Question Number	Scheme	Marks
2(a)	States or uses $\sin 2x = 2\sin x\cos x$	B1
	$\dfrac{1-\cos 2x}{2\sin 2x} = \dfrac{1-\left(1-2\sin^2 x\right)}{4\sin x\cos x} = \dfrac{2\sin^2 x}{4\sin x\cos x} = \dfrac{1}{2}\tan x$	M1 A1
		(3)
(b)	$\dfrac{9\left(1-\cos 2\theta\right)}{2\sin 2\theta} = 2\sec^2\theta \Rightarrow 9\times"\dfrac{1}{2}"\tan\theta = 2\sec^2\theta$	M1
	Attempts $1+\tan^2\theta = \sec^2\theta \Rightarrow 4\tan^2\theta - 9\tan\theta + 4 = 0$	**d**M1 A1
	$\Rightarrow \tan\theta = \dfrac{9\pm\sqrt{17}}{8}\left(1.64038..., 0.60961...\right)$	M1
	$\Rightarrow \theta =$ awrt $31.4°, 58.6°$	A1 A1
		(6)
(b) Way 2	$\dfrac{9\left(1-\cos 2\theta\right)}{2\sin 2\theta} = 2\sec^2\theta \Rightarrow 9\times"\dfrac{1}{2}"\tan\theta = 2\sec^2\theta$	M1
	$\dfrac{9}{2}\tan\theta = 2\sec^2\theta \Rightarrow \dfrac{9\sin\theta}{\cos\theta} = \dfrac{4}{\cos^2\theta} \Rightarrow 9\sin\theta\cos\theta = 4 \Rightarrow \sin 2\theta = \dfrac{8}{9}$	**d**M1A1
	$\sin 2\theta = \dfrac{8}{9} \Rightarrow 2\theta = 62.7333..., 117.266... \Rightarrow \theta = ...$	M1
	$\Rightarrow \theta =$ awrt $31.4°, 58.6°$	A1 A1
		(9 marks)

(a)

B1: States or uses $\sin 2x = 2\sin x\cos x$

M1: Attempts to use $1 - \cos 2x = \pm 2\sin^2 x$ and $2\sin 2x = A\sin x\cos x$ and to proceeds to $k\tan x$

A1: Fully correct solution with correct bracketing if seen

(b)

M1: Uses part (a) to form an equation of the form $A\tan\theta = B\sec^2\theta$

dM1: Replaces $\sec^2\theta$ by $\pm 1 \pm \tan^2\theta$ and proceeds to form a 3TQ equation in just $\tan\theta$

A1: Correct 3TQ. E.g. $9\tan\theta = 4 + 4\tan^2\theta$

M1: Correct attempt to find at least one value for $\tan\theta$ for their 3TQ in $\tan\theta$

Allow solutions from calculators and condone decimals as long as accuracy is to at least 2sf.

A1: One of either awrt 31.4° **or** awrt 58.6°

A1: Both awrt 31.4° **and** awrt 58.6°. Withhold this mark if there are extra solutions in range.

……

(b) Way 2

M1: Uses part (a) to form an equation of the form equation $A\tan\theta = B\sec^2\theta$

dM1: Uses $\sec^2\theta = \dfrac{1}{\cos^2\theta}$, $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$ and $\sin 2\theta = ...\sin\theta\cos\theta$ to produce an equation of the form $\sin 2\theta = C$

A1: $\sin 2\theta = \dfrac{8}{9}$

M1: Full method to find at least one value of θ from $\sin 2\theta = C$ where $-1 < C < 1$.

E.g. $2\theta = \sin^{-1}C$, $\theta = \frac{1}{2}\sin^{-1}C$. (NB radians gives 0.547…, 1.02… and implies the M mark)

A1, A1: As above

Question Number	Scheme	Marks
3(i)	$\int \frac{12}{(2x-1)^2}\,\mathrm{d}x = \frac{-6}{(2x-1)}(+c)$	M1 A1
		(2)
(ii)(a)	(a) $\frac{4x+3}{x+2} = 4 - \frac{5}{x+2}$	M1, A1
		(2)
(ii)(b)	(b) $\int \frac{4x+3}{x+2}\,\mathrm{d}x = \int 4 - \frac{5}{x+2}\,\mathrm{d}x = 4x - 5\ln\lvert x+2\rvert\ (+c)$	M1 A1ft
	Hence $\int_{-8}^{-5} \frac{4x+3}{x+2}\,\mathrm{d}x = (-20-5\ln 3)-(-32-5\ln 6)$	dM1
	$=12+5\ln 2$	A1
		(4)
		(8 marks)

(i)

M1: Achieves $\frac{A}{(2x-1)}$ or equivalent e.g. $A(2x-1)^{-1}$

A1: Achieves $\frac{-6}{(2x-1)}$ or $-6(2x-1)^{-1}$. There is no requirement for the $+c$

(ii)(a)

M1: For using division or any other suitable method to find either A or B

Using division look for $x+2\overline{)4x+3}$

Using an identity look for $4x + 3 = A(x + 2) + B$ followed by a value for either A or B

It may be implied by either $A = 4$ or $B = -5$

A1: Correct value for A and B or a correct expression $4 - \frac{5}{x+2}$ or $4 + \frac{-5}{x+2}$

(ii)(b)

M1: Integrates $\frac{B}{x+2} \to \ldots \ln\lvert x+2\rvert$. Condone $\frac{B}{x+2} \to \ldots \ln(x+2)$ and condone $\frac{B}{x+2} \to \ldots \ln x+2$

A1ft: Integrates $A + \frac{B}{x+2} \to Ax + B\ln\lvert x+2\rvert$. Condone $A + \frac{B}{x+2} \to Ax + B\ln(x+2)$

But do **not** condone missing brackets unless they are implied by subsequent work.

dM1: Substitutes -5 and -8 into their integrated function containing $\ln\lvert x+2\rvert$ or $\ln(x + 2)$

A1: $12+5\ln 2$ or equivalent exact answer such as $12+\ln 32$

SC: For candidates who proceed to $12+5\ln 2$ or equivalent exact answer via $(-20-5\ln(-3))-(-32-5\ln(-6))$ without sight of modulus signs withhold just the final A1