

Basic navigation

Essentials

This sheet covers the basic techniques and information needed to navigate using a map and a compass.

Maps

A map is a two dimensional representation of an area of land, as if you were looking at it from above. There are many different types, but those used for navigation are drawn to scale. Think of the scale like zooming in or out on a computer screen. The scale will be printed on the map and is expressed as a ratio, such as 1:25,000 (Ordnance Survey Explorer, Outdoor Leisure and Pathfinder series') or 1:50,000 (Ordnance Survey Landranger series). This means that a distance of 1cm measured on the map is equivalent to 250m or 500m on the ground – the higher the scale number, the more 'zoomed out' you are from the

map. In practice this means that on a higher scaled map you can see a larger area than on a lower scaled map, but in less detail.

Ordnance Survey (OS) maps show all major land features such as footpaths, hills, valleys, water courses and railway lines. OS maps also contain other useful information, including contours and grids.

Contours

Contours are used to represent the shape of the land. They are drawn on OS maps in a light brown colour. They connect points at the same height (above sea level) and are spaced at 10m intervals. The closer together the contour lines are, the steeper the slope.

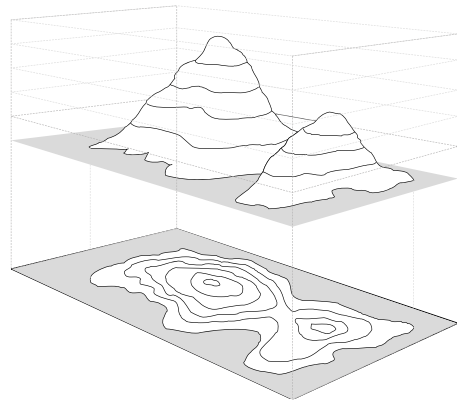
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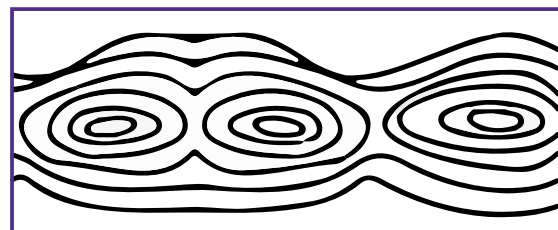
Hill

A hill is an elevated land mass that rises above the surrounding area. It is generally agreed that in the UK any hill higher than 600m (1,968 ft) is classified as a mountain.



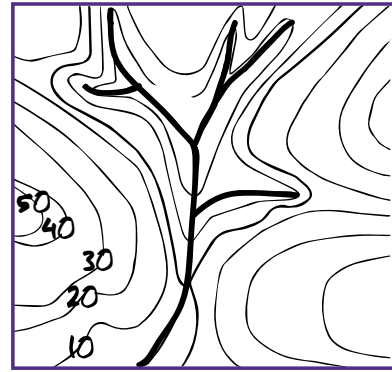
Ridge

A ridge is a series of connected mountains that forms a crest, usually at high altitude. Once a summit has been achieved, it is sometimes possible to walk along a ridge to reach the summit of an adjoining mountain.



Valley

Also known as a dale, canyon or gorge, a valley is a depression in the landscape that slopes downwards before rising back up again. A valley is usually V-shaped if formed by a river, or U-shaped if formed by a glacier during an ice age.



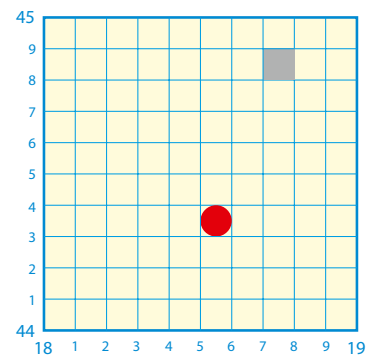
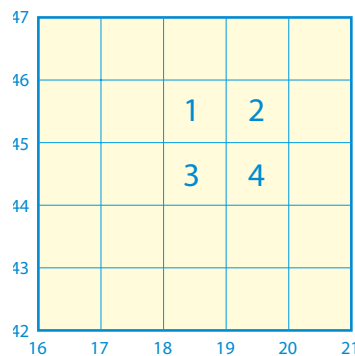
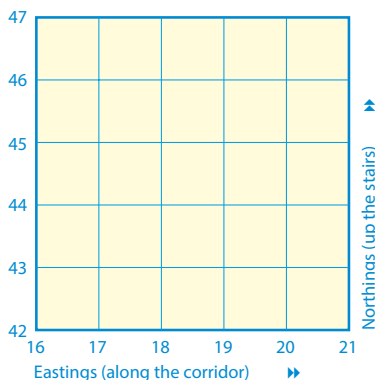
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Grid References

