

# Math Assignment 7 Solutions

Date

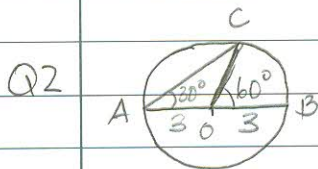
No.

Q1a)  $r\theta = 5$   
 $r = \frac{5}{(\frac{\pi}{2} - \frac{\pi}{3})}$   
 $= 9.5492\dots$   
 $OA \approx 9.55 \text{ cm} \# \text{ shown}$

b) Perimeter  $= 9.5492 \cos(\frac{\pi}{3}) + 5 + (9.5492 - 9.5492 \sin \frac{\pi}{3})$   
 $= 11.0540\dots$   
 $\approx 11.1 \text{ cm} \#$

c) Area of sector OAB  $= \frac{1}{2}(9.5492)^2(\frac{\pi}{6})$   
 $= 23.873 \text{ cm}^2$   
 Area of shaded region  $= 23.873 - \frac{1}{2}(9.5492)(9.5492 \sin \frac{\pi}{3}) \sin \frac{\pi}{6}$   
 $= 4.1301 \text{ cm}^2$

Percentage  $= 17.3\% \#$



Q2  $\angle COB = 60^\circ$  ( $\angle$  at centre  $= 2 \times \angle$  at  $O$ )

Area of shaded sector COB  $= \frac{1}{2}r^2\theta$   
 $= \frac{1}{2}(3)^2(\frac{\pi}{3})$   
 $= \frac{3\pi}{2} \text{ cm}^2 \# \text{ or } 4.71 \text{ cm}^2 \#$

Q3) Area of shaded region  $= \text{Area of } OACB - \text{Area of sector } AOB$   
 $= 6 \times AC - \frac{1}{2}(6)^2(\frac{2\pi}{3})$

$\tan \frac{\pi}{3} = \frac{AC}{6}$   
 $AC = 6 \tan \frac{\pi}{3}$

$\therefore \text{Area of shaded region} = 36 \tan \frac{\pi}{3} - 18(\frac{2\pi}{3})$   
 $= 24.6547\dots$   
 $\approx 24.7 \text{ cm}^2 \#$

Q4i) Perimeter of shaded region =  $PBQ + PM + MBN + NQ$

$$\angle PAQ = \frac{2\pi}{3} \quad (\angle \text{at centre} = 2 \times \angle \text{at } \odot^{\circ})$$

$$\begin{aligned} \therefore \text{length of Arc } PBN &= \sqrt{2} \left( \frac{2\pi}{3} \right) \\ &= \frac{2\sqrt{2}}{3} \pi \text{ cm} \end{aligned}$$

$$\begin{aligned} OM = ON = OB &= OA + AB \\ &= \sqrt{2} + \sqrt{2} \\ &= 2\sqrt{2} \end{aligned}$$

$$\begin{aligned} \therefore \text{length of Arc } MBN &= 2\sqrt{2} \left( \frac{\pi}{3} \right) \\ &= \frac{2\sqrt{2}}{3} \pi \text{ cm} \end{aligned}$$

$$\text{length of } PM = \text{length of } NQ = OM - OP$$

To find  $OP$ , use cosine rule in  $\triangle OAP$ .

$$OP^2 = (\sqrt{2})^2 + (\sqrt{2})^2 - 2(\sqrt{2})(\sqrt{2})\cos \frac{2\pi}{3} \quad \leftarrow \angle OAP = \frac{360^\circ - 120^\circ}{2}$$

$$= 6$$

$$OP = \sqrt{6}$$

$$\begin{aligned} \therefore \text{Perimeter} &= 2 \left( \frac{2\sqrt{2}}{3} \pi \right) + 2(2\sqrt{2} - \sqrt{6}) \\ &= 6.6817 \\ &\approx 6.68 \text{ cm} \# \end{aligned}$$

ii) Area of shaded region = Area of sector  $OMBN$  - sector  $APBQ$  -  $2\triangle OAP$

$$\begin{aligned} &= \frac{1}{2}(2\sqrt{2})^2 \left( \frac{\pi}{3} \right) - \frac{1}{2}(\sqrt{2})^2 \left( \frac{2\pi}{3} \right) - 2 \left( \frac{1}{2} \right) (\sqrt{2})(\sqrt{2}) \sin \frac{2\pi}{3} \\ &= \frac{4\pi}{3} - \frac{2\pi}{3} - 2 \sin \frac{2\pi}{3} \\ &= \frac{2\pi}{3} - \sqrt{3} \\ &= 0.3623... \\ &\approx 0.362 \text{ cm}^2 \# \end{aligned}$$

$$\begin{aligned} \text{Q5(i) Perimeter of keyhole} &= 2 \times 2(1.2) \\ &= 4.8 \text{ cm} \# \end{aligned}$$

$$\begin{aligned} \text{(ii) Area of } \triangle PQS &= \frac{1}{2}(2)(2)\sin 1.2 \\ &= 1.86407\dots \\ &\approx 1.86 \text{ cm}^2 \# \end{aligned}$$

$$\begin{aligned} \text{(iii) Area of PQRS} &= \frac{1}{2}(2)^2(1.2) \\ &= 2.4 \text{ cm}^2 \# \end{aligned}$$

$$\begin{aligned} \text{(iv) Area of Keyhole} &= 2 \times (2.4 - 1.86407\dots) \\ &= 1.07 \text{ cm}^2 \# \end{aligned}$$