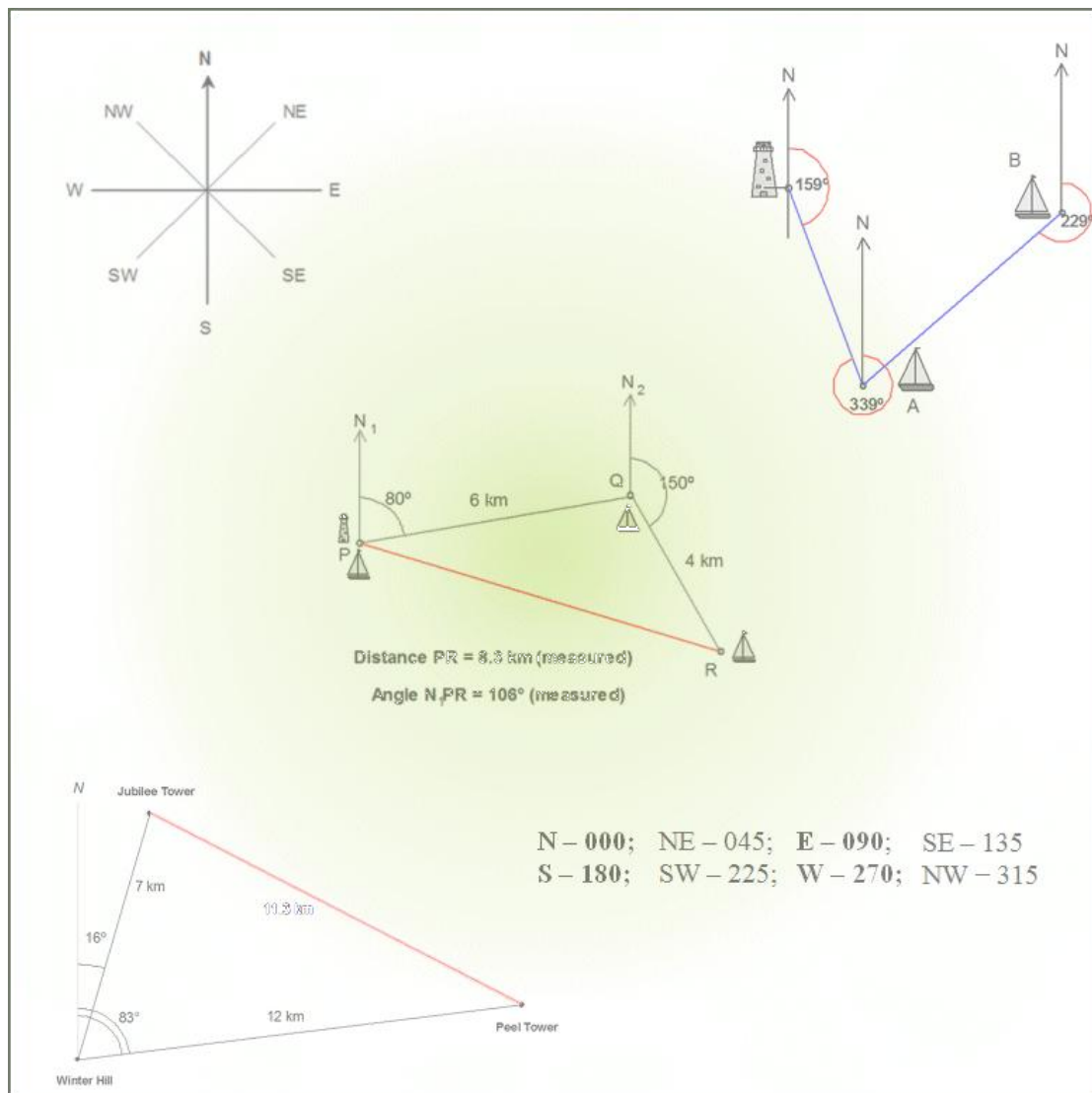


# M.K. HOME TUITION

Mathematics Revision Guides

Level: GCSE Foundation Tier

## COMPASS DIRECTION AND BEARINGS

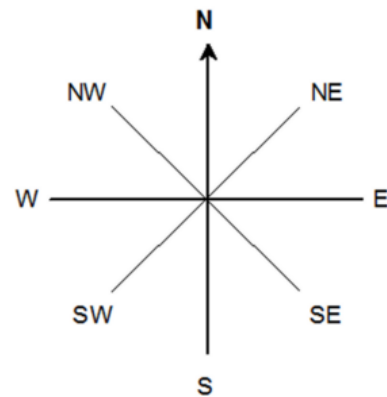


## COMPASS DIRECTION AND BEARINGS.

The principal points of the compass need no introduction, but are shown here for convenience.

