

New Leader Weekend

Map & Compass Session

2-hour session plan

The Map & Compass Session is a two-hour session designed to build a basic familiarity with the use of maps and a compass for new leaders who have no experience of using them before. It builds an understanding of basic concepts that will develop the ability of the leaders to begin using a map and compass together for navigating in the countryside. The session has three main parts:

1. Understanding and using a Compass

This part of the session will explain:

- 1.1 the concept of a bearing,
- 1.2 the components of a compass,
- 1.3 how we use a compass to work out and describe a direction of travel,
- 1.4 practice taking the bearing of an object from our current location,
- 1.5 practice setting a bearing on the compass and travelling in a straight line on that bearing before
- 1.6 playing a simple outdoor game to practice the skill of navigating with the compass.

2. Understanding and using a Map

This part of the session will:

- 2.1. build the idea of a map as a picture of the landscape we are standing in,
- 2.2. starting from an undaunting blank piece of paper we describe the idea of saying where we are on the map and develop the ability to give a grid reference of that spot.
- 2.3. From there, we can begin to talk about the things we find on a map and build up to creating a route that we can describe with a series of Grid references.
- 2.4. In a series of small steps, we can begin to talk about distance, height, timings for taking a walk, the things we might expect to see along the way and begin the development of navigation as a plan and record of what we will see as we walk our route.

3. Using a Map and a Compass together

This part of the session we will use the PACCAR orienteering map and a compass together to:

- 3.1 talk about taking a bearing from a map and turning it in to the direction we are going to walk,
- 3.2 using the bearings of two distant objects and turning them in to lines on the map which help us to know where we are standing on the map.
- 3.3 We will then play a simple map and compass game to navigate to an unseen area of the site.

There will be up to 50 participants in the session divided in to groups of 6. Each group will have an instructor. Parts 1 and 2 will run for approximately 45 minutes. Part 3 will run for 30 minutes. To ensure we have enough kit for everyone and to separate out the groups a little, we will have half the groups doing part 1 first and half doing part 2. The groups will then swap over. Finally, all the groups will complete part 3.

There may be varying levels of map and compass experience in each group. As you discover what people know, you may be able to move through the subject at a faster pace. Alternatively, you could ask those with more experience to assist those that are less familiar so that they are part of the delivery of knowledge.

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Part 1 – Understanding and using a Compass

What exactly is a Bearing?

Before we even begin to look at a compass, we can talk about this basic concept. Most people are familiar with giving directions where they may say something like “to get to the Tube station, you go to the end of the street and turn right, walk a 100-meters and then take a left, the station will be right in front of you”. They will also be happy with the idea of explaining to someone that they “walk North on this street, at the end go West for a hundred yards and MacDonalds is there on the left”.

So, we have the idea of going North, East, West or South. We can easily split down between these with things like NW or SE for places in between the major directions. But what if we want to point someone in the direction that is a little bit further West than South West? We need a measure that lets us describe that little bit in a more accurate way... This is where we can bring in the idea of a bearing.

If we turn all the way around on the spot, apart from getting a bit dizzy, we turn through all of the points North, East, South and West, and all of those little bits of direction along the way. So, let’s imagine that there are 360 different directions that we are turning through and let’s call each of those directions a number of degrees that we have turned. (Spot question: Why did I choose 360? – In reality it is simply because it makes the maths a bit easier – trust me on this. If your really want to know why, it was because the Babylonians and separately some people in ancient India over 2500 years ago made it so. Handily, it’s also connected to how people manufacture a compass).

So, for example, if I now turn from North to East, I turn from North to East, I turn through 90 degrees. I can now tell people that I want them to turn through 32 degrees, for example, which is like turning from North to a little bit less than North East.

So, a Bearing, is the amount of turn from north, measured in a number of degrees. Our trusty Compass will now help us to work out these bearings, let’s take a look.

