1	$7^2-(10\div 2)^2\,(=24)$ or $\frac{\sin\left(\frac{1}{2}x\right)}{5}=\frac{\sin 90}{7}$ oe or $\cos x=\frac{7^2+7^2-10^2}{2\times 7\times 7}$ oe or $\sin\left(\frac{1}{2}x\right)=\frac{5}{7}$ oe or $\cos y=\frac{5}{7}$ oe		5	M1	or use of sine rule or cosine rule to find angle (x) of the apex or angle y $\left(=90-\frac{1}{2}x\right)$
	$\sqrt{7^2-(10\div 2)^2}$ $(=\sqrt{24}=2\sqrt{6}=4.898...)$ or $(x=)2\times\sin^{-1}\left(\frac{5\times\sin 90}{7}\right)(=91.169\ldots)$ oe or $(x=)2\times\sin^{-1}\left(\frac{5}{7}\right)(=91.169\ldots)$ oe or $(x=)\cos^{-1}\left(\frac{7^2+7^2-10^2}{2\times 7\times 7}\right)(=91.169\ldots)$ oe or $(x=)2\left(90-\cos^{-1}\left(\frac{5}{7}\right)\right)(=2(90-44.415)...=91.169...)$ Allow 5 from correct working			M1	for complete method to find height of triangle or the angle (x) of the apex $\cos^{-1}\left(\frac{5}{7}\right)(=44.415...)$ **and** $5\times\tan'44.415...'(=4.898...)$ or $7\times\sin'44.415...'(=4.898...)$ **or** $\sin^{-1}\left(\frac{5}{7}\right)(=45.584...)$ **and** $\frac{5}{\tan'45.584...'}(=4.898...)$ or $7\times\cos'45.584...'(=4.898...)$
	E.g. $6\times 10+\frac{(10\div 2)\times'\sqrt{24}'}{2}\times 2$ $(=60+10\sqrt{6}=84.494...)$ **or** $5\times\left(6+6+'\sqrt{24}'\right)(=60+10\sqrt{6}=84.494...)$ **or** $\left(\frac{1}{2}\times 7\times 7\times\sin'91.169...'+10\times 6\right)(=60+10\sqrt{6}=84.494...)$			M1	for method to find the total area of the pentagon allow answers in the range 84.49 – 85
	E.g. '84.494' ÷ 16 (= 5.28...) or $\left(60+10\sqrt{6}\right)\div 16(=5.28...)$			M1	for method to find the number of tins required using their area
		6		A1	dep on at least M2
					Total 5 marks

2	$2\times\pi\times 7$ (= 43.982… or 14π) **or** $(2\times\pi\times 7)\div 2$ (= 21.991… or 7π) **or** $2\times\pi\times 9$ (= 56.548… or 18π) **or** $(2\times\pi\times 9)\div 2$ (= 28.274… or 9π)		3	M1	for finding the circumference of either the full circle or the length of the arc for either semicircle
	e.g. "21.991" + "28.274" (= 50.26…) **or** "7π" + "9π" (=16π) **or** "21.991" + "28.274" + 2 (= 52.26…) **or** "7π" + "9π" + 2 (= 52.26…) **or** "21.991" + "28.274" + 2 + 2 **or** "7π" + "9π" + 2 + 2			M1	for a method to find the length of the two arcs with intention to add
		54.3		A1	accept 54.2 – 54.3
					Total 3 marks

3		eg $(AD=)\sqrt{6^2+6^2-2\times 6\times 6\times\cos(50)}$ $(=5.07\ldots)$**or** $2\times 6\sin 25$ (=5.07...) **or** $\frac{6\sin 50}{\sin 65}(=5.07...)$ oe		6	M1 Correct expression for AD ie AD = … or x = oe
		eg $6+6+\sqrt{6^2+6^2-2\times 6\times 6\times\cos(50)}$ or $12+$"5.07…" (=17.0)7... or 17.1)			M1 A **correct** statement of perimeter of triangle OAD
		eg (arc BC=) $\frac{50}{360}\times\pi\times 2\times(6+x)$ oe			M1 A correct statement for arc BC (condone missing brackets around $(6+x)$ for this mark only)
		eg $2\times"17.1"=12+2x+\frac{50}{360}\times\pi\times 2\times(6+x)$ oe			M1 dep on M3 for a correct equation for x
		eg $2\times 17.1-12-\frac{30}{18}\pi=2x+\frac{5x}{18}\pi$			M1 isolating terms in x in a correct equation
			5.89		A1 5.88 – 5.89
					Total 6 marks

