1	$8.5^2 - (8 \div 2)^2$ (= 56.25) **or** $\cos x = \frac{4}{8.5}$		4	M1	**or** eg $\cos A = \frac{8^2 + 8.5^2 - 8.5^2}{2 \times 8 \times 8.5}$
	$\sqrt{"56.25"}$ (= 7.5) **or** $x = \cos^{-1}\left(\frac{4}{8.5}\right)$ (= 61.927...)			M1	**or** eg $(A =)\cos^{-1}\left(\frac{8^2 + 8.5^2 - 8.5^2}{2 \times 8 \times 8.5}\right)$ (61.927...) (other angle = 56.144...)
	8 × "7.5" ÷ 2 oe **or** 0.5 × 8 × 8.5 × sin "61.927..."			M1	**or** eg 0.5 × 8.5 × 8 × sin61.927...oe
		30		A1	
					Total 4 marks

2	30 + 4x + 10 + x + 20 (= 5x + 60) **or** 180 – 30 (=150)		4	M1	Allow 5x + 60 = n where $n \neq 180$ or for subtracting 30 from 180	M2 for 5x + 30 = 150 oe
	e.g. 30 + 4x + 10 + x + 20 = 180 **or** 5x + 60 = 180 oe **or** 180 – 30 – 10 – 20 (=120) oe eg 180 − 60			M1	for setting up the equation or for subtracting all numerical values of angles from 180	
	5x = 120 **or** "120" ÷ 5			M1	dep on M2 for correctly simplifying to $ax = b$ or for dividing "120" by 5	
		24		A1	for 24	
						Total 4 marks

3	(180 – 44) ÷ 2 (= 68)			M1	May be seen on diagram
	180 – '68' **or** 44 + '68'			M1	
		112	3	A1	
					Total 3 marks

4	e.g. $\sin 65 = \frac{16}{AB}$ **or** $\cos 25 = \frac{16}{AB}$ **or** $\frac{AB}{\sin 90} = \frac{16}{\sin 65}$ **or** $\tan 65 = \frac{16}{AD}$ **or** $\tan 25 = \frac{AD}{16}$ **or** $\frac{AD}{\sin 25} = \frac{16}{\sin 65}$		4	M1	for a correct trig ratio for AB **or** AD accept 180 – 90 – 65 for 25
	e.g. $(AB =)\frac{16}{\sin 65}$ (= 17.654…) **or** $(AB =)\frac{16}{\cos 25}$ (= 17.654…) **or** $(AB =)\frac{16 \sin 90}{\sin 65}$ (= 17.654…) **and** $(AD =)\frac{16}{\tan 65}$ (= 7.460…) **or** $(AD) = 16 \times \tan 25$ (= 7.460…) **or** $(AD =)\frac{16 \sin 25}{\sin 65}$ (= 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

5	$8^2 + 15^2$ (= 289)		5	M1	
	$\sqrt{8^2 + 15^2}$ (=17)			M1	
	$\pi \times "8.5"^2$ (226.98...) **or** 0.5 × 15 × 8 (= 60)			M1	
	$\pi \times "8.5"^2$ – 0.5 × 15 × 8 ("226.98" – "60")			M1	
		167		A1	Accept answers which round to 167
					Total 5 marks

6	48 ÷ 4 (=12)		4	M1 could be on diagram
	30 – "48 ÷ 4" (= 18) or 9			M1 allow 9 on correct side of the triangle on the diagram
	3 × "18" + "12" or 6 × "18 ÷ 2" + "12" or "54" + "12"			M1 for a complete correct method
		66		A1
				Total 4 marks

7	$\cos 30 = \frac{24}{(AC)}$ or $\sin'60' = \frac{24}{(AC)}$ **or** $\frac{\sin'60'}{24} = \frac{\sin 90}{(AC)}$ oe		5	M1 for correct trig ratio involving AC	M2 for use of tan **and** Pythagoras to obtain AC $(AB =)\ 24\tan 30\ (=13.856...)$ **and** $\sqrt{'13.856...'^2+24^2}\ (=27.712...)$ If not M2, then M1 for use of tan and Pythagoras to obtain AC^2 $(AB =)\ 24\tan 30\ (=13.856...)$ **and** $'13.856...'^2+24^2\ (=768)$
	$(AC =)\frac{24}{\cos 30}\ (=16\sqrt{3}=27.712\ldots)$ or $(AC =)\frac{24}{\sin'60'}\ (=16\sqrt{3}=27.712\ldots)$ **or** $(AC =)\frac{24\times\sin 90}{\sin'60'}$			M1 for a correct trig ratio for AC	
	$\frac{1}{2}\times 2\times\pi\times 3\ (=3\pi=9.424\ldots)$			M1 for using $\pi\times 2\times 3$ or $2\pi\times 3$ correctly to find the arc length of the semicircle, or circumference of a circle with radius 3.	
	'27.712…' + '9.424…' – 2×3			M1 for a complete correct method to find the length $AFEDC$	
		31		A1 accept answers in range from 31 to 31.15	
				Total 5 marks	

8	(c)		(*d* =) 1	1	B1	accept (5, 1)

9	(*ABD* =) 360 – 52 – 112 – 90 (= 106)		4	M1	may be marked in correct place on diagram
	(*CBD* =) 180 – "106" (=74)			M1	may be marked in correct place on diagram
		32		A1	
		Reasons given		B1	dep on M1 At least two appropriate reasons given. "angles in a quadrilateral add to 360°" accept 4-sided shape. "angles on a straight line add to 180°" **or** angles on a straight line add to 180° "angles in a triangle add to 180°" **or** angles in a triangle sum to 180° "base angles in an isosceles triangle (are equal)"
					Total 4 marks

10	$\frac{1}{2}\times 7\times h=42$ oe or $(h =)\frac{42\times 2}{7}\ (=12)$ oe or $3.5^2+h^2=y^2$ or $h=\sqrt{y^2-3.5^2}$ oe		4	M1	A correct equation involving the height or a correct expression for height – could be in terms of y
	$y^2=\left(\frac{7}{2}\right)^2+("12")^2$ oe or $\frac{1}{2}\times 7\times"\sqrt{y^2-3.5^2}"=42$ oe			M1	(indep) use of *their* height (any found value that they have called 'height')
	$y=\sqrt{\left(\frac{7}{2}\right)^2+("12")^2}$ oe			M1	**all values must come from a correct method**
	Correct answer scores full marks (unless from obvious incorrect working)	12.5		A1	oe eg $\frac{25}{2}$
					Total 4 marks

11	(a)		60	1	B1 cao
	(b)(i)		58	1	B1
	(ii)		correct reason	1	B1 for angles in a triangle add up to 180° or for angles in a triangle add up to 180°
					Total 3 marks