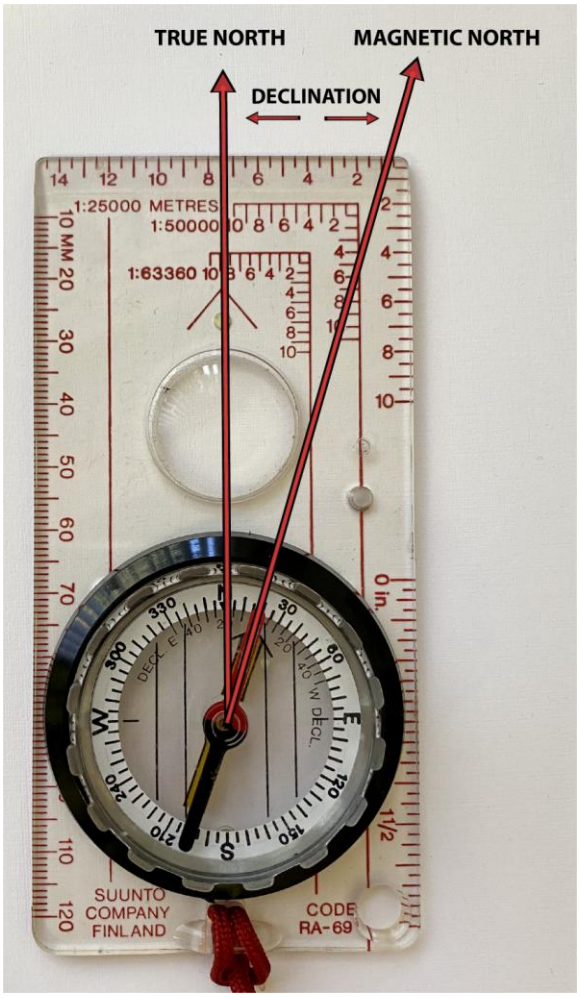
As mentioned earlier, declination is dependant on where you are. The map below shows how declination changes as you move across Canada. You can see that it is 20 to 25° east on the west coast and 20 to 25° west on the east coast. This is not as confusing as it seems. It just means that if you are on the west coast, magnetic north is east of true north and the opposite is true on the east coast. You would set your compass accordingly.

