Question	Answer	Marks	Guidance
8(a)	$r=\dfrac{a}{a+2}$	**B1**	OE SOI
	$\dfrac{a}{1-\dfrac{a}{a+2}}=264$	**M1**	Use of S∞ formula.
	$\dfrac{a(a+2)}{a+2-a}=264$ leading to $\dfrac{a(a+2)}{2}=264$ leading to $a^2+2a-528$ $[=0]$	**M1***	Process to a 3 term quadratic or a 3 term cubic. May contain terms on LHS and RHS.
	$(a-22)(a+24)$ $[=0]$	**DM1**	Attempt to solve.
	$a=22$ (only)	**A1**	22 without working **SC DB1** (dep on 2nd M1).
		5	
8(b)	$d=\dfrac{6^2}{6+2}-6=-\dfrac{3}{2}$	**B1**	
	$\dfrac{n}{2}\left\{12+(n-1)\left(\dfrac{-3}{2}\right)\right\}[<]-480$	**M1***	Forming an inequation with *their* numerical *d*. May use an equality.
	$[3]\left(n^2-9n-640\right)$ $[>0]$	**A1**	OE May contain terms on LHS and RHS.
	$[n=]\ \dfrac{9\pm\sqrt{81+2560}}{2}$	**DM1**	OE. Expect 30.19 . Working for solution must be shown.
	31 only	**A1**	Must come from a correct first inequality (or an equality). 31 no working **SC DB1** (dep on correct quadratic and correct inequality/equality).
		5	

Question	Answer	Marks	Guidance
6	$\dfrac{\dfrac{10\left(1-r^8\right)}{1-r}}{\dfrac{10\left(1-r^4\right)}{1-r}}=\dfrac{17}{16}$ $\left[a\dfrac{\left(1-r^8\right)}{(1-r)}=\dfrac{17}{16}\times a\dfrac{\left(1-r^4\right)}{(1-r)}\right]$	**M1***	OE, i.e. substituting p and q expressions into ratio $\dfrac{17}{16}$. $16=a\dfrac{\left(1-r^4\right)}{(1-r)}$, $17=a\dfrac{\left(1-r^8\right)}{(1-r)}$ gets M0 unless recovered later.
	Simplifying to $16r^8-17r^4+1$ $[=0]$ (or equivalent form)	**DM1**	Or $\dfrac{\left(1-r^8\right)}{\left(1-r^4\right)}=\left(1+r^4\right)=\dfrac{17}{16}$.
	$\left[\left(16r^4-1\right)\left(r^4-1\right)=0\right]\Rightarrow r=\pm\dfrac{1}{2}$	**A1**	Or $r^4=\dfrac{1}{16}\ \Rightarrow\ r=\pm\dfrac{1}{2}$ (condone extra $r=\pm1$ solution).
	$S_\infty=\dfrac{10}{1-\left([\pm]\dfrac{1}{2}\right)}$	**DM1**	Use of correct sum to infinity formula with either of *their r* values providing $\lvert r\rvert<1$.
	$S_\infty=20$ and $\dfrac{20}{3}$	**A1**	Allow 6.67 or better. A0 if there is only one or more than two S_∞ values.
		5	

Question	Answer	Marks	Guidance
5(a)	$\dfrac{5p}{2p+6}=\dfrac{8p+2}{5p}$	**M1**	OE. Setting up a valid relationship in terms of p.
	$9p^2-52p-12$ $[=0]$	**DM1**	OE. Simplifying to a 3 term quadratic equation, only condone sign errors.
	$\left[(9p+2)(p-6)=0\right]$ leading to $p=\frac{-2}{9}$ and 6	**A1**	
		3	
5(b)	$a=2\left(-\dfrac{2}{9}\right)+6\left[=\dfrac{50}{9}\right]$	***M1**	FT *their* $-\dfrac{2}{9}$, allow any negative non-integer.
	$r=-\dfrac{10}{9}\div\dfrac{50}{9}\left[=-\dfrac{1}{5}\right]$	***M1**	Ft *their* $-\dfrac{2}{9}$, allow any negative non-integer.
	$S_\infty=\dfrac{50}{9}\div\left(1--\dfrac{1}{5}\right)=\dfrac{125}{27}$	**DM1 A1**	Can only get DM1 if |r| < 1. Accept AWRT 4.63 .
		4	

