

Multiplication of Algebraic Terms (Ref: Croft & Davison Ch.10)

Sign of product terms

Terms with like signs give a positive product

Terms with different signs give a negative product

$$\begin{array}{lcl} \text{eg 1} & -3a \times 2a & = -6a^2 \\ & 3a \times -2a & = -6a^2 \\ & 3a \times 2a & = 6a^2 \\ & -3a \times -2a & = 6a^2 \end{array}$$

Product of two terms - one term within brackets - one term only outside

$$\text{eg 2} \quad 3(4x + 2y) \quad \text{or} \quad 4ab(3a - 2b)$$

Multiply each term inside the bracket by the term outside, taking care with the signs

$$\begin{array}{lcl} \text{eg 3} & 3(4x + 2y) & = 12x + 6y \\ & -2(2a + 3b) & = -4a - 6b \\ & -2a(3a - 4b) & = -6a^2 + 8ab \\ & 4ab(3a - 2b) & = 12a^2b - 8ab^2 \end{array}$$

Product of two terms - both within brackets

$$\text{eg 4} \quad (3x + 2y)(x + 3y) \quad \text{memory aid – multiply terms Firsts, Outsides, Insides, Lasts (FOIL)}$$

Each term in the first bracket must be multiplied by each term in the second bracket

$$\text{eg 5} \quad (3x + 2y)(x + 3y) = 3x^2 + 6y^2 + 9xy + 2xy$$

since base and power are the same for the second and third terms, they can be combined to give

$$(3x + 2y)(x + 3y) = 3x^2 + 6y^2 + 11xy$$

It is conventional in algebra to organise terms in alphabetical, descending index order so

$$= 3x^2 + 6y^2 + 11xy \quad \text{would be written as}$$

$$= 3x^2 + 11xy + 6y^2$$

This means that the terms can be multiplied in any order then rearranged at the final stage. The more complicated the term, the more important it is to obey the convention so that terms with the same base and power can be easily recognised and combined.

If the brackets contain more than two terms, the method is the same but a systematic approach must be adopted to ensure that ALL terms are multiplied

When two brackets are multiplied, the number of separate terms will equal the product of the number of terms within the brackets

eg (3 terms) (3 terms) = 9 separate terms (5 terms) (4 terms) = 20 separate terms

Often the multiplication will result in a number of similar terms (same base and same power), these can then be combined as in eg 5 above.

Multiplication of algebraic terms - Worksheet 1

Simplify the following:

1. $4(3x^3 + x^2 + 4x) =$

2. $5(a^3 - a^2 + 3a) =$

3. $7(x^2 - 3x + 4) =$

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

5. $a(a^2 - 3a + 4) =$

6. $c(4c^2 + 3c) =$

Multiplication of algebraic terms - Worksheet 2

Simplify the following:

1. $a^2b(3a^2 - 4b^2 + 3x^2) =$

2. $-x^2b(a^2 - b^2 - x^2) =$

3. $a^2x^3(a^3x^2 - 4ax^2 + 5a^2y^2) =$

4. $7x^2y^2(3a^2b + ab + 4cd - 2xy) =$

5. $(p^2 + 7)(p - 4) =$

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

7. $4(p - q)(4p + 3q) =$

8. $7(x + 3y)(5x - 2y) =$