

Navigation

How do marine electronics help us to navigate?

What have angles got to do with navigation?

Why are there 360° in a circle?

Why are right angles 90° ?

Curriculum Areas

Key stage 3 Geography

Key stage 3 Maths

Key stage 3 Design and technology

Key stage 3 ICT

Learning Objectives:

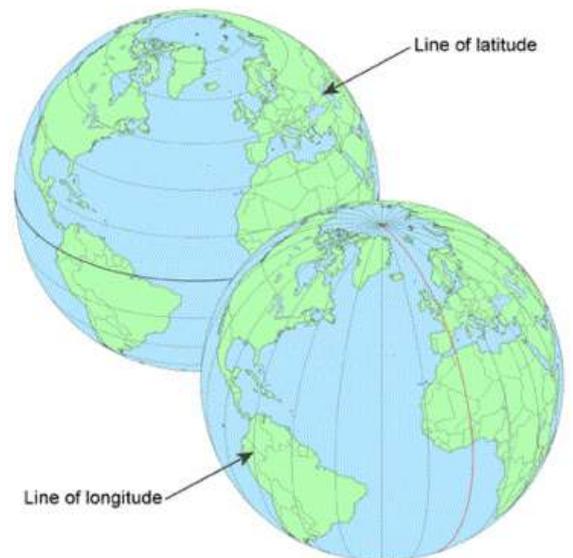
1. What is latitude and longitude
2. Why there are 360° in a circle
3. Characteristics of charts
4. How electronic aids help with navigation.

On planet Earth, navigators need a way to say exactly where they are, and where the nearest land or the dangerous rock that they had just discovered is. The Earth is like a giant ball so how can we describe the location of any rock or ship on it?

A system of lines is used to locate any place on Earth. Lines of **latitude** go from east to west and allow us to say how far north or south we are from the equator. Lines of **longitude** run from north to south and allow us to say how far east or west we are from Greenwich

Latitude

The equator is the latitude line that divides the northern part of the Earth (**northern hemisphere**) from the south. The North Pole is 90° North from the equator.

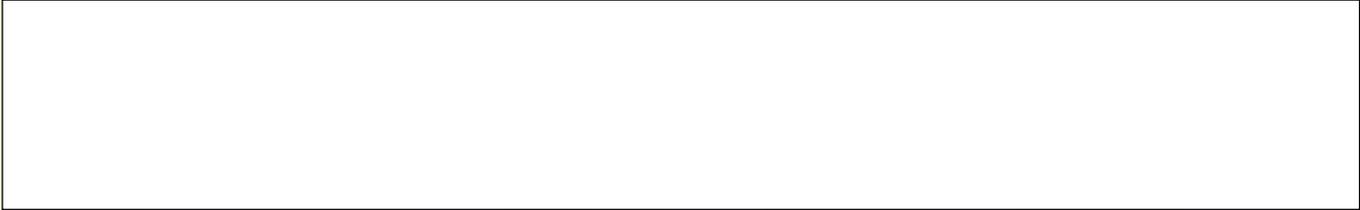


How many degrees south is the South Pole from the equator?

The city of Minneapolis in America is halfway between the equator and the North Pole so it's latitude is 45° North

