3. (a) Express

$$\frac{1}{(n+3)(n+5)}$$

in partial fractions.

(2)

(b) Hence, using the method of differences, show that for all positive integer values of n,

$$\sum_{r=1}^{n} \frac{1}{(r+3)(r+5)} = \frac{n(pn+q)}{40(n+4)(n+5)}$$

where p and q are integers to be determined.

(4)

(c) Use the answer to part (b) to determine, as a simplified fraction, the value of

$$\frac{1}{9\times11} + \frac{1}{10\times12} + \ldots + \frac{1}{24\times26}$$

(2)

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Question 3 continued

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Question 3 continued

(Total for Question 3 is 8 marks)