Question	Scheme	Marks	AOs
4(a)	$u_1 = 6 \Rightarrow u_2 = 6k - 5$ $u_2 = 6k - 5 \Rightarrow u_3 = k(6k-5) - 5$ $\Rightarrow k(6k-5) - 5 = -1$	M1	1.1b
	$\Rightarrow 6k^2 - 5k - 4 = 0$ *	A1*	2.1
		(2)	
	Alternative:		
	$u_3 = -1 \Rightarrow -1 = ku_2 - 5 \Rightarrow u_2 = \frac{4}{k}$ $u_1 = 6 \Rightarrow u_2 = 6k - 5 \Rightarrow \frac{4}{k} = 6k - 5$	M1	1.1b
	$\Rightarrow 6k^2 - 5k - 4 = 0$ *	A1*	2.1
(b)(i)	$k = \frac{4}{3}$	B1	2.2a
(ii)	$k = \frac{4}{3} \Rightarrow u_2 = \frac{4}{3} \times 6 - 5 \Rightarrow \sum_{r=1}^{3} u_r = 6 + \frac{4}{3} \times 6 - 5 - 1$	M1	1.1b
	$\sum_{r=1}^{3} u_r = 8$	A1	1.1b
		(3)	
			(5 marks)

Notes

(a)

M1: Correct application of the given recurrence relation using $u_1 = 6$ to find u_2 and then u_3 in terms of *k* and sets $u_3 = -1$

Condone missing brackets if the intention is clear e.g. $u_2 = 6k - 5 \Rightarrow u_3 = k\,6k - 5 - 5$

A1*: Obtains the printed answer with no errors including the "= 0"
This is a <u>given answer</u> so do not condone slips/missing brackets unless they are recovered **before** the final printed answer.

Alternative:

M1: Correct application of the given recurrence relation using $u_3 = -1$ to find u_2 in terms of *k* and then uses $u_1 = 6$ to find another expression for u_2 in terms of *k* and equates the 2 expressions.

A1*: Obtains the printed answer with no errors including the "= 0"
This is a <u>given answer</u> so do not condone slips unless they are recovered **before** the final printed answer.

(b)(i)

B1: Deduces the correct value of *k*. Ignore any working and just look for this value.

Allow equivalent exact values e.g. $1\frac{1}{3}$ or $1.\dot{3}$ but not clearly rounded e.g. 1.333

It must be clear that $k = \frac{4}{3}$ is selected so if both roots are offered score B0 unless $k = \frac{4}{3}$ is clearly intended by the calculation in part (ii)

(ii)

M1: Attempts the second term by e.g. $(\text{their } k)\times 6-5$ and then adds 6 and −1 to their second term. E.g. $6+\text{"}\frac{4}{3}\text{"}\times 6-5-1$

If they use u_1 and u_3 they must be as given in the question but condone a clear mis-copy of their u_2 value.

The attempt at the second term may be implied by their value.

Note that they may use $u_3=-1$ to find u_2 e.g. $-1=\text{"}\frac{4}{3}\text{"}u_2-5 \Rightarrow u_2=\text{"}\frac{3}{4}\text{"}(5-1)=3$

Condone slips when rearranging as long as the intention is clear.
The attempt at the second term may be seen embedded in their attempt at the sum e.g.

$\sum_{r=1}^{3} u_r = 6+\underline{\frac{4}{3}\times 6-5}-1$ or e.g. $\sum_{r=1}^{3} u_r = 6+\underline{\frac{3}{4}(5-1)}-1$

If they use both of their values for *k* allow M1.

Alternatives:

Note that $\sum_{r=1}^{3} u_r = 6+6k-5-1=6k$ so you may just see an attempt at 6*k* with their $\frac{4}{3}$.

Note that $\sum_{r=1}^{3} u_r = 6k^2+k-4$ so you may just see an attempt at $6k^2+k-4$ with their $\frac{4}{3}$.

A1: Correct value of 8 and no other values unless rejected.
Correct answer with no working scores both marks.
Allow recovery from an inexact value from part (i) e.g. 1.333