Question	Answer	Marks	Guidance
4(a)	$84-3(n-1)=0$	**M1**	OE, SOI. Allow either = 0 or < 0 (to -3).
	Smallest n is 30	**A1**	**SC B2** for answer only n = 30 WWW.
		2	
4(b)	$\left(\frac{2k}{2}\right)\left[168+(2k-1)(-3)\right]=\left(\frac{k}{2}\right)\left[168+(k-1)(-3)\right]$	**M1 A1**	M1 for forming an equation using correct formula. A1 for at least one side correct.
	$k=19$	**A1**	
		3	

Question	Answer	Marks	Guidance
9(a)	$ar=\frac{24}{100}\times\frac{a}{1-r}$	**M1**	Form an equation using a numerical form of the percentage and correct formula for u_2 and S_∞
	$100r^2-100r+24[=0]$	**A1**	OE. All 3 terms on one side of an equation.
	$(20r-8)(5r-3)[=0]\rightarrow\ r=\frac{2}{5},\frac{3}{5}$	**A1**	Dependent on factors or formula seen from their quadratic.
		3	

Question	Answer	Marks	Guidance
9(b)	$3\times\{(a+4d)\}=\{(2(a+1)+11(d+1))\}$	***M1**	SOI Attempt to cross multiply with contents of at least one { } correct
	Simplifies to $a+d=13$	**A1**	
	$\left[\frac{5}{2}\right]\times3\{(2a+4d)\}=\left[\frac{5}{2}\right]\times2\{(4(a+1)+4(d+1))\}$	***M1**	SOI Attempt to cross multiply with contents of at least one { } correct
	Simplifies to $-a+2d=8$	**A1**	
	Solve 2 linear equations simultaneously	**DM1**	Elimination or substitution expected
	$d=7,\ a=6$	**A1**	**SC B1** for a=6, d=7 without complete working
		6	

Question	Answer	Marks
8(a)	$r=\cos^2\theta$ SOI	**M1**
	$S_\infty=\frac{\sin^2\theta}{1-\cos^2\theta}$	**M1**
	1	**A1**
		3
8(b)(i)	$d=\sin^2\theta\cos^2\theta-\sin^2\theta$	**M1**
	$\sin^2\theta\left(\cos^2\theta-1\right)$	**M1**
	$-\sin^4\theta$	**A1**
		3

Question	Answer	Marks
8(b)(ii)	Use of $S_{16}=\frac{16}{2}[2a+15d]$	**M1**
	With <u>both</u> $a=\frac{3}{4}$ and $d=-\frac{9}{16}$	**A1**
	$S_{16}=-55\frac{1}{2}$	**A1**
		3

Question	Answer	Marks	Guidance
2	$r = \dfrac{8\sin^3\theta}{4\sin^2\theta}$ $[= 2\sin\theta]$	**B1**	A correct unsimplified expression for r, this may only be seen in a correct S_∞
	$\dfrac{4\sin^2\theta}{1-2\sin\theta} = \dfrac{1}{2}$	***M1**	OE Correct S_∞ with *their* expression for r.
	Or		
	$r = \dfrac{8\sin^3\theta}{4\sin^2\theta}$ and $\dfrac{4\sin^2\theta}{1-r} = \dfrac{1}{2}$	**B1**	
	$1-8\sin^2\theta = \dfrac{8\sin^3\theta}{4\sin^2\theta}$	***M1**	
	Then		
	Expect $8\sin^2\theta + 2\sin\theta - 1$ $[= 0]$	**DM1**	OE and attempt to solve. Attempt to solve a three-term quadratic to find at least one value of $\sin\theta$. This can be implied by a final answer of $\theta = 0.253^c$ AWRT
	$[\theta =] \sin^{-1}\dfrac{1}{4}, 0.25$	**A1**	OE Clearly identify one answer only. Accept $\sin\theta = \dfrac{1}{4} \Rightarrow k = \dfrac{1}{4}$ etc.
		4	