4	(area PQS =) $\frac{1}{2}\times 6.1\times 3.8\times \sin P = 9$ **or** (area $PQRS$ =) $6.1\times 3.8\times \sin P = 18$	$\frac{1}{2}\times 6.1\times SX = 9$ **or** $(SX =)\frac{9}{\frac{1}{2}\times 6.1}(=2.95...)$ **or** $6.1\times SX = 18$ **or** $(SX =)18\div 6.1(=2.95...)$		5	M1	correct equation for the area of the triangle or parallelogram **or** a calculation to find the height of the parallelogram (where X is the point vertically below S on PQ)
	eg $(\sin P =)\ \frac{9}{\frac{1}{2}\times 6.1\times 3.8}\left(=0.776...\text{ or }\frac{900}{1159}\right)$ **or** $(\sin P =)\ \frac{18}{6.1\times 3.8}\left(=0.776...\text{ or }\frac{900}{1159}\right)$	$(PX^2 =)3.8^2-"2.95..."^2(=5.73...)$ **or** $(PX =)\sqrt{3.8^2-"2.95..."^2}(=2.39...)$			M1	correct expression for $\sin P$ **OR** for start of Pythagoras method to find length of PX (where X is the point vertically below S on PQ)
	$(P =)\ \sin^{-1}"0.776..."\ (=50.9...)$	$(QX =)6.1-\sqrt{"5.73"}(=3.70...)$ **or** $(QX =)6.1-"2.39"(=3.70...)$			M1	for complete method to find angle P **OR** for method to find length of QX
	$(QS^2 =)3.8^2+6.1^2-2\times 3.8\times 6.1\times\cos("50.9")\ (=22.4...)$ **or** $(QS =)\sqrt{3.8^2+6.1^2-2\times 3.8\times 6.1\times\cos("50.9")}$	$(QS^2 =)"2.95..."^2+"3.70..."^2(=22.4...)$ **or** $(QS =)\sqrt{"2.95..."^2+"3.70..."^2}$			M1	correct expression for QS^2 (or QS)
			4.74		A1	accept 4.73 – 4.74
						Total 5 marks

5	eg $2d\times 2d-4\times\pi\times(\frac{1}{2}d)^2(=40)$ oe or $4r\times 4r-4\times\pi\times r^2(=40)$ oe or $x^2-4\pi\left(\frac{1}{4}x\right)^2(=40)$ oe or $w^2-\pi\left(\frac{1}{2}w\right)^2(=10)$ oe		4	M1	oe a **correct** expression or a correct equation for the shaded area (must be in one unknown only) where d = diameter r = radius x = side of large square w = side of square when shape divided into 4
	$d=\sqrt{\frac{40}{4-\pi}}(=6.826...)$ or $2d=\sqrt{\frac{160}{4-\pi}}(=13.652\ldots)$ oe $r=\sqrt{\frac{40}{16-4\pi}}$ (3.413...) or $4r=\sqrt{\frac{640}{16-4\pi}}(=13.652...)$ oe $x=\sqrt{\frac{40}{1-0.25\pi}}(13.652\ldots)$ or $w=\sqrt{\frac{10}{1-0.25\pi}}(=6.826\ldots)$oe			M1	oe a correct expression for d or $2d$ or r or $4r$ or x or w
	(perimeter =) 8 × "6.826…" (8 × diameter(or side of small square when divided)) or 16 × "3.413..." (16 × radius) oe or 4 × "13.652…"(4 × side of square)			M1ft	dep on first M1 For substituting values into a calculation for the perimeter use of **their** r, d, x, w
		54.6		A1	54.4 - 54.7
					Total 4 marks

6	$(2x+3)(x-1)<75$		5	B1	For writing the correct inequality sign with a correct calculation or correct value – this could be initially or saying that $x<6$ at the end
	$2x^2+x-78<0$			M1	rearranged to form correct quadratic < 0 (allow = 0 or other incorrect inequality sign) oe
	$(x-6)(2x+13)\ (<0)$ **or** $x=\frac{-1\pm\sqrt{(1)^2-(4\times 2\times -78)}}{2\times 2}$ **or** $2\left(x+\frac{1}{4}\right)^2-2\left(\frac{1}{4}\right)^2-78=0$			M1	first step to find critical values from the correct quadratic
		$x=6$		A1	$x=6$ identified as critical value, ignore –6.5 if given
		$1<x<6$		A1	correct inequality
					Total 5 marks