Question	Scheme		Marks	AOs
13(a)	$\dfrac{1}{\cos\theta}+\tan\theta=\dfrac{1+\sin\theta}{\cos\theta}$ or $\dfrac{(1+\sin\theta)\cos\theta}{\cos^2\theta}$		M1	1.1b
	$=\dfrac{1+\sin\theta}{\cos\theta}\times\dfrac{1-\sin\theta}{1-\sin\theta}=\dfrac{1-\sin^2\theta}{\cos\theta(1-\sin\theta)}=\dfrac{\cos^2\theta}{\cos\theta(1-\sin\theta)}$ or $\dfrac{(1+\sin\theta)\cos\theta}{\cos^2\theta}=\dfrac{(1+\sin\theta)\cos\theta}{1-\sin^2\theta}=\dfrac{(1+\sin\theta)\cos\theta}{(1+\sin\theta)(1-\sin\theta)}$		dM1	2.1
	$=\dfrac{\cos\theta}{1-\sin\theta}$ *		A1*	1.1b
			(3)	
(b)	$\dfrac{1}{\cos 2x}+\tan 2x=3\cos 2x$ $\Rightarrow 1+\sin 2x=3\cos^2 2x=3(1-\sin^2 2x)$	$\dfrac{\cos 2x}{1-\sin 2x}=3\cos 2x$ $\Rightarrow \cos 2x=3\cos 2x(1-\sin 2x)$	M1	2.1
	$\Rightarrow 3\sin^2 2x+\sin 2x-2=0$	$\Rightarrow \cos 2x(2-3\sin 2x)=0$	A1	1.1b
	$\sin 2x=\dfrac{2}{3},\ (-1)\Rightarrow 2x=...\Rightarrow x=...$		M1	1.1b
	$x=20.9°,\ 69.1°$		A1 A1	1.1b 1.1b
			(5)	
			(8 marks)	

Notes

(a) If starting with the LHS: Condone if another variable for θ is used except for the final mark

M1: Combines terms with a common denominator. The numerator must be correct for their common denominator.

dM1: Either:

- $\dfrac{1+\sin\theta}{\cos\theta}$: Multiplies numerator and denominator by $1-\sin\theta$, uses the difference of two squares and applies $\cos^2\theta=1-\sin^2\theta$
- $\dfrac{(1+\sin\theta)\cos\theta}{\cos^2\theta}$: Uses $\cos^2\theta=1-\sin^2\theta$ on the denominator, applies the difference of two squares

It is dependent on the previous method mark.

A1*: Fully correct proof with correct notation and no errors in the main body of their work. Withhold this mark for writing eg sin instead of $\sin\theta$ anywhere in the solution and for eg $\sin\theta^2$ instead of $\sin^2\theta$

Alt(a) If starting with the RHS: Condone if another variable is used for θ except for the final mark

M1: Multiplies by $\dfrac{1+\sin\theta}{1+\sin\theta}$ leading to $\dfrac{\cos\theta(1+\sin\theta)}{1-\sin^2\theta}$ or

Multiplies by $\dfrac{\cos\theta}{\cos\theta}$ leading to $\dfrac{\cos^2\theta}{\cos\theta(1-\sin\theta)}$

dM1: Applies $\cos^2\theta=1-\sin^2\theta$ and cancels the $\cos\theta$ factor from the numerator and denominator leading to $\dfrac{1+\sin\theta}{\cos\theta}$ or

Applies $\cos^2\theta=1-\sin^2\theta$ and uses the difference of two squares leading to $\dfrac{(1+\sin\theta)(1-\sin\theta)}{\cos\theta(1-\sin\theta)}$

It is dependent on the previous method mark.

A1*: Fully correct proof with correct notation and no errors in the main body of their work.
If they work from both the LHS and the RHS and meet in the middle with both sides the same then they need to conclude at the end by stating the original equation.

(b) ***Be aware that this can be done entirely on their calculator which is not acceptable***

M1: Either multiplies through by cos 2x and applies $\cos^2 2x=1-\sin^2 2x$ to obtain an equation in sin 2x only or alternatively sets $\dfrac{\cos 2x}{1-\sin 2x}=3\cos 2x$ and multiplies by $1-\sin 2x$

A1: Correct equation or equivalent. The = 0 may be implied by their later work
(Condone notational slips in their working)

M1: Solves for sin 2x, uses arcsin to obtain at least one value for 2x and divides by 2 to obtain at least one value for x. The roots of the quadratic can be found using a calculator.
They cannot just write down values for x from their quadratic in sin2x

A1: For 1 of the required angles. Accept awrt 21 or awrt 69. Also accept awrt 0.36 rad or awrt 1.21 rad

A1: For both angles (awrt 20.9 and awrt 69.1) and no others inside the range.
If they find $x=45$ it must be rejected. (Condone notational slips in their working)