Question	Scheme	Marks
7(a)	$2=\log_3 3^2$ oe seen or implied by working	**B1**
	$3\log_3(2x-1)=\log_3(2x-1)^3$ or $\log_3"3^2"+\log_3(14x-25)=\log_3\left("3^2"(14x-25)\right)$	**M1**
	$\Rightarrow(2x-1)^3=9(14x-25)$	**dM1**
	$\Rightarrow 8x^3-12x^2+6x-1=126x-225$ $\Rightarrow 8x^3-12x^2-120x+224=0\Rightarrow 2x^3-3x^2-30x+56=0$*	**A1***
		(4)
(b)	$2(\pm4)^3-3(\pm4)^2-30(\pm4)+56=...$	**M1**
	$2(-4)^3-3(-4)^2-30(-4)+56=-128-48+120+56=0$ Hence −4 is a root of the equation.	**A1**
		(2)
Alt (b)	$2x^3-3x^2-30x+56=(x\pm4)\left(2x^2+...\pm14\right)$	**M1**
	$2x^3-3x^2-30x+56=(x+4)\left(2x^2-11x+14\right)$ so −4 is a root of the equation.	**A1**
		(2)
(c)	$2x^3-3x^2-30x+56=0\Rightarrow(x+4)\left(2x^2+...\pm14\right)=0$	**M1**
	$(x+4)\left(\underline{2x^2-11x+14}\right)=0$	**A1**
	$(x+4)(2x-7)(x-2)=0\Rightarrow x=...$	**dM1**
	(Equation not defined for $x=-4$ so) solutions are 2 and $\frac{7}{2}$	**A1**
		(4)
		(10 marks)

Notes:

(a)

B1: States or implies $2=\log_3 3^2$ or equivalent. May be gained via $\log_3 f(x)=2\Rightarrow f(x)=9$

M1: Uses a correct log law, either power law on $3\log_3(2x-1)=\log_3(2x-1)^3$ or sum law on $\log_3"3^2"+\log_3(14x-25)=\log_3\left("3^2"(14x-25)\right)$ or equivalent work (e.g. difference law if combining the two log terms on one side first).

dM1: Uses correct log work to remove the logs. Allow slips, but all log work must have been correct.

A1*: Expands and simplifies to the given cubic. Must see an intermediate step between the factorised sides and final answer.

(b)

M1: Substitutes ±4 into the cubic and attempts to evaluate it.

A1: Evaluates to 0 with intermediate working shown, and gives conclusion that −4 is a root.

Alt:

M1: Attempts to take a factor of $(x \pm 4)$ out of the equation or uses long division. Look for first term $2x^2$ and last term ± 14 in the quadratic factor.

A1: Correct factorisation with conclusion. If via long division, all work must be correct with zero remainder found.

(c)

M1: Attempts to take a factor of $(x+4)$ out of the cubic, or attempts long division by $x + 4$

A1: Correct quadratic factor (either by factorisation or by long division)

Note: the first two marks may be awarded for work seen in part (b).

dM1: Depends on first M. Solves the resulting quadratic (any means).

A1: Correct two solutions **only** identified. Withhold if −4 is listed as a solution.

Since the question says "hence, using algebra and showing each step of your working", solutions derived from a calculator with no working shown score no marks. The intermediate quadratic must be attempted to gain marks in part (c)

Question	Scheme	Marks
8(i)	$3\sin(\theta+30°)=7\cos(\theta+30°)\Rightarrow\tan(\theta+30°)=\frac{7}{3}$	B1
	$\theta+30°=\arctan\left(\frac{7}{3}\right)\ (=66.8°)$	M1
	$\theta=36.8°$ or $216.8°$ (awrt)	A1A1
		(4)
(ii)	(a) $3\sin^3 x=5\sin x-7\sin x\cos x\Rightarrow 3\sin x\left(1-\cos^2 x\right)=5\sin x-7\sin x\cos x$	M1
	$\Rightarrow\sin x\left(5-7\cos x+3\cos^2 x-3\right)=0$	
	$\Rightarrow\sin x\left(3\cos^2 x-7\cos x+2\right)=0$	A1
	(b) $\sin x=0\Rightarrow x=0$	B1
	$\Rightarrow\sin x\left(3\cos x-1\right)\left(\cos x-2\right)=0\Rightarrow\cos x=...$	M1
	$3\cos x=1\Rightarrow x=\arccos\left(\frac{1}{3}\right)=(\pm)1.23$	M1
	Both of x = awrt -1.23, 1.23	A1
		(6)
		(10 marks)

Notes:

(i)

Note: answers only scores no marks.

B1: Divides through by $\cos(\theta+30°)$ to get correct equation in tan.

M1: Applies arctan to find a value for $\theta+30°$. If using other approaches it is for correct work to achieve one value for $\theta+30°$ or just θ as appropriate. (Allow if "radians" are used.)

A1: One of awrt $36.8°$ or awrt $216.8°$

A1: Both of awrt $36.8°$ and awrt $216.8°$ with no other solutions in the range.

(ii)(a)

Part (ii) may be marked as a whole.

M1: Uses $\sin^2 x=1-\cos^2 x$ in the equation and gathers terms on one side and factors out the sin x (Allow the M if the sin x is cancelled) May be seen in (b)

A1: Achieves suitable form. Accept non-zero multiples of the quadratic in cos x. (Allow if sin x is cancelled and put back in later). Result must be clearly stated but may be seen in (b).

(b)

B1: For $x = 0$ as one solution.

M1: Solves the quadratic in cos x, usual rules (may be implied by correct answers).

M1: Takes arccos of at least one value that has modulus less than 1 which is a root of their quadratic. Allow if in degrees, but must reach a value.

A1: Both solutions from cosine equation correct and no others in the range.