Circular Measure 1 MS

Q1.

7	**(i)** $AX = 6\tan\frac{\pi}{3} = 6\sqrt{3}$	B1	[1]	ag
	(ii) Area of triangle $= \frac{1}{2} \times 6 \times 6\sqrt{3}$	M1		Use of $\frac{1}{2}bh$
	Area of sector $= \frac{1}{2}\, 6^2 \times \frac{\pi}{3}$	M1		Use of $\frac{1}{2}r^2\theta$
	Area shaded $= 18\sqrt{3} - 6\pi$	A1	[3]	co
	(iii) Arc $AB = 6 \times \frac{\pi}{3} = 2\pi$	M1		Use of $r\theta$
	$OX = 6 \div \cos\frac{\pi}{3} = 12, \quad BX = 6$	B1		Use of trig to find (OX and then) BX.
	Perimeter $= 6\sqrt{3} + 2\pi + 6$	M1 A1	[4]	

Q2.

5	**(i)** **Arc** $AB = r\theta$	M1		
	$OC = r\sin\theta$ or $BC = r\cos\theta$	M1		oe eg $BC = r\sin\frac{\theta}{\tan\theta}$ etc
	$r(1 + \theta + \cos\theta + \sin\theta)$ correctly derived	A1	[3]	OC & BC reversed loses M1A1
	(ii) Sector $OAB = \frac{1}{2} \times 10^2 \times \frac{\pi}{5}$ $(= 31.42)$	M1		oe Δ in terms of π and 10
	$\Delta OCB = \frac{1}{2\left(10\cos\frac{\pi}{5}\right)\left(10\sin\frac{\pi}{5}\right)}$ $(= 23.78)$	M1		Allow OC & BC reversed (ie max 4/6)
	Total area $= 55.2$	A1	[3]	

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Q3.

6	**(i)** D to $AX = 6\sin\frac{\pi}{3} = 6\sqrt{3}\div 2$ E to $AX = 10\sin\theta$ Equate these $\rightarrow \theta = \sin^{-1}\dfrac{3\sqrt{3}}{10}$.	B1 B1 B1 [3]	co Needs $-\sqrt{3}\div 2$ not just $3\sqrt{3}$. co Correct method. ag. Use of decimals loses this B mark.
	(ii) Arc $DX = 6.\frac{1}{3}\pi = 2\pi$ Arc $EX = 10\times 0.5464 = 5.464$ Horizontal steps $= 6\cos\frac{1}{3}\pi$ and $10\cos\theta$ $DE = 10 + 6 - 6\cos\frac{1}{3}\pi - 10\cos\theta$ Perimeter = arc DX + arc BX + DE $\rightarrow$ 16.20	B1 M1 M1 M1 A1 [5]	co Use of $s = r\theta$ radians. Attempt at both steps needed Full method for DE. Co – must be exactly 16.20, not more or less places.

Q4.

6	**(i)** cosine rule or $2\times r \times \sin\frac{1}{2}.(2.4)$ $\rightarrow$ 14.9 cm	M1 A1 [2]	Any complete valid method. co
	(ii) Perimeter = (i) $+ r\theta$ $\theta = 2\pi - 2.4$, $\rightarrow$ 46.0 cm	M1 B1 A1√ [3]	Uses $s = r\theta$ with 2.4, or $\pi - 2.4$, or $2\pi - 2.4$ Anywhere in parts (ii) or (iii). Adds 31.1 to (i) for √.
	(iii) Area = Sector + triangle $\frac{1}{2}\times 8^2(2\pi - 2.4) + \frac{1}{2}\times 8^2\sin 2.4$ $124.3 + 21.6 \rightarrow 146$ cm².	M1 M1 A1 [3]	Uses $\frac{1}{2}r^2\theta$. Uses any valid method. co

Q5.

8	**(i)** $OBX = 90°$, $\cos\theta = \dfrac{r}{2r}$ $\rightarrow \theta = \frac{1}{3}\pi$.	M1 A1 [2]	Needs 90° + cos (or Pyth + sin or tan) co ag
	(ii) Arc length $AB = \frac{1}{3}r\pi$ $BX = r\tan(\frac{1}{3}\pi) = r\sqrt{3}$ $P = r + (\frac{1}{3}r\pi + r\sqrt{3})$	B1 B1 B1 [3]	r + sum of other two
	(iii) Area = $\frac{1}{2}r^2\sqrt{3} - \frac{1}{6}r^2\pi$	B1√ B1 [2]	√ on $\tan(\frac{1}{3}\pi)$. co

Circular Measure 1 MS

Q6.

6	**(i)** $AC = r - r\cos\theta$	**B1** [1]	
	(ii) arc $AB = \frac{4\pi}{3}$	**B1**	
	arc $AD = \frac{\pi}{2} \times their\ AC = \frac{\pi}{2} \times (4 - 4\cos\frac{\pi}{3}) = \pi$	**M1A1**	Allow $\pi \times their\ AC$ for M1. Allow 3.14
	$BD = 4\sin\frac{\pi}{3} - their\ AC = 2\sqrt{3} - 2$	**M1A1**	Allow 1.46
	Perimeter $= \frac{7\pi}{3} + 2\sqrt{3} - 2$	**A1** [6]	cao Accept $\sqrt{12}$

Q7.

4	area $\Delta = 2\sqrt{3}$	B1	
	$\tan A = \frac{2\sqrt{3}}{2} \Rightarrow A = \frac{\pi}{3}$	B1	Accept 60°
	Area sector $= \frac{1}{2} \times 2^2 \times \frac{\pi}{3} = \frac{2\pi}{3}$	M1	Use of $\frac{1}{2}r^2\theta$ with θ in radians
	Shaded area $= 2\sqrt{3} - \frac{2\pi}{3}$	A1 [4]	cao

Q8.

4	**(i)** $BOC = 2\tan^{-1}½ = 0.9273$	M1 A1 [2]	Correct trigonometry. (ans given)
	(ii) $OB = \sqrt{(10^2 + 5^2)}$ or $11.2 = r$	B1	Use of trig (or Pyth) for the $OB = \sqrt{125}$.
	Arc $BXC = \sqrt{125} \times 0.9273$	M1	Use of $s = r\theta$ with θ in rads , $r \neq 10$
	→ Perimeter = 20.4 cm	A1 [3]	
	(iii) Area $= ½r^2\theta$	M1	Correct formula used with rads, $r \neq 10$.
	$-$ ½.10.10 → 7.96 cm².	A1 [2]	Allow 7.95 or 7.96