

6.

Figure 1

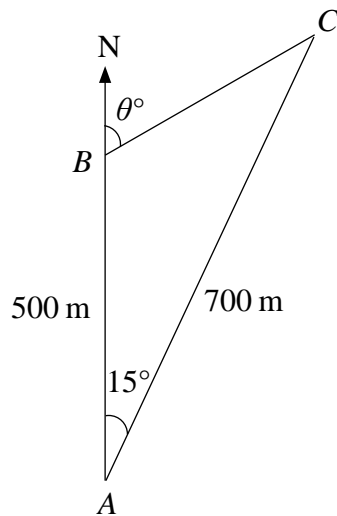


Figure 1 shows 3 yachts  $A$ ,  $B$  and  $C$  which are assumed to be in the same horizontal plane. Yacht  $B$  is 500 m due north of yacht  $A$  and yacht  $C$  is 700 m from  $A$ . The bearing of  $C$  from  $A$  is  $015^\circ$ .

- (a) Calculate the distance between yacht  $B$  and yacht  $C$ , in metres to 3 significant figures. (3)

The bearing of yacht  $C$  from yacht  $B$  is  $\theta^\circ$ , as shown in Figure 1.

- (b) Calculate the value of  $\theta$ . (4)

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7.

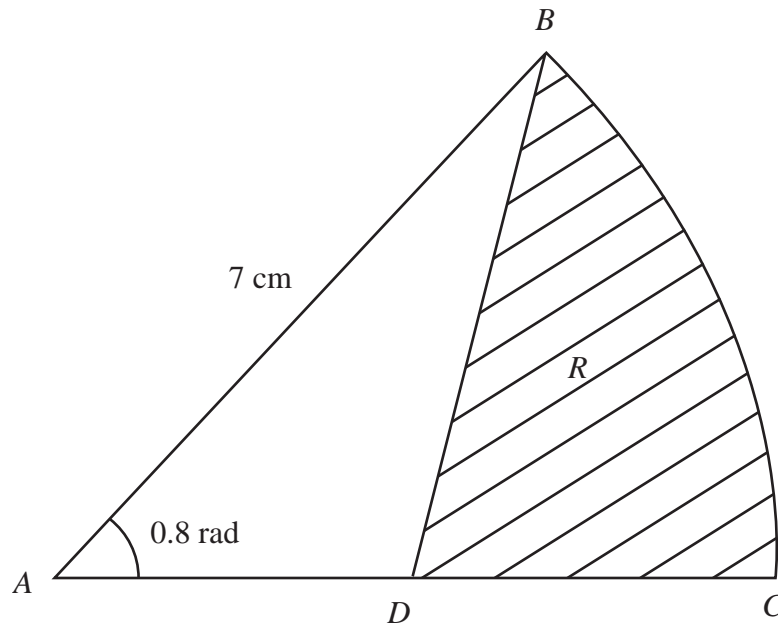
**Figure 1**

Figure 1 shows  $ABC$ , a sector of a circle with centre  $A$  and radius  $7\text{ cm}$ .

Given that the size of  $\angle BAC$  is exactly  $0.8$  radians, find

- (a) the length of the arc  $BC$ , (2)
- (b) the area of the sector  $ABC$ . (2)

The point  $D$  is the mid-point of  $AC$ . The region  $R$ , shown shaded in Figure 1, is bounded by  $CD$ ,  $DB$  and the arc  $BC$ .

Find

- (c) the perimeter of  $R$ , giving your answer to 3 significant figures, (4)
- (d) the area of  $R$ , giving your answer to 3 significant figures. (4)

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7.

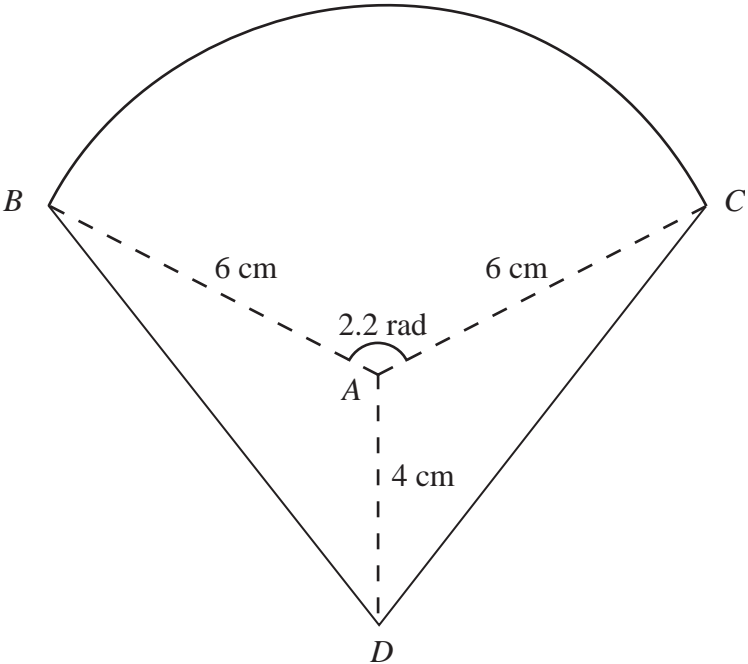


Figure 3

The shape  $BCD$  shown in Figure 3 is a design for a logo.

