1	e.g. $4 \times 6 \ (= 24)$		4	M1	for finding the perimeter of square
	e.g. ("24" − 6) ÷ 2 (= 9)			M1	for finding the length of the longest side in the triangle
	e.g. $18 \times 3 + 6$ or "9" $\times 6 + 6$			M1	oe, allow their length of the longest side in the triangle as long as clearly stated or identified (could be on diagram)
		60		A1	dep on M2
					Total 4 marks

2	$4.3^2 + 6.4^2$ or 59.45		4	M1	for squaring and adding
	$\sqrt{4.3^2 + 6.4^2}$ or $\sqrt{59.45}$ or 7.71(038…) or 7.7			M1	dep 1st M1 for square rooting
	e.g ('7.71' + 4.3 + 6.4) × 22 or '18.4' × 22 or ('8' + 4.3 + 6.4) × 22 or '18.7' × 22 or '19' × 22 or '20' × 22			M1	dep 2nd M1 for a non-rounded perimeter × 22 or 18 × 22 or 19 × 22 accept 20 × 22
		$418		A1	answer must come from 19
					Total 4 marks

3	28 ÷ 4 (= 7)			M1	
				M1	for using at least six lengths correctly (may be seen on diagram or in calculation)
	e.g. "7" + "3" + 4 + "3" + "7" + 4 + "7" + 4 + "7" + 4			M1	for a complete method to find perimeter
		50	4	A1	
				SC	Award B2 for an answer of 66 or 68
					Total 4 marks

4	e.g. $6(x − 1) \ (= 6x − 6)$			M1	method to find expression for perimeter of hexagon
	e.g. $2(x + 5) + 2x − 3 \ (= 4x + 7)$			M1	method to find expression for perimeter of triangle
	"6x − 6" = "4x + 7"			M1	(dep on at least M1) for equating both expressions
	e.g. $6x − 4x = 7 + 6$			M1	(dep on previous M1 and equation of the form $ax + b = cx + d$)for rearranging the x terms on one side and the numerical terms on the other and all expansions correct.
		5.5	5	A1	oe (dep on M2)
					Total 5 marks

5	20 ÷ 4 (= 5) **or** width = 15 **or** length = 20		3	M1	Could be clearly shown on diagram
	(4 × '5') × (3 × '5') **or** 20 × 15 **or** ('5' × '5') × 12 **or** 25 × 12			M1	dep on M1
		300		A1	for 300 SCB1 for 60 × 80 (=4800)
					Total 3 marks

6	$(AC^2 =) \ 17^2 − 15^2$		5	M1	
	$(AC =)\sqrt{17^2 − 15^2} \ (= \sqrt{64} = 8)$			M1	
	$\dfrac{\pi \times '8'}{2} (= 4\pi = 12.566...)$			M1	dep on M2 for $\dfrac{\pi \times '8'}{2}$ oe or 4π 12.5663…
	'12.566…'+ 15 + 17			M1	for '12.566' + 15 + 17 and no additional values
		44.6		A1	for awrt 44.6
					Total 5 marks

Alternative mark scheme for 6

	$\cos^{-1}\left(\dfrac{15}{17}\right)(= 28.0724)$ or $\sin^{-1}\left(\dfrac{15}{17}\right)(= 61.9275)$		5	M1	for a correct method to find one of the angles
	15 × tan ('28.0724')(= 8) or 15 ÷ tan ('61.9275')(= 8)			M1	
	$\dfrac{\pi \times '8'}{2} \ (= 4\pi = 12.566...)$			M1	dep on M2 for $\dfrac{\pi \times '8'}{2}$ or 12.5663… or 4π
	"12.566" + 15 + 17			M1	for "12.566" + 15 + 17 and no additional values
		44.6		A1	for awrt 44.6
					Total 5 marks

7	[perimeter =]$10 + 6 + 10 + 6$ (= 32) **or** $(10 + 6) \times 2$ (= 32) **or** $10 + 6$ (= 16)		4	M1	for perimeter or semi perimeter of rectangle
	[area =]10×6 (= 60)			M1	(indep) for area of rectangle
	("32" ÷ 4)^2 – '60' **or** ("16" ÷ 2)^2 – '60'			M1	for a completely correct method Allow 60 – area of square
	Working not required, so correct answer scores full marks (unless from obvious incorrect working eg a wrong conversion)	4		A1	
					Total 4 marks