The Parts of a Compass

Our compass is made up of three pieces: The base plate, the compass needle and the round moveable housing that holds the needle. Let’s look at each of these in turn:

The Compass Needle: this is the bit that gives us our main point of reference. The red bit of the needle is the bit that always points to the North (Why, because it is magnetic and is attracted to the north direction by the magnetic field of the earth). Of course, it only points North if the Compass is sitting horizontal and flat.

The Base Plate: this is the bit that has a lot of different markings on it, all of which we can use when we navigate. For the moment, we’re only interested in one of those markings, the arrow head pointing towards the end of the base plate away from the needle and round housing. That arrow head is the thing that we are going to point in the direction where we want to go.

The Round Needle Housing or Dial: this is the bit that helps us work out the bearing of the direction we want to go. It has a dial around the circular edge that is marked with the 360 degrees of bearings that we talked about earlier. Just underneath the dial, at the point where the line towards the arrow



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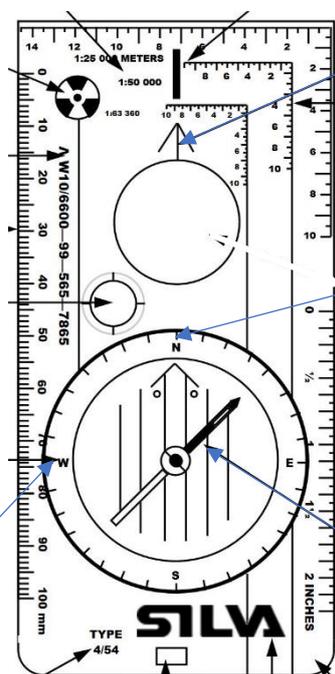
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head on the base plate meets the dial, you can see a small mark that will help us see what our bearing in the direction we want to go is. Let's take a closer look...

Inside the needle housing you can see some markings. There is an arrow with one end coloured red and the other coloured black and there are some lines that run parallel to that arrow. When we turn the dial, we see that the arrow and lines turn with it.

Setting the Compass to a Bearing

What I'd like you to do now is to turn the dial so that the number 60 is at the place where we can read the bearing.



By doing this, we are setting the compass so that we can point ourselves in the direction of a bearing of 60 degrees which is a little bit East of North East.

So, now that we have set the compass with 60 at the place where we can read the bearing, hold the compass flat and horizontal, just in front of your tummy button. What you will see, is the base plate pointing away from you, the needle inside the dial floating free and it will probably not be in line with the arrow marked inside the compass dial. Now, turn yourself using your feet, keeping the compass just in front of your tummy button so that the red end of the needle lines up with the red end of the arrow marked inside the dial. When you have done that, look up and you will be facing a bearing of 60 degrees away from North.

Has everybody got that? Good... 😊 Let's try a few more. Have a go at setting yourself up to face the bearings of 125 degrees, 270 degrees and 48 degrees.

Finding the bearing of something that you can see

Now, from where we are standing, you can see the flagpole circle. What I'd like you to do is hold the compass in front of your tummy button again and point yourself towards the flag in the middle. Looking at the compass now, you will see that the arrow inside the dial is not lined up with the needle. This time, I'd like you to stay standing still and turn the dial so that the arrow inside the dial and the needle are lined up while you keep facing the flag. When they are lined up, take a look at the number in the place where we can read the bearing. Tell me what it is. Hopefully, we all get pretty much the same answer 😊 That answer is the bearing of the flag from where we are standing.

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A small game to navigate using our new compass skill.

What I'd like you to do now is practice moving about along the bearings that you set on the compass. So, I'm going to give you a set of instructions to set a bearing, turn yourself to face that bearing and then walk a short distance. Let's see how we get on.

First, I'd like you to set a bearing of 35 degrees. Now walk 6 paces in that direction.

Now set a bearing of 305 degrees and walk 5 paces. OK?

Now set a bearing of 215 degrees and walk 6 paces. OK?

And, finally set a bearing of 125 degrees and walk 5 paces. Where have you got to?

Hopefully everyone is back where they started. 😊

Leapfrogging – Making sure that we are walking in a straight line on our bearing

If you didn't quite get back to where you set off, it may be that you didn't quite walk in a straight line on one of the bearings. How could we make sure we stay on track?

