SERIES AND SIGMA NOTATION (Σ)

1 Write expansions of the series defined by the following:

(a) $\displaystyle\sum_{k=1}^{4} k^2$

(b) $\displaystyle\sum_{r=0}^{5} 3^r$

(c) $\displaystyle\sum_{k=1}^{p} (2k-1)$

(d) $\displaystyle\sum_{k=1}^{5} k(k+1)$

(e) $\displaystyle\sum_{r=1}^{8} rx^r$

(f) $\displaystyle\sum_{r=1}^{k} \frac{1}{x^r}$

(g) $\displaystyle\sum_{k=1}^{p} (2k+1)^2$

(h) $\displaystyle\sum_{k=1}^{n+1} (3k-2)$

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2 Indicate whether each statement below is a correct or an incorrect expression for $1+x+x^2+\ldots+x^{10}$.

(a) $\displaystyle\sum_{n=0}^{10} x^n$

(b) $\displaystyle\sum_{n=1}^{10} x^n$

(c) $\displaystyle\sum_{n=1}^{11} x^{n-1}$

(d) $\displaystyle\sum_{n=1}^{10} x^{n-1}$

3 Use sigma notation to represent each of the following:

(a) $1^2 + 2^2 + 3^2 + \ldots + 9^2$

(b) $1 \times 3 + 2 \times 4 + 3 \times 5 + \ldots + 10 \times 12$

(c) $1 + 6 + 11 + \ldots + (5p - 4)$

(d) $\dfrac{1}{2 \times 3} + \dfrac{1}{3 \times 4} + \dfrac{1}{4 \times 5} + \ldots + \dfrac{1}{p(p+1)}$

(e) $2x^2 + 3x^3 + 4x^4 + \ldots + 12x^{12}$

(f) $a + ar + ar^2 + \ldots + ar^{n-1}$

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4 Evaluate:

(a) $\displaystyle\sum_{n=1}^{4} n^2$

(b) $\displaystyle\sum_{n=1}^{6} (2n+1)$

(c) $\displaystyle\sum_{k=1}^{4} (3k-2)$

(d) $\displaystyle\sum_{r=1}^{4} 2^r$

(e) $\displaystyle\sum_{n=0}^{5} n^2$

(f) $\displaystyle\sum_{n=0}^{5} (2n-1)$

(g) $\displaystyle\sum_{n=1}^{4} \left(n^2+n\right)$

(h) $\displaystyle\sum_{n=1}^{6} (12-3n)$

(i) $\displaystyle\sum_{r=1}^{4} r^r$