EXPERT ADVICE: PLAIN & SIMPLE™

ARMCHAIR NAVIGATION

Need to improve your skills but can't get to the hills? Navigation supremo **Lyle Brotherton** shows you how.

Like it or not, the most adventurous of us are inevitably sometimes confined to staying at home. When you can escape, safe and competent navigation sets you free to explore the hills – and the great news is that you can practise much of it when you are stuck inside. Here are three simple techniques you can try indoors that really will improve your navigation outdoors.

Orientating the map

On fine days this can be the only technique you need to use to navigate. In bad weather it can make the difference between getting off the hill and needing to call for help. There are two different ways to perform this technique: one using your environment around you, and the other your compass.

Using your environment

1 Draw a simple plan of your home. Mark items of furniture on it, such as the settee and TV in the lounge, your cooker and fridge in the kitchen, and all windows and doors throughout the house. You could even do this at work, marking desks, photocopiers and the ubiquitous coat stand, plus again all windows and doors.

2 Start to walk around your home or office (in your lunch break, of course!) with your map held in front of you. As you move, orientate the map in relation to the items that you have marked on your plan. In other words, if your settee is on your left, then it should be on the left of your map. Be prepared for quizzical looks from your family, friends and colleagues – it's all part of being an outdoors person.

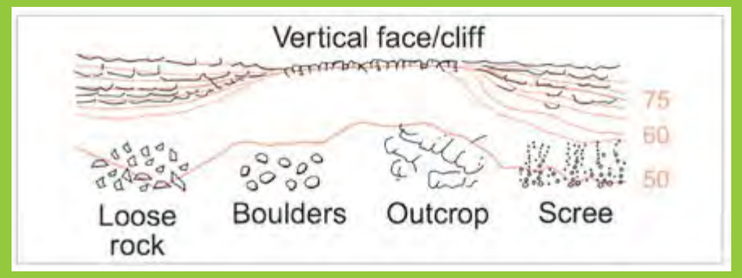
3 To transfer this skill to the outdoors, you simply use the features that are in your surrounding landscape and are marked on your map – such as cliffs, paths, walls and streams. Really proficient navigators can orientate the map using just the shape of the land alone, and once you have the basics you can advance to doing this too.

Align the compass needle with the vertical blue lines on the map.

Using your compass

All maps – no matter where you are in the world – have been drafted with north at the top. Simply place your compass on the map, look at where the compass needle (red end) is pointing, and rotate the map until the needle is parallel to the vertical grid lines on your map (usually blue) – see left. It doesn't matter which way the body of the compass is pointing; only the needle counts! Be aware that in your home there may be items that can deviate a compass needle, so try the technique in a few different rooms and you will soon have knowledge of where north is. While walking around your gaff, keep looking at the map and always keep the red needle pointing to the north of the map. You are now orientating the map!

Drawing map symbols



ORDNANCE SURVEY

Come on, let's be candid – how many of us can tell at a glance the difference between loose rock, scree, an outcrop and a vertical cliff face? Get them wrong and you can end up falling instead of scrambling down the mountain side.

For some people, simply studying the map legend (the list of features detailed, usually on the right-hand side of OS Landranger & Explorer maps) is enough. A more powerful way to commit them to memory is to draw them yourself.

Grab a pen and paper, and write down the names of the features you find difficult to remember on the left-hand side of the sheet. Next to them, copy the illustrations of these features from the legend of your map (you can also find the legends online at www.liveforheoutdoors.com/mapsymbols).

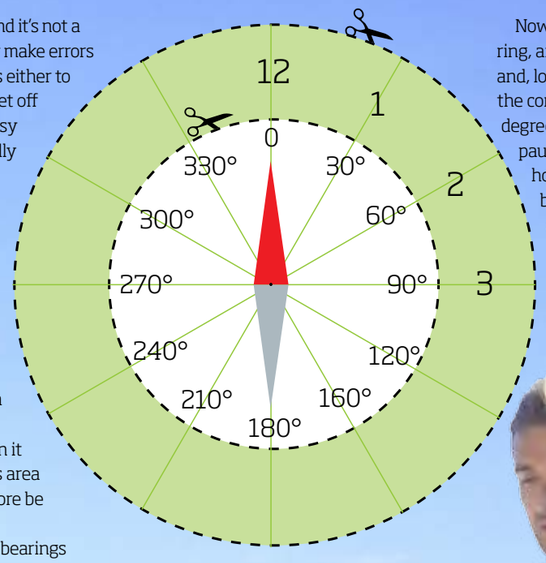
Cover the left side of your paper with the explanations, and test yourself by naming each of the features you have drawn; you'll be surprised how easy it becomes to commit these features to memory. Ordnance Survey even produces a series of flashcards that you can download to test and improve your map-reading skills – useful, yet not quite as effective as drawing your own.

Visualising the azimuth

This has nothing to do with maths and it's not a musical instrument! We all can easily make errors when transferring compass bearings either to or from a map. Plus, when we then set off to walk on a particular bearing it's easy to do so in the wrong direction, usually by 180 degrees! The reason for this is because we have not visualised where this will be in relation to us and where we are. Can you honestly say that you instantly 'see' that a bearing of 230 degrees is 7 o' clock in relation to you, therefore behind you to your left?

If, however, when you have either been given a bearing or taken a bearing from a map or a compass, you know roughly in which direction it is, you will automatically look at this area of the landscape or map, and therefore be much less likely to make a mistake.

It is so easy to put into practice: all bearings between 1 and 179 are to your **RIGHT**, and between 181 and 359 are to your **LEFT**. Just remembering this simple fact will help stop you making simple errors; but to get really smart (and skilled) you can use the following visualisation and recall learning method. Grab your pen and paper again, and using the template above as a guide, write on the bearings in 30 degree increments, then add the corresponding numbers of a clock face around the ring on the outside (we've done the first few as an example):



Now cut out the centre circle and the outer ring, and separate them. Place the two apart and, looking at either one, try to guess either the corresponding time or the number of degrees. When you next check the time, just pause for a moment to think what the hour hand would represent in degrees – because doing this will help you develop a spatial awareness for the bearings of the compass in relation to you; this is navigating at its best!

Practising basic skills will make you a better navigator.

YOUR EXPERTS

Graham Thompson
GT – **Trail**'s technical editor for over 25 years – is our walking gear guru.

Rob Johnson MIC
Rob is an international expedition leader and mountain instructor.

