

## SOLUTIONS => BINOMIAL EXPANSIONS (PART 1)

a)  $(x+1)^3$

$${}_3C_0(x)^3(1)^0 + {}_3C_1(x)^2(1)^1 + {}_3C_2(x)^1(1)^2 + {}_3C_3(x)^0(1)^3$$

$$= (1)(x^3)(1) + (3)(x^2)(1) + (3)(x^1)(1) + (1)(1)(1)$$

$$= 1x^3 + 3x^2 + 3x^1 + 1$$

$$d) \underline{(x+5)}^{\textcircled{4}}$$

Row 4

$$a = x$$

$$b = 5$$

$${}_4C_0(x^4)(5^0) + {}_4C_1(x^3)(5^1) + {}_4C_2(x^2)(5^2) + {}_4C_3(x^1)(5^3) + {}_4C_4(x^0)(5^4)$$

$$(1)(x^4)(1) + (4)(x^3)(5) + (6)(x^2)(25) + (4)(x)(125) + (1)(1)(625)$$

$$x^4 + 20x^3 + 150x^2 + 500x + 625$$

b)  $(x+2)^6$  Row 6

$$\begin{aligned} & {}_6C_0(x)^6(2)^0 + {}_6C_1(x)^5(2)^1 + {}_6C_2(x)^4(2)^2 + {}_6C_3(x)^3(2)^3 + {}_6C_4(x)^2(2)^4 + {}_6C_5(x)(2)^5 + {}_6C_6(x)(2)^6 \\ &= (1)(x^6)(1) + (6)(x^5)(2) + (15)(x^4)(4) + (20)(x^3)(8) + (15)(x^2)(16) + (6)(x)(32) + (1)(1)(64) \\ &= 1x^6 + 12x^5 + 60x^4 + 160x^3 + 240x^2 + 192x^1 + 64 \end{aligned}$$

c)  $(x+4)^5$

$$\begin{aligned} & {}_5C_0(x)^5(4)^0 + {}_5C_1(x)^4(4)^1 + {}_5C_2(x)^3(4)^2 + {}_5C_3(x)^2(4)^3 + {}_5C_4(x)(4)^4 + {}_5C_5(x)(4)^5 \\ &= (1)(x^5)(1) + (5)(x^4)(4) + (10)(x^3)(16) + (10)(x^2)(64) + (5)(x^1)(256) + (1)(1)(1024) \\ &= 1x^5 + 20x^4 + 160x^3 + 640x^2 + 1280x^1 + 1024 \end{aligned}$$

$$d) (x+5)^4$$

$${}_4C_0(x)^4(5)^0 + {}_4C_1(x)^3(5)^1 + {}_4C_2(x)^2(5)^2 + {}_4C_3(x)^1(5)^3 + {}_4C_4(x)^0(5)^4$$

$$= (1)(x^4)(1) + (4)(x^3)(5) + (6)(x^2)(25) + (4)(x^1)(125) + (1)(1)(625)$$

$$= | x^4 + 20x^3 + 150x^2 + 500x + 625$$

$$e) (x+3)^7$$

$${}_7C_0(x)^7(3)^0 + {}_7C_1(x)^6(3)^1 + {}_7C_2(x)^5(3)^2 + {}_7C_3(x)^4(3)^3 + {}_7C_4(x)^3(3)^4 + {}_7C_5(x)^2(3)^5 + {}_7C_6(x)^1(3)^6 + {}_7C_7(x)^0(3)^7$$

$$= (1)(x^7)(1) + (7)(x^6)(3) + (21)(x^5)(9) + (35)(x^4)(27) + (35)(x^3)(81) + (21)(x^2)(243) + (7)(x^1)(729) + (1)(1)(2187)$$

$$= | x^7 + 21x^6 + 189x^5 + 945x^4 + 2835x^3 + 5103x^2 + 5103x + 2187$$