

## SERIES

- 1    **a** Expand  $(1 - x)^{\frac{1}{2}}$ ,  $|x| < 1$ , in ascending powers of  $x$  up to and including the term in  $x^3$ .
- b** By substituting  $x = 0.01$  in your expansion, find the value of  $\sqrt{11}$  correct to 9 significant figures.
- 2    The series expansion of  $(1 + 8x)^{\frac{1}{2}}$ , in ascending powers of  $x$  up to and including the term in  $x^3$ , is
- $$1 + 4x + ax^2 + bx^3, \quad |x| < \frac{1}{8}.$$
- a** Find the values of the constants  $a$  and  $b$ .
- b** Use the expansion, with  $x = 0.01$ , to find the value of  $\sqrt{3}$  to 5 decimal places.
- 3    **a** Expand  $(9 - 6x)^{\frac{1}{2}}$ ,  $|x| < \frac{3}{2}$ , in ascending powers of  $x$  up to and including the term in  $x^3$ , simplifying the coefficient in each term.
- b** Use your expansion with a suitable value of  $x$  to find the value of  $\sqrt{8.7}$  correct to 7 significant figures.
- 4    **a** Expand  $(1 + 6x)^{\frac{1}{3}}$ ,  $|x| < \frac{1}{6}$ , in ascending powers of  $x$  up to and including the term in  $x^3$ .
- b** Use your expansion, with  $x = 0.004$ , to find the cube root of 2 correct to 7 significant figures.
- 5    **a** Expand  $(1 + 2x)^{-3}$  in ascending powers of  $x$  up to and including the term in  $x^3$  and state the set of values of  $x$  for which the expansion is valid.
- b** Hence, or otherwise, find the series expansion in ascending powers of  $x$  up to and including the term in  $x^3$  of  $\frac{1 + 3x}{(1 + 2x)^3}$ .
- 6    Find the coefficient of  $x^2$  in the series expansion of  $\frac{2 + x}{\sqrt{4 - 2x}}$ ,  $|x| < 2$ .
- 7    **a** Find the values of  $A$  and  $B$  such that
- $$\frac{2 - 11x}{1 - 5x + 4x^2} \equiv \frac{A}{1 - x} + \frac{B}{1 - 4x}.$$
- b** Hence, find the series expansion of  $\frac{2 - 11x}{1 - 5x + 4x^2}$  in ascending powers of  $x$  up to and including the term in  $x^3$  and state the set of values of  $x$  for which the expansion is valid.
- 8    
$$f(x) \equiv \frac{4 - 17x}{(1 + 2x)(1 - 3x)^2}, \quad |x| < \frac{1}{3}.$$
- a** Express  $f(x)$  in partial fractions.
- b** Hence, or otherwise, find the series expansion of  $f(x)$  in ascending powers of  $x$  up to and including the term in  $x^3$ .
- 9    The first three terms in the expansion of  $(1 + ax)^b$ , in ascending powers of  $x$ , for  $|ax| < 1$ , are
- $$1 - 6x + 24x^2.$$
- a** Find the values of the constants  $a$  and  $b$ .
- b** Find the coefficient of  $x^3$  in the expansion.