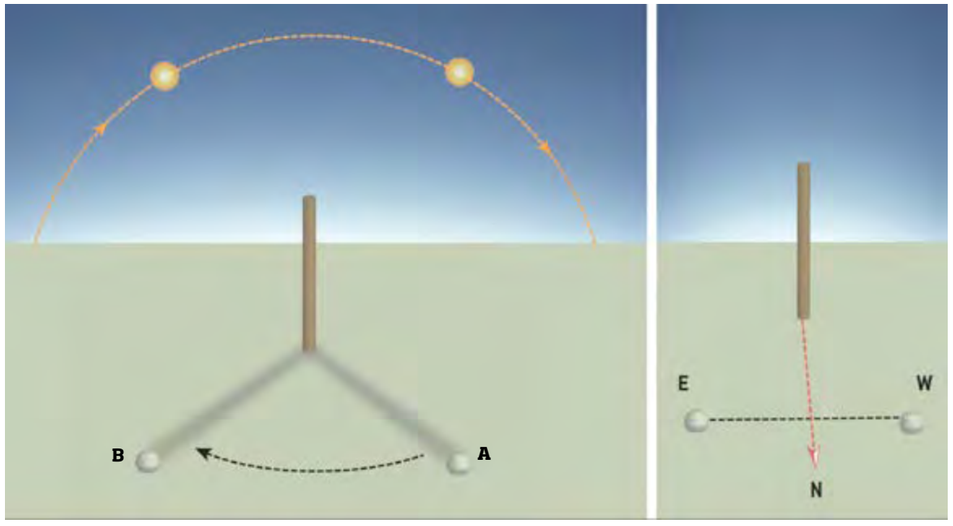
Lyle Brotherton
Navigation expert Lyle is one of the world's leading authorities on search and rescue.

Jeremy Ashcroft
Trail's mountaineering editor Jeremy has a lifetime of outdoors experience.

BACKYARD NAVIGATION

Learn handy skills right outside your door in **Part 2** of our new series. Navigation supremo **Lyle Brotherton** is the man in the know...

In the last issue we gave you some navigation tips and tools that you can try in the comfort of your own home or office. Now, we're taking you outside, all the way to... your garden! Here is a trio of techniques that you can learn in your own outdoor space before taking them to the hills to put into practice.



Finding north using a shadow

Rarely – in fact only in an emergency when all your other nav kit has died – are you going to use this technique; but (a) it is fun to do, and (b) it aids understanding of the sun's movements – important when you come to learn other aspects of natural navigation.

The sun always moves from east to west, in both hemispheres, so shadows always move from west to east in both hemispheres. Thus, if you mark the position of a shadow, it will always be west of any subsequent marks.

1. Place a stick, walking pole etc a minimum of 1m in length into the ground.
2. Mark the tip of its shadow (**A**). Wait at least 20 minutes.
3. Mark the new tip of its shadow (**B**).
4. Draw a line connecting these marks. This runs west to east, so you can now work out where north is.

This is a relatively accurate method (±12°) that is best performed within 2 hours of when the sun reaches its maximum altitude (noon, so around lunchtime) and the shadow is at its shortest.

An even more accurate way (±6°) is to measure the shadow cast sometime before the sun is highest and the shadow shortest. Mark this spot. Wait until the shadow reaches the same length again (this may take some hours) and mark this second spot. A line from the first mark to the second will run more closely west-east.

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Using aircraft flight paths and contrails

Commercial aircraft fly along designated 'air corridors' that connect one location to another at a specified altitude. You can easily identify commercial aircraft flying overhead with your naked eye (or with binoculars); the exhaust from their engines creates long artificial clouds of condensed water vapour, known as 'contrails'.

These contrails remain observable for anything from a few seconds or minutes to many hours, depending on atmospheric conditions, and they can be used to determine direction.

Prior to embarking upon your journey, check which flight paths exist for commercial aircraft in the area. You can find these on websites such as www.flightradar24.com

In this screen shot (left) you can see that in the selected area, these corridors run in the direction of NNW-SSE across the Lake District. Knowing this, you can use the contrails to determine the other cardinal points of the compass. (Note that military aircraft do not use these corridors and tend to fly lower than commercial aircraft.)

SALLY WALTERS

Using the prevailing wind

Although wind direction can change throughout the day, you can usually find permanent signs that indicate the prevailing wind's direction – for example, trees and shrubs whose branches are bent to shape by the directional wind.

In the UK these tree and bushes lean eastwards, as the prevailing wind comes from the west. Knowing which direction they lean in can help you determine the other cardinal points of the compass. In other parts of the world you may need to first establish which way the prevailing winds blow and if they are seasonal. This can be found easily from many sources, ranging from meteorological internet sites to local farmers!

TOM BAILEY

TRAIL SKILS

EXPERT ADVICE: PLAIN & SIMPLE™

NEIGHBOURHOOD NAVIGATION

In **Part 3** of our skills series, navigation expert **Lyle Brotherton** takes you into your local 'hood. Don't worry – we'll be on the hill soon!

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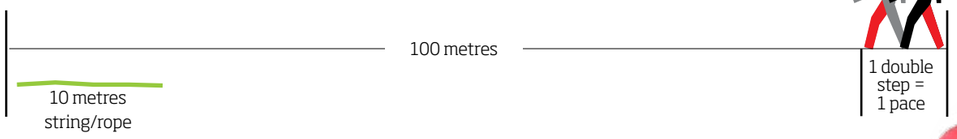
Pacing



Pacing is a very straightforward yet highly effective technique that's in my top 10 navigational 'must haves'! To do it all you need to know is your personal **pace count** – how many paces it takes you to walk 100m – because knowing this, you can easily calculate how far you have walked.

Select a level piece of ground (it can be the street outside your house, a local sports field, football pitch or municipal park) and measure out 100m in a straight line. If you have a known-length climbing rope use this; if not, measure out 10m of string.

1 Mark your starting point, then lay out the string ten times to determine your 100m point and mark this.

2 From here, walk at your normal pace back to the start and count your 'double steps'. If you start by putting your left leg forward first, count every step thereafter of your right foot only; this is a double step and it counts as one pace.

3 When you reach the start, make a note of this number.

4 Now repeat this exercise by walking back to where you came from, again counting the number of paces it takes you.

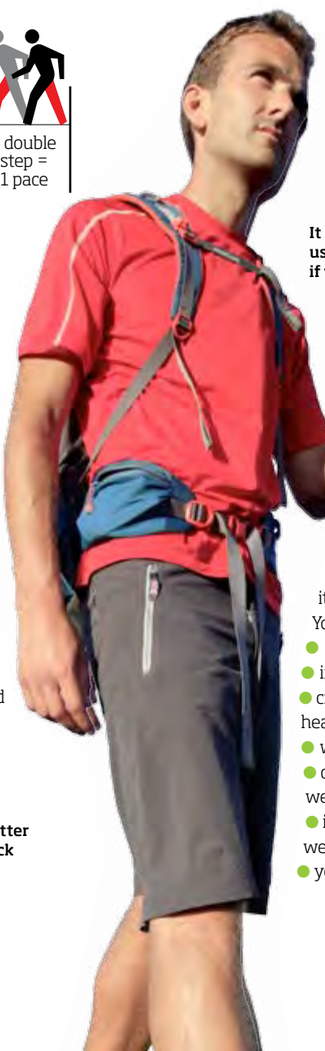
5 Keep doing this until you consistently get the same number – this is your personal pace count. (Typically this varies from 55 for very tall people to 75 for folk with shorter legs.)

Now you know your own pace count, you can predict how many paces you will need to cover, for example, 200m. Start walking, and when you reach your pace count number you've covered 100m. Then start counting from zero again, and when you reach your pace count again this time you'll have walked 200m in total.

It therefore follows that if you want to cover 50m, just walk half of your pace count.

For short distances it's easy to remember how many times you have walked 100m, but if you are wanting to measure say 500m it is easy to get confused. To remedy this, pick up five little stones; every time you reach your pace count, drop one stone and start to count from zero again. When you have dropped your last stone you have travelled 500m.

