Question	Scheme	Marks	AOs
8	$\sin^2 3x = 4\cos^2 3x$		
	$\sin^2 3x = 4\cos^2 3x \Rightarrow \tan^2 3x = 4$ or $\sin^2 3x = 4\cos^2 3x \Rightarrow \sin^2 3x = 4\left(1-\sin^2 3x\right)$ or $\sin^2 3x = 4\cos^2 3x \Rightarrow 1-\cos^2 3x = 4\cos^2 3x$	B1	1.2
	$\tan^2 3x = 4$ or $\sin^2 3x = \frac{4}{5}$ or $\cos^2 3x = \frac{1}{5}$	M1	1.1b
	$\tan^2 3x = 4 \Rightarrow \tan 3x = \sqrt{4} \Rightarrow 3x = \tan^{-1}\sqrt{4} \Rightarrow x = \frac{1}{3}\tan^{-1}\sqrt{4} = ...$ Or $\sin^2 3x = \frac{4}{5} \Rightarrow \sin 3x = \sqrt{\frac{4}{5}} \Rightarrow 3x = \sin^{-1}\sqrt{\frac{4}{5}} \Rightarrow x = \frac{1}{3}\sin^{-1}\sqrt{\frac{4}{5}} = ...$ Or $\cos^2 3x = \frac{1}{5} \Rightarrow \cos 3x = \sqrt{\frac{1}{5}} \Rightarrow 3x = \cos^{-1}\sqrt{\frac{1}{5}} \Rightarrow x = \frac{1}{3}\cos^{-1}\sqrt{\frac{1}{5}} = ...$	dM1	1.1b
	One of awrt $21.1°, 38.9°, 81.1°$	A1	1.1b
	Awrt $21.1°, 38.9°, 81.1°$	A1	2.2a
		(5)	
		(5 marks)	

Notes:

Allow to work in any variable e.g. θ for all marks.

B1: Accurately recalls and applies either $\frac{\sin^2 3x}{\cos^2 3x} = \tan^2 3x$ or $\cos^2 3x = 1-\sin^2 3x$ or $\sin^2 3x = 1-\cos^2 3x$ to the given equation.

Note that e.g. $\sin^2 3x = 4\cos^2 3x \Rightarrow \sin^2 3x = 4\times 1-\sin^2 3x$ scores B0 unless the missing brackets are recovered.

M1: Reaches $\tan^2 3x = \alpha$ or $\sin^2 3x = \beta$ or $\cos^2 3x = \gamma$ where $\alpha > 0,\ 0 < \beta < 1,\ 0 < \gamma < 1$

Condone the use of $\pm\sin^2\theta \pm \cos^2\theta = \pm 1$ for this mark or e.g. a slip in losing the 3 from $3x$ or e.g. $1-\cos^2 3x = 4\cos^2 3x \Rightarrow 3\cos^2 3x = 1 \Rightarrow \cos^2 3x = \frac{1}{3}$ but the process should be essentially correct. May be implied by e.g. $5\cos^2 3x = 1 \Rightarrow \cos 3x = \sqrt{\frac{1}{5}}$.

dM1: Uses the correct order of operations to find a value for x, i.e., attempts to take the square root, inverse sin/cos/tan as appropriate and attempts to divide by 3

You may need to check.

Note that e.g. $\sin^2 3x = \frac{4}{5} \Rightarrow \sin 3x = \sqrt{\frac{4}{5}} \Rightarrow 3x = 23.6 \Rightarrow x = 7.86$ scores M1 but

e.g. $\sin^2 3x = \frac{4}{5} \Rightarrow 3x = 23.6 \Rightarrow x = 7.86$ scores M0

A1: One of awrt $21.1°, 38.9°, 81.1°$ (Must be in degrees)

A1: All three of awrt $21.1°$, $38.9°$, $81.1°$ (Must be in degrees) and no others between $0°$ and $90°$

A less likely but correct alternative is to use "double" angles e.g.

$$\sin^2 3x = 4\cos^2 3x$$

$$\Rightarrow \frac{1-\cos 6x}{2} = 4\left(\frac{1+\cos 6x}{2}\right)$$

$$\Rightarrow \cos 6x = -\frac{3}{5}$$

$$\Rightarrow x = \frac{1}{6}\cos^{-1}\left(-\frac{3}{5}\right)$$

One of awrt $21.1°,\ 38.9°,\ 81.1°$

Awrt $21.1°,\ 38.9°,\ 81.1°$

B1: Accurately recalls and applies $\sin^2 3x = \frac{1-\cos 6x}{2}$ and $\cos^2 3x = \frac{1+\cos 6x}{2}$ or equivalent to the given equation.

M1: Reaches $\cos 6x = \alpha$ where $|\alpha| < 1$

Condone the use of $\sin^2 3x = \frac{\pm 1 \pm \cos 6x}{2}$ and $\cos^2 3x = \frac{\pm 1 \pm \cos 6x}{2}$ for this mark but the process should be essentially correct.

dM1: Uses the correct order of operations to find a value for x, i.e., takes inverse cos and attempts to divide by 6

You may need to check.

A1: One of awrt $21.1°,\ 38.9°,\ 81.1°$ (Must be in degrees)

A1: All three of awrt $21.1°,\ 38.9°,\ 81.1°$ and no others between $0°$ and $90°$ (Must be in degrees)