

3) i) Use combinations to expand the expressions

a) $(1-x)^6$

$${}^6C_0 \cdot 1^6 \cdot (-x)^0 = 1 \cdot 1 \cdot 1 = 1$$

$${}^6C_1 \cdot 1^5 \cdot (-x)^1 = 6 \cdot 1 \cdot (-x) = -6x$$

$${}^6C_2 \cdot 1^4 \cdot (-x)^2 = 15 \cdot 1 \cdot x^2 = 15x^2$$

$$\therefore \underline{(1-x)^6 = 1 - 6x + 15x^2 + \dots}$$

b) $(1+2x)^6$: ${}^6C_0 \cdot 1^6 \cdot (2x)^0 = 1 \cdot 1 \cdot 1 = 1$

$${}^6C_1 \cdot 1^5 \cdot (2x)^1 = 6 \cdot 1 \cdot 2x = 12x$$

$${}^6C_2 \cdot 1^4 \cdot (2x)^2 = 15 \cdot 1 \cdot 4x^2 = 60x^2$$

$$\therefore \underline{(1+2x)^6 = 1 + 12x + 60x^2 + \dots}$$

ii) $\left[(1-x)(1+2x) \right]^6 = (1-6x+15x^2)(1+12x+60x^2)$

$$= 1 + 12x + \underline{60x^2} - 6x - \underline{72x^2} - 360x^3 + \underline{15x^2} + 180x^3 + 900x^4$$

$$= (60 - 72 + 15)x^2$$

$$= \underline{3x^2}$$

\therefore The coefficient of x^2 in this expansion is 3.