Small stones work better than bigger bits of rock

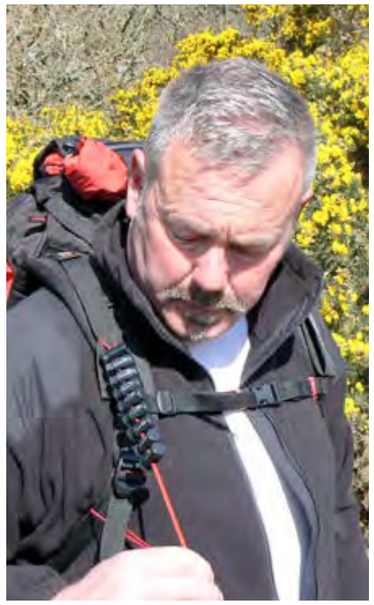


A better alternative to pebbles is to make a 'tally counter' (see above). Put ten toggles on a length of paracord, attach them to your rucksack, and move one down for every 100m covered.

It can be tricky to keep count using your digits (and especially if wearing mittens!).

Our personal pace count is remarkably consistent across most terrain, and while it can increase – as in you take more steps (it never decreases) – it does not do so by a large amount. You just need to be aware of this when:

- moving up a slope
- in a headwind
- crossing sand, gravel, mud, snow or heavy undergrowth
- walking in snow or ice
- carrying a heavy rucksack and wearing boots with poor traction
- in poor visibility, either in bad weather or at night
- you are tired



Paracord + 10 toggles = a tally counter!

Timing

Timing requires less concentration than pacing and is easier to use, especially over long distances. However, when these two techniques are used together they are a brilliant set of navigational skills and can be a lifesaver in poor visibility.

Knowing how fast you are walking and relating this to a 'timing card' is the key to this technique.

Approximate speeds for different terrain	
5kmph	level surface covered in grass
4kmph	variable, rough surface
3kmph	soft snow / strong headwind
2kmph	deep snowdrift / severe headwind

Looking at the table above, walking on a level, grassy surface for an hour without stopping, you will cover 5km. Thus in half an hour 2.5km, in quarter of an hour 1.25km, and every minute 83.3m. For shorter distances the calculations can be tricky, so to make this easy below is a table that you can cut out and carry with you.

Timing card	Speed				
Distance	**2kmph**	**3kmph**	**4kmph**	**5kmph**	**6kmph**
50m	1min 30 sec	1min	45sec	36sec	30sec
100m	3min	2min	1min 30sec	1min 12sec	1min
200m	6min	4min	3min	2min 24sec	2min
300m	9min	6min	4min 30sec	3 min 46sec	3min
400m	12min	8min	6min	4min 48sec	4min
500m	15min	10min	7min 30sec	6min	5min
1000m	30min	20min	15min	12min	10min

From the timing card, let's say you want to cover 500m to your next attack point and your walking speed is 4kmph. Simply check your watch, set off, and stop when you have been walking for 7min 30sec.

Similarly, to cover 750m at 4kmph, walk for 11min 45sec (500m = 7min 30sec + 200m = 3min + 50m = 45sec).

However, your speed can vary; again, the calculations have been done for you to cut out and keep:

Time to add for other conditions	
Darkness	**½ daylight speed**
Very heavy loads	**½ normal speed**
Heavy load	**Subtract 1kmph**
Headwind	**Subtract 1kmph, or more if very strong**

Going uphill add 1 minute for every 10m contour line crossed up to a maximum of 3 contour lines in 100m. **Going downhill** subtract 20 seconds for every 10m contour line crossed up to a maximum of 3 contour lines in 100m

An easy way to get to know your different walking speeds is to do this either using a hand-held GPS or download an app such as Viewranger to your smartphone.

- You can buy a handy plastic credit card-sized version of this table at **www.shavenraspberry.com**

PARK NAVIGATION

With the basics perfected close to home, it's time to move further afield as **Lyle Brotherton** shares more key skills in Part 4 of our series...

This issue we are working with **bearings**, the backbone of all navigation. Even for experienced navigators it's good to refresh your knowledge and test exactly how accurate you are, because for example an error of just 5° over a kilometre means you will miss your target by more than 87m; and in poor visibility or at night, this is a game-changer!

There are two ways of taking a bearing: one is by looking directly at the object and using a compass to walk to it; the other is by using a map. Buy an OS 1:25,000 (Explorer) map of your local area and take this with your compass to your local park, where you can perfect both methods.

To minimise error, make sure that you are always working on as stable and level a surface as possible, ideally adopting the 'brace' position (above) – and try to make this standard practice.

Taking a bearing to a visible object using your compass

- Facing the identifiable feature to which you wish to take a bearing, assume the brace position to create a solid and stable platform (see the photos). Place the compass on your knee and point the direction-of-travel arrow towards your identifiable feature. Let the compass needle float freely, and it will point to magnetic north.
- Move your head directly over the compass housing to avoid creating parallax – an error whereby your line of sight and the compass needle are not aligned.
- With one hand, hold the compass still on your knee and rotate the bezel until the red orientating arrow is exactly underneath the red north of your needle. The north on your bezel will match the north of your needle.
- Check again that the compass is pointing exactly towards your identifiable feature, and that the arrow and needle are in perfect alignment.
- The reading at the compass index is your magnetic bearing to this target. Do not move the bezel again.

SAFETY CHECK
Estimate what you think the bearing is going to be, for either method, before your measure it – and if the bearing you then measure differs significantly from your estimation, question why this is before committing yourself to it.

Taking a bearing using your map

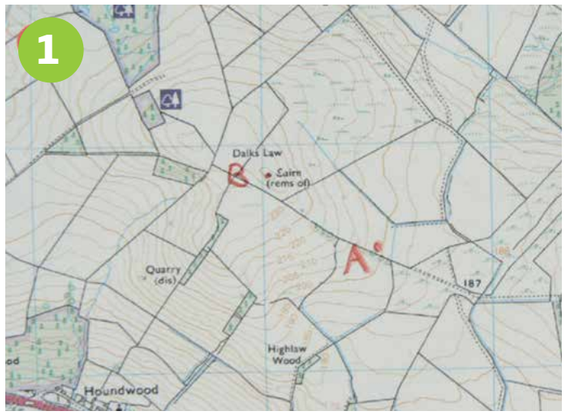
Assume the brace position and place the map on your thigh.

1 Identify where you are on the map (Point A) and the feature you wish to take a bearing to (Point B) – see below.

2 Use the ruler line on the compass to join Point A to Point B, making sure that the arrow on the compass points in the direction you wish to go. Note: you can ignore the compass needle as it is not required for this technique.

3 Rotate the compass bezel until the N on the bezel points north on the map (always the top of the map). Align the compass housing orientating lines parallel with the map's vertical blue grid lines.

The bearing to this object is indicated at the index. To maximise accuracy when following this bearing on a compass, you would need to adjust for magnetic declination, which we will cover in a later issue.



Walking on a compass bearing

With the bearing set, hold the compass squarely out in front of you at about waist height and lean slightly over to look down on it. Let the needle float freely and it will point to magnetic north.