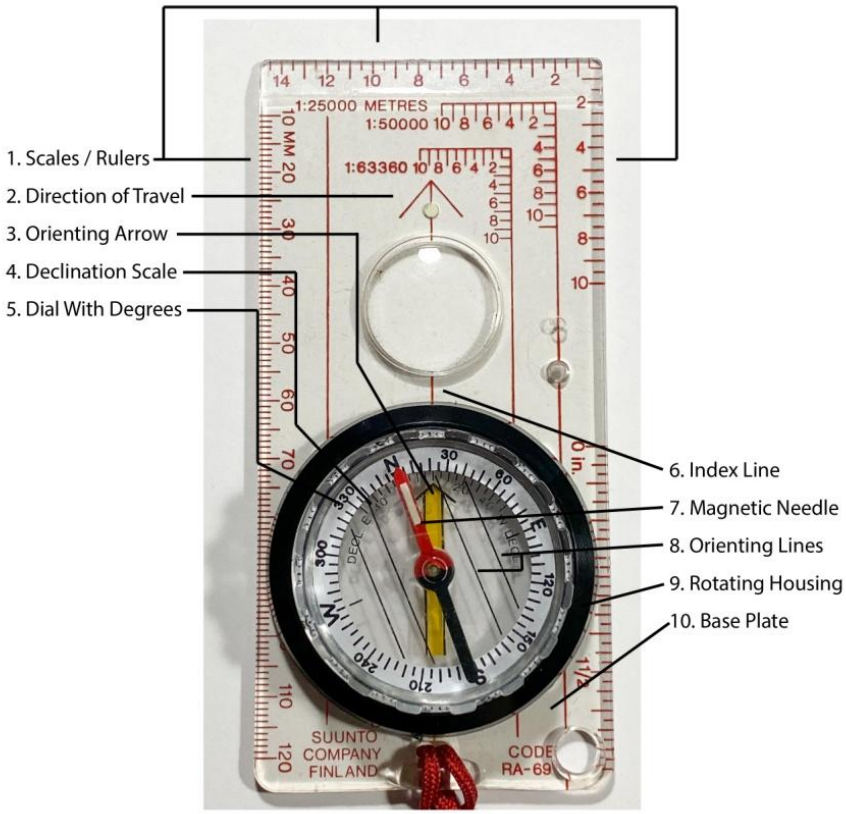


COMPASS



Your compass is designed to accommodate declination and is easy to set up. Be sure to check your compass against the declination indicated on your map before you do any map and compass work. You could be wasting your time and might end up somewhere that you don't want to be. In the example above, let's assume the declination at its current location is 20° east, or +20, meaning that magnetic north is 20 °east of true north. To set appropriate declination you would simply spin the numbered dial 20°counter clockwise so that the large red arrow is pointing directly to 20° (360 plus 20). This means that lining up the red part of the compass needle with the large red arrow on the compass base will give you directions based on true north.

Below is a picture of a good compass with the parts identified. We will discuss some of them in the final section.



PUTTING IT ALL TOGETHER

Now that you have the basics of maps and compasses, we need to look at how to use them to plot a path and to follow it!

First of all, you will need to take out your map and be ready to draw some lines on it. We recommend getting a photocopy of the section(s) you will be drawing on so you don't damage your map. Find where you want to go and what looks to be a suitable route to get there. Plot your path using straight lines, because your compass will only take you in straight lines, not in a curve. Label each pivot point (where you are going to change direction) as "A", "B", "C" etc. Plot them on a grid as below:

Path	Target	Azimuth	Distance
A to B	Tower	189°	1.1km
B to C	Trail intersection	276°	476m
C to D	Campsite	14°	598m

This grid tells us that from our starting point we are going 1.1 kilometers on a bearing of 189° toward a tower, turning to 276° and walking 476 meters, then resetting your compass to 14° and walking the final 598 meters to your final destination at your campsite.

In order to determine the azimuths, you will place the edge of the compass along your intended path with the ”Direction of Travel” arrow pointing to your next target. Now turn the rotating housing so that the orienting lines are parallel with the true north lines on your map. Be sure your declination has been set before doing this. The number that is now in line with the index line on your compass is your heading/bearing/azimuth. This is the number you write on your grid. You can then measure that line and, using the scale, determine distance.

From point “B”, you simply follow the same procedure of placing the edge on the compass on the line of travel, rotating the housing until the orientation lines are lined up with the true north/south grid lines and read the bearing at the top of the compass. Repeat for the last line and you have your travel plan!

If you have a method of measuring your distance travelled on the ground, you may want to make point B in line with the tower, but not right at it. Once you have gone 1.1 kilometers at 189°, you will check your compass and take another bearing of 276° and walk 476 meters until you come to an intersection of two trails. From there you reset to 14° and walk to your final destination, your campsite.

Now take your map, compass and travel plan with you to the starting point you decided on. Rotate the housing so that the first bearing (189°) is at the top (index line) of the compass. Now , making sure your declination is still set, hold the compass in front of you and rotate your entire body until the red part of the needle is fully inside and parallel to the orienting arrow. Once you have done this, your direction of travel will be indicated by the “direction of travel” arrow pointing out the front of the compass. It is best to find an object (tree, rock, sign)

that is directly in your path, but 100 or so meters away and walk to it, rather than checking your compass every few meters. Once at the tree or whatever you used, take another bearing and find another object to walk to. Continue doing this until you can clearly see your target object and can walk directly to it.

Once you reach your target, follow the same procedure to find your next bearing, and head out!