The north, south, east and west are known as cardinal points.

The main source of confusion with compass points is wind direction: a westerly wind is **coming from** the west and actually heading **east**, and not heading towards the west.



### Bearings.

A **bearing** of a point **B** from point **A** is its compass direction generally quoted to the nearest degree, and stated as a number from  $000^\circ$  (North) to  $359^\circ$ .  
(In practice, leading zeros are included, and degree symbols omitted, when quoting bearings.)

Bearings are measured **clockwise** from the **northline**. More often than not, the northline is given in the question.

**Example(1):** Express the eight points of the compass shown in the diagram as bearings from north.

N –  $000^\circ$ ;      NE –  $045^\circ$ ;      E –  $090^\circ$ ;      SE –  $135^\circ$   
S –  $180^\circ$ ;      SW –  $225^\circ$ ;      W –  $270^\circ$ ;      NW –  $315^\circ$

Examination questions on compass direction and bearing will usually ask for a scale drawing, or taking measurements.

**Example(2):** Find the following bearings to the nearest degree, using the actual points closest to each symbol:

- the bearing of yacht **A** from the lighthouse
- the bearing of the lighthouse from yacht **A**
- the bearing of yacht **A** from yacht **B**



Since we are being asked to find bearings from each of the three reference points, we first need to draw northlines parallel to the given one, and then measure the required angles.



Having drawn the northlines, it is a simple matter of measuring the required angles.

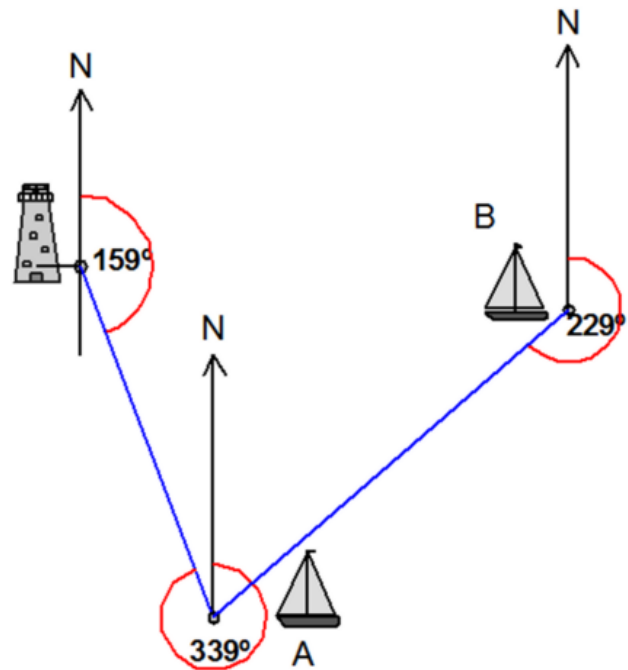
i) Yacht **A** is on a bearing of  $159^\circ$ , i.e. between southeast and south of the lighthouse.

ii) Conversely the bearing of the lighthouse from yacht **A** is measured as  $339^\circ$ , i.e. between northwest and north of the yacht. (To measure this reflex angle, we would have to measure the small  $21^\circ$  angle and subtract from  $360^\circ$ ).

When such readings are quoted in pairs, this 'reverse' reading is sometimes called a back bearing.

Such pairs of bearings are compass opposites, and therefore they are always separated by  $180^\circ$ .

iii) Yacht **A** is similarly measured as being on a bearing of  $229^\circ$ , or about southwest of yacht **B**.



**Example (3):** A sailor passes a lighthouse at point **P** and sails for 6 km on a bearing of  $080^\circ$  until he reaches point **Q**. He then changes direction to sail for 4 km on a bearing of  $150^\circ$ .