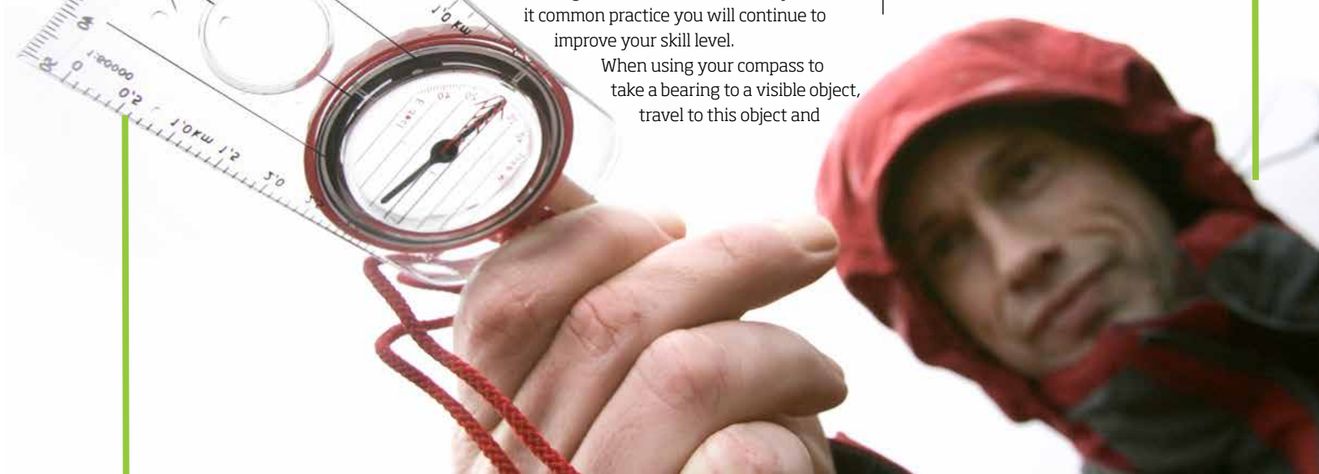
Rotate your body, not the compass, until the red end of the compass needle (north) is exactly over and aligned with the red arrow in the bottom of the compass housing. The front of the compass with the direction-of-travel arrow is now pointing towards your destination. Look directly in this direction and line up a distant landmark.

Testing your proficiency

Here's the smart part! You can easily test how accurately you have measured your bearings for both methods, and if you make it common practice you will continue to improve your skill level.

When using your compass to take a bearing to a visible object, travel to this object and now take a bearing, using your compass, from where you started. It should be exactly 180° different. A quick test is to glance and see if the white end of your compass needle is pointing to your original bearing when you are taking this bearing back to it.

To test your map bearing skills, take the bearing from Point B to Point A; this should be exactly 180° different. These are called 'back bearings' and they will be useful when you learn to locate your position, which we will cover in a later issue along with magnetic declination.



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EXPERT ADVICE: PLAIN & SIMPLE™

HILL NAVIGATION

In PART 5 of our navigation series with Lyle Brotherton we start looking at the techniques that can be put into practice where we need them most: on the hill.

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This issue we're looking at how easy it is to use natural features in the landscape to keep you on track. **Handrailing**, **collecting features** and **catching features** are the three techniques I use most, because they allow you to enjoy the great outdoors without constantly concentrating on navigation.

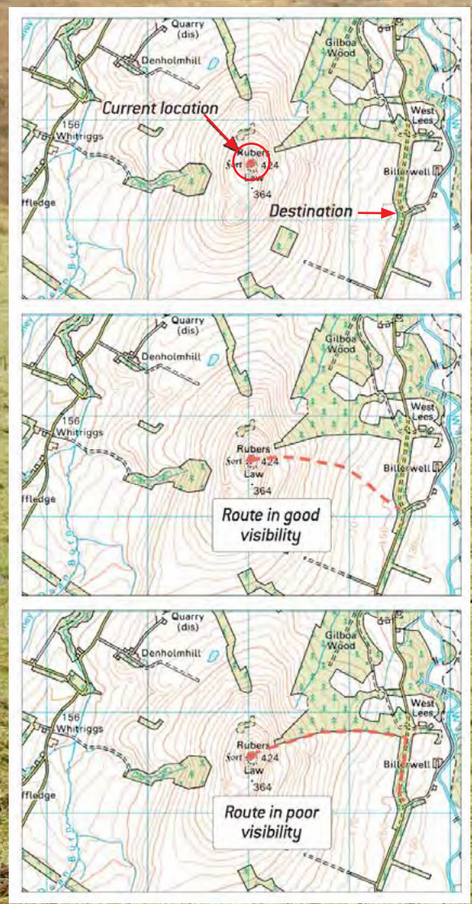
Handrailing

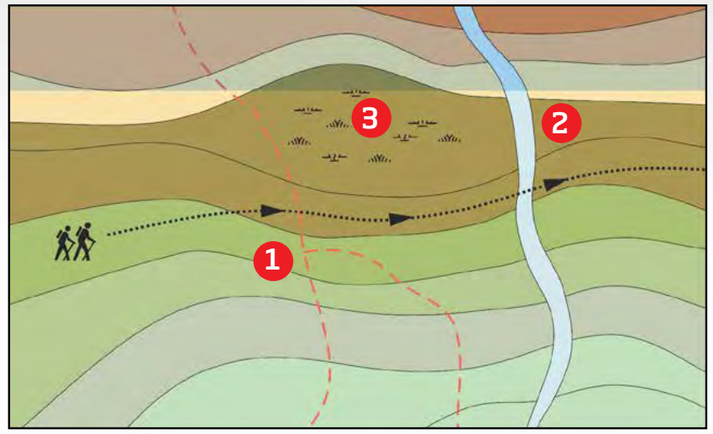
A 'handrail' is an easily identifiable linear feature, marked on your map, that you can follow towards your next attack point (or destination).

Typical handrails are:
- Fences
- Forest edges
- Overhead power lines
- Paths, roads and tracks
- River banks
- Ridges
- Stream beds
- Valleys
- Walls

If visibility is reduced, either in poor weather or low light levels, then following a handrail is the safest form of travel - and in severe conditions the technique becomes essential.

On the maps, right, the edge of the woodland is the handrail.





Collecting features

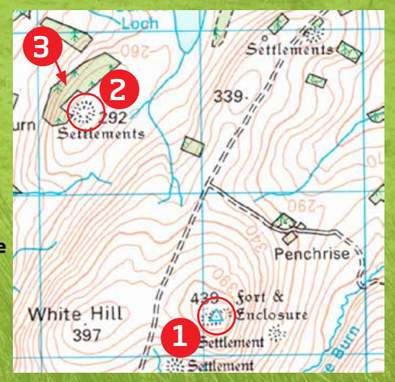
Features are the things you predict or know will be on your chosen path. Mentally 'collecting' them along the way confirms that you are on the right route. Typically, collectable features are:

1. **Spot features:** such as bridges, intersections of paths, junctions in rivers/streams, cairns, summits.
2. **Linear features:** such as walls, streams, and ridges with no junctions.
3. **Area features:** the terrain may change from rocky to marshy to rolling; you start going uphill or downhill; the ground levels out; you reach a particular land feature.