OS maps use a grid marked with two-letter codes to divide the UK into 100km squares. Each 100km square is divided into smaller squares using vertical and horizontal blue lines spaced every 1km. These are called grid lines and make a series of grid squares. The horizontal lines show you how far north you are and are called Northings, while the vertical lines show you how far East you are and are called Eastings. All of the grid lines are given a reference number, enabling a specific location on the map to be identified through a grid reference.

A grid reference is comprised of the two-digit reference number of the Easting followed by the two-digit reference number of the Northing. Grid references are always given in this format to avoid confusion – the number along the bottom of the map (Eastings) first, then the number up the side of the map (Northings). Remember this as “Go along the corridor before you go up the stairs”. This type of grid reference is known as a four-figure grid reference.

To be even more precise, a six-figure grid reference is used to identify a 100m square area within a 1km grid square. This can be useful if, for example, there are two phone boxes in the same grid square and you need to identify one in particular. To find a six-figure grid reference, imagine you are adding a decimal place to the end of your four-figure grid reference – so if the telephone box is halfway between grid lines 18 and 19, you would call it 18.5. However, the decimal point is not actually used, so the reference is given as 185. A six-figure grid reference of 185, 443 would be ‘0.2’ of the way between the Eastings of 18 and 19, and ‘0.3’ of the way between the Northings of 44 and 45.



















Map symbols


Maps use symbols to tell the viewer what something is and what it does. Usually this will be a physical feature, such as a castle, but sometimes it will be something less tangible, such as a nature reserve. OS maps use a standard set of symbols across each map scale. The key or legend on the side of the map explains what each symbol means.

It is important to realise that map symbols often don't show the shape (or form) of the thing they are representing. Instead they show its function. Youth hostels aren't actually giant pyramids. This makes the map easier to understand – it would actually be much harder to find the closest telephone box if the map simply showed them as tiny black squares.

Examples of symbols found on Ordnance Survey maps

Complete Ordnance Survey map symbol sheet can be downloaded at ordnancesurvey.co.uk

-  Camp site; caravan
-  Building; important building
-  Bus or coach station
-  Place of worship
-  Youth hostel
-  Bunkhouse/camping barn/ other hostel
-  Wind pump; wind turbine
-  Electricity transmission line
-  Lighthouse; disused lighthouse; beacon
-  Slopes
-  Site of antiquity
-  Site of battle
-  Coniferous trees
-  Non-coniferous trees
-  Coppice
-  Orchard

-  Footpath
-  Bridleway
-  Byway open to all traffic
-  Restricted byway (not for use by mechanically propelled vehicles)
-  Cattle grid
-  Footbridge
-  Monument
-  Post office
-  Police station
-  Roman site
-  Non-Roman
-  Scrub
-  Bracken, heath or rough grassland
-  Marsh, reeds or salting
-  Viewpoint
-  Current or former place of worship { With tower
-  With spire, minaret or dome

Good practice

- Map symbols may vary, depending on what type of map is being used. Check the key to make sure that a symbol means what you think it does.
- When navigating with a map, you should 'set the map' by aligning it with the landscape. Stand in a fixed spot next to a feature or landmark and find this location on the map. Then rotate the map so that other features and landmarks line up with those you can see on the ground.
- Ensure that you have the right type of map for the situation. A map that gives too much or too little detail is of limited use.
- When using a map on an expedition or hike, carry it in a waterproof map case.
- Always remember to account for changes in ground level, as indicated by contours. A general rule, known as Naismith's rule, is to allow 1 hour for every 3 miles (5 km) of open ground covered, plus 1 hour for every 2000 feet (600 metres) of ascent. It is also common to add on 20 minutes for each 600m of steep descent, and subtract 20 minutes for 600m of gentle descent.

Compasses

A compass is an instrument with a magnetised needle that points to magnetic north. Compasses are used on land, at sea and in the air to help people specify direction.

Apart from determining the direction of north, a compass can also be used to work out a compass bearing. Bearings are expressed as an angle, measured in the 360 degrees of a circle, in which 0° is north, east is 90°, south is 180° and so on.

