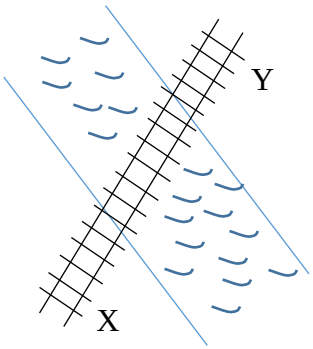
Section 3: The sine and cosine rules

Exercise level 3 (Extension)

1. A surveyor walks 40 metres from the base of a vertical radio mast PQ across horizontal ground to a point A. She then measures that the foot of the mast is on a bearing of 030°, and the angle of elevation of the top of the mast is 42°. She then walks due East to point B, where she measures the new angle of elevation as 31°.

   (i) Draw a diagram to show the configuration.
   (ii) How far has she walked from A to B?
   (iii) What is the bearing of the foot of the mast from her at point B?

2. A railway bridge is to be built at an angle across a canal as in the diagram. The railway runs in a straight line in a direction 040°, and the ends of the final support columns of the bridge are to be built at X and Y, each 10 metres along the railway from the banks of the canal. A surveyor walks 40 metres due South from point X to point Z, and the bearing of point Y is now 022°.



   (i) What is the length of the bridge from X to Y?
   (ii) The canal flows in the direction 155°, and where the bridge crosses it, the banks are straight, and parallel. What is the width of the canal?
   (iii) The highest point of the bridge structure is above H, exactly half-way between X and Y. What is the bearing of that point from the surveyor at Z?