Catching features

These are similar to handrails or collectable features, but rather than confirming you are on the right path, these features indicate that you have either reached or potentially overshot your destination.

See the map, right. Imagine you had been visiting the ancient settlement on top of Penchrise Hill at the trig point, spot height 439 1 and you want to travel to another settlement north-west of where you are, at the summit of the small hill, spot height 292 2. If you reach the forest 3 you have travelled too far - the forest is your 'catching feature'.



GRID MAGNETIC ANGLE

In **PART 6** of our navigation series **Lyle Brotherton** explains why there is more than one north!

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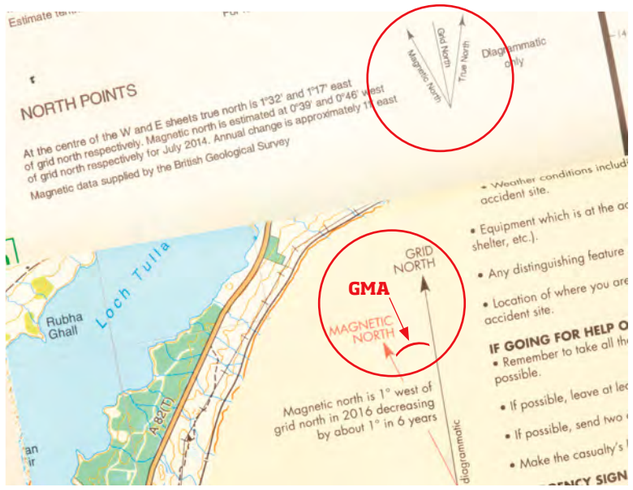
The navigation term **grid magnetic angle** (GMA) sounds daunting, but it isn't! Here you will learn exactly what it is, and how and where to use it.

If you stick a pencil vertically through an orange and imagine it is the Earth on its axis, the point at the top would be **true north**. This is where all lines of longitude originate. Running across the orange, imaginary parallel lines would be lines of latitude. This is the universal coordinate system used on maps the world over.

The British Isles cover a small section of the Earth, and lines of longitude and latitude curve, so Ordnance Survey introduced its own grid system: the National Grid. These are the blue lines on your OS maps (grey on Harvey), and the vertical ones point to **grid north**.

Our compasses, however, point to **magnetic north**, and this angular difference between the north on your compass (magnetic) and the north on your maps (grid) is called **grid magnetic angle**, or **GMA** (not to be confused with magnetic declination or variation, which is the difference between true north and magnetic north). When we transfer a bearing from our compass to our maps, or vice versa, we need to take the GMA difference into account.

All OS and Harvey maps state what the difference between magnetic north and grid north is for the area covered (see left).



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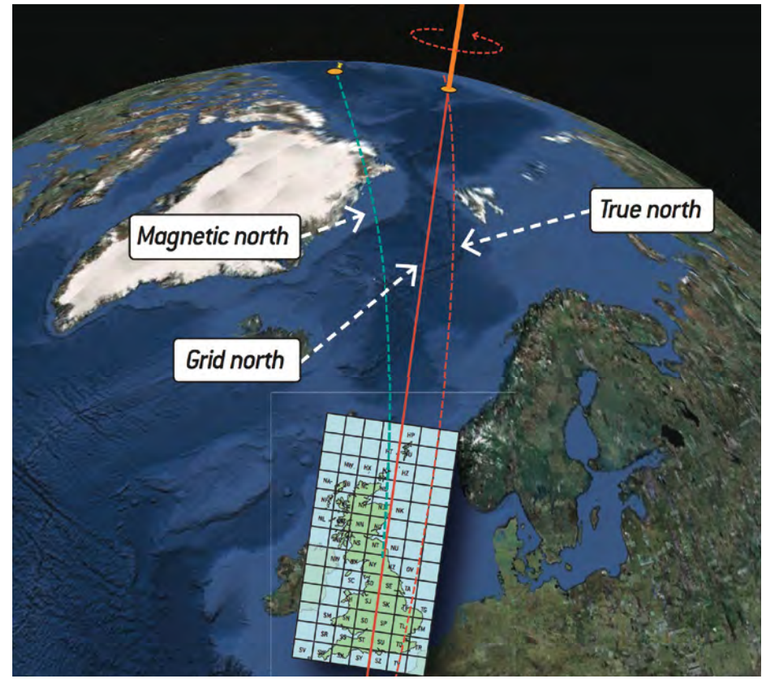

To adjust for GMA when transferring a bearing taken with your compass to a map (**grid**), **SUBTRACT** the grid magnetic angle from your compass bearing.

To adjust for it when transferring a bearing taken on your map to your compass (**mag**) – **ADD** the grid magnetic angle to your compass bearing.

A simple mnemonic to help you remember how to do this is **Add for mag, Rid for grid.**

If the difference is 1.5° or less, we can forget about it. So for example in Devon, where it is currently less than 1°, we need not bother; but if we are over in East Anglia, where it can be more than 3°, we must take it into account.

A couple of degrees might not seem much, but if you were 2° out when you took your bearing and another 1° when transferring it, your compound error including GMA could be 5°, which over a kilometre means you will miss your target by more than 87m!

The magnetic north pole is also moving over time, so check the date of your map. You can find the up-to-date GMA on the British Geological Survey's website at **tinyurl.com/GMAcalc** If your map is more than 5 years old, visit this website and write on your map the GMA plus the date.

If navigating abroad you'll need to take account of the variation between magnetic north and true north (magnetic declination or variation) if a local grid system is not used, such as in Canada and America – where the variation can be as much as 25°!

For the adventurous among us, you can calculate your local GMA when out navigating:

1. Locate exactly where you are on the map; the more accurate the fix, the more accurate your result.
2. Take a bearing with your compass on a distant feature, ideally one that is narrow such as a radio mast and which is identifiable on your map.
3. Make a note of this bearing.
4. Now take a bearing on the map from your position to the feature (on the map).
5. The difference between these two bearings on an OS or Harvey map is your local GMA.

Understanding GMA is an important part of navigation.

TRAIL SKILLS

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BOXING

In PART 7 our navigation series, Lyle Brotherton explains how to cleverly avoid obstacles.

TOM BAILEY

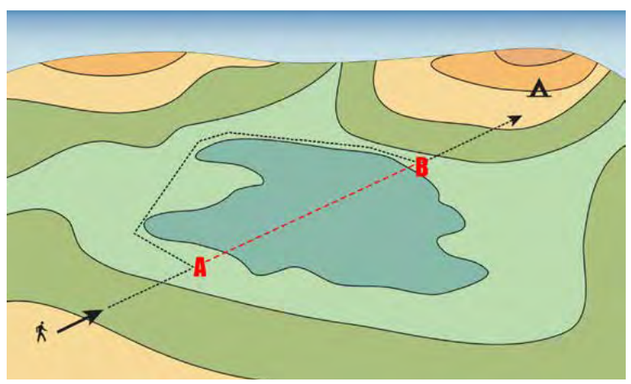
The usual definition of the phrase 'boxing clever' is to use one's resources beyond conventional ways. This is equally apt for 'boxing' in navigation; it is a much underused technique, and yet it's incredibly effective and very straightforward to master.

