Question Number	Scheme	Marks
3(a)	$\dfrac{1}{(n+3)(n+5)} \equiv \dfrac{A}{(n+3)} + \dfrac{B}{(n+5)}$ $\Rightarrow A = ..., B = ...$	M1
	$\dfrac{1}{2(n+3)} - \dfrac{1}{2(n+5)}$ (oe)	A1
		(2)
(b)	$\left(\dfrac{1}{2}\right)\sum_{r=1}^{n}\left(\dfrac{1}{r+3} - \dfrac{1}{r+5}\right) =$ $\left(\dfrac{1}{2}\right)\left(\dfrac{1}{4} - \dfrac{1}{6} + \dfrac{1}{5} - \dfrac{1}{7} + \dfrac{1}{6} - \dfrac{1}{8} + ... + \dfrac{1}{n+2} - \dfrac{1}{n+4} + \dfrac{1}{n+3} - \dfrac{1}{n+5}\right)$	M1
	$= \left(\dfrac{1}{2}\right)\left(\dfrac{1}{4} + \dfrac{1}{5} - \dfrac{1}{n+4} - \dfrac{1}{n+5}\right)$ (oe)	A1
	$= \left(\dfrac{1}{2}\right)\left(\dfrac{9(n+4)(n+5) - 20(n+5) - 20(n+4)}{20(n+4)(n+5)}\right) = ...$	dM1
	$= \dfrac{n(9n+41)}{40(n+4)(n+5)}$	A1
		(4)
(c)	$\dfrac{1}{9\times11} + \dfrac{1}{10\times12} + ... + \dfrac{1}{24\times26} = \dfrac{21(9\times21+41)}{40\times25\times26} - \dfrac{5(9\times5+41)}{40\times9\times10}$	M1
	$= \dfrac{194}{2925}$	A1
		(2)
		Total 8

Notes:

(a)

M1: Correct partial fraction attempt to obtain values for *A* and *B*. May be implied by correct values.

A1: Correct expression as shown or any equivalent. May be ½ in each numerator, or the ½ may be factored out. The expression must be given in (a) not just embedded in the summation in (b).

(b)

M1: Uses the method of differences to identify non-cancelling terms. Expect to see at least first two pairs and last pair of terms listed, but this may be implied by the correct first two or last two non-cancelling terms being stated with no cancelling explicitly shown. Allow if the ½ is missing for this mark.

A1: Identifies the correct non-cancelling terms. Allow if the ½ is missing for this mark.

dM1: Puts over a common denominator $k(n+4)(n+5)$, where $k \neq 1$, and makes progress towards the required form. The ½ may be missing for this mark. Allow slips in the numerator coefficients but should have correct terms in *n*.

A1: Achieves the correct answer.

(c)

M1: Attempts to use the formula from (b) with $\sum_{r=1}^{21} - \sum_{r=1}^{k}$ where $k = 5$ or 6.

Substitution into the formula must be seen at least once.

A1: Correct answer achieved (the M must have been scored). Must be simplified.