Questions

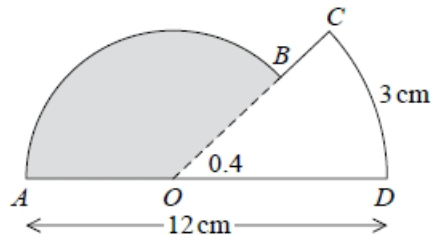**Q1.**

Figure 1

The shape *ABCDOA*, as shown in Figure 1, consists of a sector *COD* of a circle centre *O* joined to a sector *AOB* of a different circle, also centre *O*.

Given that arc length *CD* = 3 cm, ∠*COD* = 0.4 radians and *AOD* is a straight line of length 12 cm,

(a)   find the length of *OD*,

(2)

(b)   find the area of the shaded sector *AOB*.

(3)
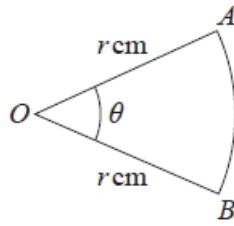
(Total for question = 5 marks)

Q2.

Figure 1

Figure 1 shows a sector *AOB* of a circle with centre *O* and radius *r* cm.

The angle *AOB* is θ radians.
The area of the sector *AOB* is 11 cm^2

Given that the perimeter of the sector is 4 times the length of the arc *AB*, find the exact value of *r*.

(4)
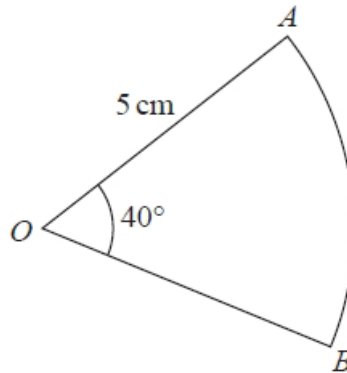
(Total for question = 4 marks)

Q3.

Figure 1

Figure 1 shows a sector *AOB* of a circle with centre *O*, radius 5 cm and angle *AOB* = 40°

The attempt of a student to find the area of the sector is shown below.

$$\text{Area of sector} = \frac{1}{2}r^2\theta$$

$$= \frac{1}{2} \times 5^2 \times 40$$

$$= 500 \, \text{cm}^2$$

(a) Explain the error made by this student.

(1)

(b) Write out a correct solution.

(2)

(Total for question = 3 marks)

Mark Scheme

Q1.

Question	Scheme	Marks	AOs
(a)	Uses $s = r\theta \Rightarrow 3 = r \times 0.4$	M1	1.2
	$\Rightarrow OD = 7.5 \text{ cm}$	A1	1.1b
		(2)	
(b)	Uses angle $AOB = (\pi - 0.4)$ or uses radius is $(12 - \text{'7.5'})$ cm	M1	3.1a
	Uses area of sector $= \dfrac{1}{2}r^2\theta = \dfrac{1}{2} \times (12 - 7.5)^2 \times (\pi - 0.4)$	M1	1.1b
	$= 27.8\text{cm}^2$	A1ft	1.1b
		(3)	
		(5 marks)	

Notes:

(a)

M1: Attempts to use the correct formula $s = r\theta$ with $s = 3$ and $\theta = 0.4$

A1: $OD = 7.5$ cm (An answer of 7.5cm implies the use of a correct formula and scores both marks)

(b)

M1: $AOB = \pi - 0.4$ may be implied by the use of $AOB = $ awrt 2.74 or uses radius is $(12 - \text{their '7.5'})$

M1: Follow through on their radius $(12 - \text{their } OD)$ and their angle

A1ft: Allow awrt 27.8 cm^2. (Answer 27.75862562). Follow through on their $(12 - \text{their '7.5'})$

Note: Do not follow through on a radius that is negative.

Q2.

Question	Scheme	Marks	AOs
	States or uses $\quad \frac{1}{2}r^2\theta = 11$	B1	1.1b
	States or uses $\;2r + r\theta = 4r\theta$	B1	1.1b
	Attempts to solve, full method $\;r = ...$	M1	3.1a
	$r = \sqrt{33}$	A1	1.1b
		[4]	
			(4 marks)

Notes:

B1: States or uses $\frac{1}{2}r^2\theta = 11$ This may be implied with an embedded found value for θ

B1: States or uses $2r + r\theta = 4r\theta$ or equivalent

M1: Full method to find $r = ...$ This involves combining the equations to eliminate θ or find θ
The initial equations must be of the same "form" (see **) but condone slips when attempting to solve.
It cannot be scored from impossible values for θ Hence only score if $0 < \theta < 2\pi$ FYI $\theta = \frac{2}{3}$ radians

Allow this to be scored from equations such as $...r^2\theta = 11$ and ones that simplify to $\;...r = ...r\theta$ **

Allow their $2r + r\theta = 4r\theta \Rightarrow \theta = ..$ then substitute this into their $\frac{1}{2}r^2\theta = 11$

Allow their $2r + r\theta = 4r\theta \Rightarrow r\theta = ..$ then substitute this into their $\frac{1}{2}r^2\theta = 11$

Allow their $\frac{1}{2}r^2\theta = 11 \Rightarrow \theta = \frac{..}{r^2}$ then substitute into their $2r + r\theta = 4r\theta \Rightarrow r = ..$

A1: $r = \sqrt{33}$ only but isw after a correct answer.

The whole question can be attempted using θ in degrees.

B1: States or uses $\quad \frac{\theta}{360} \times \pi r^2 = 11$

B1: States or uses $2r + \frac{\theta}{360} \times 2\pi r = 4 \times \frac{\theta}{360} \times 2\pi r$

Q3.

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	The formula is only valid when the angle AOB is given in radians	B1	This mark is given for a correct explanation
(b)	$\dfrac{40}{360} \times \pi \times 5^2$	M1	This mark is given for a correct method to find the area of the sector
	$\dfrac{25\pi}{9}$ cm^2	A1	This mark is given for a correct value for the area of the sector
			(Total 3 marks)