

What is Algebra?

Algebra is the branch of mathematics that uses letters instead of unknown numbers.

These letters are called **variables** or **unknowns**.

What is an algebraic expression?

An **Algebraic Expression** is a combination of letters (variables) and numbers using the operations of addition, subtraction, multiplication, division and exponentiation.

An algebraic expression is made up of **terms**.

Examples:

- The algebraic expression $3x + 2y - 8$ has three terms:

$$3x \quad + 2y \quad - 8$$

- The algebraic expression $2x^4y^3 + 9x^2 - 2x + 7$ has four terms:

$$2x^4y^3 \quad 9x^2 \quad - 2x \quad 7$$

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

$$= (a+b)a + (a+b)b$$

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

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

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

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

$$= (a-b)a - (a-b)b$$

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

$$= a^2 - ba - ab + b^2$$

$$= a^2 - 2ba + b^2$$

$$\begin{aligned}
 (a+b)^3 &= (a+b)(a+b)(a+b) \\
 &= (a^2 + 2ab + b^2)(a+b) \\
 &= (a^2 + 2ab + b^2)a + (a^2 + 2ab + b^2)b
 \end{aligned}$$

$$\begin{aligned}
 2ab \times a \\
 = 2a^2b \\
 = 2ab \times a \\
 = 2a \times a \times b \\
 = 2a^2 \times b \\
 = 2a^2b
 \end{aligned}$$

$$\begin{aligned}
 &= a^3 + 2a^2b + b^2a + a^2b + 2ab^2 + b^3 \\
 &= a^3 + 3a^2b + 3b^2a + b^3
 \end{aligned}$$

$$(a-b)^3 = (a-b)(a-b)(a-b)$$

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

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

$$= a^3 - 2a^2b + b^2a - (a^2b - 2ab^2 + b^3)$$

$$\Rightarrow a^3 - 2a^2b + b^2a - a^2b + 2ab^2 - b^3$$

$$= a^3 - 3a^2b + 3ab^2 - b^3$$