8	e.g. $\sin 65 = \dfrac{16}{AB}$ or $\cos 25 = \dfrac{16}{AB}$ or $\dfrac{AB}{\sin 90} = \dfrac{16}{\sin 65}$ or $\tan 65 = \dfrac{16}{AD}$ or $\tan 25 = \dfrac{AD}{16}$ or $\dfrac{AD}{\sin 25} = \dfrac{16}{\sin 65}$		4	M1	for a correct trig ratio for AB or AD accept $180 - 90 - 65$ for 25
	e.g. $(AB =)\dfrac{16}{\sin 65}(= 17.654...)$ or $(AB =)\dfrac{16}{\cos 25}(= 17.654...)$ or $(AB =)\dfrac{16\sin 90}{\sin 65}(= 17.654...)$ **and** $(AD =)\dfrac{16}{\tan 65}(= 7.460...)$ or $(AD) = 16 \times \tan 25\ (= 7.460...)$ or $(AD =)\dfrac{16\sin 25}{\sin 65}(= 7.460...)$			M1	for finding AB **and** AD Allow use of Pythagoras $(AD =)\sqrt{"17.654..."^2 - 16^2}\ (= 7.460...)$ or $(AB =)\sqrt{"7.460..."^2 + 16^2}\ (= 17.654...)$
	("17.654..." × 2) + ("7.460..." × 2) oe			M1	for a complete method to find the perimeter
		50.2		A1	accept 49.6 – 50.6
					Total 4 marks

9	$4x + 6x + 11 + 9x - 18 = 126$ oe eg $19x - 7 = 126$ or eg $(126 + 18 - 11) \div 19$		4	M1	A correct equation or a correct calculation for x
	$x = 7$			A1	
	$0.5 \times (9 \times "7" - 18) \times (4 \times "7")$ $(0.5 \times 45 \times 28)$			M1	Dep on M1
		630		A1	cao
					Total 4 marks

10	$48 \div 4$ (=12)		4	M1	could be on diagram
	$30 - "48 \div 4"$ (= 18) or 9			M1	allow 9 on correct side of the triangle on the diagram
	$3 \times "18" + "12"$ or $6 \times "18 \div 2" + "12"$ or "54" + "12"			M1	for a complete correct method
		66		A1	
					Total 4 marks

| 11 | (d) | | 12 | 1 | B1 | |

12	$12.8^2 + x^2 = 16^2$ oe or $163.84 + x^2 = 256$ or $(x^2 =)16^2 - 12.8^2\ (= 92.16)$ or $(x^2 =)256 - 163.84\ (= 92.16)$		4	M1	for applying Pythagoras theorem correctly Allow $\cos^{-1}\left(\dfrac{12.8}{16}\right)(= 36.9...)$ **and** $\dfrac{x}{\sin(36.9...)} = \dfrac{16}{(\sin 90)}$
	$(x =)\sqrt{16^2 - 12.8^2}\ (= \sqrt{92.16})\ (= 9.6)$ or $(x =)\sqrt{256 - 163.84}\ (= \sqrt{92.16})\ (= 9.6)$			M1	for square rooting Allow $x = \dfrac{16}{(\sin 90)} \times \sin(36.9...)$
	$(12.8 - "9.6") + "9.6" + "9.6" + 16 + 16 + 16$ oe			M1	(dep on M1) for a complete method to find the perimeter
		70.4		A1	oe e.g. $\dfrac{352}{5}$
					Total 4 marks

13	$24 \div 4 \ (= 6)$ **or** width $= 24$			3	M1 Could be clearly shown on diagram.
	$10 \times \text{'6'}$ oe **or** $24 + 24 + 6 + 6$ oe				M1 dep M1
			60		A1 SC if no other marks scored B1 for $24 \times 4 \ (= 96)$
					Total 3 marks