Yes, we could work together to help each other. Get in to pairs so that we can try a technique called "Leapfrogging". If one of you sets a bearing of 35 degrees on their compass and stands so that they are facing in that direction. The other person can now walk away from them in that direction and go 10 paces, say. If they wander off track, the person standing at the start can ask them to move left or right a little to get them back on track. When they have got 10 meters, the person walking can set their compass to a bearing of 215 degrees and stand themselves looking in that direction, they should be looking at the place they came from and their partner. This is called taking a "back bearing" where we have set the compass exactly 180 degrees more than the original bearing (or pointing it back to where they came from).

Clockface Orienteering

Let's go and do some Compass orienteering. What we're going to do is work in groups of three and do a little competition. I have set up a giant clockface area on the field. 12 o'clock is at the North of the clockface, 3 is East, 6 is South, 9 West and all the other numbers are in between. It is 35 meters from the centre of the clock to the numbers.

I'm going to give each team a card with some bearings and distances to walk along from a starting point somewhere on the clockface. What I want you to do is to follow the bearings and walk those distances in sequence, taking the next bearing from the place you got to after the last bearing and distance. At the end of each leg of that walk, you will be at a point on the clockface where there is a peg, with a letter. Write down the letter. When you reach the end, you will have a word, come and tell me that word. If you get to the end of a leg and there is no peg, go back to where you came from and try again.

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Part 2 – Understanding and using a Map

Before we talk Maps, let's talk about Graphs

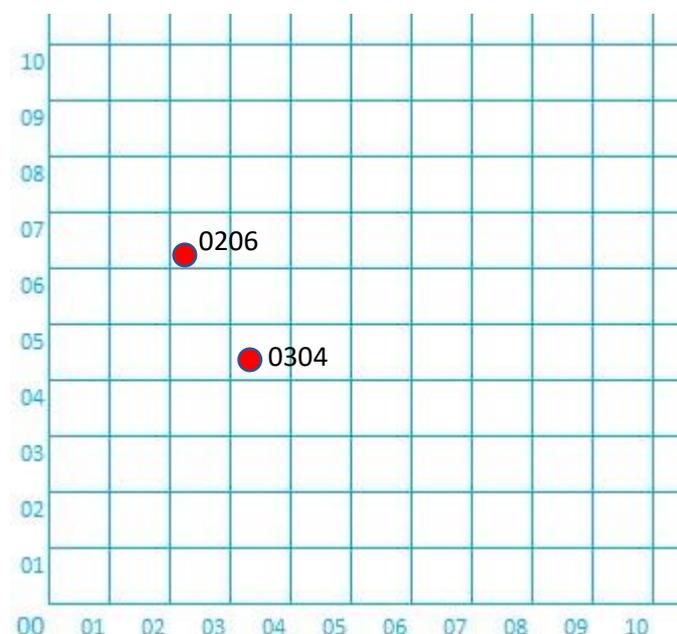
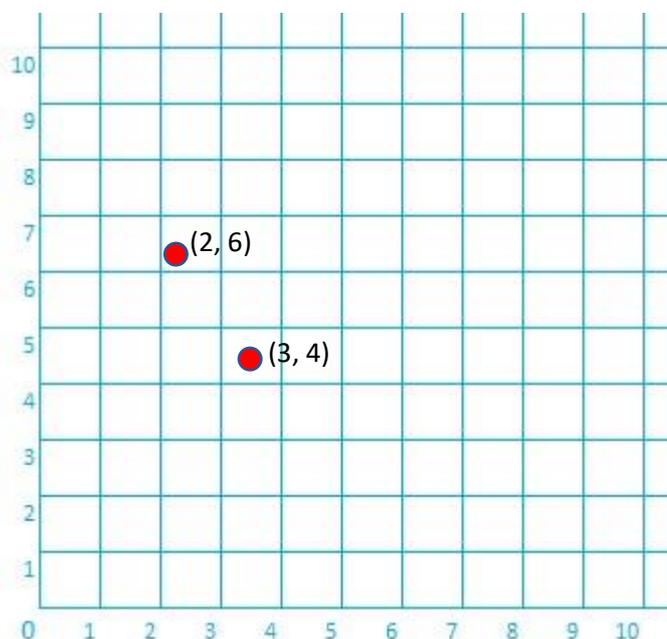
We all did a bit of drawing graphs at school didn't we... So, I want to remind you a little bit about those graphs and how we knew what to draw where. Let's put ourselves in the picture. We will need to take our shoes off to do this...

