Question	Scheme	Marks	AOs
14(a)	Recognises $ar = e^{15-6k}$ or $ar^5 = e^{35-14k}$	B1	1.2
	$r^4 = e^{35-14k-(15-6k)} \Rightarrow r^4 = e^{20-8k}$	M1	3.1a
	$\lvert r\rvert < 1 \Rightarrow e^{5-2k} < 1$	dM1	1.1b
	$k > \frac{5}{2}$ *	A1*	2.1
		(4)	
(b)	Attempts to find $a = e^{10-4k}$	M1	3.1a
	Attempts $S_\infty = \frac{e^{10-4k}}{1-e^{5-2k}} > 10$	dM1	1.1b
	$e^{10-4k} > 10 - 10e^{5-2k}$ or $e^{10-4k} + 10e^{5-2k} - 10 > 0$	A1	1.1b
	$\left(e^{5-2k}\right)^2 + 10e^{5-2k} - 10 > 0$ $\Rightarrow e^{5-2k} = -5 \pm \sqrt{35}$	ddM1	2.1
	Hence $\frac{5}{2} < k < \frac{5 - \ln(-5+\sqrt{35})}{2}$	A1	2.2a
		(5)	
			(9 marks)

Notes:

(a)

B1: Recognises the formula for the second or sixth term of a geometric series. May be implied.

M1: Uses both $ar = e^{15-6k}$ and $ar^5 = e^{35-14k}$ to achieve an expression for r^4 in terms of k only.

dM1: For the key step in using convergence to establish an inequality involving their r and 1

Look for $\lvert r\rvert < 1 \Rightarrow e^{5-2k} < 1$ or $\lvert r\rvert < 1 \Rightarrow e^{20-8k} < 1$

A1*: $k > \frac{5}{2}$ cso. Requires the method marks to have been scored.

(b)

M1: Attempts to find a using either the second or sixth term and their r using a correct method.

dM1: Attempts S_∞ using $\frac{a}{1-r}$ with their a and r and constructs an inequality with 10.

A1: For a correct inequality on one line, e.g. $e^{10-4k} > 10 - 10e^{5-2k}$ or $e^{10-4k} + 10e^{5-2k} - 10 > 0$

ddM1: For the key step in identifying and solving a quadratic equation in e^{5-2k} using the quadratic formula or calculator. If their quadratic is incorrect then their solutions will need checking.

A1: $\frac{5}{2} < k < \frac{5-\ln(-5+\sqrt{35})}{2}$ o.e., e.g., the $\frac{5}{2}$ might appear as 2.5