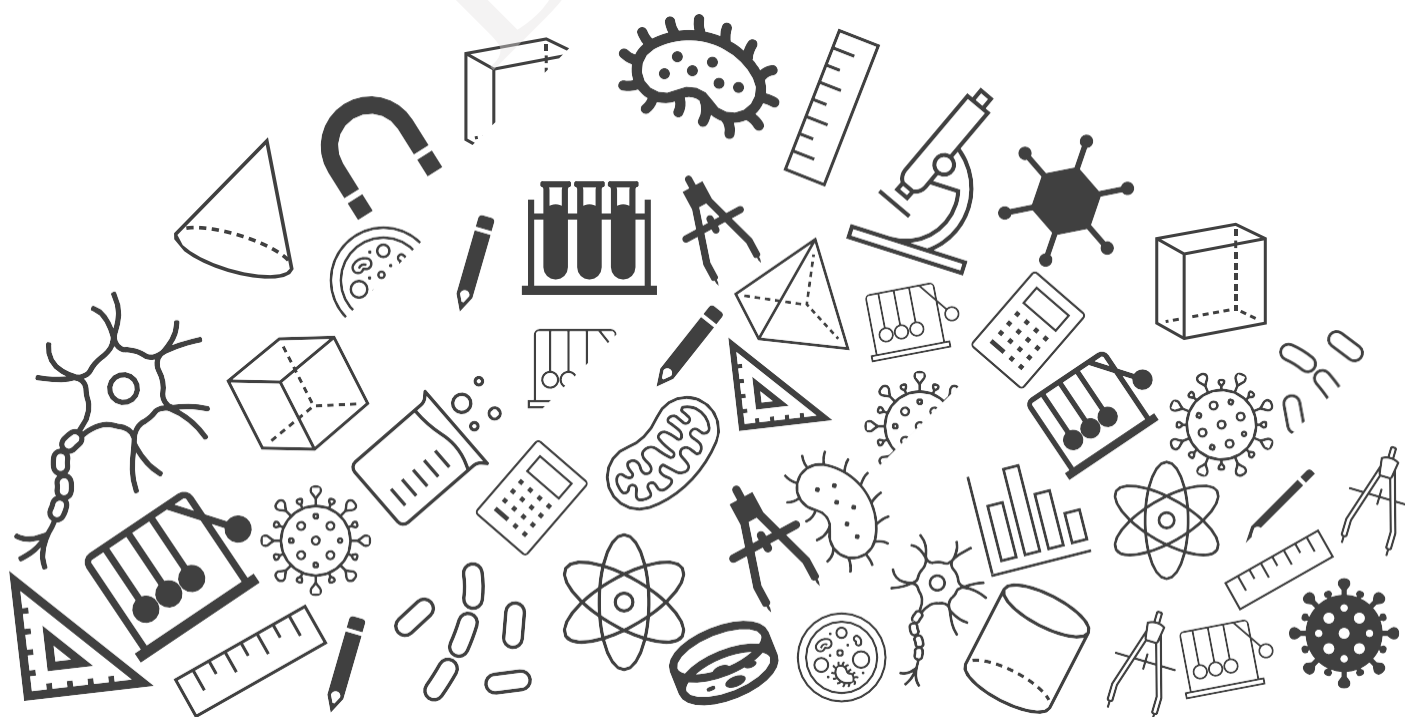# BYJU'S

Grade 08
Maths Chapter Notes

BYJU'S Classes

Chapter Notes

Algebraic Expressions and Identities

Grade 08

Algebraic expressions and Identities

1. Introduction to Algebraic Expression

1.1. Definitions related to an Expression
1.2. Terms, Factors and Coefficients
1.3. Types of Terms

Polynomial and its Classification

2.1. Polynomials
2.2. Classification of Polynomials

3. Addition of Algebraic Expression

4. Subtraction of Algebraic Expression

5. Multiplication of Algebraic Expression

1. Introduction to Algebraic Expressions

1.1. Definitions related to an Expression

Constant:
Constant is a value or a number that never changes.
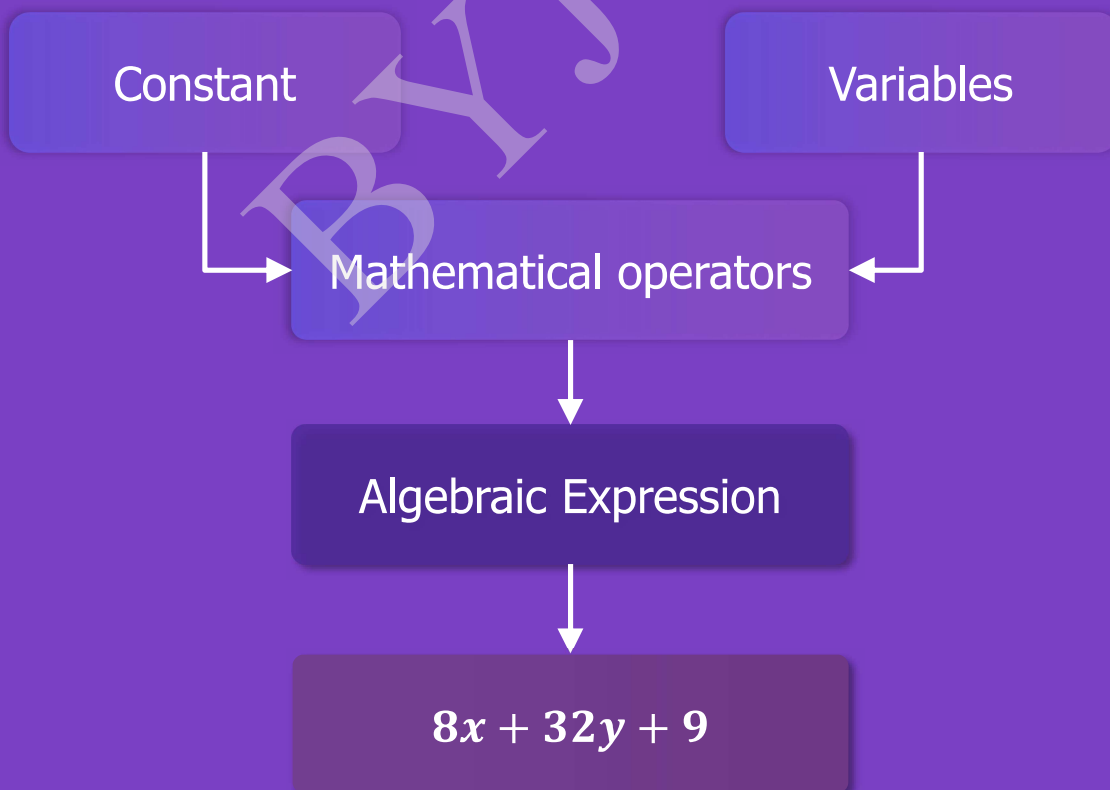**Example:** 5 is a constant.

Variable:
Variable is a letter representing some unknown.
Example: We can use letter x, y, z, etc. whose value is unknown.

Algebraic Expression:
These constants and variables together with mathematical operators, form an algebraic expression.
**Example:** $8x + 32y + 9$

Constant	Variables

Mathematical operators

Algebraic Expression

$$8x + 32y + 9$$

1. Introduction to Algebraic Expressions

1.2. Terms, Factors and Coefficients

- Take the expression $9x - \frac{3}{5}y$. This expression is made up of two terms, $9x$ and $-\frac{3}{5}y$. Terms are added to form expressions.
- Terms themselves can be formed as the product of factors.
- The term $9x$ is the product of its factors 9 and x.
- The term $-\frac{3}{5}y$ is made up of factors, $-\frac{3}{5}$ and y.
- The numerical factor of a term is called its numerical coefficient or simply coefficient.
- **Example:** Coefficient of $9x$ is 9 and coefficient of $-\frac{3}{5}y$ is $-\frac{3}{5}$.