When plotting a route to your objective, you navigate a series of short 'legs'. Each leg starts from a known point and leads to an identifiable point in the landscape/on the map known as an 'attack point'. Given good visibility, your attack point can be quite a distance from where you are. Consequently there may be obstacles in your path that are difficult to walk over, such as rough ground or a bog, which require you to deviate from your original line. To keep on track we can use 'boxing' to circumnavigate these obstacles and return to our original bearing.

There are three levels of difficulty for boxing – rough, pure and stepped; learning them all will put you at the top of your game! Remember this, though: the golden rule for boxing is '*Do not move your compass bezel*'.

Rough box

This technique is used where you can clearly see to the other side of the obstacle.



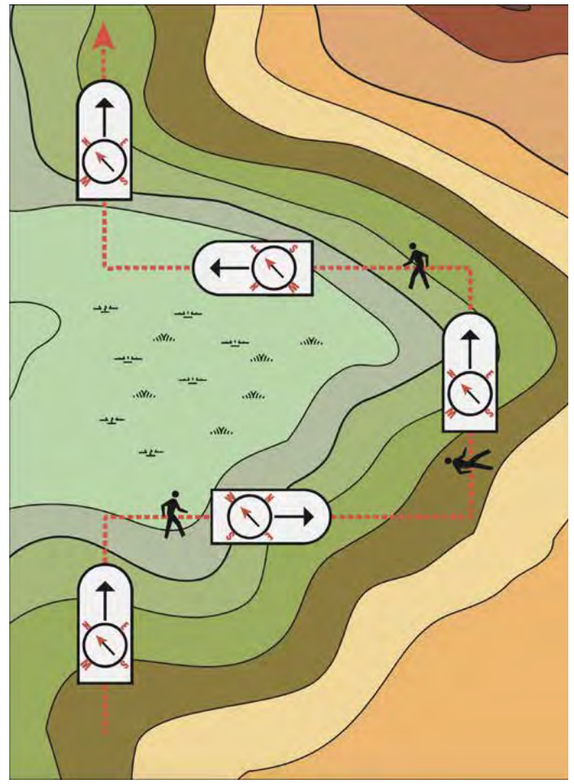
1 As you approach the obstacle – in this case a lake – identify a very clear intermediate landmark (B) that is on your bearing beyond the obstacle.

2 Stop at a point before the obstacle (A) that you'll be able to see once you've reached the landmark (B).

3 Circumnavigate the obstacle to the landmark (B). Once you have reached it, turn around and confirm that you are in the correct place by taking a back bearing to the point before the obstacle (A).

Pure box

This technique is used where you cannot see to the other side of the obstacle.



1 Stop at a safe distance from the obstacle – in this case a bog. Estimate its size, either from the map or visually if it is not on the map. The detour starts at right angles to the obstacle by choosing either east or west on your compass.

2 As you've been walking on a bearing the needle of your compass will currently be pointing north. Rotate your body until the red north of the compass needle points to either east or west on the compass bezel.

3 Do not touch the compass bezel! Pace the new bearing (along the 'direction-of-travel' indicator on your compass), counting your steps until reaching the outer edge of the obstacle.

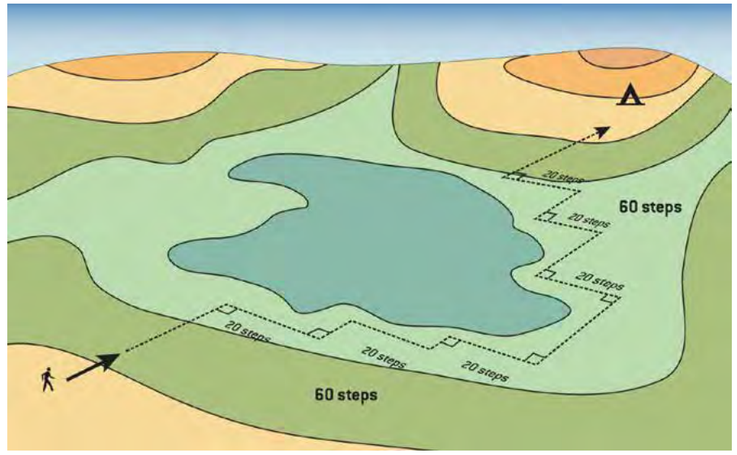
4 Turn so that the needle of your compass is once again pointing north, and begin walking on your original bearing.

5 On reaching the far edge of the obstacle, stop and rotate your body until the red north of the compass needle points either east or west on the compass bezel (whichever is the opposite of that selected at the start of your detour).

6 Walk on this bearing for the same distance that you paced on the first leg of your detour, then stop. You should now be back on your original line. Turn so that your compass needle is pointing north once more, and continue on your original bearing.

Stepped box

This technique is used if the obstacle is particularly large and irregular in shape.



1 Stop at a safe distance from the obstacle. The detour starts at right angles to the obstacle by choosing east or west on your compass.

2 As you've been walking on a bearing, the needle of your compass will currently be pointing north. Rotate your body until the red north of the compass needle points to either east or west on the compass bezel.

3 Do not touch the compass bezel! Pace the new bearing (along the 'direction-of-travel' indicator on your compass), counting your steps until reaching an area where it is safe to walk forward again.

4 Turn so that the needle of your compass is once again pointing north, and begin walking on your original bearing until reaching another area where you need to detour.

5 Repeat steps 2-4 until you have cleared the obstacle, making a note of your accumulated paces from each leg.

6 On reaching the far edge of the obstacle, stop and rotate your body until the red north of the compass needle points either east or west on the compass bezel (whichever is the opposite of that selected at the start of your detour).

7 Walk on this bearing for the pace count that you have accumulated in your outward journey.

8 If your progress is blocked by the obstacle, however, repeat steps 2-4 in the opposite direction, deducting steps from your pace count as you travel.

9 You should now be back on your original line. Turn so that your compass needle is pointing north once more, and continue on your original bearing.

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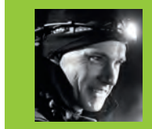


Jeremy Ashcroft
Trail's mountaineering editor Jeremy has a lifetime of outdoors experience.

Lyle uses a water tower in France as a 'baseline'.

HOOK & BASELINE

In **PART 8** of our navigation skills series, **Lyle Brotherton** shares a handy technique that can help if you get lost...

I developed the 'hook & baseline' technique while exploring the flat and relatively featureless Somme Valley in northern France, and I now employ it everywhere I navigate, from the streets of Manhattan to the mountains of Scotland.

A 'baseline' is simply a bearing taken on any prominent feature, from a water tower or a skyscraper to a mountain peak, that you can use to find your way back to your starting point – and it is especially useful if you are lost. A 'hook' is a 'catching feature' behind the prominent feature from your starting point – in Manhattan for example I used the Hudson River.

1 From your starting point, take a bearing on a prominent feature (see diagram) – one that will be visible from all points on your journey. This bearing is your **baseline**; make a note of this number.

2 Study the map and select a **hook** ('catching feature', see diagram) that is behind the prominent feature from where you are, and make a note of this.

3 On your journey, if you need to make a direct route back to your start, or you are lost, locate the prominent feature you identified, even if you have to (safely) ascend to do so.