On the floor here, we have a giant piece of graph paper with lines going up and across the paper. (On the floor there will be a 3mx3m piece of paper with blue lines drawn on it, there will be some cards with the numbers 1, 2, 3, 4, 5, 6, ... on them placed at the bottom and left edge of the lines on paper)

So, if I wanted someone to stand in the square in position 3, 4, for example, where would you stand?

Ok, and if I said square in position 2, 6?

Good, we've all got the idea, we very easily worked out that the numbers at the edges gave us the coordinates of the squares and we used them to identify the square to the left and above the pair of numbers I read out. Ok, everyone, pick a square and stand on it. Tell the person next to you what the coordinates are where you are standing.



Right, now I'm going to make a small change. (swap the number cards for a set of cards that have 00, 01, 02, 03, 04, ...)
Now, what I want you to do is tell me where you are but use both numbers on the lines for the square that you are standing on.

Ok, so what was 2,6 before we're going to say 0206 and what was 3,4 before we're going to call 0304.

So, what we have here is a Grid of lines that make all of these squares and instead of calling the place where we're standing some coordinates, we're going to call it a Grid Reference. Is everyone happy with that? Even more exciting, we're going to

call it a four figure Grid Reference. Why are we going to do that? Yes, because it has four numbers in it ...

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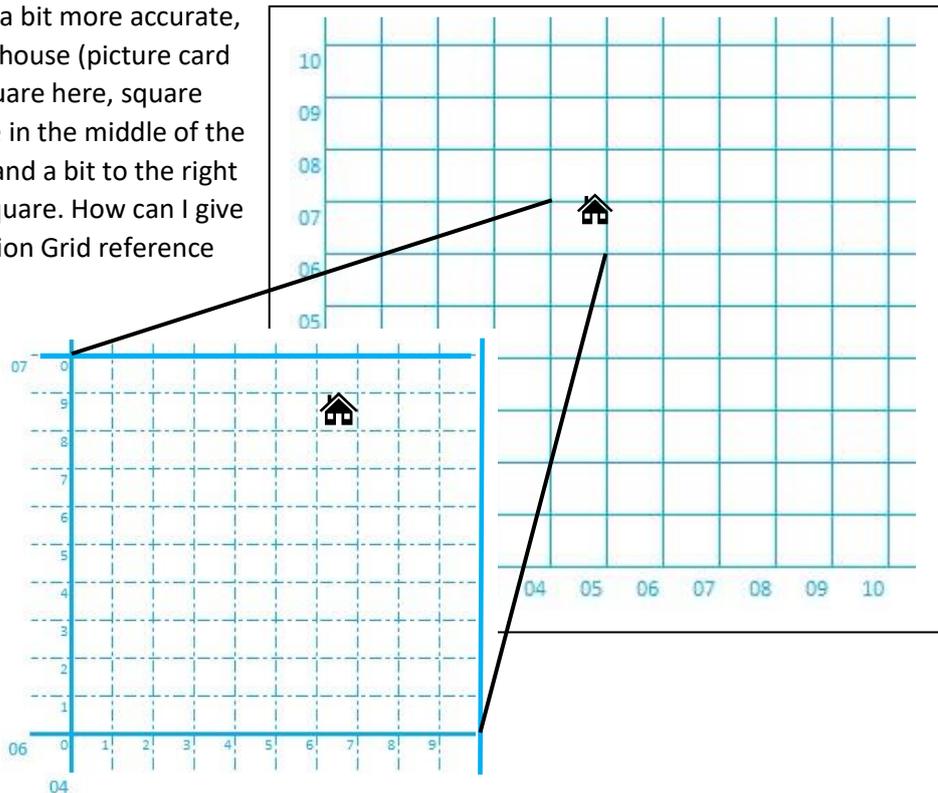
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Ok, now I want to get a bit more accurate, I'm going to place my house (picture card of a house) on this square here, square 0406. But its not quite in the middle of the square, it's a bit high and a bit to the right of the center of the square. How can I give a more accurate position Grid reference for it?