| Expression	$9x - \frac{3}{5}y$	
Terms	$9x$	$-\frac{3}{5}y$
Factors	9 x	$-\frac{3}{5}$ y
Coefficient	9	$-\frac{3}{5}$
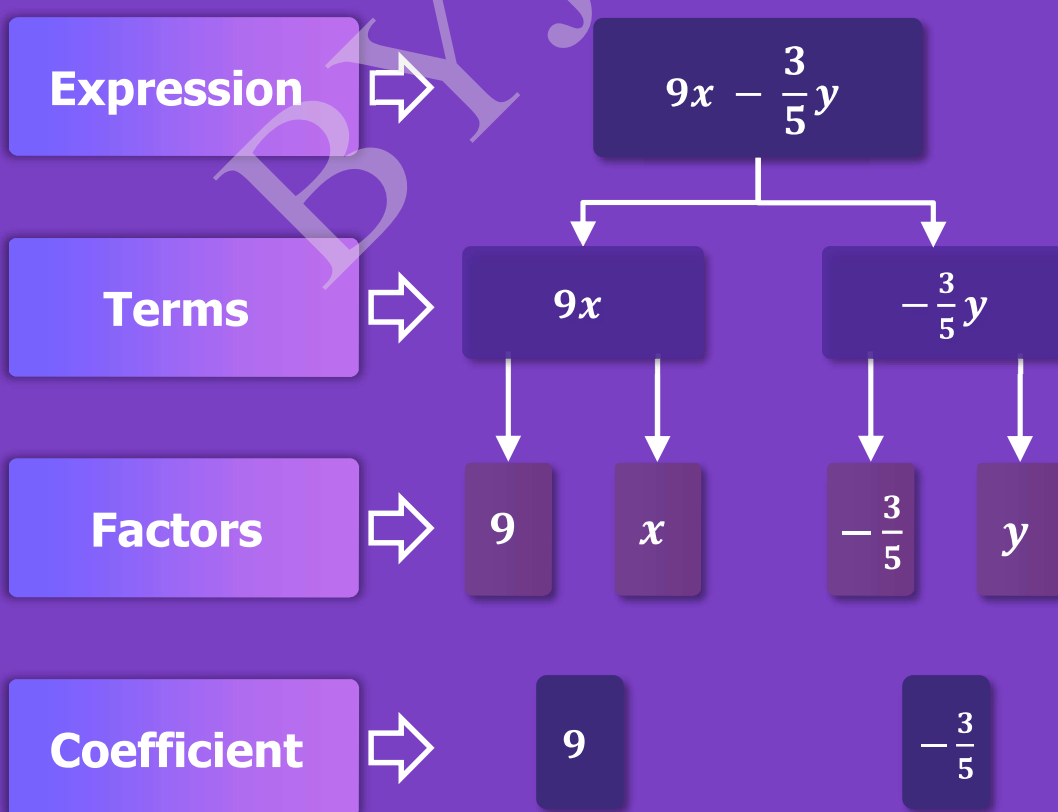
1.3. Types of Terms

Like Terms: Terms with same variable and same exponents are called like terms.
- Example: $6xy$ and $87xy$ are like terms.

Unlike Terms: Terms with different variable or same variables with different exponents are known as unlike terms.
- Example: $6xy^2$ and $15x^2y$ are unlike terms

Types of Terms

Like Terms

Unlike Terms

Same variables with same exponents.

Different variables or same variables with different exponents.

$6xy$ **and** $15xy$

$6xy^2$ **and** $15x^2y$
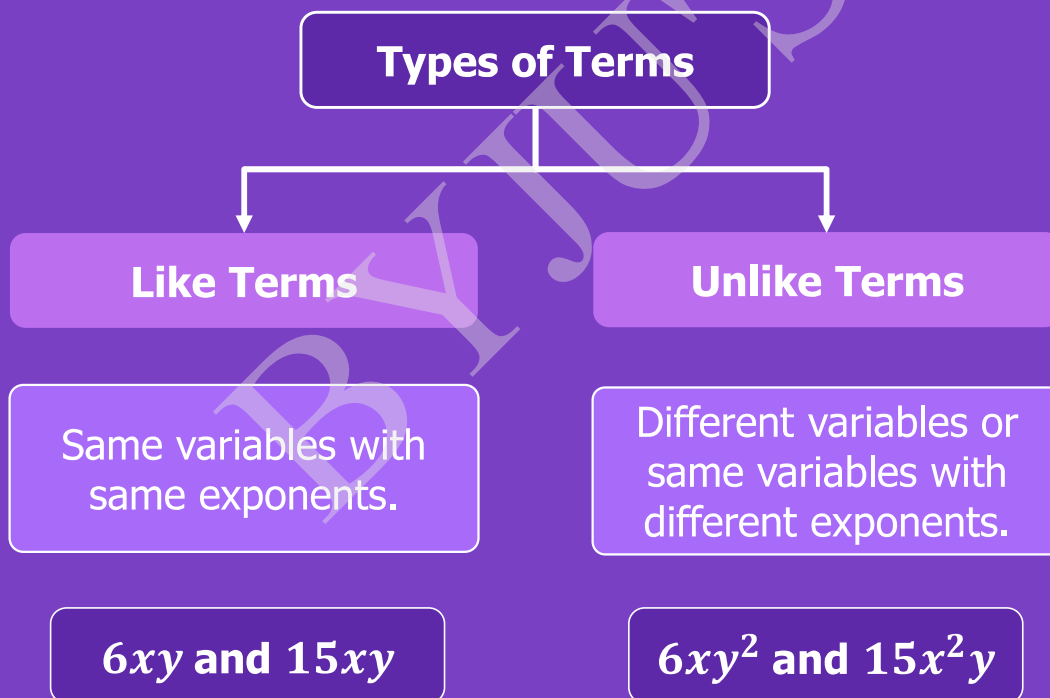
2. Polynomial and its Classification

2.1. Polynomials

Polynomial is made up of two terms, namely 'Poly' (meaning 'many') and 'Nominal' (meaning 'terms').
In general, an expression containing, one or more terms with non-zero coefficient (with variables having non-negative integers as exponents) is called a **polynomial**.

