Binomial Products

$Bi = 2$ $nomial =$ terms

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

$$= x^2 + 7x + 6$$

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

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

In general :

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

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

$$(a+b)^2 \qquad a^2 \quad +2ab \quad +b^2$$

e.g. (i) $(x+2)^2 = x^2 + 2(x)(2) + 2^2$

$$= x^2 + 4x + 4$$

(ii) $(3x-4)^2 = 9x^2 - 24x + 16$

(iii) $(2p-5)(2p+5) = 4p^2 - 25$

2 terms $\times$ 3 terms $\qquad \therefore$ answer has 6 terms

(iv) $(a+2)(a^2 - 3a + 7) = a^3 - 3a^2 + 7a + 2a^2 - 6a + 14$

$$= a^3 - a^2 + a + 14$$

Method of Detached Coefficients

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

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

highest power
equals
highest power
times
highest power

$$
\begin{array}{rrrrrr}
2 & -4 & 0 & -5 & & \\
3 & 4 & -2 & & & \\
\hline
6 & -12 & 0 & -15 & & \\
& 8 & -16 & 0 & -20 & \\
& & -4 & 8 & 0 & 10 \\
\hline
6 & -4 & -20 & -7 & -20 & 10 \\
\end{array}
$$

(ii) $(a+2)(a^2-3a+7)$ $= a^3 - a^2 + a + 14$

$$
\begin{array}{rrrr}
1 & -3 & 7 & \\
1 & 2 & & \\
\hline
1 & -3 & 7 & \\
& 2 & -6 & 14 \\
\hline
1 & -1 & 1 & 14 \\
\end{array}
$$

(iii) $(3x^4 + 2x^3y + 4xy^3 + 2y^4)(2x^2 - y^2)$

$= 6x^6 + 4x^5y - 3x^4y^2 + 6x^3y^3 + 4x^2y^4 - 4xy^5 - 2y^6$

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

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