Question	Scheme	Marks	AOs
13(a)	$\operatorname{cosec}2x + \cot 2x \equiv \cot x, \quad x \neq 90n°, \quad n \in \mathbb{Z}$		
	$\operatorname{cosec}2x + \cot 2x = \dfrac{1}{\sin 2x} + \dfrac{\cos 2x}{\sin 2x}$	M1	1.2
	$= \dfrac{1 + \cos 2x}{\sin 2x}$	M1	1.1b
	$= \dfrac{1 + 2\cos^2 x - 1}{2\sin x \cos x} = \dfrac{2\cos^2 x}{2\sin x \cos x}$	M1	2.1
		A1	1.1b
	$= \dfrac{\cos x}{\sin x} = \cot x \quad *$	A1*	2.1
		(5)	
(b)	$\operatorname{cosec}(4\theta + 10°) + \cot(4\theta + 10°) = \sqrt{3}; \quad 0 \leqslant \theta < 180°,$		
	$\cot(2\theta \pm ...°) = \sqrt{3}$	M1	2.2a
	$2\theta \pm ... = 30° \Rightarrow \theta = 12.5°$	M1	1.1b
		A1	1.1b
	$2\theta + 5° = 180° + PV° \Rightarrow \theta = ...°$	M1	2.1
	$\theta = 102.5°$	A1	1.1b
		(5)	
			(10 marks)

Question 13 Notes:	
(a)	
M1:	Writes $\operatorname{cosec}2x = \dfrac{1}{\sin 2x}$ and $\cot 2x = \dfrac{\cos 2x}{\sin 2x}$
M1:	Combines into a single fraction with a common denominator
M1:	Applies $\sin 2x = 2\sin x \cos x$ to the denominator **and** applies either • $\cos 2x = 2\cos^2 x - 1$ • $\cos 2x = 1 - 2\sin^2 x$ and $\sin^2 x + \cos^2 x = 1$ • $\cos 2x = \cos^2 x - \sin^2 x$ and $\sin^2 x + \cos^2 x = 1$ to the numerator and manipulates to give a one term numerator expression
A1:	Correct algebra leading to $\dfrac{2\cos^2 x}{2\sin x \cos x}$ or equivalent.
A1*:	Correct proof with correct notation and no errors seen in working
(b)	
M1:	Uses the result in part (a) in an attempt to deduce either $2x = 4\theta + 10$ or $x = 2\theta + ...$ and uses $x = 2\theta + ...$ to write down or imply $\cot(2q \pm ...^\circ) = \sqrt{3}$
M1:	Applies $\operatorname{arccot}\left(\sqrt{3}\right) = 30^\circ$ or $\arctan\left(\dfrac{1}{\sqrt{3}}\right) = 30^\circ$ and attempts to solve $2\theta \pm ... = 30^\circ$ to give $\theta = ...$
A1:	Uses a correct method to obtain $\theta = 12.5^\circ$
M1:	Uses $2\theta + 5 = 180 +$ their PV° in a complete method to find the second solution, $\theta = ...$
A1:	Uses a correct method to obtain $\theta = 102.5^\circ$, with no extra solutions given either inside or outside the required range $0 \leqslant \theta < 180^\circ$