C2 THE BINOMIAL THEOREM *Worksheet A*

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.