Example: $3xy, 2x + 6y$, etc.

All polynomials are algebraic expressions,
but all algebraic expression are not polynomials.

Example: $9x - \frac{4}{3}y$ is an **algebraic expression** as well as a **polynomial**.

Example: $3x^3 - 4\sqrt{x} + x^2 + 1$ is an **algebraic expression** but **not a polynomial**.

2.2. Classification of Polynomials

Based on number of terms in a polynomial, they are classified into different categories:

➢ A polynomial containing only one term is called a **monomial**.
• **Example:** $4x$
➢ A polynomial containing contains two unlike terms is called a **binomial**.
• **Example:** $4n + 42x$
➢ A polynomial containing three unlike terms is a **trinomial** and so on.
• Example: $3x + 4y + 9z$.

3. Addition of Algebraic Expressions

Steps to add two algebraic expressions:
- Look for like terms and group them.
- Solve the groups.

Example: Add $7x + 5y + 3xy$ and $7xy - 3x + 37$

$$7x + 5y + 3xy$$
$$+ \quad -3x \qquad + 7xy + 37$$
$$\overline{\quad 4x + \; 5y + 10xy + 37 \quad}$$

4. Subtraction of Algebraic Expressions

Steps to subtract two algebraic expressions:
- Reverse the sign of all the terms which we need to subtract.
- Look for like terms and group them.
- Solve the groups.

Example: Subtract $12a - 9ab + 5b - 3$ from $4a - 7ab + 3b + 12$

$$4a - 7ab + 3b + 12$$
$$- \quad 12a - 9ab + 5b - \; 3$$
$$\quad (-) \quad\;\; (+) \qquad (-) \quad\; (+)$$
$$\overline{\quad -8a + 2ab - 2b + 15 \quad}$$

Subtraction is the same as addition with its additive inverse.

5. Multiplication of Algebraic Expression

Multiplying a Monomial with a Monomial

For the multiplication of a monomial with another monomial, multiply the constants and variables separately.
Example:

$$5x \times 4x^2 = (5 \times 4) \times (x \times x^2)$$

$$= (20) \times (x^3)$$

$$= 20x^3$$

Law of exponents:
$$x^a \times x^b = x^{a+b}$$

A product of **two monomials** gives a **monomial**.

Multiplying a Monomial with a Binomial

For the multiplication of a monomial with a binomial, apply the distributive law of multiplication over addition.
Example:

$$2x \times (3x + 5xy) = (2x \times 3x) + (2x \times 5xy)$$
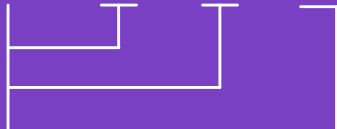
$$= 6x^2 + 10x^2y$$

A product of a **monomial** with a **binomial** gives a **binomial**.

5. Multiplication of Algebraic Expression

Multiplying a Monomial with a Trinomial

For the multiplication of a monomial with trinomial, apply the distributive law of multiplication over addition.

Example:

$$2x \times (3x + 5xy + 2xyz) = (2x \times 3x) + (2x \times 5xy) + (2x \times 2xyz)$$

$$= 6x^2 + 10x^2y + 4x^2yz$$

The product of a **monomial** and a **trinomial** is a **trinomial.**

Multiplying a Binomial with a Binomial

For the multiplication of a binomial with another binomial, multiply each term of the first binomial with the other binomial separately.

Example:

$$(x + y) \times (5x + 3y) = x(5x + 3y) + y(5x + 3y)$$

$$= 5x^2 + 3xy + 5xy + 3y^2$$

$$= 5x^2 + 8xy + 3y^2$$

Multiplying a Binomial with a Trinomial

Multiplication of a binomial with a trinomial is similar to multiplication of two binomials.
For the multiplication of a binomial with a trinomial, multiply each term of the binomial with the trinomial separately.

Example:

$$(x + y) \times (5x + 3y + z) = x(5x + 3y + z) + y(5x + 3y + z)$$

$$= 5x^2 + 3xy + xz + 5xy + 3y^2 + yz$$

$$= 5x^2 + 8xy + xz + 3y^2 + yz$$