

As outcomes, Year 8 pupils should, for example:

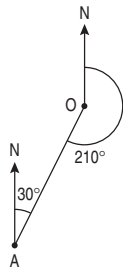
Bearings

Use, read and write, spelling correctly: bearing, three-figure bearing... and compass directions.

Use bearings to specify direction and solve problems, including making simple scale drawings.

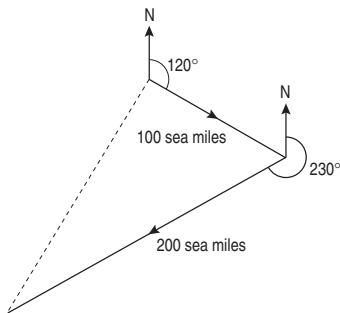
Know that the bearing of a point A from an observer O is the angle between the line OA and the north line through O, measured in a clockwise direction.

In the diagram the bearing of A from O is 210°. The three-figure bearing of O from A is 030°.



For example:

- If the bearing of P from Q is 045°, what is the bearing of Q from P?
- If the bearing of X from Y is 120°, what is the bearing of Y from X?
- A ship travels on a bearing of 120° for 100 sea miles, then on a bearing of 230° for a further 200 sea miles. Represent this with a scale drawing. What is the ship's distance and bearing from the starting point?



Link to angles and lines (pages 178–83), and scale drawings (pages 216–17).

As outcomes, Year 9 pupils should, for example:

Compound measures

Use, read and write, spelling correctly: speed, density, pressure... and units such as: miles per hour (mph), metres per second (m/s).

Understand that:

- **Rate** is a way of comparing how one quantity changes with another, e.g. a car's fuel consumption measured in miles per gallon or litres per 100 km.
- The two quantities are usually measured in different units, and 'per', the abbreviation 'p' or an oblique '/' is used to mean 'for every' or 'in every'.

Know that if a rate is **constant** (uniform), then the two variables are in direct proportion and are connected by a simple formula. For example:

- **speed** = $\frac{\text{distance travelled}}{\text{time taken}}$
- **density** = $\frac{\text{mass of object}}{\text{volume of object}}$
- **pressure** = $\frac{\text{force on surface}}{\text{surface area}}$

Know that if a rate varies, the same formula can be used to calculate an **average rate**. For example:

- A cyclist travels 36 miles in 3 hours. Her **average speed** is 12 mph.

Solve problems involving average rates of change.

For example:

- The distance from London to Leeds is 190 miles. An Intercity train takes about 2¼ hours to travel from London to Leeds. What is its average speed?
- a. A cyclist travels 133 km in 8 hours, including a 1 hour stop. What is her average cycling speed?
b. She cycles for 3 hours on the flat at 20 km/h and 1½ hours uphill at 12km/h. What is her total journey time?
c. The cyclist travels 160km at an average speed of 24km/h. How long does the journey take?
- Naismith's rule, used by mountain walkers, says that you should allow 1 hour for every 3 miles travelled and ½ hour for each 1000ft climbed. At what time would you expect to return from a walk starting at 09:00, if the distance is 14 miles and 5000 feet have to be climbed, allowing an extra 2 hours for stops and possible delays?

Use speed, density and pressure in other subjects, such as science or physical education.

Link to formulae and direct proportion in algebra (pages 136–7), and distance–time graphs (pages 172–7).