4 Take your bearing to it.

If your bearing reads fewer degrees than your recorded baseline, move left.

If your bearing reads more degrees than your recorded baseline, move right.

5 When your current bearing to the feature matches your baseline, following it will always take you to your starting point. On your journey back, if the prominent feature disappears from sight, or if you encounter obstacles in your path, use your 'boxing' techniques (see the March 2017 issue of **Trail**) to bypass them, and you will eventually arrive back at your start position.

If you overshoot your start, your hook (catching feature) will stop you:

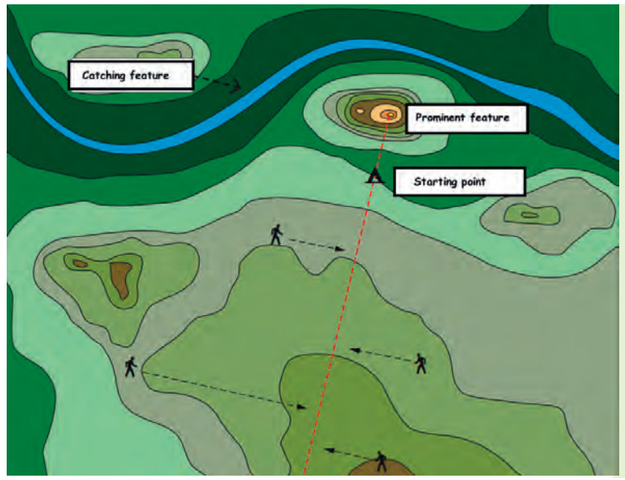
1 If you reach your catching feature, stop.

2 Determine the back bearing (see boxout, above right) of your prominent feature.

3 Now travel along your catching feature till you are on this bearing.

4 Travel back towards to your starting point.

Employing this technique allows you to roam without a specific route, even off your map!



Back bearing

A 'back bearing' is in the opposite direction to your travel, ie plus or minus 180 degrees. For example: if you are following a bearing of 070°, to walk back along exactly the same route your bearing would be 250° (070°+180°=250°). This is the back bearing.

> **"Employing this technique allows you to roam without a specific route"**

In Glasgow, the middle tower became the 'baseline' feature, with the motorway in the foreground as the 'hook'.

Lyle often uses his hook & baseline technique.

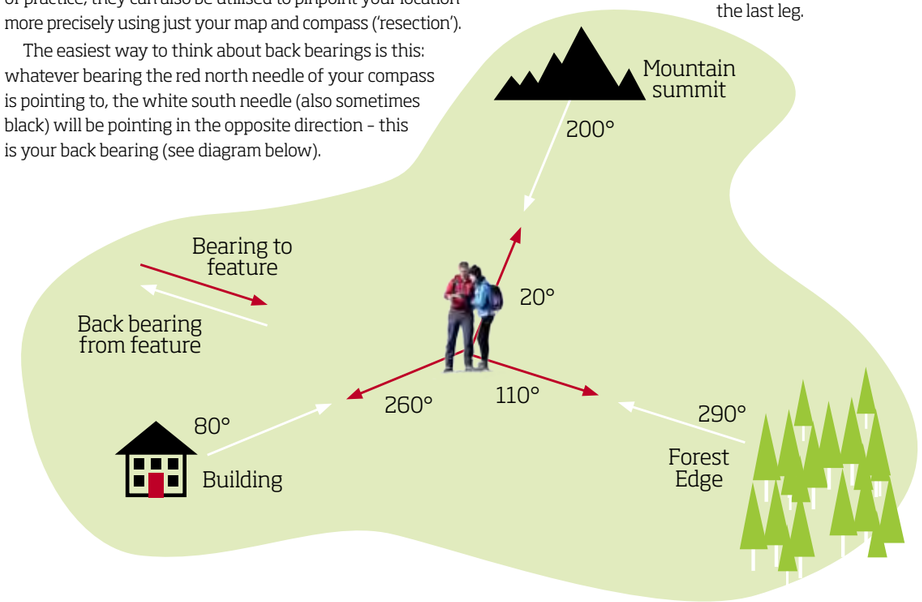
EXPERT ADVICE: PLAIN & SIMPLE™

CHECK YOUR POSITION

In **PART 9** of our series on navigation techniques, **Lyle Brotherton** explains how back bearings can be used to stop you getting lost.

If you're unsure of your exact position and you don't have the luxury of a GPS or satnav-enabled phone, it's possible to work out roughly where you are the old-fashioned way with just a map and compass. Of course, you can also use these tools to check your navigation as you go, and one of the easiest (yet oft-overlooked) techniques for this is using back bearings. These can be employed quite simply to check that you have walked on the correct bearing (called 'leg confirmation'). Plus, with a bit of practice, they can also be utilised to pinpoint your location more precisely using just your map and compass ('resection').

The easiest way to think about back bearings is this: whatever bearing the red north needle of your compass is pointing to, the white south needle (also sometimes black) will be pointing in the opposite direction – this is your back bearing (see diagram below).



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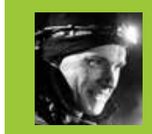


Jeremy Ashcroft
Trail's mountaineering editor Jeremy has a lifetime of outdoors experience.

Take a bearing to your intended destination – your 'attack point'. Walk on that bearing until you reach the location.

Using back bearings to check (leg confirmation)

To follow your route to your destination you navigate a series of short legs. Each leg starts from a known point and leads to an identifiable point on the map (known as an attack point).

Quick method

When you arrive at your attack point, turn around and point your compass in the direction of the point you have just walked from. If the white needle of the compass aligns exactly where the red needle of the compass was you are on the right track!

Precise method

Sometimes an attack point may not be a particularly obvious feature, so it's important to confirm that you have accurately followed the last leg.

1 Once you believe you have reached your planned attack point, without changing the bearing hold the compass squarely out in front of you at about waist height. Lean slightly over to look down on it and let the compass needle float freely. It will point to magnetic north.

2 Rotate your whole body (not just the compass) until the white (or black) end of the compass needle is exactly aligned with the orienting arrow in the bottom of the compass bezel housing (see images above). This is your back bearing (180° to your original bearing).

3 If you've followed your original bearing accurately your compass' direction of travel arrow should be pointing at the place you have just come from.

Precise method – (sometimes called the Cocked Hat technique)

This is not a technique you will need to use very often, but it could be invaluable in vast featureless areas. If the three lines do not precisely intersect in the same point, you will end up with a small triangle where they meet. Your approximate position is somewhere within this triangle.

On arrival, check your back bearing to your starting point. If you are in the right place it will be exactly 180 degrees from your original bearing.

Using back bearings to confirm your position (resections)

This is the use of back bearings to establish where you are. It is particularly effective if you are on or near a linear feature such as a path, river or the edge of a wooded area.

