

Q	Marking instructions	AO	Marks	Typical solution
8(a)	Recalls $\operatorname{cosec} \theta = \frac{1}{\sin \theta}$ PI by use of $\operatorname{cosec}^2 \theta = \frac{1}{\sin^2 \theta}$	1.2	B1	$\frac{1}{1 - \cos \theta} + \frac{1}{1 + \cos \theta}$ $\equiv \frac{1 + \cos \theta + 1 - \cos \theta}{(1 - \cos \theta)(1 + \cos \theta)}$ $\equiv \frac{2}{1 - \cos^2 \theta}$ $\equiv \frac{2}{\sin^2 \theta}$ $\equiv 2 \operatorname{cosec}^2 \theta$
	Recalls $\cos^2 \theta + \sin^2 \theta = 1$ OE	1.2	B1	
	Forms a single fraction with a denominator of $(1 - \cos \theta)(1 + \cos \theta)$ OE	1.1a	M1	
	Completes reasoned argument using $\cos^2 \theta + \sin^2 \theta = 1$ to prove the given identity. AG	2.1	R1	
	Subtotal		4	

Q	Marking instructions	AO	Marks	Typical solution
8(b)	Forms the equation $2 \operatorname{cosec}^2 \theta = A$ or $\frac{2}{\sin^2 \theta} = A$ OE PI by $A \geq 2$	1.1a	M1	$2 \operatorname{cosec}^2 \theta = A$ $\operatorname{cosec} \theta \leq -1$ or $\operatorname{cosec} \theta \geq 1$ Hence $\operatorname{cosec}^2 \theta \geq 1$ $\therefore A \geq 2$
	Explains that $\operatorname{cosec} \theta \leq -1$, $\operatorname{cosec} \theta \geq 1$ or $\operatorname{cosec}^2 \theta \geq 1$ or Explains that $-1 \leq \sin \theta \leq 1$ or $\sin^2 \theta \leq 1$ Accept an accurate sketch of $y = \operatorname{cosec}^2 \theta$ with 1 labelled on the y-axis Condone strict inequalities.	2.4	E1	
	Deduces $A \geq 2$	2.2a	R1	
	Subtotal		3	

Q	Marking instructions	AO	Marks	Typical solution
8(c)	Uses the identity from part (a) to obtain $2(1 + \cot^2 \theta) = 16$ or $\operatorname{cosec}^2 \theta = 8$ or $\sin^2 \theta = \frac{1}{8}$ or $\cos^2 \theta = \frac{7}{8}$	1.1a	M1	$2 \operatorname{cosec}^2 \theta = 16$ $\operatorname{cosec}^2 \theta = 8$ $1 + \cot^2 \theta = 8$ $\cot^2 \theta = 7$
	Obtains $\cot^2 \theta = 7$ PI by $\cot \theta = \sqrt{7}$ or $\cot \theta = -\sqrt{7}$	1.1b	A1	$\cot \theta = -\sqrt{7}$ since θ is obtuse
	Deduces $\cot \theta = -\sqrt{7}$	2.2a	R1	
	Subtotal		3	

Q	Marking instructions (Modified Question Paper only)	AO	Marks	Typical solution
8(c)	Uses the identity from part (a) to obtain $\sin^2 \theta = \frac{1}{8}$ or Rearranges $\frac{1}{1 - \cos \theta} + \frac{1}{1 + \cos \theta} = 16$ to obtain $\cos^2 \theta = \frac{7}{8}$	1.1a	M1	$2 \operatorname{cosec}^2 \theta = 16$ $\operatorname{cosec}^2 \theta = 8$ $\sin^2 \theta = \frac{1}{8}$ $1 - \cos^2 \theta = \frac{1}{8}$
	Obtains $\cos \theta = \sqrt{\frac{7}{8}}$ or $\cos \theta = -\sqrt{\frac{7}{8}}$ OE Must be exact.	1.1b	A1	$\cos^2 \theta = \frac{7}{8}$ $\cos \theta = -\sqrt{\frac{7}{8}}$
	Deduces $\cos \theta = -\sqrt{\frac{7}{8}}$ OE Must be exact.	2.2a	R1	since θ is obtuse
	Subtotal		3	

Question 8 Total		10	
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