14	$\cos 50 = \dfrac{18}{(AB)}$ or $\sin 40 = \dfrac{18}{(AB)}$ or $\dfrac{(AB)}{\sin 90} = \dfrac{18}{\sin 40}$			5	M1	M2 for $(AB =) \sqrt{18^2 + (18\tan 50)^2}$ oe $(= 28.0030\ldots)$ or 28
	$(AB =) \dfrac{18}{\cos 50} (= 28.0030\ldots)$ oe or 28 or $(AB =) \dfrac{18}{\sin 40} (= 28.0030\ldots)$ oe or 28				M1	
	$\dfrac{1}{2} \times \pi \times "28.0030\ldots" (= 43.9\ldots)$ oe or 44 $\pi \times "28.0030\ldots" (= 87.9\ldots)$ oe or 88				M1 for use of πd or $\dfrac{1}{2}\pi d$ oe Allow any value of $AB > 18$ if M2 not scored	
	$"28\ldots" + "43.9\ldots" \ (= 71.9900\ldots)$ or $"28" + "44"$				M1ft from previous M1 Allow *their d* + *their* $\dfrac{1}{2}\pi d$	
	Correct answer scores full marks (unless from obvious incorrect working)		72		A1 awrt 72	
						Total 5 marks

15	eg $5x - 1 = 3x + 7.4$ oe **or** eg $10x - 2 + 48$ **or** $6x + 14.8 + 48$ **or** $24 + 24 + 5x - 1 + 3x + 7.4$ oe			4	M1 a correct equation to find x **or** a correct expression for the perimeter in terms of x
	$x = 4.2$				A1 the correct value of x (implies previous mark)
	$2 \times 24 + 2(5 \times "4.2" - 1)$ oe **or** $2 \times 24 + 2(3 \times "4.2" + 7.4)$ oe **or** $2 \times 24 + (5 \times 4.2 - 1) + (3 \times 4.2 + 7.4)$ oe eg $24 + 24 + 20 + 20$ oe				M1dep on a correct method to find the perimeter – use of positive x from correct working (1st M1 awarded for an equation) **and** only if used the same measurement for AD and BC
	working required		88		A1 cao dep on either M1 or $x = 4.2$
					Total 4 marks

16	$(54 - 24) \div 2 \ (=15)$ [may be marked on diagram]		5	M1	
	$"15"^2 - (24 \div 2)^2 (= 81)$			M1	ft their "15" (if > 12)
	$[\text{height} =] \sqrt{"15"^2 - (24 \div 2)^2} (= 9)$			M1	ft their "15" (if > 12)
	$(24 \times "9") \div 2$ oe			M1	figures must be from correct working
	Correct answer scores full marks (unless from obvious incorrect working)		108	A1	allow $107.9 - 108.1$
	ALTERNATIVES BELOW				**Total 5 marks**
16	$(54 - 24) \div 2 \ (=15)$ [may be marked on diagram]		5	M1	
	or $x = \cos^{-1}\left(\dfrac{"12"}{"15"}\right) (= 36.86\ldots)$ **or** $y = \sin^{-1}\left(\dfrac{24 \div 2}{"15"}\right)(= 53.13\ldots)$ **or** $A = \cos^{-1}\left(\dfrac{15^2 + 15^2 - 24^2}{2 \times 15 \times 15}\right)(= 106.2\ldots)$ **or** $B = \cos^{-1}\left(\dfrac{15^2 + 24^2 - 15^2}{2 \times 15 \times 24}\right)(= 36.8\ldots)$			M1	ft their "15" (if > 12) [using Hero's formula S $= 0.5 \times 54 \ (= 27)$ and] $27 \times (27 - 24) \times (27 - "15") \times (27 - "15")$
	or $"12" \tan "36.86\ldots" (= 9)$ (allow 8.9… for these) $"12" \div \tan "53.13\ldots" (= 9)$ **or** $"15" \times \sin "36.86\ldots" (= 9)$ **or** $"15" \times \cos "53.13\ldots" (= 9)$			M1 ft their "15" (if > 12)	M2 for $0.5 \times 24 \times "15" \times \sin "36.86\ldots"$ or $0.5 \times "15" \times "15" \times \sin(2 \times "53.13\ldots")$ or $0.5 \times "15" \times "15" \times \sin("106.2\ldots")$ **or** $\sqrt{"27"("27" - 24)("27" - "15")("27" - "15")}$
	$(24 \times "9") \div 2$ oe			M1	
	Correct answer scores full marks (unless from obvious incorrect working)		108	A1	allow $107.9 - 108.1$
					Total 5 marks

