

1 Write down the expansion of the following:

a $(1 + x)^4$ **b** $(3 + x)^4$ **c** $(4 - x)^4$ **d** $(x + 2)^6$ **e** $(1 + 2x)^4$ **f** $(1 - \frac{1}{2}x)^4$

2 Use the binomial theorem to find the first four terms in the expansion of:

a $(1 + x)^{10}$ **b** $(1 - 2x)^5$ **c** $(1 + 3x)^6$ **d** $(2 - x)^8$ **e** $(2 - \frac{1}{2}x)^{10}$ **f** $(3 - x)^7$

3 Use the binomial theorem to find the first four terms in the expansion of:

a $(2x + y)^6$ **b** $(2x + 3y)^5$ **c** $(p - q)^8$ **d** $(3x - y)^6$ **e** $(x + 2y)^8$ **f** $(2x - 3y)^9$

4 Use the binomial expansion to find the first four terms, in ascending powers of x , of:

a $(1 + x)^8$ **b** $(1 - 2x)^6$ **c** $(1 + \frac{x}{2})^{10}$
d $(1 - 3x)^5$ **e** $(2 + x)^7$ **f** $(3 - 2x)^3$
g $(2 - 3x)^6$ **h** $(4 + x)^4$ **i** $(2 + 5x)^7$

Hint Your answers should be in the form $a + bx + cx^2 + dx^3$ where a, b, c and d are numbers.

5 Find the first 3 terms, in ascending powers of x , of the binomial expansion of $(2 - x)^6$ and simplify each term. **(4 marks)**

6 Find the first 3 terms, in ascending powers of x , of the binomial expansion of $(3 - 2x)^5$ giving each term in its simplest form. **(4 marks)**

7 Find the binomial expansion of $(x + \frac{1}{x})^5$ giving each term in its simplest form. **(4 marks)**

- 1 a $1 + 4x + 6x^2 + 4x^3 + x^4$
 b $81 + 108x + 54x^2 + 12x^3 + x^4$
 c $256 - 256x + 96x^2 - 16x^3 + x^4$
 d $x^6 + 12x^5 + 60x^4 + 160x^3 + 240x^2 + 192x + 64$
 e $1 + 8x + 24x^2 + 32x^3 + 16x^4$
 f $1 - 2x + \frac{3}{2}x^2 - \frac{1}{2}x^3 + \frac{1}{16}x^4$
- 2 a $1 + 10x + 45x^2 + 120x^3$
 b $1 - 10x + 40x^2 - 80x^3$
 c $1 + 18x + 135x^2 + 540x^3$
 d $256 - 1024x + 1792x^2 - 1792x^3$
 e $1024 - 2560x + 2880x^2 - 1920x^3$
 f $2187 - 5103x + 5103x^2 - 2835x^3$
- 3 a $64x^6 + 192x^5y + 240x^4y^2 + 160x^3y^3$
 b $32x^5 + 240x^4y + 720x^3y^2 + 1080x^2y^3$
 c $p^8 - 8p^7q + 28p^6q^2 - 56p^5q^3$
 d $729x^6 - 1458x^5y + 1215x^4y^2 - 540x^3y^3$
 e $x^8 + 16x^7y + 112x^6y^2 + 448x^5y^3$
 f $512x^9 - 6912x^8y + 41\,472x^7y^2 - 145\,152x^6y^3$
- 4 a $1 + 8x + 28x^2 + 56x^3$
 b $1 - 12x + 60x^2 - 160x^3$
 c $1 + 5x + \frac{45}{4}x^2 + 15x^3$
 d $1 - 15x + 90x^2 - 270x^3$
 e $128 + 448x + 672x^2 + 560x^3$
 f $27 - 54x + 36x^2 - 8x^3$
 g $64 - 576x + 2160x^2 - 4320x^3$
 h $256 + 256x + 96x^2 + 16x^3$
 i $128 + 2240x + 16\,800x^2 + 70\,000x^3$
- 5 $64 - 192x + 240x^2$
- 6 $243 - 810x + 1080x^2$
- 7 $x^5 + 5x^3 + 10x + \frac{10}{x} + \frac{5}{x^3} + \frac{1}{x^5}$