Magnetic declination – grid north and magnetic north

It is important to understand that grid north on your map and magnetic north on your compass are not quite the same thing. Grid north is fixed, but magnetic north changes slowly through time. The difference between the two is called Grid Magnetic Angle but is often incorrectly referred to as Magnetic Variation or Declination, which actually refers to the difference between magnetic north and true North.

This means that a bearing taken from a map should be corrected before it is used for navigation. All OS maps show what the difference between grid north and magnetic north was at the time the map was printed, and also how much that angle will change for each subsequent year. In practice this means adding on or subtracting a little to a bearing. How much you add or subtract varies, depending on where you are and what year it is, so don't assume it will always be the same. All the information you need to calculate the correction is supplied on the map key.

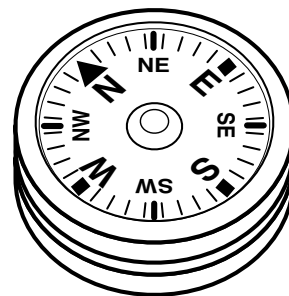
More information about magnetic variation can be found at [ordnancesurvey.co.uk/oswebsite/support/knowledgebase/grid-north-magnetic-north-and-true-north.html](https://www.ordnancesurvey.co.uk/oswebsite/support/knowledgebase/grid-north-magnetic-north-and-true-north.html)

Types of compass

Modern compasses come in different shapes and sizes.

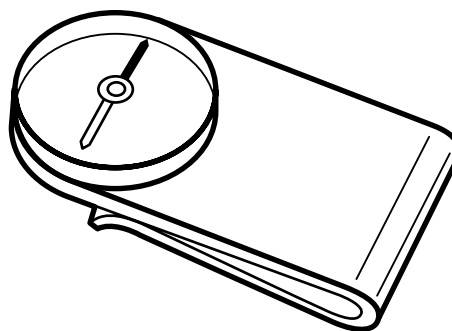
Air-damped compass

The simplest and cheapest form of compass. It does little more than indicate the approximate direction of magnetic north. It takes a long time to stabilise and the slightest movement makes the needle move. This compass should never be used for any sort of hike or expedition.



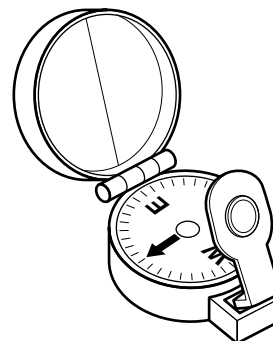
Simple map-setting compass

A liquid-filled compass that marks magnetic north only. It can be clipped to the side of a map, and is useful for positioning a map until whatever is in front of you in reality is in front of you on the map. This can only be approximate as there is no allowance for magnetic variation (the difference between magnetic north and grid north – see Magnetic declination for a full explanation of these terms).



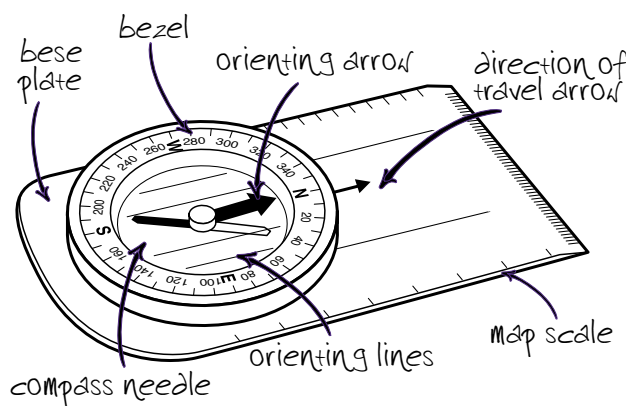
Prismatic compass

A more expensive compass with a prism, which enables a compass bearing to be taken while sighting your objective. It can be more accurate than other compasses but it is harder to use and therefore should only be used once the basic principles of map and compass work have been mastered.