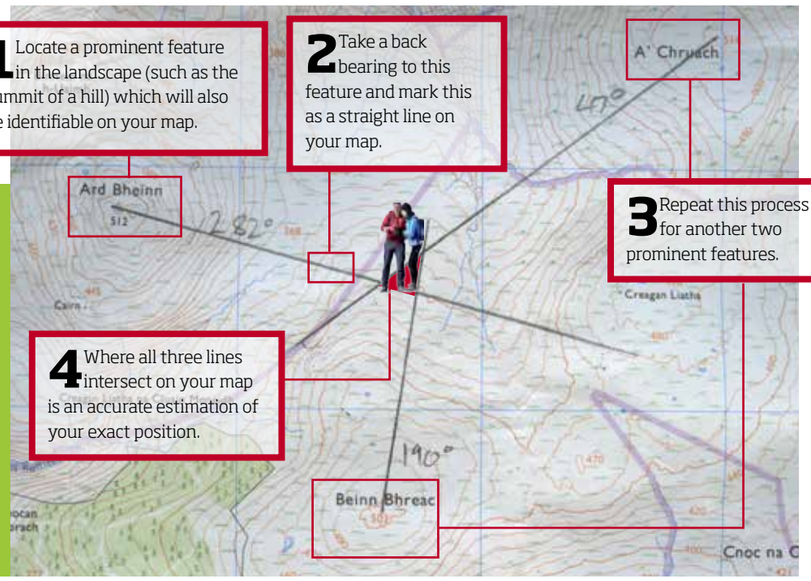
Quick method

1 Standing by your linear feature, look for a prominent feature in the landscape (such as the summit of a hill) which will also be identifiable on your map.

2 Turn and face this prominent feature straight on.

3 Orient your map by placing your compass on it and rotating both together until the red needle of your compass is pointing to the top of your map parallel to the north/south grid lines.

4 With the map oriented, draw an imaginary line from the prominent feature in the landscape through the same feature on your map and straight back to you. Where this imaginary line intersects, the linear feature on the map is a rough guide to your position.



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THE QUESTION OF SCALE

As summer approaches, a map can often be the only navigational tool you bother using – but which mapping scale is best? In **PART 10** of our navigation series, **Lyle Brotherton** explains how to interpret them.

In Great Britain, we are fortunate to have the best maps for walking in the world, and all due to the creation of our national mapping agency, Ordnance Survey (OS), on 21 June 1791. Originally all Ordnance Survey mapping used Imperial measurements: miles, yards, feet and inches. Today they all use the much simpler metric system (kilometres, metres and centimetres) and we also have access to other excellent maps available from Harvey Maps.

The tricky part: map scales!

The scale of a map shows how much you would have to enlarge your map to get the actual size of the piece of land you are looking at. It is expressed as a ratio and is always printed on the map.

If your map has a scale of 1:25,000, this means that every 1 unit on the map represents 25,000 of those same units of measurement on the ground. These maps use metric measurements and we navigate using metres and kilometres, so using the aforementioned ratio 1cm on the map equals 25,000cm, or 250m, on the land. This means that every 4cm on a 1:25,000 map = 1km in real life. To make life easy the blue grid lines (grey on Harvey Maps) are exactly 4cm apart, so every square is 1km by 1km.

The first number (*map distance*) is always 1. The second number (*ground distance*) is different for each scale – the larger the second number is, the smaller the scale of the map. This sounds confusing, but in fact it is easy to understand:

Large scale maps show small features on the land, such as an individual house.

Small scale maps show large features, such as an entire city.

So, a 1:50,000 map has large area (and therefore less detail) on one sheet, whereas a 1:12,500 map has a small area (and therefore more detail) on the same space.

The most popular maps

1:50,000 scale

Ordnance Survey Landranger Maps: 204 of these pink-sleeved maps cover the whole of Great Britain. You'll find footpaths, rights of way and some tourist information features on these maps, but you do lose some detail as compared to smaller scale maps such as the 1:25 000. This means you won't find minor paths, field boundaries, open access areas and public rights of way, or smaller areas of marshland, rocky ground or small streams on these maps. However, don't be put off Landrangers, because they do have their place in walking and mountaineering. Indeed, some Scottish Mountain Rescue teams use these as standard issues where fences and rights of way are unimportant and where they need to view larger areas of land.

Why should I use these? In places where the terrain is extremely complex or very spread out, too much detail can become confusing and the 1:50,000 scale is easier to follow.

1:40,000 scale

Harvey British Mountain Maps: Centred around specific mountain locations in Britain, these have a large area of clear, detailed mapping on one sheet. Layer colouring is used for easy ID of hills and valleys. With detailed enlargements of selected summits, climbers' crags are highlighted too. Mountain incident info is included, as well as a BGS (British Geological Survey) map of the geology of the area.

Harvey National Trail Maps: All the detail needed for sure navigation of your chosen National Trail is shown, with 100 miles of detailed mapping on one sheet along with an introduction to the route. Directions to the start, facilities available in towns and villages, information on finding accommodation, camping and food plus ranger service contacts are all shown.

Harvey Ultramaps: Slim, light and pocket-perfect (weighing 25gms), the unique folding pattern of the compact Ultramaps allows you to open to either side of the sheet. They show all the detail you'd expect on a large-scale walking map, including boundaries, walls, fences and rights of way.

Why should I use these? Like the 1:50,000 scale, these 1:40,000 maps are often preferable in confusingly contoured landscape when a more general view of the shape of the land is required.

1:25,000 scale

Ordnance Survey Explorer Maps: 403 of these orange-sleeved maps cover the whole of Great Britain (with the exception of the Isle of Man, which is excluded from this series). They show the detail of Britain's landscape, minor paths, field boundaries (walls and fences), open access areas and public rights of way (except in Scotland where the 'right to roam' act covers most land), and small areas of marshland, rocky ground and small streams.

Harvey Superwalker Maps: Like the OS Explorers the 1:25,000 scale of the Superwalkers shows land shape in clear and accurate detail. However, although public footpaths, bridleways and other key features are shown, these Harvey maps do away with information irrelevant to the walker, making them appear less cluttered than their Ordnance Survey equivalents.

Why should I use these? Because of the extra detail shown they are superb for micro-navigation when you need to be able to identify as much of the terrain as possible.

1:12,500 scale

Harvey Summit Maps: Although they only cover an area of 4x3km, the extra close-up version of Harvey's maps are used by some Mountain Rescue teams as they are excellent for complex ridges such as the Cuillin on Skye.

Why should I use these? For navigating super-complex mountain summits like those on the notoriously difficult Cuillin Ridge, these maps offer an extremely clear view.

Important considerations when choosing your map

Durability: Using a map cover will protect your map, but these can be unwieldy and you may need to take a paper map out to refold it as you move across terrain – not ideal in the rain. Laminated maps are waterproof and these are good, but my preference is maps that are printed directly onto a plastic material (all Harvey Maps are 100 per cent) as these fold more easily and are less cumbersome.

Buy the most up-to-date maps you can: From the minute they are produced maps start going out of date. New OS maps come with a free digital version of the sheet, which will update automatically – but remember that your paper map will not!

BE AWARE!
Tourist features in blue ink (nature trails, visitor centres and – importantly – ski-lifts) are not placed accurately on any of the above maps. They should NOT be used as navigation aids.

CUSTOMISE YOUR MAP

I place a great deal of emphasis on manually personalising and updating maps; you should do so too. Annotate your maps, indicating streams that have dried up, paths that are incorrect, a rock fall or wash-out, unmarked potholes, new tracks, overgrowth, scree and great areas to wild camp.