17	eg $\left(AB^2=\right)6^2+6^2(=72)$ or $\sin 45=\dfrac{6}{(AB)}$ or $\cos 45=\dfrac{6}{(AB)}$ or or $\left(AB^2=\right)6^2+6^2-2\times6\times6\times\cos90$		5	M1	for a correct start to the method to find *AB*
	eg $(AB=)\sqrt{6^2+6^2}\left(=\sqrt{72}\text{ or }6\sqrt2\text{ or }8.48...\right)$ or $(AB=)\dfrac{6}{\sin 45}\left(=\sqrt{72}=6\sqrt2=8.48...\right)$ or $(AB=)\dfrac{6}{\cos 45}\left(=\sqrt{72}=6\sqrt2=8.48...\right)$ or $(AB=)\sqrt{6^2+6^2-2\times6\times6\times\cos90}$			M1	for a complete method to find the length of *AB*
	eg $\pi\times6(=6\pi$ or $18.8...)$ or $\pi\times6\div2(=3\pi$ or $9.42...)$ or $\pi\times"8.48..."(=26.6...)$ or $\pi\times"8.48..."\div2\,(=13.3...)$			M1	(indep) for a method to find the circumference of one whole circle **or** the arc length of one semicircle seen (may be embedded)
	eg $2\times"3\pi"+"13.3..."$ or "9.42" + "9.42" + "13.3" or "18.8" + "13.3"			M1	for a complete correct method to find the perimeter of the shape
	Correct answer scores full marks (unless from obvious incorrect working)	32.2		A1	accept answers in the range 32.1 – 32.3
					Total 5 marks

18	10 – 3 (= 7) (could be on diagram) **or** 10 + 3 + 10 + 3 (= 26) oe **or** (10 + 3 + 10 + 3) × 3 (= 78) oe **or** 6 × 10 + 4 × 3 (= 72) oe **or** 4 × 10 + 4 × 3 (= 52) oe		3	M1	for 10 – 3 (= 7) (could be on diagram) **or** for finding the perimeter of one rectangle **or** for finding the perimeter of 3 rectangles **or** for finding the perimeter including the internal sides **or** for finding the perimeter excluding the two lengths of 7
	eg 3 + 10 + 3 + 10 + 3 + 10 + 3 + "7" + 10 + "7" oe **or** 4 × 10 + 4 × 3 + 2 × "7" oe **or** "78" – (4 × 3) oe **or** "72" – (2 × 3) oe **or** "52" + (2 × "7") oe			M1	for a fully correct method to find the perimeter of the shape, with at most one error (which could be one length omitted or an extra length added)
	Correct answer scores full marks (unless from obvious incorrect working)	66		A1	
					Total 3 marks

19	$7.2^2 + 5.4^2\ (= 81)$		4	M1	for correct first step using Pythagoras	M1 for reaching one step from the length of *AB* if using trig eg $(EAB=)\tan^{-1}\left(\dfrac{5.4}{7.2}\right)(=36.8...)$ $\textbf{and}\sin("36.8...")=\dfrac{5.4}{AB}$
	$\sqrt{7.2^2+5.4^2}\ \ (=9)$			M1	for complete Pythagoras method to find length of *AB/DC* check the diagram for sight of 9, *DC* marked as 9 implies M2	M1 for complete method to find the length of *AB/DC* eg $\dfrac{5.4}{\sin("36.8...")}(=9)$
	7.2 + 5.4 + 6 + "9" + 6 oe			M1	for a complete method to find the perimeter	
	Correct answer scores full marks (unless from obvious incorrect working)	33.6		A1	oe	
						Total 4 marks