Question	Scheme	Marks
9(a)	$AC = \sqrt{12^2+12^2} = \sqrt{288} = 12\sqrt{2}$	M1A1 [2]
(b)	$x = \dfrac{\frac{12\sqrt{2}}{2}}{\cos 30^\circ} = \sqrt{96} = \left(4\sqrt{6}\right)$ *	M1A1 cso [2]
(c)	$\cos\angle AOB = \dfrac{96+96-12^2}{2\times\sqrt{96}\times\sqrt{96}} \Rightarrow \angle AOB = 75.522...^\circ$	M1A1
	Area $\Delta OAB = \dfrac{1}{2}\times\sqrt{96}\times\sqrt{96}\times\sin'75.522^\circ' = (46.4758...)$	M1
	$4\times 46.4758 + 12^2 = 329.90.... \Rightarrow \text{Area} = 330\ [\text{m}^2]$	M1A1 [5]
(d)	$\left[\angle OBC = \dfrac{180-75.522}{2} = 52.239^\circ\right]$ Let Y on OB be the foot of the perpendicular from A to OB $AY = 12\sin 52.239^\circ = (9.4868...)$	M1 A1
	$\cos\angle AYC = \dfrac{'9.4868'^2 + '9.4868'^2 - 288}{2\times'9.4868'\times'9.4868'} \Rightarrow \angle AYC = 126.87... \approx 127^{[\circ]}$	M1A1 [4]
		Total 13 marks

Question	Notes	Marks
9(a)	For using Pythagoras theorem on triangle ABC or triangle ADC $AC = \sqrt{12^2+12^2} = ...$	M1
	For the correct value of AC $AC = \sqrt{288} = 12\sqrt{2}$	A1 [2]
(b)	Let the intersection of AC and BD be X Uses any appropriate trigonometry on triangle OAX For example; $x = \dfrac{\frac{12\sqrt{2}}{2}}{\cos 30^\circ} = ...$ **OR** $\dfrac{\sin 120^\circ}{12\sqrt{2}} = \dfrac{\sin 30^\circ}{OA} \Rightarrow OA = ...$ OR $\left(12\sqrt{2}\right)^2 = x^2 + x^2 - 2\times x\times x\cos 120 \Rightarrow x = ...$	M1
	For the correct value of x	A1 cso

	$x=\sqrt{96}=\left(4\sqrt{6}\right)$ *	[2]
(c)	For using trigonometry to find angle $\angle AOB$ $\cos\angle AOB=\dfrac{96+96-12^2}{2\times\sqrt{96}\times\sqrt{96}}=\ldots$	M1
	$\angle AOB=75.522...^\circ$	A1
	Area of triangle *OAB* Area = $\dfrac{1}{2}\times\sqrt{96}\times\sqrt{96}\times\sin'75.522^\circ{}'=\left(46.4758...\right)$	M1
	Total area of the pyramid = $4\times 46.4758+12^2=\left(329.90....\right)$	M1
	For the correct final area = awrt 330 (cm^2)	A1 [5]
	ALT	
	Height of the triangle of one of the triangular faces: $h=\sqrt{\left(4\sqrt{6}\right)^2-6^2}=\ldots$	M1
	$h=2\sqrt{15}$	A1
	Area of triangle *OAB* = $\dfrac{1}{2}\times 2\sqrt{15}\times 12=12\sqrt{15}=\left(46.4758...\right)$	M1
	Total area of the pyramid = $4\times 12\sqrt{15}+144=\left(329.903...\right)$	M1
	For the correct final area = awrt 330 (cm^2) Allow an exact answer of $48\sqrt{15}+144\quad\left(\text{cm}\right)^2$ oe	A1
(d)	$\cos\angle AOB=\dfrac{96+96-12^2}{2\times\sqrt{96}\times\sqrt{96}}=75.522^\circ$ or $\angle OBC=\dfrac{180^\circ-75.522^\circ}{2}=52.239^\circ$	
	Let *Y* on *OB* be the foot of the perpendicular from *A* to *OB* Length *AY* = $12\sin 52.239^\circ=\left(9.4868...\right)$ OR Length *AY* = $4\sqrt{6}\sin 75.522^\circ=\left(9.4868...\right)$	M1A1 [M1A1]
	For the appropriate trigonometry on triangle *AYC* to find angle *AYC* $\cos\angle AYC=\dfrac{'9.4868'^2+'9.4868'^2-288}{2\times'9.4868'\times'9.4868'}\Rightarrow\left(\angle AYC=126.87\right)$	M1
	Angle between plane *AOB* and plane *OBC* =awrt 127[°]	A1 [4]
		Total 13 marks