The straight lines  $DB$  and  $DC$  are equal in length. The curve  $BC$  is an arc of a circle with centre  $A$  and radius  $6\text{ cm}$ . The size of  $\angle BAC$  is  $2.2$  radians and  $AD = 4\text{ cm}$ .

Find

- (a) the area of the sector  $BAC$ , in  $\text{cm}^2$ , (2)
  
- (b) the size of  $\angle DAC$ , in radians to 3 significant figures, (2)
  
- (c) the complete area of the logo design, to the nearest  $\text{cm}^2$ . (4)

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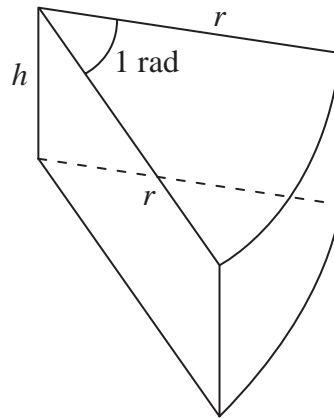
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9.



**Figure 2**

Figure 2 shows a closed box used by a shop for packing pieces of cake. The box is a right prism of height  $h$  cm. The cross section is a sector of a circle. The sector has radius  $r$  cm and angle 1 radian.

The volume of the box is  $300 \text{ cm}^3$ .

(a) Show that the surface area of the box,  $S \text{ cm}^2$ , is given by

$$S = r^2 + \frac{1800}{r} \quad (5)$$

(b) Use calculus to find the value of  $r$  for which  $S$  is stationary. (4)

(c) Prove that this value of  $r$  gives a minimum value of  $S$ . (2)

(d) Find, to the nearest  $\text{cm}^2$ , this minimum value of  $S$ . (2)

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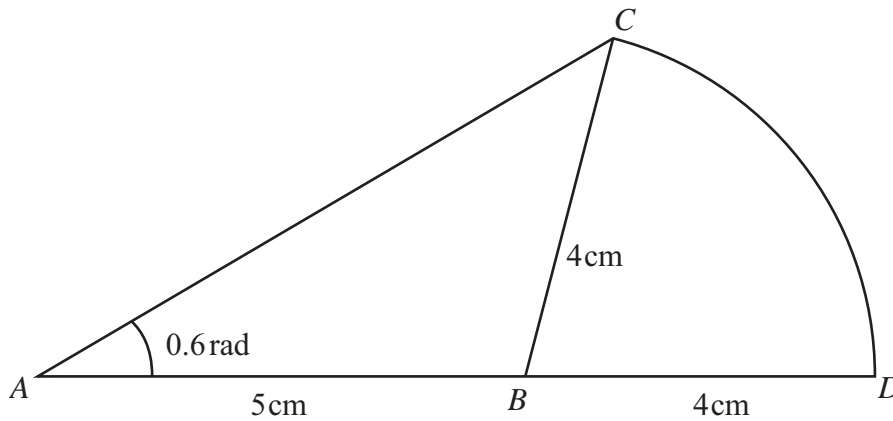
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4.

**Figure 1**

An emblem, as shown in Figure 1, consists of a triangle  $ABC$  joined to a sector  $CBD$  of a circle with radius 4 cm and centre  $B$ . The points  $A$ ,  $B$  and  $D$  lie on a straight line with  $AB = 5$  cm and  $BD = 4$  cm. Angle  $BAC = 0.6$  radians and  $AC$  is the longest side of the triangle  $ABC$ .

(a) Show that angle  $ABC = 1.76$  radians, correct to 3 significant figures. (4)

(b) Find the area of the emblem. (3)

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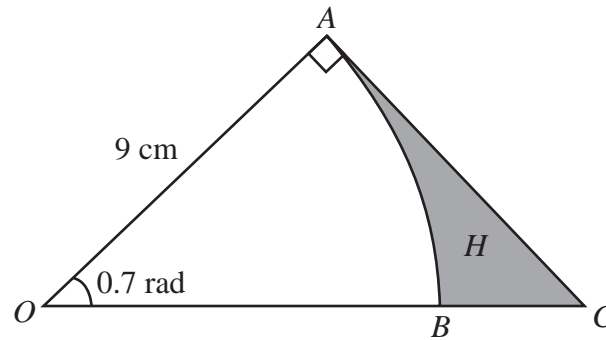
**Figure 1**

Figure 1 shows the sector  $OAB$  of a circle with centre  $O$ , radius 9 cm and angle 0.7 radians.

(a) Find the length of the arc  $AB$ . (2)

(b) Find the area of the sector  $OAB$ . (2)

The line  $AC$  shown in Figure 1 is perpendicular to  $OA$ , and  $OBC$  is a straight line.

(c) Find the length of  $AC$ , giving your answer to 2 decimal places. (2)

The region  $H$  is bounded by the arc  $AB$  and the lines  $AC$  and  $CB$ .

(d) Find the area of  $H$ , giving your answer to 2 decimal places. (3)

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