Question	Answer	Marks	Guidance
6(b)(i)	$\dfrac{(1+\tan\theta)(1+\cos\theta)+(1-\tan\theta)(1-\cos\theta)}{1-\cos^2\theta}$	**M1**	Allow $(1+\cos\theta)(1-\cos\theta)$ in the denominator
	Expansion of numerator and simplification of denominator	**M1**	**Dep** on previous M mark
	Use of $\tan\theta\cos\theta = \sin\theta$	**B1**	soi
	$\dfrac{2(1+\sin\theta)}{\sin^2\theta}$	**A1**	Sufficient simplification to justify obtaining the given answer
6(b)(ii)	$2(1+\sin\theta) = 3\sin^2\theta$ $3\sin^2\theta - 2\sin\theta - 2 = 0$	**M1**	For use of part **(a)** and attempt to simplify to a 3-term quadratic equation equated to zero.
	$\sin\theta = \dfrac{1-\sqrt{7}}{3}$ or –0.5485…	**M1**	**M1** for attempt to solve and obtain a value for θ, may be implied by one correct solution
	213.3° and 326.7°	**A2**	**A1** for one solution If 0 scored **SC1** for awrt 213 and 327 Penalise excess solutions in the range
7(a)	Common difference = $2\lg 3$	**B1**	Must be exact
	$\dfrac{n}{2}(2\lg 3 + (n-1)2\lg 3) = 256\lg 81$ or $\dfrac{n}{2}(\lg 9 + (n-1)\lg 9) = 512\lg 9$	**M1**	For use of the sum formula
	$\lg 81 = 4\lg 3$ soi or $\lg 81 = 2\lg 9$ soi	**B1**	Allow when working with decimal
	$n^2 = 1024$ oe	**M1**	Dep on first M mark, for attempt to simplify the sum equation by dividing through by $\lg 3$ oe to obtain an equation in n only
	$n = 32$ cao	**A1**	Must have exact working through out
7(b)	$\ln 256 = 4\ln 4$, $\ln 16 = 2\ln 4$ oe	**M1**	For use of power rule to obtain the common ratio
	Common ratio = 0.5	**A1**	
	$S_\infty = \dfrac{4\ln 4}{1-\textit{their } r}$ oe	**M1**	Allow $\ln 256$ for first term and *their r* provided it is positive and < 1
	$16\ln 2$	**A1**	

Question	Answer	Marks	Guidance
8(a)	$x^2 + 2\sqrt{5}x - 20 = 3\sqrt{5}x + 10$ $x^2 - \sqrt{5}x - 30 = 0$	**M1**	For equating x terms and simplifying to a 3-term quadratic equation equated to zero.
	$x = \dfrac{\sqrt{5} \pm \sqrt{5 - (4 \times -30)}}{2}$ oe	**M1**	**Dep** on previous M mark for attempt to solve to obtain $x =$, sufficient detail must be shown
	$x = 3\sqrt{5} \quad x = -2\sqrt{5}$	**A1**	For both
	$y = 55, y = -20$	**A1**	For both
8(b)	Use of $\text{cosec}^2\,\theta = 1 + \cot^2\,\theta$	**B1**	May be implied by later work
	$\text{cosec}^2\theta = 1 + \dfrac{\left(2+\sqrt{3}\right)^2}{\left(\sqrt{3}-1\right)^2}$	**M1**	For attempting to deal with tan correctly, forming a single fraction and simplifying, with sufficient detail – at least 4 terms in the numerator
	$\text{cosec}^2\theta = \dfrac{11+2\sqrt{3}}{4-2\sqrt{3}}$	**A1**	
	$\text{cosec}^2\theta = \dfrac{11+2\sqrt{3}}{4-2\sqrt{3}} \times \dfrac{4+2\sqrt{3}}{4+2\sqrt{3}}$	**M1**	For attempt to rationalise *their* expression, with sufficient detail in the simplification of the numerator – at least 3 terms
	$14 + \dfrac{15\sqrt{3}}{2}$	**A1**	
	Alternative 1 Use of $\text{cosec}^2\,\theta = 1 + \cot^2\,\theta$	**(B1)**	May be implied by later work
	$\cot\theta = \dfrac{2+\sqrt{3}}{\sqrt{3}-1}$ $= \dfrac{3\sqrt{3}+5}{2}$	**(2)**	**M1** for attempting to rationalise cot θ or tan with sufficient detail in the simplification of the numerator – at least 3 terms
	$\text{cosec}^2\theta = 1 + \left(\dfrac{3\sqrt{3}+5}{2}\right)^2$ $= 14 + \dfrac{15\sqrt{3}}{2}$	**(2)**	**M1** for expressing as a single fraction and attempt to simplify to required form.