Question	Scheme	Marks	AOs
5(a)	$\sum_{r=1}^{n} r(r+1) = \sum_{r=1}^{n} r^2 + \sum_{r=1}^{n} r = \frac{n}{6}(2n+1)(n+1) + \frac{n}{2}(n+1)$	M1 A1	2.1 1.1b
	$= \frac{n}{6}(n+1)[(2n+1)+3]$ or $\frac{n}{3}(n+1)\left[\frac{2n+1}{2}+\frac{3}{2}\right]$	dM1	1.1b
	$= \frac{n}{3}(n+1)(n+2)$	A1	1.1b
		(4)	
(b)	$\log 3^2 + 2\log 3^3 + 3\log 3^4 + \cdots + 11\log 3^{12}$	M1	3.1a
	$(1\times 2)\log 3 + (2\times 3)\log 3 + (3\times 4)\log 3 + \cdots + (11\times 12)\log 3$ $= \log 3\,[(1\times 2) + (2\times 3) + (3\times 4) + \cdots + (11\times 12)]$	M1	3.1a
	$= \log 3 \times \sum_{r=1}^{11} r(r+1) = \frac{11}{3}(11+1)(11+2)\log 3$	M1	1.1b
	$= 572\log 3$ o.e.	A1	1.1b
		(4)	
		(8 marks)	

Notes:

(a)

M1: Multiplies out the brackets and uses at least one correct standard series formula

A1: Fully correct expression

dM1: Attempts to factorise out either $\frac{n}{6}$ or $\frac{n}{3}$ having used at least one standard series formula. Dependent on previous method mark and having n in each term.

A1: Correct answer

(b)

M1: Realising the powers of 3 in the log terms.

M1: Uses the log power law and factorises out log 3 to achieve a series of the form $\sum r(r+1)$

M1: Uses log 3 × their answer to part (a) with $n = 11$

A1: Correct answer