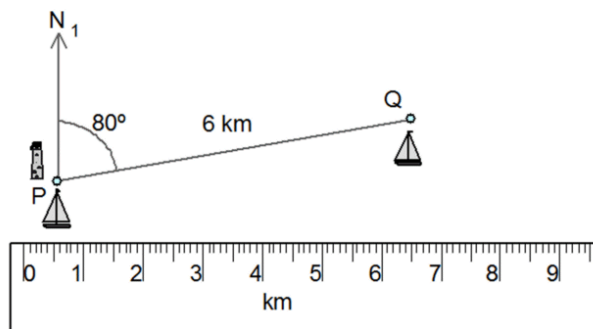
Draw a scale diagram (1cm to 1 km) to work out his distance and bearing from the lighthouse at point **R**, after the second stage of his sailing.

Although the diagram shows graphics of the boat and lighthouse, these are not necessary. Only the points and northlines need to be shown.

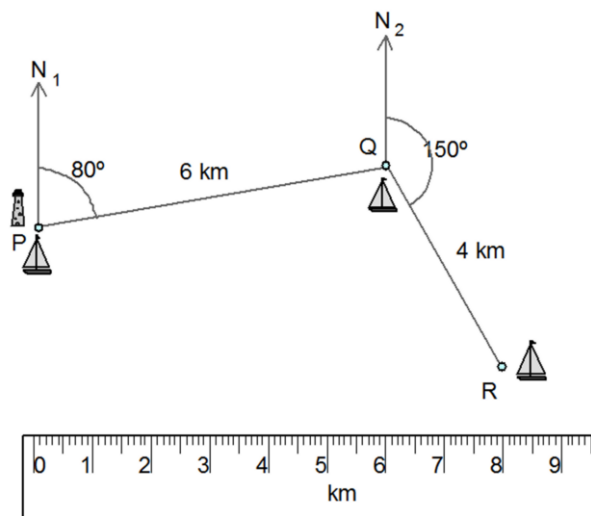
(See the document “Angle Problems” on how to construct accurate angles using a protractor).

**Stage 1:** With a protractor centred on point **P** and the  $0^\circ$  line mark aligned at northline  $N_1$ , mark a point  $80^\circ$  clockwise from that northline.

Complete the line from **P** passing through the marker point, and plot point **Q**, 6 cm along the line.

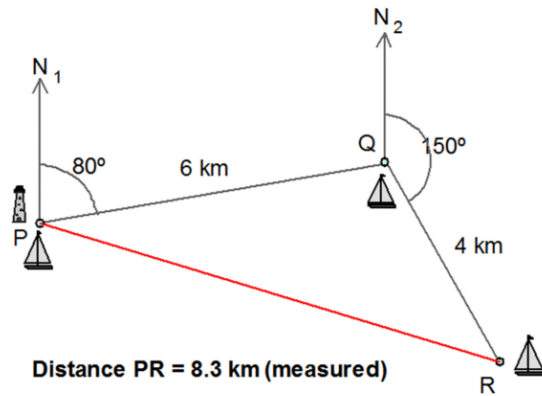


**Stage 2:** Draw another northline  $N_2$  parallel to  $N_1$  at point **Q**. With a protractor centred on point **Q** and the  $0^\circ$  line aligned at northline  $N_2$ , mark a point  $150^\circ$  clockwise from northline  $N_2$ . Complete the line from **Q** passing through the marker point, and plot point **R** 4 cm along the line.



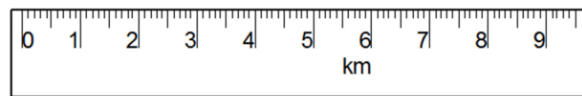
**Stage 3:** Draw the line **PR** and measure both its length and the angle it makes clockwise with the northline  $N_1$ .

$\therefore$  From the completed diagram, the boat at **R** is 8.3 km from the lighthouse, and at a bearing of  $106^\circ$  from it.



Distance PR = 8.3 km (measured)

Angle  $N_1PR = 106^\circ$  (measured)