Well, let's imagine that this grid square is divided in to smaller squares 10x10 inside that square 0406. The house is sitting in the mini-square 6,8. So, we can add these two numbers to our Grid reference to

make it 04**6**0**6****8**. And so, now our six-figure grid reference is 046068.



Here are some more cards for you each to add to what is now our map wherever you want to put them. When you have put them on the map, tell me what the six-figure grid reference is for your thing.

Building the layers of Our Map...

Before there were any towns or forests or farms or rivers, what did the land all around us have that shaped the way it looks? Yes, there were hills and valleys. How could we represent them on our map?

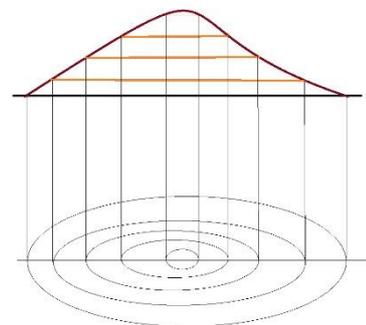
If you imagine a hill (drawn on a piece of flip chart for now) with horizontal slices cut through it then it would look something like this.

And if we were to look down from above on the lines those slices made around the hill then we might see something like the set of round shapes that we can see in the bottom of this picture.

These lines indicate places that are all at the same height on the hill. And they are called? Contours.

So, let's put some contours on to our map. (Place plastic sheet marked with contours on top our grid squares).

Now we can see some hill tops, some valleys and some other land shapes that cover our map and tell us something about the shape of the land around us. Who can tell me the grid reference of one



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of the hill tops? Usually, on the maps we're going to be using today the height difference between the contours is 5 meters. On maps where there are more mountains, the height differences are 10 meters just so the map isn't just end to end contour coloured 😊 ...

What other things might we look for when we're building our map of the countryside?

Place laminated sheets showing: Woodland, roads, railways, streams, footpaths, a farm, a youth hostel, some fences around some fields and some rocky outcrops on to the map.

Distances on our map

Can anyone tell me how far it is between the farm we have placed on our map and the youth hostel? Yes, it depends upon what the scale of the map is. And we haven't defined that yet. So, let's say that the distance between each of our blue grid lines is 1 kilometer. How far is it from the farm to the youth hostel?

How about the distance from one side of the wood to the other?

Or, the distance from the Railway Station to the nearest stream?

Ok so we know how far it is from the farm to the youth hostel. How long will it take us to walk from the farm to the youth hostel? Yes, it depends upon how fast we are going to walk... let's say we will walk at 3 kilometers an hour. (that's 20 minutes per kilometer). How long will it take us?

So now, we can see the things that we have represented on the map, we know the shape of the landscape, we know how far apart everything is and we can work out how long it will take us to walk from place to place. We are already starting to navigate 😊 ...

Let's take a look at a real map of this area.

Chiltern Hills East, OS Landranger Map: 172

In your teams, open out the map on the floor and take a look. As you start to look around the map, you will see some of the things we have been talking about plus a whole lot more. So, let's practice finding things. I'd like you to find Gerrards Cross Town centre and tell me the six-figure grid reference of the railway station in the middle of town. Remember the four-figure part of the grid reference comes from the two-digit numbers in blue at the bottom and side of the map.

Can anyone tell me which way is north on the map? Yes, North is at the top of the page. It's always that way up.

