5. (a) Use the standard results for summations to show that for all positive integers n

$$\sum_{r=1}^{n} r(r+1)(r+5) = \frac{1}{4}n(n+a)(n+b)(n+c)$$

where a, b and c are integers to be determined.

(5)

(b) Hence determine the value of

$$20 \times 21 \times 25 + 21 \times 22 \times 26 + ... + 40 \times 41 \times 45$$

(2)

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Question 5 continued

(Total for Question 5 is 7 marks)