Question	Scheme	Marks	AOs
4	$\frac{2}{(r+4)(r+6)} \equiv \frac{A}{r+4} + \frac{B}{r+6} \Rightarrow A = ...,\ B = ...$	M1	3.1a
	$\frac{2}{(r+4)(r+6)} \equiv \frac{1}{r+4} - \frac{1}{r+6}$	A1	1.1b
	$\sum_{r=1}^{n} \frac{2}{(r+4)(r+6)} = \sum_{r=1}^{n} \frac{1}{r+4} - \frac{1}{r+6}$ $\frac{1}{5} - \frac{1}{7} + \frac{1}{6} - \frac{1}{8} + \frac{1}{7} - \frac{1}{9} + ...$ $+\frac{1}{n+2} - \frac{1}{n+4} + \frac{1}{n+3} - \frac{1}{n+5} + \frac{1}{n+4} - \frac{1}{n+6}$	M1	2.1
	$= \frac{1}{5} + \frac{1}{6} - \frac{1}{n+5} - \frac{1}{n+6}$	A1	2.2a
	$= \frac{1}{5} + \frac{1}{6} - \frac{1}{n+5} - \frac{1}{n+6} = \frac{11(n+5)(n+6) - 30(n+6) - 30(n+5)}{30(n+5)(n+6)}$	M1	1.1b
	$= \frac{n(11n+61)}{30(n+5)(n+6)}$	A1	1.1b
		(6)	

(6 marks)

Notes

M1: Recognises the need to find partial fractions and applies a correct method leading to finding values for *A* and *B*

Allow a slip when finding the constants

A1: Correct partial fractions **seen** at any stage. Not just values for *A* and *B* listed

Note: Proof by induction will not score the next 4 marks.

M1: Starts the process of finding terms at the start and at the end, in order to establish the non-cancelling terms

Must have attempted a minimum of $r = 1$, $r = 2$, ... $r = n - 1$ and $r = n$,this may be implied by their correct non-cancelling terms.

Follow through on their values of *A* and *B*. Look for

$r = 1$ ® $\frac{A}{5} - \frac{B}{7}$ $\qquad$ $r = 2$ ® $\frac{A}{6} - \frac{B}{8}$

$r = n - 1$ ® $\frac{A}{n+3} - \frac{B}{n+5}$ $\qquad$ $r = n$ ® $\frac{A}{n+4} - \frac{B}{n+6}$

A1: Correct non-cancelling terms which may be listed separately.

Correct fractions from the beginning and end that do not cancel stated.

M1: Combines 'their' fractions of the form $p + \frac{q}{n+5} + \frac{r}{n+6}$ over a correct common denominator which does not need to be the lowest common denominator and obtains a quadratic expression in the numerator.

A1: Correct answer.

Note: If they start with $r = 0$ the maximum they can score is M1A1M0A0M1A0