Question Number	Scheme	Marks
7 (i)	$8^{2x-5} = 20$	
	Take $\log_2$ of <u>both</u> sides and uses power rule $(2x-5)\log_2 8 = \log_2 20$	M1
	Uses $\log_2 8 = 3$ or $\log_2 20 = \log_2 4 + \log_2 5$	dM1
	$3(2x-5) = 2 + \log_2 5$	A1
	$x = \frac{17}{6} + \frac{1}{6}\log_2 5$	A1
		(4)
(ii)	$\log_3(13+2y) + 3 = 2\log_3(4-y)$	
	One correct log law $2\log_3(4-y) \to \log_3(4-y)^2$ or $3 \to \log_3 27$	B1
	Correct attempt to combine two terms	M1
	Correct equation (not involving logs) E.g. $(4-y)^2 = 27(13+2y)$	A1
	$y^2 - 62y - 335 = 0$	
	$(y+5)(y-67) = 0$	dM1
	$y = -5$ only	A1
		(5)
		(9 marks)

(i)

M1: Take $\log_2$ of <u>both</u> sides and uses power rule $(2x-5)\log_2 8 = \log_2 20$

Allow this mark for log work with any or no base: E.g. $(2x-5)\log 8 = \log 20$

dM1: Uses $\log_2 8 = 3$ or $\log_2 20 = \log_2 4 + \log_2 5$ **correctly** to obtain an equation in x involving just $\log_2 5$

A1: A **correct** intermediate equation in x involving just $\log_2 5$

A1: $x = \frac{17}{6} + \frac{1}{6}\log_2 5$

There are several ways of solving part (i). These are the General Principles for marking this. Allow numerical slips only, index and log work must be correct.

M1: Deal with the index and take logs of both sides

dM1: Simplify logs/use the addition law **correctly** to obtain an equation involving x, $\log_2 5$ and constant(s) only. If candidates change from base 8 to base 2 it must be correct throughout.

A1: For a **correct** equation involving x and $\log_2 5$ (no other logs) and constant(s)

A1: For $x = \frac{17}{6} + \frac{1}{6}\log_2 5$

(ii)

B1: One correct log law $2\log_3(4-y) \rightarrow \log_3(4-y)^2$ or $3 \rightarrow \log_3 27$

M1: Correct attempt to **combine** two terms

$\log_3(13+2y)+3=\log_3 27(13+2y)$ or

$$2\log_3(4-y)-\log_3(13+2y)=\log_3\frac{(4-y)^2}{(13+2y)}$$

Do not award this mark for an equation from incorrect log work when **combining** the terms, for example:

$$2\log_3(4-y)-\log_3(13+2y)=\frac{\log_3(4-y)^2}{\log_3(13+2y)} \Rightarrow \log_3\frac{(4-y)^2}{(13+2y)}$$

A1: Correct equation (not involving logs) E.g. $(4-y)^2=27(13+2y)$

dM1: Correct method of solving 3TQ in y. Allow for either 67 or – 5 seen.

Dependent upon previous M

A1: A1: $y=-5$ **only** If $y = 67$ is not rejected then award A0

Question Number	Scheme	Marks
8 (i)	$4\tan^2(2\theta-30)°+1=49$	
	$\tan(2\theta-30)°=(\pm)\sqrt{12}$	M1
	$(2\theta-30)=$ any of awrt 74, 106, 254, 286	A1
	Correct method to find θ E.g. $\theta=$ awrt $\frac{74+30}{2}$	dM1
	Two of $\theta=$ awrt 51.9, 68.1, 141.9, 158.1	A1
	All four of $\theta=$ awrt 51.9, 68.1, 141.9, 158.1	A1
		(5)
(ii)	Uses $\tan x=\frac{\sin x}{\cos x}\Rightarrow 2\times\frac{\sin x}{\cos x}\sin x+3=0$	M1
	$2\sin^2 x+3\cos x=0\Rightarrow 2\left(1-\cos^2 x\right)+3\cos x=0$	dM1
	$\Rightarrow 2\cos^2 x-3\cos x-2=0$	A1
	$\Rightarrow(2\cos x+1)(\cos x-2)=0\Rightarrow\cos x=-\frac{1}{2}$	ddM1
	$\Rightarrow x=\frac{2}{3}\pi,\frac{4}{3}\pi$	A1
		(5) **(10 marks)**

(i)

M1: **Either:** Attempts to make $\tan(2\theta-30)°$ the subject. Allow $\tan\alpha°=3.46$

An attempt is defined as a numerical slip in finding '12'

Allow the use of a substitution here e.g., let $2\theta-30=x\Rightarrow\tan x°=(\pm)\sqrt{12}$

OR: Uses the sin/cos and Pythagorean identities as follows:

$$\tan^2\alpha=12\Rightarrow\frac{\sin^2\alpha}{\cos^2\alpha}=12\Rightarrow 1-\cos^2\alpha=12\cos^2\alpha$$

$$\cos^2\alpha=\frac{1}{13}\Rightarrow\cos\alpha=(\pm)\sqrt{\frac{1}{13}}\quad\text{o.e.}$$

OR $\sin\alpha=(\pm)\sqrt{\frac{12}{13}}$ o.e.

Award this mark for obtaining a value for either sin or cos allowing for numerical slips only.

A1: Achieves $(2\theta-30)=$ any of one of awrt 74, 106, 254, 286

Allow a substitution, so achieves any one of $x=$ awrt 74, 106……..