Using a map and compass can be fun and exciting and/or could get you out of some big trouble if you find yourself lost while hiking, hunting, fishing or whatever. Remember that a GPS is effective too, but is susceptible to failure as is any mechanical or electronic device.

For more information on using map and compass, contact us at info@aheia.com or edmontoninfo@aheia.com.

Map and Compass Activities

Activity #1

This activity can be set up in any open place, the points will be determined based on the space available in the given area. The purpose of the activity is to learn how to work a compass, plot courses and follow a plotted course. This will allow the participants to be able to find their way if they are trying to get from one point to another.

Starting point

Select a starting point that has good visibility of the area, mark the starting point with a flag or stake in the ground or by using a landmark in the area.

Waypoint

While standing touching the starting point look out and determine the first waypoint. It should be lined up with a feature or be the feature itself. This could be a tree, rock or some other landmark that is easy to recognize. Align the compass to the waypoint and spin the inner circle to align the red arrow outline with the arrow, mark the degrees that are now lined up with the way point you have chosen. Walk towards the waypoint and count your paces. Once you are at the waypoint look around and choose a second waypoint follow the same procedures and record the compass direction and distance from each waypoint to the next. Continue choosing waypoints or choose the final destination. You may choose to end the course back at the starting point or at an arbitrary point of your choosing.

Note: All compasses must be set to the same declination.

Example:

Starting Point: _____

_____Degrees and _____ Paces to Waypoint 1

_____Degrees and _____ Paces to Waypoint 2

_____Degrees and _____Paces to Waypoint 3

_____Degrees and _____Paces to Finish Point

Once all the points have been chosen and measured out, consolidate the measurements and directions onto a master sheet and make copies. You can also put the distance and measurement on the waypoint itself rather than making copies to hand out.

To make this activity more advanced you can give the participants a blank paper and get them to plot out their own course and switch with each other and try to follow the other person's course.

Activity #1 Work Sheet

Starting Point: _____

_____ Degrees and _____ Paces to get to Waypoint #1

_____ Degrees and _____ Paces to get to Waypoint #2

_____ Degrees and _____ Paces to get to Waypoint #3

_____ Degrees and _____ Paces to get to Waypoint #4

_____ Degrees and _____ Paces to get to Waypoint #5

_____ Degrees and _____ Paces to get to Waypoint #6

_____ Degrees and _____ Paces to get to Waypoint #7

_____ Degrees and _____ Paces to get to Waypoint #8

_____ Degrees and _____ Paces to get to Waypoint #9

_____ Degrees and _____ Paces to get to Waypoint #10

Activity #2

Draw a route on a map by plotting several points and labeling them as “A”, “B”, “C”, etc. Determine the bearing and the distance between each point using a compass (bearing) and the scale of the map and a measuring device (distance). You may want to end the exercise back at the starting point “A”.

Option 1:

Give participants a map with the bearing and distances included and have them follow the same route at the location indicated, using those numbers.

Option 2:

Give the participants a map with just the points, the scale and all the information necessary for them to determine the bearings of the lines. Have them determine the bearing and distance on the maps and then go to the actual location to follow the route they have plotted, using just the degrees and distance they came up with.

You may want to start with Option 1 and follow with Option 2, using separate locations.

Route	Bearing	Distance
A to B		
B to C		
C to D		
D to A		

AHEIA offers numerous resources and training to ensure the safe and responsible use of the great outdoors.

Our mission is to

Make wildlife and fish part of the value system of every Albertan.

Courses, manuals, seminars and workbooks, such as this, proactively educate the user to be safe and to enjoy their wilderness experience while perpetuating Alberta's vast natural heritage.

This workbook is one in a series of informational, entertaining and proactive materials produced for Conservation Education.

For more information, or to review additional resources, please visit our website or contact us directly.

Alberta Hunter Education Instructors' Association

911 Sylvester Crescent SW
Calgary, Alberta T2W 0R8

Telephone 403.252.8474
www.aheia.com

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