Advanced sector and triangle

1. The following diagram shows a circle, centre O and radius r mm. The circle is divided into five equal sectors.

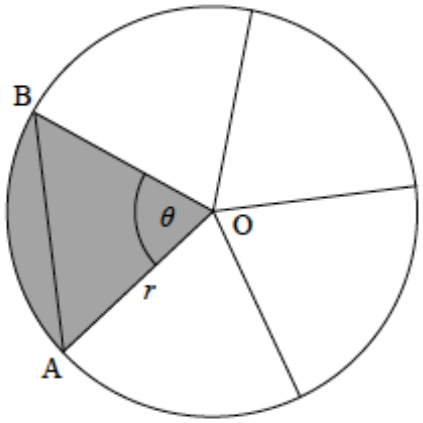


diagram not to scale

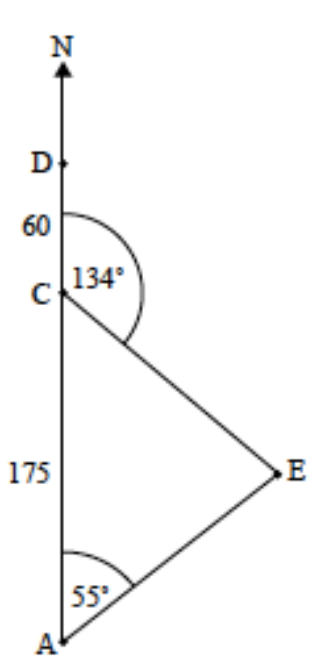
One sector is OAB and angle AOB = θ.

(a) Write down the exact value of θ in radians.

The area of sector AOB is 20π mm^2.

(b) Find the value of r.
(c) Find AB.

2. A ship is sailing north from a point A towards point D. Point C is 175 km north of A. Point D is 60 km north of C. There is an island at E. The bearing of E from A is 055°. The bearing of E from C is 134°. This is shown in the following diagram.



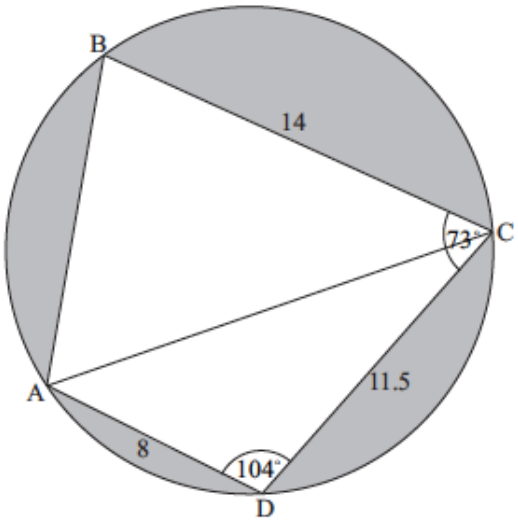
(a) Find the bearing of A from E.

(b) Find CE.

(c) Find DE.

(d) When the ship reaches D, It changes direction and travels directly to the island at 50 km per hour. At the same time the ship changes direction, a boat starts travelling to the island from a point B. This point B lies on (AC), between A and C, and is the closest point to the island. The ship and the boat arrive at the island at the same time. Find the speed of the boat.

3. The diagram shows a circle of radius 8 metres. The points ABCD lie on the circumference of the circle.



BC = 14 m, CD = 11.5 m, AD = 8 m, $A\hat{D}C = 104°$, and $B\hat{C}D = 73°$

(a) Find AC.

(b) (i) Find angle ACD.
(ii) Hence, find angle ACB.

(c) Find the area of triangle ADC.

(d) Hence or otherwise, find the total area of the shaded regions.