

STEP III, 2008 Q8

- 8 (i) The coefficients in the series

$$S = \frac{1}{3}x + \frac{1}{6}x^2 + \frac{1}{12}x^3 + \cdots + a_r x^r + \cdots$$

satisfy a recurrence relation of the form $a_{r+1} + pa_r = 0$. Write down the value of p .

By considering $(1 + px)S$, find an expression for the sum to infinity of S (assuming that it exists). Find also an expression for the sum of the first $n + 1$ terms of S .

- (ii) The coefficients in the series

$$T = 2 + 8x + 18x^2 + 37x^3 + \cdots + a_r x^r + \cdots$$

satisfy a recurrence relation of the form $a_{r+2} + pa_{r+1} + qa_r = 0$. Find an expression for the sum to infinity of T (assuming that it exists). By expressing T in partial fractions, or otherwise, find an expression for the sum of the first $n + 1$ terms of T .



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