Question	Scheme	Marks	AOs
9(a)	$\tan\theta+\cot\theta\equiv\dfrac{\sin\theta}{\cos\theta}+\dfrac{\cos\theta}{\sin\theta}$	M1	2.1
	$\equiv\dfrac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}$	A1	1.1b
	$\equiv\dfrac{1}{\frac{1}{2}\sin 2\theta}$	M1	2.1
	$\equiv 2\text{cosec}2\theta$ *	A1*	1.1b
		(4)	
(b)	States $\tan\theta+\cot\theta=1\Rightarrow\sin 2\theta=2$ AND no real solutions as $-1\leqslant\sin 2\theta\leqslant 1$	B1	2.4
		(1)	
			(5 marks)

Notes:

(a)

M1: Writes $\tan\theta=\dfrac{\sin\theta}{\cos\theta}$ and $\cot\theta=\dfrac{\cos\theta}{\sin\theta}$

A1: Achieves a correct intermediate answer of $\dfrac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}$

M1: Uses the double angle formula $\sin 2\theta=2\sin\theta\cos\theta$

A1*: Completes proof with no errors. This is a given answer.

Note: There are many alternative methods. For example

$\tan\theta+\cot\theta\equiv\tan\theta+\dfrac{1}{\tan\theta}\equiv\dfrac{\tan^2\theta+1}{\tan\theta}\equiv\dfrac{\sec^2\theta}{\tan\theta}\equiv\dfrac{1}{\cos^2\theta\times\dfrac{\sin\theta}{\cos\theta}}\equiv\dfrac{1}{\cos\theta\times\sin\theta}$ then as the main scheme.

(b)

B1: Scored for sight of $\sin 2\theta=2$ and a reason as to why this equation has no real solutions.
Possible reasons could be $-1\leqslant\sin 2\theta\leqslant 1$.....and therefore $\sin 2\theta\neq 2$
or $\sin 2\theta=2\Rightarrow 2\theta=\arcsin 2$ which has no answers as $-1\leqslant\sin 2\theta\leqslant 1$