

Question			Answer	Marks	AO	Guidance
11	(a)		$\frac{\sqrt{n+1} + 1 - (\sqrt{n+1} - 1)}{(\sqrt{n+1} - 1)(\sqrt{n+1} + 1)}$	M1	3.1a	- Finding common denominator or attempt to rationalise denominator for at least one fraction e.g. $\frac{1}{\sqrt{n+1}-1} \cdot \frac{\sqrt{n+1}+1}{\sqrt{n+1}+1} - \frac{1}{\sqrt{n+1}+1} \cdot \frac{\sqrt{n+1}-1}{\sqrt{n+1}-1}$ or $\frac{\sqrt{n+1}+1}{n} - \frac{(\sqrt{n+1}-1)}{n}$ oe - Condone consistently considering any general term in the sequence e.g. a_{k+1} for all marks $\frac{1}{\sqrt{k+2}-1} \cdot \frac{\sqrt{k+2}+1}{\sqrt{k+2}+1} - \frac{1}{\sqrt{k+2}+1} \cdot \frac{\sqrt{k+2}-1}{\sqrt{k+2}-1}$
			$\frac{2}{(n+1)-1} = \frac{2}{n}$	A1	2.1	- Correct simplification a_{k+1} leads to $\frac{2}{k+1}$
			Numerator and denominator are integers (and denominator is not zero) so this is rational	A1	2.2a	- nfww - Correct explanation of why the general term must be rational e.g. in form $\frac{p}{q}$ oe p, q integers - Condone rational as n an integer or k integer '$\frac{2}{n}$ is rational' alone is A0 - <u>must</u> include comment that n is an integer
				[3]		

Question			Answer	Marks	AO	Guidance
11	(b)		(Since $n > 0$) as n increases, $\frac{2}{n}$ decreases Or $\frac{2}{n+1} - \frac{2}{n} = -\frac{2}{n(n+1)}$	M1	2.2a	- Must relate to $\frac{2}{n}$, $a_n \rightarrow 0$ is not sufficient - Allow "$(n > 0 \text{ and }) \lim_{n \rightarrow \infty} \frac{2}{n} = 0$" - Condone omission of $n > 0$ - May find the difference between 2 terms or use inequalities - Allow $f(x) = \frac{2}{x} \Rightarrow f'(x) = -\frac{2}{x^2} < 0$ (condone n instead of x) - Condone listing terms for M1 A0 FT <i>their</i> $\frac{2}{n}$ provided in the form $\frac{b}{n+c}$ where b, c integers
			$\Rightarrow$ sequence is decreasing	A1	2.5	See appendix Convincing conclusion e.g. difference between terms is negative, so sequence is decreasing or $\frac{2}{n+1} < \frac{2}{n}$, so decreasing or function $f(x)$ is decreasing therefore sequence a_n decreasing A1 is only available if <i>their</i> $\frac{2}{n}$ is correct for <i>their</i> term e.g. $\frac{2}{k+1}$ from considering a_{k+1} SC B1 for ‘decreasing’ following M0 for a correct but incomplete argument. But not just for ‘decreasing’ unsupported.
				[2]		

Question 11b

These would earn M1A1
As n tends towards infinity $\frac{2}{n}$ will tend towards zero. Decreasing.
$a_{n+1} = \frac{2}{n+1} < \frac{2}{n} = a_n$ So $a_{n+1} < a_n$ so the sequence is decreasing
As k increases $\frac{2}{k+1}$ decreasing, therefore the sequence is decreasing
Note: This is follow through from their answer in 11a as noted in the guidance column.

This would earn SCB1
$n = 1 \rightarrow a_1 = 2$ $n = 2 \rightarrow a_2 = 1$ $n = 2 \rightarrow a_3 = \frac{2}{3}$ $n = 4 \rightarrow a_4 = \frac{1}{2}$ It is decreasing. This is insufficient for the award of M1A1 marks as they are using numerical values, however would earn SCB1.

This would earn M0A0
The sequence is decreasing
No special case awarded as ‘decreasing’ is unsupported.