

Q	Marking instructions	AO	Marks	Typical solution
8(a)	Forms an equation for sum to infinity or 2 nd term PI by correct answer	1.1a	M1	$ar = 18$
	Obtains both correct equations	1.1b	A1	$\frac{a}{1-r} = 96$
	Solves their two equations to find two values of a or r PI by correct values of a or r	3.1a	M1	$r - r^2 = \frac{18}{96}$
	Obtains two correct values of $a = 72$ or 24 or obtains two correct values of $r = \frac{1}{4}$ or $\frac{3}{4}$	1.1b	A1	$r = \frac{1}{4}$ or $\frac{3}{4}$
	Deduces correct pair of a and r Follow through their values of a and r Must have one value of $a > 30$	2.2a	A1F	$a = 72$ or 24 Since $a < 30$ $r = \frac{3}{4}$ $a = 24$
8(b)(i)	Substitutes their a and r into the expression $u_n = ar^{n-1}$	1.1b	B1F	$u_n = 24 \times \left(\frac{3}{4}\right)^{n-1}$
	Writes their a or r in terms of prime numbers fully	3.1a	M1	$= 3 \times 2^3 \times \frac{3^{n-1}}{2^{2(n-1)}}$
	Deduces that $a = 24$ can be written as $2^3 \times 3$ and $r = \frac{3}{4}$ as $\frac{3}{2^2}$ PI by expressing all terms in powers of 2 and 3	2.2a	A1	$= \frac{3 \times 3^{n-1}}{2^{-3} \times 2^{2(n-1)}}$
	Completes reasoned argument by expressing all terms in powers of 2 and 3 and simplifies to show required result AG	2.1	R1	$= \frac{3^n}{2^{2n-5}}$
8(b)(ii)	Applies logarithmic subtraction or addition law correctly	1.1a	M1	
	Applies logarithmic power law to obtain either $n \log_3 3$ or $(2n-5) \log_3 2$ Condone omission of brackets	1.1a	M1	

Completes reasoned argument by using $n \log_3 3$ and $(2n-5) \log_3 2$ to show required result

AG

Do not allow recovery of omitted brackets

2.1

R1

$$\begin{aligned}\log_3 u_n &= \log_3 \frac{3^n}{2^{2n-5}} \\ &= \log_3 3^n - \log_3 2^{2n-5} \\ &= n - (2n-5) \log_3 2 \\ &= n + (5-2n) \log_3 2 \\ &= n - 2n \log_3 2 + 5 \log_3 2 \\ &= n(1-2 \log_3 2) + 5 \log_3 2\end{aligned}$$

Total

12