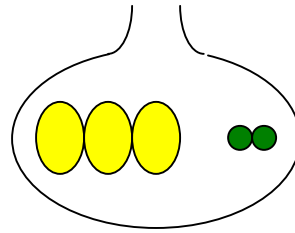


expanding

Expanding Brackets

In this bag there are 3 eggs and two peas.



$$(3x + 2p)$$

Four such bags will have 4 lots of $(3x + 2p) = 12 \text{ eggs and } 8 \text{ peas} = 12x + 8p$

Multiply **everything** inside the bracket by 4 to **expand**.

$$4(3x + 2p) = 12x + 8p$$

To expand **two brackets** multiplied together, multiply **everything** inside the first bracket by **everything** inside the second.

$$(a + b)(c + d) = ac + ad + bc + bd$$

Beware of the minus signs: $(a + b)(c - d) = ac - ad + bc - bd$

And since we are multiplying, remember that a minus times a minus is a plus:

$$(a - b)(c - d) = ac - ad - bc + bd$$

If each bracket is linear. I.e. of the form $mx + c$, then the result of expanding is a Quadratic.

$$(2x + 3)(3x - 1) = 6x^2 - 2x + 9x - 3 = \underline{6x^2 + 7x - 3} \quad \text{since the two middle terms can be simplified.}$$

To square a bracket:

$$(x + a)^2 = (x + a)(x + a) = x^2 + ax + ax + a^2 = x^2 + \underline{2ax} + a^2$$

First term squared _____
 Product and doubled _____
 Last term squared _____

Taking a bracket to any power:

$$\begin{aligned} (x + a)^2 &= x^2 + 2ax + a^2 \\ (x + a)^3 &= x^3 + 3x^2a + 3xa^2 + a^3 \\ (x + a)^4 &= x^4 + 4x^3a + 6x^2a^2 + 4xa^3 + a^4 \\ (x + a)^5 &= x^5 + 5x^4a + 10x^3a^2 + 10x^2a^3 + 5xa^4 + a^5 \end{aligned}$$

$$\begin{array}{ccccccc} & & & & 1 & & & & \\ & & & & & 1 & & & \\ & & & & & & 1 & & \\ & & & & & & & 1 & \\ & & & & & & & & 1 & \\ & & & & & & & & & 1 & \\ & & & & & & & & & & 1 \end{array}$$

Notice how the powers of x and a decline for x , and rise for a .
 Also the coefficients occur in accordance with Pascal's Triangle.



Pascal's Triangle

To simplify by expanding a bracket:

Simplify $(2x^2y^3)^4$

$$\begin{aligned} (2 \quad)^4 &= 16 \\ (x^2 \quad)^4 &= x^8 \\ (\quad y^3)^4 &= y^{12} \\ \underline{(2x^2y^3)^4} &= \underline{16x^8y^{12}} \end{aligned}$$