Question Number	Scheme	Marks
2 (a)	$8\cos\theta = 3\text{cosec}\,\theta$	
	States or uses $\text{cosec}\,\theta = \dfrac{1}{\sin\theta}$	B1
	Attempts to use $\sin 2\theta = 2\sin\theta\cos\theta$	M1
	$\sin 2\theta = \dfrac{3}{4}$ cso	A1
		(3)
(b)	Correct order of operations to find θ, Look for $\dfrac{\arcsin\left(\frac{3}{4}\right)}{2}$	M1
	$(\theta =)$awrt $24.3°$	A1
		(2)
		(5 marks)

(a)

B1: States or uses $\text{cosec}\,\theta = \dfrac{1}{\sin\theta}$. May be implied by the line $8\sin\theta\cos\theta = 3$.

Also allow with a consistent use of a different variable E.g. $\text{cosec}\,x = \dfrac{1}{\sin x}$ but not $\text{cosec} = \dfrac{1}{\sin}$

unless it has been recovered. Note that $3\text{cosec}\,\theta = \dfrac{1}{3\sin\theta}$ is B0 unless there is an aside that does state $\text{cosec}\,\theta = \dfrac{1}{\sin\theta}$

M1: Attempts to use the identity $\sin 2\theta = 2\sin\theta\cos\theta$ and proceeds to $\sin 2\theta = k$ where $|k| \leqslant 1$

Note that an attempt such as $8\sin\theta\cos\theta = 3 \Rightarrow 8\sin 2\theta = 3$ would be M0

A1: Achieves $\sin 2\theta = \dfrac{3}{4}$ o.e. with no errors. Condone the odd notational slip, e.g $\sin\theta \leftrightarrow \sin$

(b)

M1: Uses the correct order of operations to find any value of θ, in degrees or radians that works for their

$\sin 2\theta = k$ follow through on their k with $|k| \leqslant 1$.

In general look for a value of θ found from evaluating $\theta = \dfrac{\arcsin\left(\frac{3}{4}\right)}{2}$.

From a correct equation it is implied by $\theta =$ awrt 0.42 (radians)

A1: $\theta =$ awrt $24.3°$ ONLY

Question Number	Scheme	Marks
3 (i)	$\int (2x-5)^7 \, \mathrm{d}x = \dfrac{(2x-5)^8}{16} + c$	M1 A1 **(2)**
(ii)	$\int \dfrac{4\sin x}{1+2\cos x} \, \mathrm{d}x = -2\ln(1+2\cos x) \quad (+c)$	M1 A1
	$\int_0^{\frac{\pi}{3}} \dfrac{4\sin x}{1+2\cos x} \, \mathrm{d}x = \left[-2\ln(1+2\cos x)\right]_0^{\frac{\pi}{3}} = -2\ln 2 + 2\ln 3 = \ln\dfrac{9}{4}$	dM1 A1 **(4)**
		(6 marks)

(i)

M1: Achieves $a(2x-5)^8$ or equivalent where a is a constant. Alternatively achieves au^8 with $u = (2x-5)$

Allow this mark from a miscopy such as $\int (2x-3)^7 \, \mathrm{d}x = k(2x-3)^8$

A1: Achieves $\dfrac{(2x-5)^8}{16} + c$ or exact simplified equivalent such as $\dfrac{1}{16}(2x-5)^8 + c$. **The +*c* (o.e) must be present.**

Any attempts that start by multiplying out $(2x-5)^7$ are likely to end in failure. They are unlikely to get an expression of the form $a(2x-5)^8$

FYI

$(2x-5)^7 = 128x^7 - 2240x^6 + 16800x^5 - 70000x^4 + 175000x^3 - 262500x^2 + 218750x - 78125$

Score B1 SC for at least 5 out of 8 **correct** terms of

$\dfrac{128}{8}x^8 - \dfrac{2240}{7}x^7 + \dfrac{16800}{6}x^6 - \dfrac{70000}{5}x^5 + \dfrac{175000}{4}x^4 - \dfrac{262500}{3}x^3 + \dfrac{218750}{2}x^2 - 78125x$

(ii)

M1: Achieves $b\ln(1+2\cos x)$ or $b\ln|1+2\cos x|$ where b is a constant. Condone a missing bracket

Alternatively achieves $b\ln u$ with $u = 1+2\cos x$ (You may see $b\ln ku$ which is also correct)

A1: Achieves $-2\ln(1+2\cos x)$, $-2\ln|1+2\cos x|$ or $-2\ln u$ o.e .with $u = 1+2\cos x$ oe. There is no need for $+c$ This may be left unsimplified. Only condone a missing bracket if subsequent work implies one

dM1: Substitutes **both** 0 and $\dfrac{\pi}{3}$ into an expression of the form $b\ln(1+2\cos x)$ a or $b\ln|1+2\cos x|$ and subtracts either way around . There must have been some attempt to evaluate the trig terms

Alternatively substitutes both 3 and 2 into an expression of the form $k\ln u$ and subtracts

A1: $\ln\dfrac{9}{4}$

Note that algebraic integration must be seen here. Candidates using their calculators to just write down $\int_0^{\frac{\pi}{3}} \dfrac{4\sin x}{1+2\cos x} \, \mathrm{d}x = 0.81093... = \ln\dfrac{9}{4}$ should be awarded 0 marks