The method: The binomial theorem

The coefficients of $(a + b)^n$ are row n of Pascal's triangle, nC0 to nCn. The powers of a go down while the powers of b go up.

$$(3x - 3)^4 = (3x)^4 + 4(3x)^3(-3) + 6(3x)^2(-3)^2 + 4(3x)(-3)^3 + (-3)^4$$

row 4 of Pascal's triangle: 1, 4, 6, 4, 1

$$(3x)^4 + 4(3x)^3(-3) + 6(3x)^2(-3)^2 + 4(3x)(-3)^3 + (-3)^4 =$$

$$81x^4 - 324x^3 + 486x^2 - 324x + 81$$ multiply out each term

$(x - 1)^3$: the x^2 term $= -3x^2$

$3C1 = 3$

$3 \cdot x^2 \cdot (-1) = -3x^2$ the term with x^2 uses the second term 1 time

Problems 1 and 2 worked out · Version 0A

$(x + 1)^5$: the x term $= 5x$

$5C4 = 5$

$5 \cdot x \cdot (1)^4 = 5x$ the term with x uses the second term 4 times

$(x - 2)^5$: the x term $= 80x$

$5C4 = 5$

$5 \cdot x \cdot (-2)^4 = 80x$ the term with x uses the second term 4 times

The binomial theorem · Version 0A

1) $5x$ 2) $80x$ 3) $-8x$ 4) $27x^3 + 54x^2 + 36x + 8$
5) $24x^2$ 6) $x^3 - 9x^2 + 27x - 27$
7) $81x^4 - 216x^3 + 216x^2 - 96x + 16$
8) $x^3 - 6x^2 + 12x - 8$ 9) $90x^3$
10) $x^5 + 10x^4 + 40x^3 + 80x^2 + 80x + 32$ 11) $-80x^2$
12) $16x^4 + 64x^3 + 96x^2 + 64x + 16$
13) $x^3 + 9x^2 + 27x + 27$
14) $x^5 - 15x^4 + 90x^3 - 270x^2 + 405x - 243$
15) $-27x^2$ 16) $x^3 - 3x^2 + 3x - 1$ 17) $54x^2$
18) $8x^3 - 36x^2 + 54x - 27$