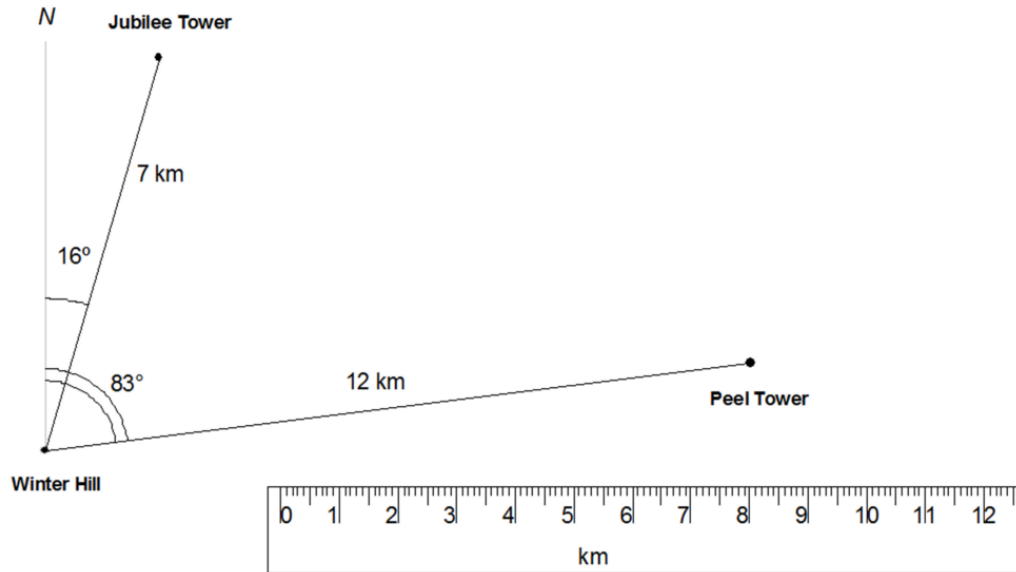


**Example (4):** Peel Tower is 12 km from Winter Hill, on a bearing of  $083^\circ$ , whereas Jubilee Tower is 7 km from Winter Hill, on a bearing of  $016^\circ$ .

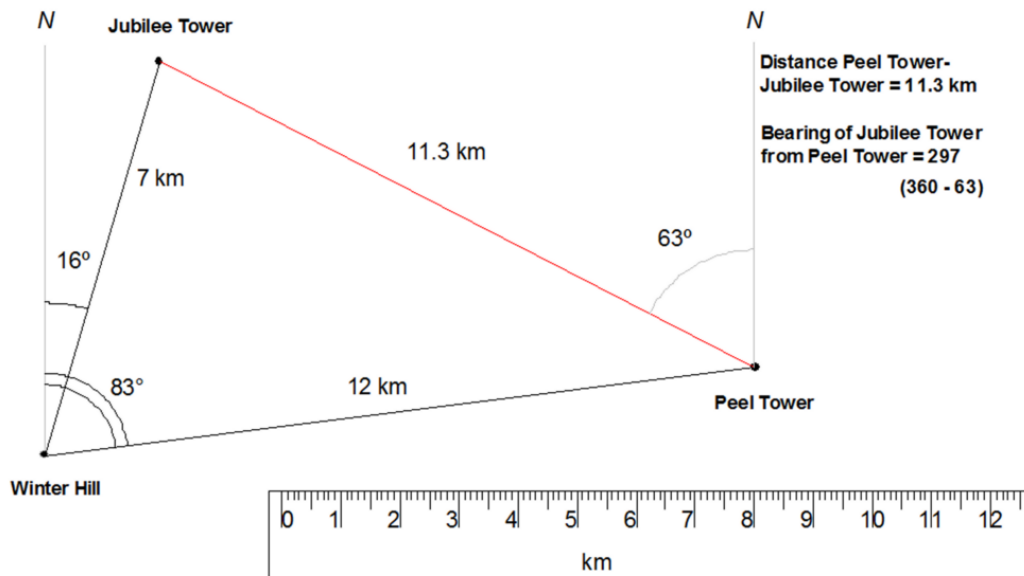
Draw an accurate scale diagram (suggested scale: 1 cm to 1 km) showing the above details.  
Use your diagram to find the distance and bearing of Jubilee Tower from Peel Tower.

**Stage 1:** Draw the northline from Winter Hill, mark off a clockwise angle of  $83^\circ$  using a protractor, and draw a line from Winter Hill passing through the marker point. Plot the position of Peel Tower, 12 cm along that line.

**Stage 2:** Using the same northline from Winter Hill, mark off a clockwise angle of  $16^\circ$ , and draw another line through *that* marker point. Plot Jubilee Tower 7 cm along that line.



**Stage 3:** Complete the triangle by drawing in the side joining Peel Tower to Jubilee Tower, and draw a northline from Peel Tower. Note how the resulting bearing is a reflex angle, so we measure the smaller acute angle of  $63^\circ$  and subtract from  $360^\circ$  to obtain the true clockwise bearing.



$\therefore$  The distance between Peel Tower and Jubilee Tower is about 11.3 km, and the bearing of Jubilee Tower from Peel Tower is  $297^\circ$ .