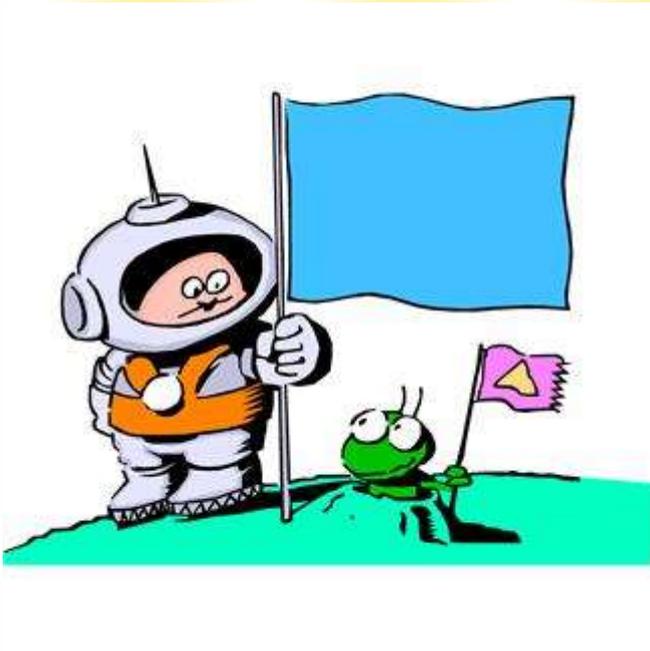
Longitude

A line on the Earth's surface going from the North Pole to the South Pole is called a line of longitude or **a meridian**. The **Prime Meridian** is a line that goes from the North Pole to the South Pole and runs through Greenwich in London.



But, why are there 360° in a circle?

The Story of Zog and Bob



Far out in the left hand spiral arm of our galaxy, there was an argument going on.

You see space explorer Bob, and the little green space explorer Zog were arguing about the best way to map a new planet called Oceanis, which they had both discovered together.

Zog loved the decimal system as it was easy to do sums with tens and argued that there should be 100° degrees to go right around the planet. Bob said “No 360 can be divided into whole numbers more times, so there

should be 360° to go right around Oceanis”

Who was right?

How many different ways are there of dividing 100? For example $100 \div 1 = 100$ and $100 \div 2 = 50$, but does $100 \div 3$ exactly? Write out each sum that gives a whole number answer.

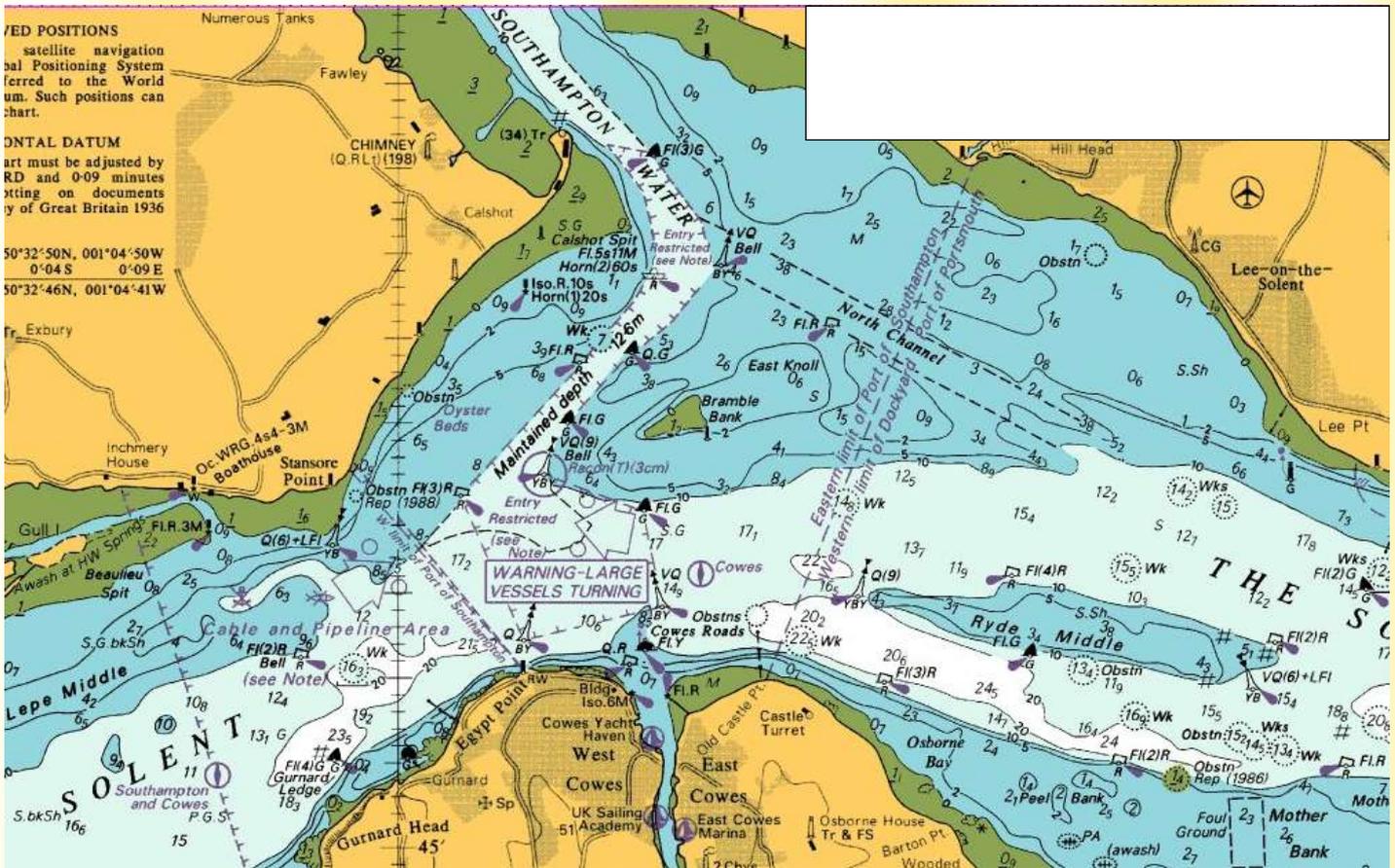
How many different ways are there of dividing 360? Do the same as you did for 100.

