

Section 1: Finding binomial expansions

Solutions to Exercise level 1

1. Pascal's triangle:

				1							
				1		1					
			1		2		1				
		1		3		3		1			
	1		4		6		4		1		
1		5		10		10		5		1	
1	6		15		20		15		6		1

$$(i) \quad (x+1)^6 = x^6 + 6x^5 + 15x^4 + 20x^3 + 15x^2 + 6x + 1$$

$$(ii) \quad (x-2)^5 = x^5 + 5x^4(-2)^1 + 10x^3(-2)^2 + 10x^2(-2)^3 + 5x(-2)^4 + (-2)^5$$

$$= x^5 + 5x^4 \times -2 + 10x^3 \times 4 + 10x^2 \times -8 + 5x \times 16 - 32$$

$$= x^5 - 10x^4 + 40x^3 - 80x^2 + 80x - 32$$

$$(iii) \quad (2x+1)^4 = (2x)^4 + 4(2x)^3 + 6(2x)^2 + 4(2x) + 1$$

$$= 16x^4 + 4 \times 8x^3 + 6 \times 4x^2 + 8x + 1$$

$$= 16x^4 + 32x^3 + 24x^2 + 8x + 1$$

$$(iv) \quad (3x-2y)^3 = (3x)^3 + 3(3x)^2(-2y) + 3(3x)(-2y)^2 + (-2y)^3$$

$$= 27x^3 + 3 \times 9x^2 \times -2y + 3 \times 3x \times 4y^2 - 8y^3$$

$$= 27x^3 - 54x^2y + 36xy^2 - 8y^3$$

$$2. (i) \quad {}_8C_3 = \frac{8 \times 7 \times 6}{1 \times 2 \times 3} = 8 \times 7 = 56$$

$$(ii) \quad {}_9C_5 = {}_9C_4 = \frac{9 \times 8^2 \times 7 \times 6}{1 \times 2 \times 3 \times 4} = 9 \times 2 \times 7 = 126$$

$$(iii) \quad {}_{12}C_4 = \frac{12 \times 11 \times 10^2 \times 9}{1 \times 2 \times 3 \times 4} = 11 \times 9 \times 5 = 495$$

$$(iv) \quad {}_{20}C_{18} = {}_{20}C_2 = \frac{20^{10} \times 19}{1 \times 2} = 10 \times 19 = 190$$

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3. (i) Term in $x^3 = {}_{10}C_3(3x)^3 = 120 \times 27x^3 = 3240x^3$
Coefficient of x^3 is 3240.

(ii) Term in $x^5 = {}_9C_4(-2x)^5 = 126 \times -32x^5 = -4032x^5$
Coefficient of x^5 is -4032.

(iii) Term in $x^{10} = {}_{15}C_{11} \times 2^4 x^{11} = 1365 \times 16x^{11} = 21840x^{11}$
Coefficient of x^{11} is 21840.