

## Section 1: The method of differences

## Exercise level 2

1. (i) Express  $\frac{1}{(r+1)(r+2)(r+3)}$  in partial fractions.

(ii) Hence find  $\sum_{r=1}^n \frac{1}{(r+1)(r+2)(r+3)}$ .

(iii) Find  $\sum_{r=1}^{\infty} \frac{1}{(r+1)(r+2)(r+3)}$ .

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

3. Show that  $r(r+1)(r+2)(r+3) - (r-1)r(r+1)(r+2) \equiv 4r(r+1)(r+2)$  and hence find the sum of the first  $n$  terms of  $r(r+1)(r+2)$ .

4. (i) Express  $\frac{4}{(2r-1)(2r+1)(2r+3)}$  in partial fractions.

(ii) Hence find  $\sum_{r=1}^n \frac{4}{(2r-1)(2r+1)(2r+3)}$ .