Algebraic Manipulation

Topical EU

-Algebra is the language upon which the world can be MODELLED mathematically.

Topical EQ

-What is algebra and its role?
-How does algebra explain and predict relationship?

Key Points (Learning Outcomes)

• Algebraic Manipulation Rules

Difficult Point

• Transition from Model Method to Algebraic Representation Critical Point
• Recognising the same rules apply to numbers

Definition

Algebra is a branch of mathematics in which general properties of numbers are studied by using symbols, usually letters, to represent variables and unknown quantities.

1. A collection of **Algebraic Terms** that are connected by the signs '+', '–', '×' or '÷' makes up an **Algebraic Expression**.

   Example 1: The algebraic expression $2x+4y+5$ has **3** terms; $2x$, $4y$ and 5.

   Example 2: The algebraic expression $8s-4$ has **2** terms; $8s$ and 4.

2. In the term $7y$, the numerical part 7 is called the **coefficient** of y.

   (This means that the number that is in front of the variable or a group of variables is called the coefficient.)

   Example 1: In the term $9p$, **9** is the coefficient of p.

   In the term x, **1** is the coefficient of x.

   In the term $-3w^2$, -3 is the coefficient of w^2.

   In the term $\frac{1}{2}xy$, $\frac{1}{2}$ is the coefficient of xy.

   Example 2: The expression $3a^2-5ab$ has **2** terms.

   The 2 terms are $3a^2$ and $-5ab$.

   The coefficient of $3a^2$ is 3.

   The coefficient of $-5ab$ is -5.

3. Any algebraic term that does not have a variable attached to it is called a **constant**.

   Example 1: In the algebraic expression, $11x+2$, the constant term is 2.

   Example 2: In the algebraic expression, $6y-3$, the constant term is -3.

4. Algebraic terms that have the same variables where each variable has the same power are called **like terms**.

   Example : The algebraic terms $5x$ and $9x$ are like terms because they have the same variable and the variable has the same power.

5. If two terms are not like terms, then they are called **unlike terms**.

   Example : The algebraic terms $5x$ and $9x^2$ are unlike terms because even though they share the same variable, the powers are different.

6. We collect all the like terms together to simplify an algebraic expression. *Only like terms can be added or subtracted.*

Distributive Law

1. (x + y)a = xa + ya (Multiplication can be distributed over addition from the right.)
   =ax+ay
2. a (x − y) = ax − ay (Multiplication can be distributed over subtraction.)
3. a(x+y+z)=ax+ay+az (Multiplication can be distributed over several terms.)

Factorisation is the process of writing an algebraic expression as a product of two or more other algebraic expressions.

There are many ways to factorise an algebraic expression.

(i) Grouping common factors
(ii) Grouping terms
(iii) Cross multiplication