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 \((1 + \frac{1}{2}x)^4\)  \(f\) \((1 + \frac{1}{4}y)^3\)  \(g\) \((1 + x^2)^5\)  \(h\) \((1 - \frac{3}{7}x)^4\)

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 \(x^3\)  \(b\) \((1 - x)^4\), 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 \(x^4\)  \(f\) \((1 - \frac{1}{7}x)^{16}\), coefficient of \(x^5\)
   g \((1 + \frac{2}{5}x)^{15}\), coefficient of \(x^2\)  \(h\) \((1 + y^3)^8\), 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 \((1 + x)^4 + (1 - x)^4\)  \(b\) \((1 - \frac{1}{7}x)^3 - (1 + \frac{1}{7}x)^3\)

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.