Navigation at Sea

At sea sailors use special maps called **Marine Charts**



The British Isles Chart is for planning long journeys by sea, it doesn't show enough detail to show where actual shallows are, or the details of harbours. For normal navigation sailors use charts showing a lot more detail. This part of the Solent chart.



Bramble Bank Cricket Match



Hilary Lister's sail around the UK

Hilary is a record breaking sailor; she is the first quadriplegic woman to have sailed across the English Channel singlehanded and the first quadriplegic woman to **circumnavigate** Britain (sail right round Britain). You can find out more about Hilary on her Website <http://www.hilarylister.com>

Before setting off on any of her voyages she needs to have a **passage plan** (a plan of the route she intends to sail). The passage plan includes location of each place on her route and the lengths of each leg of the route.

Hilary has a specially adapted sailing boat. She is able to control the sails and rudder by sucking and blowing on straws linked to electronics, that in turn control sail winches and an autopilot.

To find out how this was developed watch this short video clip <http://vimeo.com/34792842>



At the Boat Show

Hilary uses electronic navigation aids to help her sail her boat. Find out how electronic instruments can help with navigation by answering these questions.

- 1.) What is an autopilot and how does it work?
- 2.) What is a chart plotter?
- 3.) What is radar?
- 4.) How can sailors find out how deep the sea is under their boat?
- 5.) What does A.I.S. stand for, and how might it help reduce boat crashes?
- 6.) What is a D.S.C. radio, and how might it help summon help if your boat catches fire?
- 7.) Can you find any smart phone applications to help with navigation at sea? Do they need any electronic kit to be fitted into the boat?

A **Nautical Almanac** is a book that anyone who plans to go to sea should keep a copy of on board their boat. As well as giving the times of the high tides, it is very useful for passage planning. It will also have the latitude and longitude of all of the ports that Hilary Lister used in her round Britain voyage.

You can have a go at plotting Hilary's round Britain passage without an almanac if you have either a school atlas that has latitude and longitude lines or a map of the UK that shows latitude and longitude (you can find this online if you search for "map of uk latitude and longitude")

You may choose to do the entire route, or just the section of coast that is nearest your school.

Port	Latitude	Longitude
Dover		
Eastbourne		
Brighton		
Chichester		
Lymington		
Portland		
Brixham		
Salcombe		
Mevagissey		
Newlyn		
Padstow		
Milford Haven (Pembroke Dock)		
Fishguard		
Arklow		
Wicklow		
Howth		
Carlingford Lough		
Ardglass		
Portpatrick		
Troon		
Tarbert		
Ardrishaig / Crinan Canal / Crinan		
Dunstaffnage		
Fort William		
Caledonian Canal		
Inverness		
Whitehills		
Banff		
Peterhead		

Stonehaven		
Arbroath		
Dunbar		
Eyemouth		
Blyth		
Hartlepool		
Scarborough		
Bridlington		
Grimsby		
Blakeny		
Yarmouth		
Harwich		
Ramsgate		
Dover		