

Cambridge International AS & A Level

Mathematics

9709

Paper 1 Pure Mathematics 1

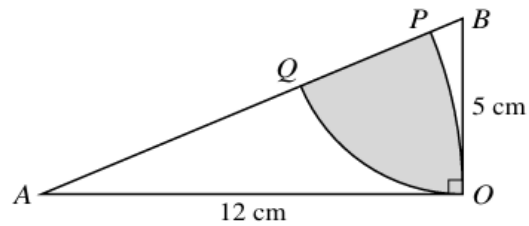
Topic 4-Circular Measure

Question No (15)

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Question No (15)

The diagram shows a triangle AOB in which OA is 12 cm, OB is 5 cm and angle AOB is a right angle. Point P lies on AB and OP is an arc of a circle with centre A . Point Q lies on AB and OQ is an arc of a circle with centre B .

- (i) Show that angle BAO is 0.3948 radians, correct to 4 decimal places.
- (ii) Calculate the area of the shaded region.

Solution

On Next page

(i)

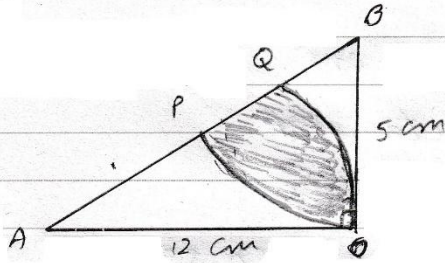
In triangle BOA

$$\tan \hat{B}AO = \frac{\text{vertical}}{\text{Base}}$$

$$= \frac{5}{12}$$

$$\hat{B}AO = \tan^{-1}\left(\frac{5}{12}\right)$$

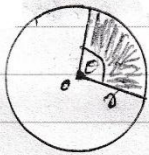
$$\hat{B}AO = 0.3948 \text{ radians}$$



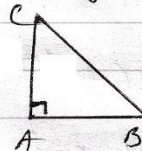
(ii) now we calculate the area of the shaded region

Area of sector

$$A = \frac{1}{2} r^2 \theta$$

Area of triangle having angle 90°

$$\frac{1}{2} (AB)(AC)$$



From triangle OAB

$$\hat{ABO} = \frac{\pi}{2} - 0.3948$$

$$\hat{ABO} = 1.176 \text{ radians}$$

Area of sector BOQ

$$= \frac{1}{2} r^2 \theta$$

$$= \frac{1}{2} (5)^2 (1.176)$$

$$= OB = r = 5$$

$$\angle A = 1.176$$

$$= 14.7 \text{ cm}^2$$

Area of sector AOP

$$= \frac{1}{2} r^2 \theta$$

$$= \frac{1}{2} (12)^2 (0.3948)$$

$$= r = OA = 12$$

$$\angle AOP = 0.3948$$

$$= 28.426 \text{ cm}^2$$

now area of triangle OAB

$$\text{area of right angled triangle OAB} = \frac{1}{2} \text{ base} \times \text{height}$$

$$= \frac{1}{2} \times 12 \times 5$$

$$= 30 \text{ cm}^2$$

= area of the shaded region

$$= \text{area of sector AOP} + \text{area of sector BOQ} - \text{area of } \triangle OAB$$

$$= 28.426 + 14.7 - 30$$

$$= 13.1 \text{ cm}^2$$