Solutions

2.1

- $1-3, 4-3, 9-3, 16-3$
- $\mathbf{-2}, \mathbf{1}, \mathbf{6}, \mathbf{13}$

2.2

- first differences $4, 6, 8, 10$
- second differences $2, 2, 2$: constant, so the sequence is quadratic

2.3

- half the second difference: $\mathbf{3}$, so the nth term starts $3n^2$

2.4

- second difference 4, so $a = 2$; $2n^2$ gives $2, 8, 18, 32, 50$, matching every term
- $\boldsymbol{2n^2}$

2.5

- second difference 2, so n^2; subtract $1, 4, 9, 16, 25$ to leave $2, 2, 2, 2, 2$
- $\boldsymbol{n^2 + 2}$

3.1

- first differences $3, 5, 7$; second difference 2, but the nth term is n^2, with coefficient $\mathbf{1}$: the coefficient is half the second difference

3.2

- first differences $7, 11, 15, 19$; second difference 4, so $a = 2$
- subtract $2n^2$: $5-2, 12-8, 23-18, 38-32 = 3, 4, 5, 6$, which is $n + 2$
- $\boldsymbol{2n^2 + n + 2}$

3.3

- first differences $3, 7, 11, 15$; second difference 4, so $a = 2$
- subtract $2n^2$: $0-2, 3-8, 10-18, 21-32 = -2, -5, -8, -11$, which is $1 - 3n$
- $\boldsymbol{2n^2 - 3n + 1}$

3.4

- $n^2 + 4n = 140$, so $n^2 + 4n - 140 = 0$
- $(n + 14)(n - 10) = 0$, so $n = 10$ or $n = -14$
- $n = 10$ is a positive whole number, so 140 is the **10th** term

3.5

- common ratio $r = \dfrac{\sqrt{3}}{1} = \sqrt{3}$; the nth term is $(\sqrt{3})^{n-1}$
- 7th term: $(\sqrt{3})^6 = 3^3 = 27$
- 6th term: $(\sqrt{3})^5 = 3^2 \times \sqrt{3} = \mathbf{9\sqrt{3}}$