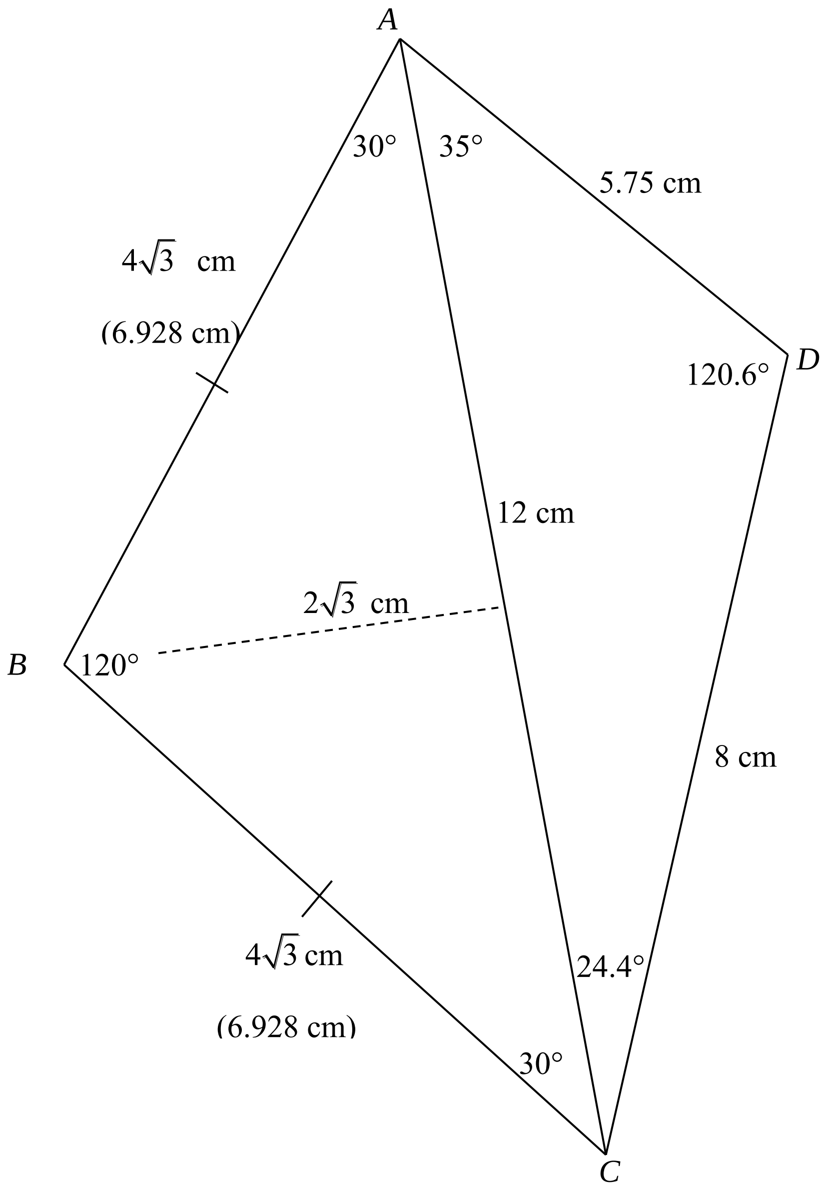
Question number	Scheme	Marks
5. **(a)**	$12^2 = 2BA^2 - 2\times BA\times BC\times\cos 120 \Rightarrow 144 = 3AB^2 \Rightarrow AB = \sqrt{48} = (4\sqrt{3})$	M1A1
	ALT	
	$AB = \dfrac{12\sin 30}{\sin 120} = 4\sqrt{3}$ (6.9282...)	(M1A1)
		(2)
(b)	$\dfrac{\sin D}{12} = \dfrac{\sin(35)}{8} \Rightarrow D = \sin^{-1}\left(\dfrac{12\sin(35)}{8}\right) = 59.357...$	M1A1
	$D = 180 - 59.3755 = 120.64245.. \approx 120.6$	A1ft
		(3)
(c)	ACD= 24.3541°	B1
	Area of ABC = $\dfrac{1}{2}\times\left(\sqrt{48}\right)^2\times\sin 120 = 12\sqrt{3}\,(= 20.78...)$	M1A1
	Area of ADC = $\dfrac{1}{2}\times 12\times 8\times\sin(24.3576...) = 19.7966...$	M1A1
	Area of $ABCD$= 40.5812… = 40.6 cm^2 (3sf)	A1
		(6)
	ALT	
	$\left[AD = \dfrac{8\sin('24.3576..')}{\sin(35)} = 5.7524..\right]$	(B1)
	Area of ABC = $\dfrac{1}{2}\times\left(\sqrt{48}\right)^2\times\sin 120 = 12\sqrt{3}$	(M1A1)
	Area ADC = $\dfrac{1}{2}\times 5.752...\times 8\times\sin(120.6424...) = 19.7966...$	(M1A1)
	Area of $ABCD$ = 40.5812… = 40.6 cm^2 (3sf)	(A1) (6)
		(11)

