SEQUENCES AND SERIES

1 Expand each of the following, simplifying the coefficient in each term.

a $(1 + x)^4$ **b** $(1 - x)^5$ **c** $(1 + 4x)^3$ **d** $(1 - 2y)^3$

e $(1 + \frac{1}{2}x)^4$ **f** $(1 + \frac{1}{3}y)^3$ **g** $(1 + x^2)^5$ **h** $(1 - \frac{3}{2}x)^4$

2 Expand each of the following, simplifying the coefficient in each term.

a $(x + y)^3$ **b** $(a - b)^5$ **c** $(x + 2y)^4$ **d** $(2 + y)^3$

e $(3 - x)^3$ **f** $(5 + 2x)^4$ **g** $(3 - 4y)^5$ **h** $(3 + \frac{1}{2}x)^4$

3 Find the first four terms in the expansion in ascending powers of x of

a $(1 + x)^{10}$ **b** $(1 - x)^6$ **c** $(1 + 2x)^8$ **d** $(1 - \frac{1}{2}x)^7$

e $(1 + x^3)^6$ **f** $(2 + x)^9$ **g** $(3 - x)^7$ **h** $(2 + 5x)^{10}$

4 Find the coefficient indicated in the following expansions.

a $(1 + x)^{20}$, coefficient of x^3 **b** $(1 - x)^{14}$, coefficient of x^4

c $(1 + 4x)^9$, coefficient of x^2 **d** $(1 - 3y)^{14}$, coefficient of y^3

e $(1 - \frac{1}{3}x)^{12}$, coefficient of x^4 **f** $(1 - \frac{1}{2}x)^{16}$, coefficient of x^5

g $(1 + \frac{2}{5}x)^{15}$, coefficient of x^2 **h** $(1 + y^2)^8$, coefficient of y^6

5 Express each of the following in the required form where a and b are integers.

a $(1 + \sqrt{5})^3$ in the form $a + b\sqrt{5}$ **b** $(1 - \sqrt{3})^4$ in the form $a + b\sqrt{3}$

c $(2 + \sqrt{2})^3$ in the form $a + b\sqrt{2}$ **d** $(1 + 2\sqrt{3})^4$ in the form $a + b\sqrt{3}$

6 **a** Expand $(1 + x)^6$ in ascending powers of x up to and including the term in x^3, simplifying each coefficient.

b By substituting a suitable value of x into your answer for part **a**, obtain an estimate for

i 1.02^6 **ii** 0.99^6

giving your answers to 4 decimal places.

7 **a** Expand $(1 + 2y)^8$ in ascending powers of y up to and including the term in y^3, simplifying each coefficient.

b By substituting a suitable value of y into your answer for part **a**, obtain an estimate for

i 0.98^8 **ii** 1.01^8

giving your answers to 4 decimal places.

8 Expand and simplify

a $(1 + x)^4 + (1 - x)^4$ **b** $(1 - \frac{1}{3}x)^3 - (1 + \frac{1}{3}x)^3$

9 The coefficient of x^2 in the expansion of $(1 + ax)^4$ in ascending powers of x is 24, where a is a constant and $a < 0$. Find

a the value of a,

b the value of the coefficient of x^3 in the expansion.