1		$\dfrac{50}{360}\times\pi\times7\times2$ oe eg $\dfrac{14\pi}{36}\times5$ **or** "43.98…"÷ 360 × 50 oe		2	M1	Students may use π or 3.14, 3.142 or $\dfrac{22}{7}$
		Working not required, so correct answer scores full marks (unless from obvious incorrect working)	6.1		A1	Accept answers in the range 6.05 – 6.2
						Total 2 marks

2		[chord $AB =]\sqrt{5^2+5^2-2\times5\times5\times\cos50}$ **or** $2\times5\times\sin25$ ($=10\sin25$ or $4.226...$)		6	M1	oe
		$[\angle APB =]\cos^{-1}(\dfrac{4^2+4^2-"4.226..."^2}{2\times4\times4})$ $(=63.77...)$ **or** $[\angle OPA =]\sin^{-1}(\dfrac{0.5\times"4.226..."}{4})(=31.88...)$			M1	oe may use other methods but must be a complete method for $\angle APB$ **or** $\angle OPA$ (see below for sine rule)
		[Area sector $AOB =]\dfrac{50}{360}\times\pi\times5^2(=\dfrac{125}{36}\pi$ or $10.9...)$			M1	oe independent
		[Area sector $APB =]\dfrac{"63.77..."}{360}\times\pi\times4^2\ (=8.90...)$			M1	oe NB: 2 × "31.88…" = "63.77…"
		$\left(\dfrac{50}{360}\pi\times5^2-\dfrac{1}{2}\times5^2\times\sin50\right)+\left(\dfrac{"63.77..."}{360}\times\pi\times4^2-\dfrac{1}{2}\times4^2\times\sin"63.77..."\right)$			M1	oe $(10.9...-9.57...)+$ $(8.90...-7.17...)$
		Working not required, so correct answer scores full marks (unless from obvious incorrect working)	3.06		A1	allow 3 – 3.1
		***Alternative version** (using line of symmetry OP in quadrilateral OAPB)*				**Total 6 marks**
		$[\angle OPA] = \sin^{-1}\left(\dfrac{5\sin25}{4}\right)(=31.88..)$		6	M1	oe (see above for cosine rule & trig)
		[Area sector $APB =]\dfrac{2\times"31.88..."}{360}\times\pi\times4^2(=8.90...)$			M1	oe
		[Area $OAPB =]2\times\frac{1}{2}\times5\times4\times\sin(180-"31.88.."-25)\ (=16.75...)$			M1	oe
		[Area sector $AOB =]\dfrac{50}{360}\times\pi\times5^2(=\dfrac{125}{36}\pi=10.9...)$			M1	oe independent
		[Area **R** =] "10.9…" + "8.90..." – "16.75..."			M1	oe
		Working not required, so correct answer scores full marks (unless from obvious incorrect working)	3.06		A1	allow 3 – 3.1
						Total 6 marks

3		$360-40\ (=320)$ or $\dfrac{320}{360}$ oe **or** $\dfrac{40}{360}\times2\pi\times9\ (=6.28...)$		4	M1	
		$\dfrac{"320"}{360}\times2\pi\times9\ (=16\pi=50.26...)$ **or** $2\pi\times9-"6.28"\ (=50.26)$			M1	
		"50.26" + 2 × 9			M1	complete method to find perimeter
			68.3		A1	68.2 to 68.3
						Total 4 marks

4		$75\times2\ (=150)$		5	M1	"150" for AOC may be seen on diagram.
		$\dfrac{"150"\times\pi r^2}{360}$ oe $(=1.309r^2$ or $\dfrac{5\pi}{12}r^2)$			M1	dep 1st M1
		$0.5\times\sin("150")\times r^2$ oe $(=0.25r^2)$			M1	dep 1st M1 a complete method to find the area of triangle OAC in terms of r
		eg $\dfrac{150\pi}{360}r^2-0.5\sin(150)r^2=200$ oe or $(1.309...-0.25)r^2=200$			M1	correct equation in r^2 or rearranged to make r^2 or r the subject.
			13.7		A1	accept 13.7 – 13.8
						Total 5 marks

5		$\dfrac{110}{360}\times\pi\times7.1^2$ oe or $\dfrac{110}{360}\times3.14....\times7.1^2$ oe		2	M1 for a complete method to find the area
			48.4		A1 accept 48.3 – 49.2
					Total 2 marks

6	$(PT =) \dfrac{12 \times 4}{3} \ (= 16)$		3	M1	NB: 16 from 12 + 4 is incorrect working
	$(r =)$ ("16" + 3) ÷ 2			M1	
		9.5		A1	oe
					Total 3 marks

7	eg $(x + 5)(5x - 12) = x(x + 12)$		5	M1	for setting up a correct equation
	eg $4x^2 + x - 60 \ (= 0)$ oe allow $4x^2 + x = 60$			A1	for writing the correct quadratic expression in the form $ax^2 + bx + c (= 0)$ allow $ax^2 + bx = c$
	eg $(4x - 15)(x + 4)(= 0)$ **or** $\dfrac{-1 \pm \sqrt{1^2 - 4 \times 4 \times -60}}{2 \times 4}$ **or** $4\left[\left(x + \dfrac{1}{8}\right)^2 - \left(\dfrac{1}{8}\right)^2\right] = 60$ oe			M1	(dep on M1) for a complete method to solve **their** 3-term quadratic (allow one sign error and some simplification – allow as far as $\dfrac{-1 \pm \sqrt{1 + 960}}{8}$) Allow + instead of ± in quadratic formula
	eg $(ADE =) \sin^{-1}\left(\dfrac{("3.75" + 5)\sin(48)}{"3.75" + 12}\right)$			M1	for a complete method for *ADE*. Allow use of $x = -4$ for this mark
	Correct answer scores full marks (unless from obvious incorrect working)	24.4		A1	accept 24.3 – 24.4
					Total 5 marks

8	$\pi \times 4.8^2 \times \dfrac{72}{360} \ (= 14.4(76\ldots))$ oe		5	M1 for finding the area of the sector
	$\dfrac{1}{2} \times 4.8^2 \times \sin 72 \ (= 10.9(56\ldots)$ or 11) oe or $\dfrac{1}{2} \times 5.6(4\ldots) \times 3.8(8\ldots)$ oe			M1 for finding the area of the triangle (Allow use of cosine rule/sine rule/SOHCAHTOA/Pythagoras to find *AC* (5.6(427.8…)) and *OM* (3.8(8328…)) where *M* is the midpoint of *AC*)
	"14.4(76…)" – "10.9(56…)" (= 3.520…)			M1 for finding the shaded area with all figures from correct working
	"3.5(20…)" × 14 × 3 × 60 "3.5(20…)" × 2520			M1
	Award marks within the range from correct working	8870		A1 accept 8820 – 8950 from correct working
				Total 5 marks