Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

- $1 + 5(2x) + 10(2x)^2$
- $\mathbf{1 + 10x + 40x^2}$

2.2

- $u_{20} = 7 + 19 \times 4 = \mathbf{83}$
- $S_{20} = 10(7 + 83) = \mathbf{900}$

2.3

- $r = \mathbf{\frac{2}{3}}$
- $S_\infty = \dfrac{81}{1/3} = \mathbf{243}$

2.4

- general term $\binom{4}{r} x^{4-r} \left(\frac{3}{x}\right)^r$; power $4 - 2r = 0$, $r = 2$
- $\binom{4}{2} \times 9 = \mathbf{54}$

3.1

- $(2 - x)^5 = 32 - 80x + 80x^2 - \ldots$
- x^2: $80 + a(-80) = 20$
- $\mathbf{a = \frac{3}{4}}$

3.2

(a) $5d = 20$: $\mathbf{d = 4}$, $\mathbf{a = 10}$

(b)

- $\frac{n}{2}\big(20 + 4(n-1)\big) > 1000 \Rightarrow n^2 + 4n - 500 > 0$
- $n > \dfrac{-4 + \sqrt{2016}}{2} = 20.4$
- $\mathbf{n = 21}$

3.3

(a)

- $ar = 24$, $\dfrac{a}{1 - r} = 108$
- $108(1 - r)r = 24$
- $108r^2 - 108r + 24 = 0 \Rightarrow 9r^2 - 9r + 2 = 0$

(b)

- $(3r - 1)(3r - 2) = 0$
- $r = \frac{1}{3}$, $\mathbf{a = 72}$; $r = \frac{2}{3}$, $\mathbf{a = 36}$

(c) $\dfrac{36\,(1 - (2/3)^{10})}{1/3} = \mathbf{106.1}$

(d)

- $108\,(1 - (2/3)^n) > 107 \Rightarrow (2/3)^n < \frac{1}{108}$
- $n > \dfrac{\ln 108}{\ln 1.5} = 11.5$
- $\mathbf{n = 12}$