

Exercise 9B

$$2b. (1-x)^8 = \binom{8}{0}(-x)^0 + \binom{8}{1}(-x)^1 + \binom{8}{2}(-x)^2 + \binom{8}{3}(-x)^3$$

Coeff of $x^3 = \underline{\underline{-56}}$

$$3b. (3-x)^8 = \binom{8}{0}(3)^8(-x)^0 + \binom{8}{1}(3)^7(-x)^1 + \binom{8}{2}(3)^6(-x)^2 + \binom{8}{3}(3)^5(-x)^3 +$$

Coeff of $x^5 = \binom{8}{5}(3)^3(-x)^5 = -56 \times 27 = \underline{\underline{-1512}}$

$$4b. (2x+y)^{14}. \text{Coeff of } x^6 y^8 :$$
$$= \binom{14}{8}(2x)^6 (y)^8 = \binom{14}{8}(2)^6 = \underline{\underline{192192}}$$

$$5b. \text{The first four terms of } (1-x)^{15} :$$
$$= \binom{15}{0}(-x)^0 + \binom{15}{1}(-x)^1 + \binom{15}{2}(-x)^2 + \binom{15}{3}(-x)^3$$
$$= 1 - 15x + 105x^2 - 455x^3$$

$$6b. \text{The first three terms of } (1-x)^{30} :$$
$$= \binom{30}{0}(-x)^0 + \binom{30}{1}(-x)^1 + \binom{30}{2}(-x)^2$$
$$= 1 - 30x + 435x^2$$

$$9. (1+2x)^{16} = \binom{16}{0} + \binom{16}{1}(2x) + \binom{16}{2}(2x)^2 + \binom{16}{3}(2x)^3$$
$$= 1 + 32x + 480x^2 + 4480x^3$$

$$(1+3x)(1+2x)^{16} = (1+3x)(1 + 32x + 480x^2 + 4480x^3 + \dots)$$

Coeff of x^3

$$= 3x(480x^2) + 4480x^3$$
$$= 5920$$

$$7. (1+2x)^8, x = 0.01$$
$$1.02^8 \approx ?$$
$$(1+2x)^8 = \binom{8}{0} + \binom{8}{1}(2x) + \binom{8}{2}(2x)^2$$
$$= 1 + 16x + 28.4x^2$$

($x=0.01$) $= 1 + 16(0.01) + 112(0.01)^2 \approx 1.1712$

$$10. (1-3x)^{10} = \binom{10}{0} + \binom{10}{1}(-3x) + \binom{10}{2}(-3x)^2 + \dots$$
$$= 1 - 30x + 405x^2$$

Coeff of x^2 in $(1+3x)^2(1-3x)^{10}$

$$= (1+3x)^2(1-30x+405x^2)$$
$$= (1+6x+9x^2)(1-30x+405x^2)$$
$$x^2 : (6x)(-30x) + 405x^2 + 9x^2$$
$$-180 + 405 + 9 = \underline{\underline{234}}$$

$$8. (2+5x)^{12} = \binom{12}{0}(2)^{12} + \binom{12}{1}(2)^{11}(5x) + \binom{12}{2}(2)^{10}(5x)^2$$
$$= 2^{12} + 60(2)^{11}x + 1650 \cdot 2^{10} \cdot x^2$$
$$= 4096 + 122880x + 1689600x^2$$

$$(2+5x) = 2.005$$

If $x = 0.001$

$$(2+5x)^{12} \approx 4096 + 122.880 + 16.89600$$
$$\approx 4220.5696 \approx \underline{\underline{4220.57}}$$

11. $(1+ax)(1+5x)^{40}$ Coef of x is 207
 $(1+5x)^{40} = \binom{40}{0} + \binom{40}{1}(5x) + \dots = 1 + 200x$

$$(1+ax)(1+200x)$$

$$x : 200 + a = 207$$

$$a = 7$$

12. $(1-x)^8 + (1+x)^8 = 1 + 8(-x) + \binom{8}{2}(-x)^2 + \binom{8}{3}(-x)^3 + \binom{8}{4}(-x)^4 + \binom{8}{5}(-x)^5 + \binom{8}{6}(-x)^6 + \binom{8}{7}(-x)^7 + \binom{8}{8}(-x)^8$
 $0.99^8 + 1.01^8 = 1 + 8x + \binom{8}{2}x^2 + \binom{8}{3}x^3 + \binom{8}{4}x^4 + \binom{8}{5}x^5 + \binom{8}{6}x^6 + \binom{8}{7}x^7 + \binom{8}{8}x^8$
 $x = 0.01$
 $= 2 + 2\binom{8}{2}x^2 + 2\binom{8}{4}x^4 + 2\binom{8}{6}x^6 + 2\binom{8}{8}x^8$
 $= 2 + 56x^2 + 140x^4 + 56x^6 + 2x^8 = \underline{\underline{2.0056}}$

13. $(1+ax)^n = 1 + 36x + 576x^2$

$$36 = \binom{n}{1}a$$

$$576 = \binom{n}{2}a^2$$

$$axn = 36 \Rightarrow a = \frac{36}{n}$$

$$\frac{n!}{2!(n-2)!} \times a^2 = 576$$

$$\frac{n \times (n-1)}{2} \times a^2 = 576$$

$$\frac{n(n-1)}{2} \times \frac{36^2}{n^2} = 576$$

$$\frac{576}{6} = \frac{96}{6} = 16$$

$$\frac{n-1}{n} = \frac{576 \times 2}{36 \times 36} = \frac{16}{18}$$

$$\frac{n-1}{n} = \frac{8}{9}$$

$$8n = 9n - 9$$

$$9 = n //$$

$$a = \frac{36}{9} = \underline{\underline{4}}$$