		Notes
(a)	M1	Uses a correct cosine rule to find length *AB*
	A1	For $AB = 4\sqrt{3}$
ALT 1		
(a)	M1	For using a correct sine rule to find length *AB*
	A1	For $AB = 4\sqrt{3}$
ALT 2		
(a)	M1	Divides triangle *ABC* into two congruent right angle triangles. $AB = \dfrac{6}{\sin 60^\circ}$
	A1	For $AB = 4\sqrt{3}$
(b)	M1	For using a correct sine rule to find $\angle ADC$
	A1	For the acute angle resulting from their sine rule = 59.357...° (accept minimum accuracy of 59.4°)
	A1	For the correct obtuse angle $\angle ADC = 120.6^\circ$
The general principle of marking part (c) is; First M1A1 for triangle *ABC*, second M1A1 for triangle *ADC*		
(c)	B1	$\angle ACD = 24.3576^\circ$ (accept minimum accuracy of 24.4°)
	M1	Area of ΔABC using correct formula for area of a triangle using 120° and their length *AB* or *BC* (but their *AB* = *BC*)
	A1	Area ΔABC = $12\sqrt{3}$ (oe., accept minimum accuracy of 20.8)
	M1	Area of ΔADC using correct formula and their $\angle ADC$ and the given lengths 12 cm and 8 cm.
	A1	Area ΔADC = 19.79662... (accept minimum 19.8)
	A1	Area of quadrilateral *ABCD* = 40.6 (cm^2)
ALT 1		
(c)	B1	For finding length *AD* = 5.7524.. (accept minimum accuracy of 5.7)
	M1	Area of ΔABC using correct formula for area of a triangle using 120° and their length *AB* or *BC* (but their *AB* = *BC*)
	A1	For substitution of correct values. [Area ΔABC = $12\sqrt{3}$ (oe., accept minimum accuracy of 20.8)]
	M1	Area of using correct formula and their *AD* and the given length 12 cm and angle 35°.
	A1	For substitution of correct values. [Area ΔADC = 19.79662... (accept minimum 19.8)]
	A1	Area of quadrilateral *ABCD* = 40.6 (cm^2)
ALT 2		
(c)	B1	Divides triangle *ABC* into two congruent right angle triangles. (midpoint of *AB* is *M*) $BM = \dfrac{6}{\tan 60^\circ} = 2\sqrt{3}$ accept 3.46...
	M1	Area of ΔABC using 2 × correct formula for area of a triangle $2 \times \frac{1}{2} \times 6 \times '2\sqrt{3}' = '12\sqrt{3}'$
	A1	Area ΔABC = $12\sqrt{3}$ (oe., accept minimum accuracy of 20.8)
Areas of ΔADC and quadrilateral *ABCD* as above.		

Useful Sketch



Area $ABC = 12\sqrt{3}$ or 20.78... cm^2

Area of ADC = 19.79... cm^2

Total area = 40.6 cm^2

Penalise rounding only once. If they their answer to (b) as awrt120.6 (e.g.120.64) deduct the A mark. If they then give their answer to (c) as 40.61 do not penalise.