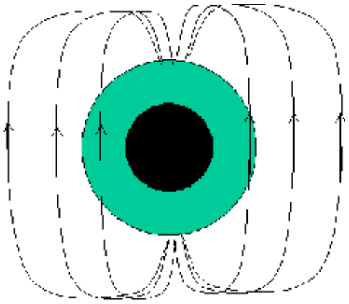
Compasses

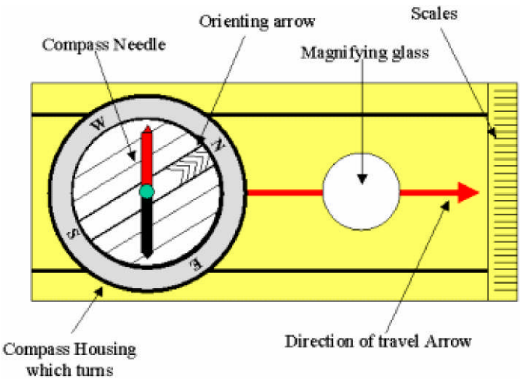
How does a compass work?



Inside the earth is a big ball of iron, which produces a magnetic field. The lines of the magnetic field all point in one direction, as shown on the diagram.
Inside a compass is a small magnet attached to a needle. Given that magnets attract each other, the magnet of the needle will be attracted to the magnet produced by the Earth.
Since the magnetic lines always point in one direction, the compass needle will also point in one direction. Thus we can know where the North pole is.
(N.B. Since a compass is affected by magnetic fields, it needs to be used away from iron and steel objects, e.g. pocket knives and cars)

Parts of a Compass

There are several kinds of compasses, but the one shown is the base plate type, which is the most suited to hiking and orienteering.



Compass Needle. This always points to the magnetic North Pole.
Compass Housing. This can be turned separately from the base of the unit. On the housing will be marked the letters N, S, E and W for North, South, East and West. Also on the housing (but not shown on the drawing) will be numbers on a scale from 0 to 360, representing the degrees around a circle. The housing is 'fluid filled' (no, it's not water!) to dampen (slow down) the movement of the needle.
Orienting Arrow. This is really part of the housing and turns with the housing. Along with the lines of the base of the compass it enables you to 'set' a map, but more of that later.
Magnifying glass. Hope you know how to use that.
Direction of travel arrow. If you set a bearing, then once aligned this arrow tells you which way to walk.
Scales. In the above picture the scales are shown on the front of the compass. However, there are often more scales down the sides and these enable you to take measurements from maps of the distance between two points. As you will see when we get to using a map and compass together, we can use the scale to measure the distance between two places on the map.

How to take a bearing and use it.

Having understood that the compass needle always points in the same direction, we can use this to help us travel to any point that we can see. It also enables us to reach our destination even when the land is not flat or we cannot see the end point throughout the entire journey.

- Always hold the compass flat, otherwise the needle will touch the bottom or top of the housing and then it won't always point to the North.
- Point the compass base (direction of travel arrow) towards the object you wish to go to.
- Keep the compass pointing in the correct direction and turn the housing until the orienting arrow is underneath the RED end of the Needle
- Look at the number on the compass housing where it touches the direction of travel arrow. Remember the number, which is the bearing to your destination. You need to remember the number since you could knock the compass housing while travelling, which would then mean the compass you set up so beautifully is now pointing to the wrong place!

- Follow the direction of travel arrow, keeping the RED end of the needle over the orienting arrow. If you look at the compass say every 50 - 100 meters it should get you to your target. Don't watch your compass all the while if you don't want to fall over an obstacle!

How to set a bearing (or go in a particular direction)

Suppose you want to go West from your present position. Looking at the compass housing we can see the 'W' symbol.

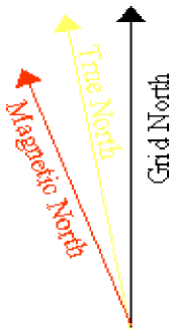
- Turn the compass housing until the 'W' is over the top of the direction arrow.
- Turn the compass base (keeping it flat) until the RED end of the needle is over the top of the orienting arrow.
- As above, keeping the compass flat, follow the direction arrow.

Which North?

There are three North Poles. True North, Magnetic North and Grid North.

- True North is the Geographical North Pole i.e. the one at the 'top of the world'.
- Grid North is where all the grid lines of the map point to.
- Magnetic North comes from the earth's magnetic field and wanders around a bit.

When using a compass it will indicate Magnetic North. When you need to transfer a bearing from the compass to the map, you need to alter the bearing (number of degrees) to compensate for the difference. The rule to remember how to alter the number is:



"When going from small to large, add the difference. When going from large to small subtract i.e. make the number smaller." Therefore when going from a map (which is small) to the outside world (which is large) add on the difference to make the bearing bigger. When going from the outside world to the map, subtract the difference.

The difference (declination) between magnetic North and Grid North is indicated on topographic maps. Therefore, when taking a bearing from the outside world to use on a map, you should take this declination from the bearing you read on the compass and vice versa (e.g. if the declination is 4^{o}, you should adjust your compass by 4^{o} for this map).

Caring for a compass

Compasses are expensive pieces of safety equipment (typically $50 each for the type illustrated) and should be cared for to ensure they have a long life and are working correctly when they are needed.

- Don't drop it - this can crack the housing:-
  - A large air bubble forms inside the housing which interferes with the needle (NOTE: small bubbles form quite naturally inside the compass as the fluid expands and contracts with temperature changes – these are harmless)
  - It might lose all the fluid so that the needle swings 'undamped'
  - The cracked plastic can prevent the needle swinging at all.
- Don't swing it around on it's cord. It's likely to hit something and crack the housing.
- Don't store it near anything magnetic (including other compasses). This can effect the magnetism of the needle.
- Keep it clean by wiping with a damp cloth – don't use cleaning fluids which can remove the markings from the compass.

Did you know?

- Every few tens of thousands of years the Earth's magnetic field flips. However since the compass you are using has been made more recently than the last flip, you can confidently use you compass knowing that the Red end of the needle points to the North Pole of the Earth!!
- Orienteering maps are actually drawn slightly differently to 'normal' maps. The orienteering maps are drawn so that the grid lines are actually aligned with magnetic north, so that there is no need to adjust the compass.