

Cambridge International AS & A Level

Mathematics 9709

Paper 1 Pure Mathematics 1

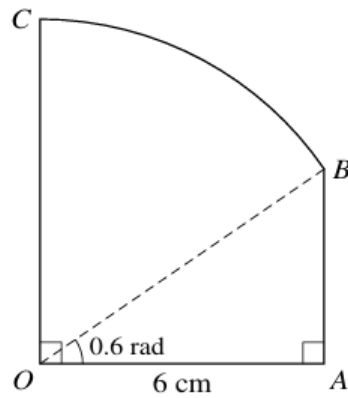
Topic 4-Circular Measure

Question No (17)

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Question No (17)

The diagram shows a metal plate $OABC$, consisting of a right-angled triangle OAB and a sector OBC of a circle with centre O . Angle $AOB = 0.6$ radians, $OA = 6$ cm and OA is perpendicular to OC .

- (i) Show that the length of OB is 7.270 cm, correct to 3 decimal places.
- (ii) Find the perimeter of the metal plate.
- (iii) Find the area of the metal plate.

Solution

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(i) From the right angled triangle OAB

$$\cos(0.6) = \frac{\text{base}}{\text{hypotenuse}}$$

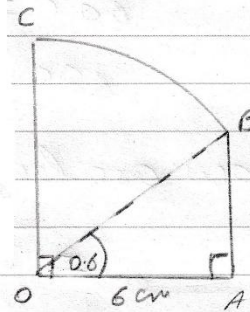
$$\cos(0.6) = \frac{6}{OB}$$

$$OB = \frac{6}{\cos(0.6)}$$

$$= \frac{6}{0.8253}$$

$$OB = 7.270$$

∴ length of OB is 7.270 cm



(ii) perimeter of the metal plate from triangle OAB

$$\tan(0.6) = \frac{AB}{OA}$$

$$\tan(0.6) = \frac{AB}{6}$$

$$AB = 6 \tan(0.6)$$

$$= 6(0.6841)$$

$$AB = 4.105 \text{ cm}$$

From fig

$$\widehat{BOC} = \frac{\pi}{2} - 0.6$$

$$\widehat{BOC} = 0.971 \text{ radians}$$

Now arc length BC

$$= r\theta$$

$$= (7.270)(0.971)$$

$$\widehat{BC} = 7.057$$

$$\checkmark s = r\theta$$

$$\checkmark OB = r = 7.270$$

$$\theta = \widehat{BOC} = 0.971$$

\therefore Perimeter of the plate is

$$= OA + AB + \widehat{BC} + OC$$

$$= 6 + 4.105 + 7.057 + 7.270$$

$$= 24.4 \text{ cm}$$

(iii) Area of the plate

$$= \text{Area of triangle } OAB + \text{Area of sector } OBC$$

$$= \frac{1}{2}(\text{base})(\text{height}) + \frac{1}{2}r^2\theta$$

$$= \frac{1}{2}(6)(4.105) + \frac{1}{2}(7.270)^2(0.971)$$

$$= 12.315 + 25.660$$

$$= 38 \text{ cm}^2$$

$$\checkmark r = 7.270$$

$$\theta = \widehat{BOC} = 0.971$$