Silva-type compass

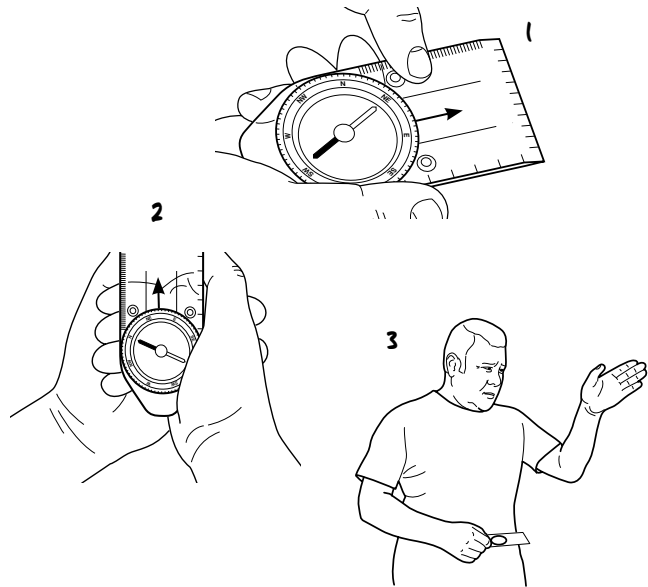
This compass consists of a magnetised needle suspended in an alcohol-filled housing. This housing can be turned and is called a bezel. Around the outside of the bezel are the 360-degree markings of a circle. The compass housing has etched orienting lines and an orienting arrow, while the base plate (on which the housing is mounted) is marked with the direction of travel arrow and map scales. This compass enables the user to take bearings, an accurate method of determining direction, and it is therefore the compass of choice for hiking and expeditions, or when making a route card.



Walking on a bearing using a compass

It is easy to walk on a bearing with a Silva-type compass. Imagine you have been asked to follow a bearing of 60° .

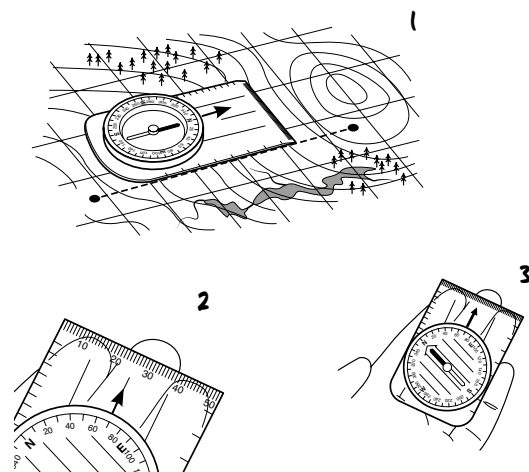
1. Holding the compass flat and level in your hand, turn the bezel until the bearing (60°) lines up with the direction of travel arrow. This has set your direction of travel to 60° .
2. Now turn the compass until the needle lines up with the orienting arrow (ie north on the needle matches north on the compass).
3. You can now follow the direction of travel arrow. Remember to check your bearing and your objective at regular intervals.



Using a map and compass to take a bearing

To find a bearing on a map a similar process is used.

1. Place the compass on your map so that one long edge of the baseplate follows a straight line between the starting point and your objective. Turn the bezel until the orienting lines are parallel to the blue printed Eastings on the map.
2. Take the compass off the map and read off the number that is now at the beginning of your direction of travel arrow. Add or subtract the local magnetic variation. This is your bearing.
3. Turn the whole compass so that the needle rests over the orienting arrow, with the red part pointing north. Hold the compass in front of you, pick out a landmark along your line of travel and walk towards it.



Good practice

- Storing compasses near magnetic items (including other compasses) can cause them to give a false reading of north. Similarly, air bubbles trapped in the compass housing can prevent the needle turning properly and prevent an accurate reading.
- When following a bearing it is best to pick out a target, such as a tree, to aim for instead of staring at the compass. This will prevent you veering off course and also ensure you stay vigilant for hazards.
- Check bearings before following them, especially in low visibility. Additionally scan the map for possible hazards so you can ensure that a slight error with your bearing will not lead you into danger.

Safety guidelines

- Practise map reading and compass use so that you can calculate distances quickly and accurately. Failing to do this before going out on a hike can have serious consequences.
- Never set out walking in unfamiliar territory without letting someone know exactly where you intend to go.
- Do not undertake a hike or expedition without the proper kit and sufficient knowledge. You will need to know how to set a map, use a map and compass, and take and follow bearings before setting out.

Find out more

- The Scouting factsheets on GPS navigation and Hiking will help you learn more about navigation.
- The Haynes Outdoor Adventure Manual and The Complete Guide to Scouting Skills are also useful references.
- The handbooks of the British Mountaineering Council are the definitive reference source for information about navigation.
- Ordnance Survey sponsors the Cub and Scout Navigator Activity Badges. Download the activity packs to help Cubs and Scouts improve their map reading skills to work towards badge requirements.