University of Anbar

College of Science

Department of Applied Geology

Field Geology

Title of the lecture

Determining location using a compass

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Triangulation: Determining location using a compass

A further important use of the compass is to determine your position by taking a compass direction (bearing) off at least two, and preferably three, features that are marked on the topographical map of the area – a process known as triangulation. The most accurate triangulation will result from using features that are between about 60 ° and 90 ° apart, but in some cases, this is not possible. The closer the features are to you the more accurately you will be able to find your position. The types of features used are: the corner of a building, corner of a tree plantation, road junction, river confluence, telecommunications mast, and the top of a hill or other distinct feature. Ensure that you take the azimuth and draw the line on the map using the edge of the building or particular side of the road (rather than the middle or general direction) because any small variation will result in an inaccurate position. The point at which the two- or three-lines cross determines your position. If the lines do not cross, one or more of your azimuth readings is poor; recheck your azimuth readings and/or pick another feature to sight off. Alternatively take the midpoint of the triangle figure (5). If you know you are somewhere along a linear feature such as a road just one azimuth sighting from a feature at a high angle to the linear feature can be used to produce a single intersection. However, an azimuth reading from a second feature will reduce the possible error.

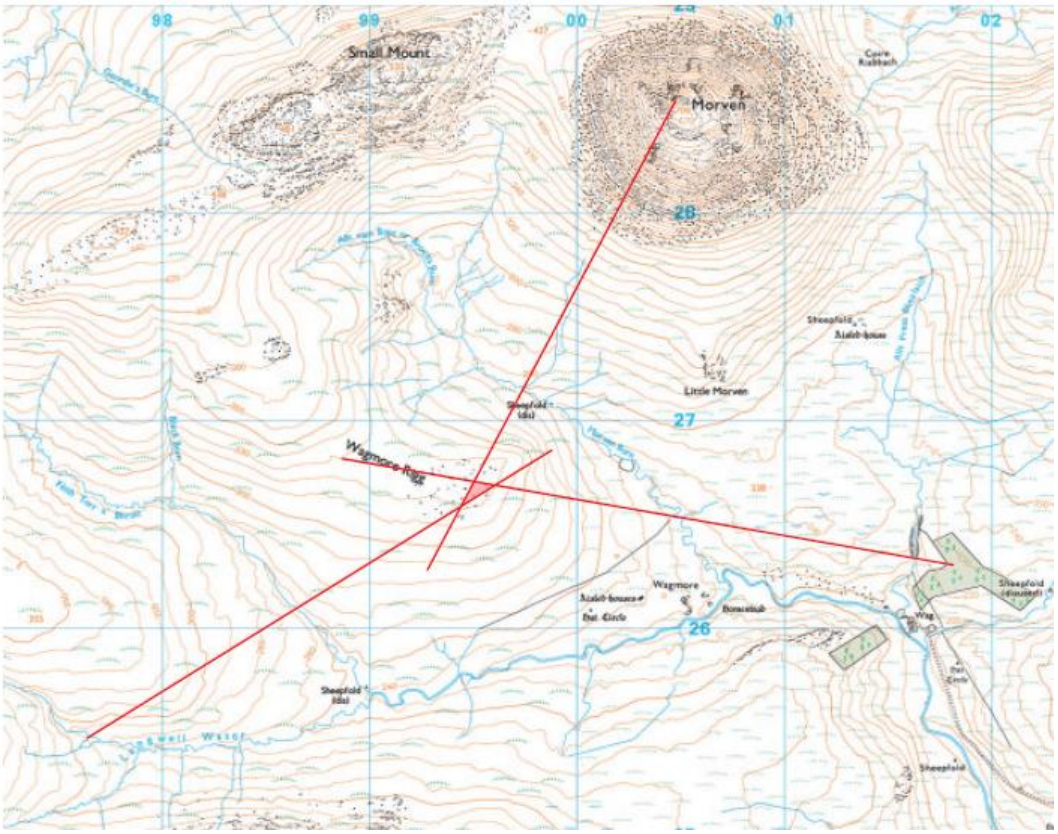

Figure (5) shooting to three features to determine your location on a map

The steps to determine your location on a map as following:

1. Identify features

Identify at least two features on the map and on the ground on which to take bearings by shooting.

2. Measure azimuth

Hold the compass horizontal at waist height with the back of mirror towards you and the mirror at about 120° to the compass window. Line up the feature so that

you can see the feature through the long sight in the mirror, ensuring that the compass is level using the round spirit level. Read off the azimuth.

3. Orientate the map

Put the compass-clinometer on to the map with the long edge of the compass-clinometer parallel to a N–S grid line. Check that you have the compass the correct way round and not 180° out, i.e. that the north needle is pointing roughly north on the map. Rotate the map and compass together until the north needle is at its zero mark. The map is now orientated. Note that the long edge of the compass is parallel to the N–S grid line and the compass needle is at its 0° mark. Note also that the compass has been corrected for magnetic declination.

4. Transfer azimuth to the map

Keeping the map orientated in exactly the same way, place the long edge of the compass so that it runs through the feature that you sighted. Rotate just the compass until the compass needle shows the azimuth of the feature that you sighted off. Draw a feint line along the edge of the compass. You are somewhere along this line.

Global positioning systems and altimeters

Global positioning systems (GPS) use ultra-high frequency radio wave signals from satellites to trigonometrically derive your position to within few meters laterally. A wide range of GPS systems are available on the market and the reader should refer to specialist reviews and literature for more information. Increasingly, mobile phones contain a GPS unit. Global positioning systems units do not work in deep ravines and on some coastal sections; they are also not particularly accurate

for altitude. The GPS can be set up for the particular grid system that you are working with or for a global reference that is based on latitude and longitude. The global reference World Geodetic

System 1984 (WGS84) is the most commonly used. Instructions on how to set up your GPS will be in the manufacturer's manual. After setting it up or modifying any settings, for instance when you go to a new country, it is a good idea to test it out at a known location. The unit may take some time to locate the satellites if the GPS has been moved hundreds of kilometers. If you use a GPS together with hard copy maps as your main location device in the field you should ensure that you also have a ruler with you so that you can accurately plot your position. A GPS should not be a total substitute for basic navigation skills. You should also know how to locate yourself with a map and a compass so that if the GPS goes wrong, the batteries fail, or you are in an area where the satellites are obstructed, you have an alternative means of location and navigation. Alternatively, if you are in an area of the world where the base maps are poor or only available at a small scale, a GPS reading will probably be more precise than compass triangulation and will more easily allow exactly the same locality to be found again. An altimeter is useful for recording elevation more precisely than a GPS when mapping or working in steep terrain, for instance recording a steep stream section. Altimeters use air pressure to measure elevation and this will vary with the weather. You need to calibrate your altimeter by taking a reading when you are at a known elevation at least once a day and throughout the day if the weather is changing significantly.

Reference

Angela L. Coe Tom W. Argles David A. Rothery Robert A. Spicer. 2010 GEOLOGICAL FIELD TECHNIQUES, Department of Earth and Environmental Sciences, The Open University, Walton Hall, Milton Keynes, UK