Question	Scheme	Marks	AOs
9(a)	$\dfrac{12-3k}{3k+4}=\dfrac{k+16}{12-3k}$	M1	3.1a
	$3k^2-62k+40=0$ *	A1*	1.1b
		(2)	
(b)(i)	$3k^2-62k+40=0 \Rightarrow k=...$	M1	1.1b
	States $k=20$ and gives a reason e.g. that this gives a values of r such that $\lvert r\rvert<1$	A1	3.2a
(ii)	$a=64$ **and** $r=-\dfrac{3}{4}$ (or allow $a=6$ **and** $r=\dfrac{5}{3}$)	B1	1.1b
	$S_\infty=\dfrac{"64"}{1-"\left(-\frac{3}{4}\right)"}=...$	M1	3.1a
	$S_\infty=\dfrac{256}{7}$	A1	1.1b
		(5)	
			(7 marks)

Notes

(a)

M1: Forms a correct equation linking the three terms. Condone invisible brackets if implied by further work.
Possible equations below (which are not exhaustive) should use nth term or sum of series formulae

e.g. $\dfrac{12-3k}{3k+4}=\dfrac{k+16}{12-3k}$ or $\left(\dfrac{12-3k}{3k+4}\right)^2=\dfrac{k+16}{3k+4}$ or $(12-3k)^2=(3k+4)(k+16)$ or

$(3k+4)\left(\dfrac{k+16}{12-3k}\right)=12-3k$ or $(12-3k)\left(\dfrac{12-3k}{k+16}\right)=k+16$ or

$$3k+4+12-3k+k+16=\dfrac{(3k+4)\left(1-\left(\dfrac{k+16}{12-3k}\right)^3\right)}{1-\dfrac{k+16}{12-3k}} \text{ (sum of three terms)}$$

A1*: Achieves the given quadratic with no errors including invisible brackets. It cannot be for just proceeding in one step from the starting equation to the given answer and usually will involve attempting to multiply out brackets or dealing with any fractions.

(b)(i)

M1: Attempts to solve the given quadratic achieving at least one value for k. Usual rules apply for solving a quadratic and this may be achieved directly from a calculator. (May also be implied by $\dfrac{2}{3}$)

A1: 20 and gives correct reasoning (**if *r* is found anywhere in part (i) then it must be correct**):
e.g. 20 since $|r|<1$. e.g. since $|r|=0.75<1$

e.g. by listing **at least two consecutive** terms for $k=20$ (must be correct) e.g. 64, -48 do not withhold this mark if they proceed to make a comment e.g. "the numbers are getting smaller" as we are condoning this to mean they are referring to the magnitude of the numbers

e.g. when $k=20$, $r=-\frac{3}{4}$ o.e. which is between 1 and -1 (condone "it is smaller than 1").

Do not accept a reason on its own which is just simply stating that the sequence is converging or equivalent such as "spiralling".

Allow reasoning which excludes $k=\frac{2}{3}$ e.g. $r=\frac{5}{3}$ which is greater than 1.

(ii)

Work may be seen in part (i), but must be used in part (ii) to score.

B1: $a=64$ **and** $r=-\frac{3}{4}$ o.e. (or allow $a=6$ **and** $r=\frac{5}{3}$ o.e.) May be implied by later work or a correct calculation using these values to find S_∞

M1: A full attempt to find S_∞ by using their value of *k* to reach a value for *r* such that $|r|<1$ and a value for *a*. Condone sign slips in their calculations of *a* and *r* only. You may need to check this by substituting in their value for *k* if no calculations are seen.

They must substitute these values in to $\frac{a}{1-r}$ correctly so e.g. $a=64,\ r=-\frac{3}{4} \Rightarrow S_\infty=\frac{64}{1-\frac{3}{4}}$ is M0.

They cannot just substitute in their *k* as *r* in the formula.
Do not allow attempts to manually calculate the values of lots of terms for this mark as this would not lead to the answer. $\sum_{n=1}^{\infty} 64\times\left(-\frac{3}{4}\right)^{n-1}$ on its own is M0.

A1: $\frac{256}{7}$ cao. (Do not allow 36.6 as this is not S_∞) isw after a correct exact answer is seen.