Chapter 5 Answers

Exercise 5A

1 **a** $x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$
b $p^5 + 5p^4q + 10p^3q^2 + 10p^2q^3 + 5pq^4 + q^5$
c $a^3 - 3a^2b + 3ab^2 - b^3$
d $x^3 + 12x^2 + 48x + 64$
e $16x^4 - 96x^3 + 216x^2 - 216x + 81$
f $a^5 + 10a^4 + 40a^3 + 80a^2 + 80a + 32$
g $81x^4 - 432x^3 + 864x^2 - 768x + 256$
h $16x^4 - 96x^3y + 216x^2y^2 - 216xy^3 + 81y^4$

2 **a** 16 **b** -10 **c** 8 **d** 1280
e 160 **f** -2 **g** 40 **h** -96

3 **d** $1 + 9x + 30x^2 + 44x^3 + 24x^4$

4 $8 + 12y + 6y^2 + y^3$, $8 + 12x - 6x^2 - 11x^3 + 3x^4 + 3x^5 - x^6$

5 -143

6 ± 3

7 $\frac{5}{2}$, -1

8 $\frac{3}{4}$

Exercise 5B

1 **a** 24 **b** 720 **c** 56
d 10 **e** 6 **f** 28
g 10 **h** 20 **i** 10
j 15 **k** 56 **l** $\dfrac{n(n-1)(n-2)}{6}$

2 **a** 1 **b** 4 **c** 6 **d** 4 **e** 1

3 **a** $\binom{3}{0}\ \binom{3}{1}\ \binom{3}{2}\ \binom{3}{3}$ **b** $\binom{5}{0}\ \binom{5}{1}\ \binom{5}{2}\ \binom{5}{3}\ \binom{5}{4}\ \binom{5}{5}$

4 **a** Selecting a group of 4 from 6 creates a group of 2.
b ${}^6C_2 = 15$, $\binom{6}{4} = 15$

Exercise 5C

1 **a** $16x^4 + 32x^3y + 24x^2y^2 + 8xy^3 + y^4$
b $p^5 - 5p^4q + 10p^3q^2 - 10p^2q^3 + 5pq^4 - q^5$
c $1 + 8x + 24x^2 + 32x^3 + 16x^4$
d $81 + 108x + 54x^2 + 12x^3 + x^4$
e $1 - 2x + \frac{3}{2}x^2 - \frac{1}{2}x^3 + \frac{1}{16}x^4$
f $256 - 256x + 96x^2 - 16x^3 + x^4$
g $32x^5 + 240x^4y + 720x^3y^2 + 1080x^2y^3 + 810xy^4 + 243y^5$
h $x^6 + 12x^5 + 60x^4 + 160x^3 + 240x^2 + 192x + 64$

2 **a** $90x^3$ **b** $80x^3y^2$ **c** $-20x^3$
d $720x^3$ **e** $120x^3$ **f** $-4320x^3$
g $1140x^3$ **h** $-241\,920x^3$

3 **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 $2187 - 5103x + 5103x^2 - 2835x^3$
g $x^8 + 16x^7y + 112x^6y^2 + 448x^5y^3$
h $512x^9 - 6912x^8y + 41\,472x^7y^2 - 145\,152x^6y^3$

4 $a = \pm\frac{1}{2}$

5 $b = -2$

6 1, $\dfrac{5 \pm \sqrt{105}}{8}$

7 $1 - 0.6x + 0.15x^2 - 0.02x^3$, 0.941 48, accurate to 5 dp

8 $1024 + 1024x + 460.8x^2 + 122.88x^3$, 1666.56, accurate to 3 sf

Exercise 5D

1 **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 $128 + 2240x + 16\,800x^2 + 70\,000x^3$

3 $a = 162$, $b = 135$, $c = 0$

4 **a** $p = 5$ **b** -10 **c** -80

5 $1 + 16x + 112x^2 + 448x^3$, 1.171 648, accurate to 4 sf

Mixed exercise 5E

1 **a** $p = 16$ **b** 270 **c** -1890

2 **a** $A = 8192$, $B = -53\,248$, $C = 159\,744$

3 **a** $1 - 20x + 180x^2 - 960x^3$
b 0.817 04, $x = 0.01$

4 **a** $1024 - 153\,60x + 103\,680x^2 - 414\,720x^3$
b 880.35

5 **a** $81 + 216x + 216x^2 + 96x^3 + 16x^4$
b $81 - 216x + 216x^2 - 96x^3 + 16x^4$
c 1154

6 **a** $n = 8$ **b** $\frac{35}{8}$

7 **a** $81 + 1080x + 5400x^2 + 12\,000x^3 + 10\,000x^4$
b 1 012 054 108 081, $x = 100$

8 **a** $1 + 24x + 264x^2 + 1760x^3$
b 1.268 16
c 1.268 241 795
d 0.006 45% (3 sf)

9 $x^5 - 5x^3 + 10x - \dfrac{10}{x} + \dfrac{5}{x^3} - \dfrac{1}{x^5}$

10 **b** $\dfrac{4096}{729} + \dfrac{2048}{81}x + \dfrac{1280}{27}x^2 + \dfrac{1280}{27}x^3$

11 **a** $64 + 192x + 240x^2 + 160x^3 + 60x^4 + 12x^5 + x^6$
b $k = 1560$

12 **a** $k = 1.25$ **b** 3500

13 **a** $A = 64$, $B = 160$, $C = 20$ **b** $x = \pm\sqrt{\frac{3}{2}}$

14 **a** $p = 1.5$ **b** 50.625