

# MEI Further Pure 1 Induction and series

## Section 1: Proof by induction

### Exercise level 1

In Questions 1 to 5 prove the given result by induction.

1. The sum of the first  $n$  terms of the series  $1 + 4 + 7 + \dots$  is  $\frac{1}{2}n(3n-1)$

2.  $\sum_{r=1}^n (2r-3) = n(n-2)$

3. The sum of the first  $n$  terms of the series  $(1 \times 3) + (2 \times 4) + (3 \times 5) + \dots$  is  $\frac{n(n+1)(2n+7)}{6}$

4. The sum of the first  $n$  terms of the series  $\frac{1}{1 \times 3} + \frac{1}{3 \times 5} + \frac{1}{5 \times 7} + \dots + \frac{1}{(2r-1)(2r+1)}$  is  $\frac{n}{(2n+1)}$

5.  $\sum_{r=1}^n 2^{r-1} = 2^n - 1$