Question	Scheme	Marks	AOs
4	$\dfrac{1}{(r+1)(r+2)(r+3)} \equiv \dfrac{A}{r+1}+\dfrac{B}{r+2}+\dfrac{C}{r+3} \Rightarrow A=\ldots,\ B=\ldots,\ C=\ldots$ $\left(\text{NB } A=\frac{1}{2}\ \ B=-1\ \ C=\frac{1}{2}\right)$	M1	3.1a
	$r=0$ $\quad \dfrac{1}{2}\left[\dfrac{1}{1}-\dfrac{2}{2}+\dfrac{1}{3}\right]$ or $\dfrac{1}{2\ 1}-\dfrac{1}{2}+\dfrac{1}{2\ 3}$ or $\dfrac{1}{2}-\dfrac{1}{2}+\dfrac{1}{6}$	M1	2.1
	$r=1$ $\quad \dfrac{1}{2}\left[\dfrac{1}{2}-\dfrac{2}{3}+\dfrac{1}{4}\right]$ or $\dfrac{1}{2\ 2}-\dfrac{1}{3}+\dfrac{1}{2\ 4}$ or $\dfrac{1}{4}-\dfrac{1}{3}+\dfrac{1}{8}$		
	$r=n-1$ $\quad \dfrac{1}{2}\left[\dfrac{1}{n}-\dfrac{2}{n+1}+\dfrac{1}{n+2}\right]$ or $\dfrac{1}{2\ n}-\dfrac{1}{n+1}+\dfrac{1}{2\ n+2}$ or $\dfrac{1}{2n}-\dfrac{1}{n+1}+\dfrac{1}{2n+4}$		
	$r=n$ $\quad \dfrac{1}{2}\left[\dfrac{1}{n+1}-\dfrac{2}{n+2}+\dfrac{1}{n+3}\right]$ or $\dfrac{1}{2\ n+1}-\dfrac{1}{n+2}+\dfrac{1}{2\ n+3}$ or $\dfrac{1}{2n+2}-\dfrac{1}{n+2}+\dfrac{1}{2n+6}$		
	$\dfrac{1}{2}-\dfrac{1}{2}+\dfrac{1}{4}+\dfrac{1}{2(n+2)}-\dfrac{1}{n+2}+\dfrac{1}{2(n+3)}$ or $\dfrac{1}{4}-\dfrac{1}{2(n+2)}+\dfrac{1}{2(n+3)}$	A1	1.1b
	$=\dfrac{n^2+5n+6+2n+6-4n-12+2n+4}{4(n+2)(n+3)}$	M1	1.1b
	$=\dfrac{(n+1)(n+4)}{4(n+2)(n+3)}$	A1	2.2a
		(5)	
			(5 marks)

Notes
M1: A complete strategy to find *A*, *B* and *C* e.g. partial fractions. Allow slip when finding the constant but must be the correct form of partial fractions and correct identity. M1: Starts the process of differences to identify the relevant fractions at the start and end. Must have attempted a minimum of $r=0$, $r=1$, ... $r=n-1$ and $r=n$ Follow through on their values of *A*, *B* and C. Look for $r=0\rightarrow \frac{A}{1}-\frac{B}{2}+\frac{C}{3}$ $\quad r=1\rightarrow \frac{A}{2}-\frac{B}{3}+\frac{C}{4}$ $r=n-1\rightarrow \frac{A}{n}-\frac{B}{n+1}+\frac{C}{n+2}$ $\quad r=n\rightarrow \frac{A}{n+1}-\frac{B}{n+2}+\frac{C}{n+3}$ A1: Correct fractions from the beginning and end that do not cancel stated. M1 Combines all 'their' fractions (at least two algebraic fractions) over their correct common denominator, does not need to be the lowest common denominator (allow a slip in the numerator). A1: Correct answer. **Note**: if they start with $r=1$ the maximum they can score is M1M0A0M1A0 **Note:** Proof by induction gains no marks