The campsite office here at PACCAR is at grid reference 010907. Can you see it on the map? It's a small square on the map. There is a number showing the height of the contour just next to it. How high are we above sea level in meters?

If you were to follow the green footpath trail outside the office going west, down to the red A-road at the bottom of the hill and then walk along the roads back to Gerrards cross station. How far would it be? And, how long would it take to walk it if we went at 3 kilometres an hour?

Ok, a few quick-fire questions...

How far is it to Amersham town centre from here?

Can you tell me the Grid reference of the pub in Horn Hill about two kilometres north of here?

What height above sea level is the lake to the west of us? (Keep doing this for as long as you like)

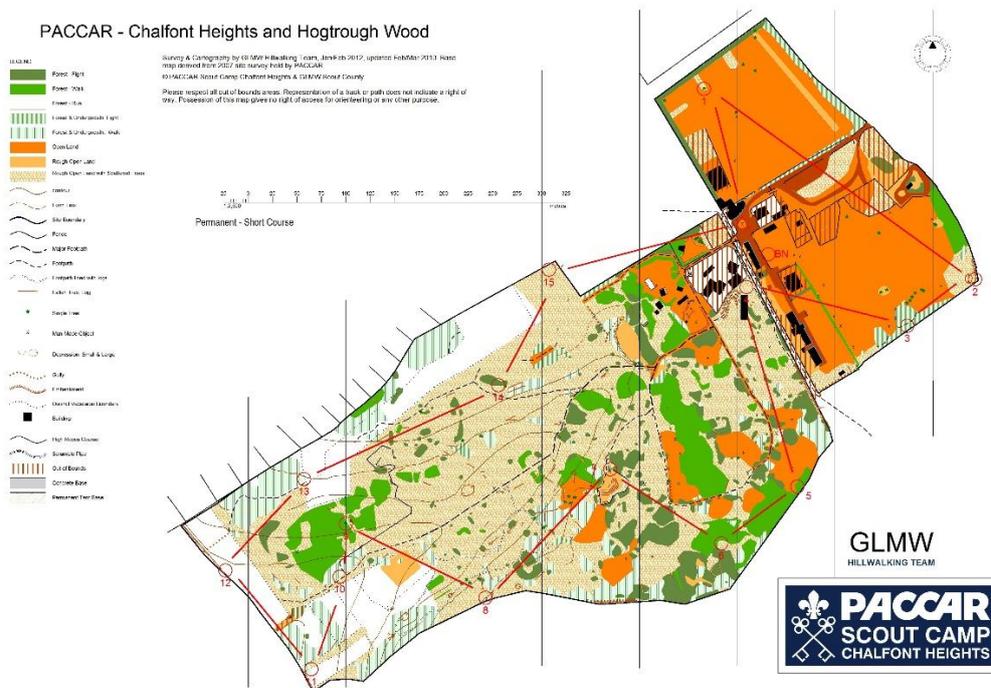
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Part 3 – Using a Map and a Compass together

Ok, so we have practiced using our compass and we've built and done some work with a map. This is where we bring the two together. In this session, we're going to be using a map of the site here at PACCAR which looks a bit different to the OS map we looked at earlier but the principles are the same. The PACCAR map doesn't have grid squares on it but it does have lines pointing to magnetic north, which is where the compass points to.

