

Binomial Products

$Bi = 2$

nomial = terms

e.g. $(x + 6)(x + 1) = x^2 + x + 6x + 6$
 $= x^2 + 7x + 6$

a single term in a binomial product is called a **binomium**

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

In general :

$$(a + b + c + \dots)^2 = a^2 + b^2 + c^2 + \dots + 2ab + 2ac + 2bc + \dots$$

$$(a + b)(a - b) = a^2 - b^2$$

$$(a+b)^2 = a^2 + 2ab + b^2$$

e.g. (i) $(x+2)^2 = x^2 + 2(x)(2) + 2^2$
 $= \underline{x^2 + 4x + 4}$

(ii) $(3x-4)^2 = \underline{9x^2 - 24x + 16}$

(iii) $(2p-5)(2p+5) = \underline{4p^2 - 25}$

2 terms \times 3 terms

\therefore answer has 6 terms

(iv) $(a+2)(a^2-3a+7) = a^3 - 3a^2 + 7a + 2a^2 - 6a + 14$
 $= \underline{a^3 - a^2 + a + 14}$

Method of Detached Coefficients

e.g. (i) $(2x^3 - 4x^2 - 5)(3x^2 + 4x - 2) = \underline{6x^5 - 4x^4 - 20x^3 - 7x^2 - 20x + 10}$

1. List **all** the coefficients of the first factor, starting with highest power
2. List **all** the coefficients of the second factor, starting with highest power
3. Multiply all of the first row by the **first** number in the second row, writing the first result under the **first** number
4. Multiply all of the first row by the **second** number in the second row, writing the first result under the **second** number, and so on....
5. **Add** down the columns
6. The result is the coefficients of the answers, starting with the highest power

	2	-4	0	-5				
highest power	3	4	-2					
equals	<hr/>							
highest power	6	-12	0	-15				
times		8	-16	0	-20			
			-4	8	0	10		
highest power	<hr/>							
	6	-4	-20	-7	-20	10		

$$(ii) (a+2)(a^2-3a+7) = \underline{a^3 - a^2 + a + 14}$$

$$\begin{array}{r} 1 \quad -3 \quad 7 \\ 1 \quad 2 \\ \hline 1 \quad -3 \quad 7 \\ \quad 2 \quad -6 \quad 14 \\ \hline 1 \quad -1 \quad 1 \quad 14 \end{array}$$

each term in this quartic is the product of four pronumerals
it is "missing" the x^2y^2 term

it is multiplied by a quadratic
where each term is the product of two pronumerals

the answer is a sextic
where each term is the product of six pronumerals

$$(iii) (3x^4 + 2x^3y + 4xy^3 + 2y^4)(2x^2 - y^2) = \underline{6x^6 + 4x^5y - 3x^4y^2 + 6x^3y^3 + 4x^2y^4 - 4xy^5 - 2y^6}$$

$$\begin{array}{r} 3 \quad 2 \quad 0 \quad 4 \quad 2 \\ 2 \quad 0 \quad -1 \\ \hline 6 \quad 4 \quad 0 \quad 8 \quad 4 \\ \quad -3 \quad -2 \quad 0 \quad -4 \quad -2 \\ \hline 6 \quad 4 \quad -3 \quad 6 \quad 4 \quad -4 \quad -2 \end{array}$$

**Exercise 1A; 3agk, 4fl, 6mqv,
7ac, 8, 9abd, 10bd, 11b,
12*, 13b*, 14***