Radians, Circle Sectors and Triangles Exam Questions (From OCR 4722)

Q1, (Jun 2006, Q7)

(i)	$AC^2 = 11^2 + 8^2 - 2\times11\times8\times\cos 0.8$ $= 62.3796...$ Hence AC=7.90 cm	M1 A1 A1	3	Attempt to use the cosine formula Correct unsimplified expression Show the given answer correctly
(ii)	Area of sector = $\frac{1}{2}\times7.90^2\times1.7 = 53.0$ Area of triangle = $\frac{1}{2}\times7.90^2\times\sin 1.7 = 30.9$ Hence shaded area = 22.1 cm^2	M1 M1 A1	3	Attempt area of sector using $(\frac{1}{2})r^2\theta$ Attempt area of ΔACD, using $(\frac{1}{2})r^2\sin\theta$, or equiv Obtain 22.1
(iii)	(arc) $DC = 7.90\times1.7 = 13.4$ (line) $DC^2 = 7.90^2 + 7.90^2 - 2\times7.90\times7.90\times\cos 1.7$ $DC = 11.9$ Hence perimeter = 25.3cm	M1 A1 M1 A1	4	Use $r\theta$ to attempt arc length Obtain 13.4 Attempt length of line DC using cosine rule or equiv. Obtain 25.3
			10	

Q2, (Jan 2007, Q2)

2	**(i)** $46\times\frac{\pi}{180} = 0.802 / 0.803$	M1		Attempt to convert to radians using π and 180 (or 2π & 360)
		A1	**2**	Obtain 0.802 / 0.803, or better
	(ii) 8 x 0.803 = 6.4 cm	B1	**1**	State 6.4, or better
	(iii) ½ x 8^2 x 0.803 = 25.6 / 25.7 cm^2	M1		Attempt area of sector using $\frac{1}{2}r^2\theta$ or $r^2\theta$, with θ in radians
		A1	**2**	Obtain 25.6 / 25.7, or better
			5	

Q3, (Jun 2008, Q3)

(i)	$\frac{1}{2}\times8^2\times\theta = 48$ Hence θ = 1.5 radians	**M1** **A1**	State or imply $(\frac{1}{2})\,8^2\theta = 48$ Obtain θ = 1.5 (or 0.477π), or equiv
		2	
(ii)	area = 48 – ½ × 8^2 × sin 1.5 = 48 – 31.9 = 16.1	**M1*** **M1d*** **A1**	Attempt area of Δ using $(\frac{1}{2})\,8^2\sin\theta$ Attempt 48 – area of Δ Obtain 16.1 cm^2
		3	

Q4, (Jun 2010, Q5)

(i)	$\frac{\sin\theta}{8} = \frac{\sin 65}{11}$	**M1**		Attempt use of correct sine rule
	$\theta = 41.2^o$	**A1**	**2**	Obtain 41.2^o, or better
(ii) a	$180 - (2 \times 65) = 50^o$ or $65 \times {}^{\pi}/_{180} = 1.134$ $50 \times {}^{\pi}/_{180} = 0.873$ **A.G.** $\pi - (2 \times 1.134) = 0.873$	**M1**		Use conversion factor of ${}^{\pi}/_{180}$
		A1	**2**	Show 0.873 radians convincingly (**AG**)
(ii) b	area sector = ½ x 8^2 x 0.873 = 27.9 area triangle = ½ x 8^2 x sin 0.873 = 24.5 area segment = 27.9 – 24.5 = 3.41	**M1**		Attempt area of sector, using (½) $r^2\theta$
		M1		Attempt area of triangle using (½) $r^2 \sin\theta$
		M1		Subtract area of triangle from area of sector
		A1	**4**	Obtain 3.41or 3.42
			8	

Q5, (Jan 2013, Q7)

(i)	$\cos^{-1} {}^{6}/_{7} = 0.5411$ **AG**	M1		Attempt correct method to find angle *CAB*
		A1		Obtain 0.5411
		[2]		
(ii)	arc length = 7 x (2 x 0.5411) = 7.575 perimeter = 15.2	M1		Attempt arc length using 7θ
		A1		Obtain perimeter as 15.2, or better
		[2]		

Q6, (Jun 2014, Q3)

(i)		arc $= 12 \times \frac{2\pi}{3}$	M1	Attempt use of $r\theta$
		$= 8\pi$	A1 **[2]**	Obtain 8π only
(ii)		sector $= \frac{1}{2} \times 12^2 \times \frac{2\pi}{3} = 48\pi$	M1*	Obtain area of sector using $\frac{1}{2}r^2\theta$
		triangle $= \frac{1}{2} \times 12^2 \times \sin\frac{2\pi}{3} = 36\sqrt{3}$	M1*	Attempt area of triangle using $\frac{1}{2}r^2\sin\theta$
		segment $= 48\pi - 36\sqrt{3}$	M1d*	Correct method to find segment area
			A1	Obtain either $48\pi - 36\sqrt{3}$ or 88.4
			A1 **[5]**	Obtain $48\pi - 36\sqrt{3}$ only

Q7, (Jun 2016, Q2)

(i)		$54^\circ \times \frac{\pi}{180} = \frac{3\pi}{10}$	M1	Attempt to use conversion factor of $\frac{\pi}{180}$
			A1	Obtain $\frac{3\pi}{10}$
			[2]	
(ii)		$\frac{3\pi}{10}r + 2r = 60$ $r = 20.4$	M1*	Attempt perimeter in terms of r
			M1d*	Equate to 60, and attempt to solve
			A1	Obtain 20.4, or better
			[3]	