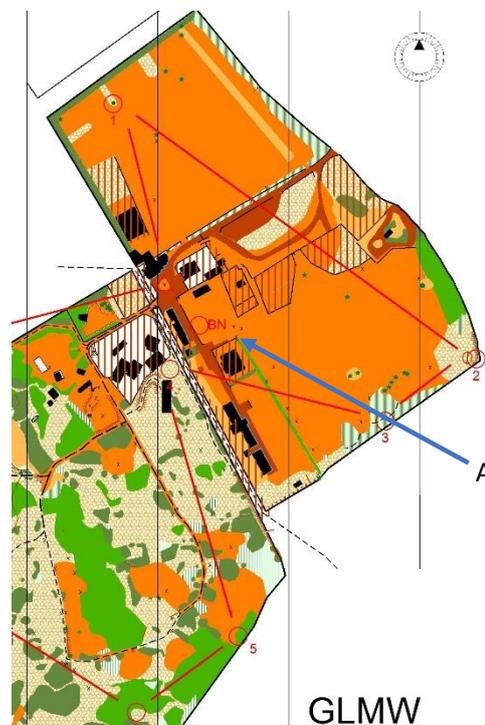


The map was drawn a while ago so there are a few things that have changed since then. Most of the features we're going to use today are still there though. We're going to work in either the Main Field or on Franks Field. So, let's take a closer look at that area.

You can see things like, the main office, the flag circle, the Archery Range, the big tree (green star) in the middle of the main field, the fence around the Pedal Kart track, Rowallan building and more.

What I'd like us to do is go and stand next to something so that you know exactly where you are on the map. Let's say we go stand at the top right corner of the fencing around the Rowallan Building (marked with an "A" and a blue arrow on the map here).

While you are standing there, take a look at the flag circle, and using your compass, work out what the bearing of the flag circle is. (People should get around 314°)



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Now, without adjusting anything on your compass, I'd like you to put the base plate of the compass on to the map with the edge of the plate running through the place you are standing and the middle of the flag circle. You should find that the lines and arrow marked inside the dial line up with the magnetic north lines of the map.

Ok, try that again with a different thing that you can see. The tree in the middle of the field or the corner of the Go kart Track.

So, we can check that we know where we are by taking a bearing of something and seeing if it lines up with the place we're standing.

We can also do this in the other direction to work out what the bearing of something is from where we are standing by using the map. If you put the compass on the map with the edge of the compass running through the place you know we are standing and also through the object you want to work out the bearing for.



Let's say we're going to work out what the bearing of the tree in the middle of the field is. With the edge lined up with where you are and the tree, turn the dial until the lines and arrow in the dial are in line with the magnetic north lines on the map.

Now, without adjusting the dial or base plate lift the compass off the map and hold it in front of your tummy. Turn your body using your feet until the compass needle lines up with the arrow drawn inside the dial. When you have done that, you should be facing the tree on the field.

So, we can work out what the bearing of any object is from where we are standing or we can check that bearing is what we expect it to be.

Now we can use that same skill, to work out exactly where we are on the map. So let's walk out in to the field and do that.

Now that were standing in the middle of the

field we can pick two points, let's say that we choose the Tree in the middle of the field that is marked on the map and the north corner of the Toilet block. For each of these in turn, work out with

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your compass what the bearing of each place is from where you are standing. Don't move from that spot while you are doing it though. When you have a bearing for the first one, place your compass on the map with the edge running through that place and with the arrow inside the dial lined up with the magnetic North lines. Draw a line along the edge with a pencil. Do the same thing for the second place you have chosen and draw a second line. The place where the two lines cross. Is exactly at the point you are standing and is now marked on the map.

Now, here, that is maybe a fairly odd exercise to do but imagine that you are now in the middle of the Snowdonia Mountains and you are maybe a bit unsure of where you are. You recognise a couple of features on the mountains from the map so you can use the bearings of those features to pinpoint your location.

If time allows

Talk about how you can do the same thing using an Ordnance survey map and the vertical gridlines on the map. But, because of the slight difference between Grid North and Magnetic North, we need to make a small adjustment to the bearings we measure (usually only a degree or so at the moment so not wildly critical) So when we take a bearing of something in the real world and we want to check it on the map we need to subtract that degree or so. When we have worked out a bearing from the small world of the map we need to add that degree or so on to the bearing on the compass.

The degree or so is known as the Magnetic Variation. It changes over time as the geology of the Earth shifts. Every map tells you in the margin notes what the Magnetic variation was when the map was drawn and how much it is thought to be changing each year.

As a final exercise, you could work out the bearing of something that you can't see. The corner of the field behind the trees, for example. And then leapfrog towards it to check that you got it right, it's a bit like navigating in the fog until you can actually see your destination.

Thank you