

Section 1: The method of differences

Exercise level 1

1. Show that $\frac{1}{r+1} - \frac{1}{r+2} = \frac{1}{(r+1)(r+2)}$ and hence find the sum of $\sum_{r=1}^n \frac{1}{(r+1)(r+2)}$.

2. Show that $\frac{1}{3r} - \frac{1}{3(r+1)} = \frac{1}{3r(r+1)}$ and hence find the sum of $\sum_{r=1}^n \frac{1}{3r(r+1)}$.

3. (i) Show that $(r+1)! - r! = r \times r!$

(ii) Hence find the sum of $\sum_{r=1}^n r \times r!$