Question Number	Scheme	Marks
1	$3\tan^2\theta+7\sec\theta-3=0\Rightarrow 3\left(\sec^2\theta-1\right)+7\sec\theta-3=0$	M1
	$3\sec^2\theta+7\sec\theta-6=0$	A1
	$(3\sec\theta-2)(\sec\theta+3)=0\Rightarrow\sec\theta=...\Rightarrow\cos\theta=...$	dM1
	$\theta=109.5°, 250.5°$	A1, A1
		(5)
		Total 5

Main method: Also allow if another variable is used e.g $x\leftrightarrow\theta$

M1: Attempts to set up a quadratic equation in $\sec\theta$ using $\tan^2\theta=\pm1\pm\sec^2\theta$

Condone bracketing slips, for example, where $3\tan^2\theta$ is replaced by $\pm3\sec^2\theta\pm1$

A1: Collects terms to form a correct 3TQ, $3\sec^2\theta+7\sec\theta-6=0$ o.e

Terms do not need to be all on one side of the equation and the $=0$ can be implied by subsequent work.

dM1: Dependent upon the previous M1, it is scored for the method of producing a solvable non zero solution for $\cos\theta$

Look for;

- A valid way of solving their quadratic equation in $\sec\theta$ using any allowable method including a calculator leading to $\sec\theta=...$
- Use of $\sec\theta=\dfrac{1}{\cos\theta}$ to produce a solution $\cos\theta=k$ where $-1<k<1, k\neq0$

E.g. $3\sec^2\theta+7\sec\theta-6=0\Rightarrow\sec\theta=-3\Rightarrow\cos\theta=-\dfrac{1}{3}$. You can ignore the 2nd solution

If the error had been $\tan^2\theta=\sec^2\theta+1$ look for $3\sec^2\theta+7\sec\theta=0\Rightarrow\sec\theta=-\dfrac{7}{3}\Rightarrow\cos\theta=-\dfrac{3}{7}$

A1: One of $\theta=$ awrt $109.5°$, awrt $250.5°$ following M1, A1, dM1

Allow either answer in radians here so score for awrt 1.91 or awrt 4.37

A1: CSO. Both $\theta=$ awrt $109.5°$ and awrt $250.5°$ and no extras in the range

……..

Other methods do exist but the same marking principles will apply

Alt method:

M1: For an attempt to set up a quadratic equation in a single trigonometric term, e.g. $\cos\theta$

Replaces $\tan^2\theta$ by $\dfrac{\sin^2\theta}{\cos^2\theta}$, $\sec\theta$ by $\dfrac{1}{\cos\theta}$ and then uses $\sin^2\theta=\pm1\pm\cos^2\theta\Rightarrow$ quadratic equation in $\cos\theta$ E.g. $3\tan^2\theta+7\sec\theta-3=0\Rightarrow3\dfrac{\sin^2\theta}{\cos^2\theta}+7\times\dfrac{1}{\cos\theta}-3=0\Rightarrow3\sin^2\theta+7\cos\theta-3\cos^2\theta=0$

and then uses $\sin^2\theta=\pm1\pm\cos^2\theta\Rightarrow3\left(1-\cos^2\theta\right)+7\cos\theta-3\cos^2\theta=0$.

Condone slips

A1: For a correct 3TQ in $\cos\theta$. FYI $6\cos^2\theta-7\cos\theta-3=0$. Terms do not have to be on one side

dM1: Solves the quadratic equation in $\cos\theta$ using an appropriate method including a calculator.

It must lead to a solution $\cos\theta=k$ where $-1<k<1, k\neq0$