Important Words Or Terms

- Expression
- Terms
- Monomial
- Binomial
- Trinomial
- Polynomial
- Like terms
- Unlike terms
- Co-efficient
- Factors
- Identity

EXPRESSIONS

- Expressions are formed by using variables and constants.
- For example,
  - $x + 3$
  - $2y - 5$
  - $3x^2$
  - $4xy + 7$
- If we take the example of $2y - 5$, it is made up of y as the variable and 2 , (-5) as the constants.

TERMS

- Terms are added to form expressions.
- For example,
  - $5ab + 90$: $\{(5ab) + (90)\}$
  - $14gh - 13$: $\{(14gh) + (-13)\}$ i.e. $\{(14gh) - (13)\}$
  - $56m^3 + 65 - yz$: $\{(56m^3) + (65) + (-yz)\}$ i.e. $\{(56m^3) + (65) - (yz)\}$
- Terms are commonly made up of co – efficients, variables or constants.

MONOMIAL

- An expression comprising of only one (1) term is known as a MONOMIAL.
- For example,
  - $5x$
  - $2y^2$
  - $6mn$
  - $90a$
  - $-9q$
  - $10cd$
  - -11
  - xyz

Binomial

- An expression having two (2) terms is known to be a BINOMIAL.
- For example,
  - $a + b$
  - $4l + 5m$
  - $a + 4$
  - $5 – 3xy$
  - $z^2 - 4y$
  - $7x^2 - 4xy$
  - $6y + 6$
  - $5k^2 - 4np^2$

TRINOMIAL

- An expression consisting of three (3) terms is said to be known as a TRINOMIAL.
- For example,
  - $a + b + c$
  - $2x + 3y - 5$
  - $x^3y - xy^3 + y^3$
  - $7x - 4y + 5$
  - $5xy + 9zy + 3zx$
  - $6kl - 9op + 18$

POLYNOMIAL

- In general, an expression containing, one or more terms with a non-zero co-efficient (with variables having non-negative exponents) is called a POLYNOMIAL.
- A polynomial may contain any number of terms, one (1) or more than one (>1).
- For example,
  - $a + b + c + d$
  - $3xy$
  - $7xyz - 10$
  - $2x + 3y + 7z$

Like Terms

- Like terms are formed from the same variables.
- The powers of these variables have to be same too to be a like term.
- Co – efficient of these like terms may or may not be the same.
- For example,
  - $7xy$ and $8xy$
  - $5x^2$ and $7x^2$
  - $6xyz$ and xyz

Unlike Terms

- The terms that do not have the same variable content are said to be unlike tems.
- In unlike terms the powers and the co - efficients of the variable may or may not be the same.
- For example,
  - $7k^2$ and 11g
  - $63xyz^3$ and klm
  - op and x

Co - Efficient

- The numerical factor of a term is called its numerical co-efficient or simply co-efficient.
- For example,

Term	Co – Efficient	Variable
7xy	7	xy
-5t	-5	t
-6ab	-6	ab
32mn	32	mn
-98pk	-98	pk

Factors

- Terms themselves can be formed as the product of FACTORS.
- For example,

Term	First Factor	Second Factor
14x	14	x
11j	11	j
-5x	-5	x
10	10	-
op	o	p

ADDITION OF ALGEBRAIC EXPRESSIONS

- There are two (2) common methods by which we add algebraic expressions.
- Lets take the following example :
  - $(7xy + 5yz - 3zx) + (4yz + 9zx - 4y) + (-2\ xy - 3zx + 5x)$
- Now we will solve this problem by both the methods in the next two slides.

METHOD 1

- Write the terms of the first bracket.
- Followed by the terms of the second bracket and the third bracket below their like terms.
- Now solve the problem below the line.

	$7xy$	$+ 5yz$	$- 3zx$		
$+$		$4yz$	$+ 9zx$		$- 4y$
$+$	$- 2xy$		$-3zx$	$+ 5x$	
	$5xy$	$+ 9yz$	$+ 3zx$	$+ 5x$	$- 4y$

METHOD 2

- Write the question in one line.
- Open the brackets, taking care of the signs.
- When opened the brackets, the next step is to bring all the like terms together.
- Then the last step is to solve the problem.

$(7xy + 5yz - 3zx) + (4yz + 9zx - 4y) + (-2xy - 3zx + 5x)$ {opening the brackets}

$= 7xy + 5yz - 3zx + 4yz + 9zx - 4y - 2xy - 3zx + 5x$ {bringing the like terms together}

$= 7xy - 2xy + 5yz + 4yz - 3zx + 9zx - 3zx + 5x - 4y$ {solving the problem}

$= 5xy + 9yz + 3zx + 5y - 4y$

Subtraction Of Algebraic Expressions

- There are two (2) common methods by which we add algebraic expressions.
- Lets take the following example :
  - (12a – 9ab + 5b – 3) – (4a – 7ab + 3b + 12)
- Now we will solve this problem by both the methods in the next two slides.

METHOD 1

- Write the terms of the first bracket.
- Followed by the terms of the second bracket below their like terms.
- In the next line in brackets invert the signs of the second bracket's terms (for as when this bracket will be opened to take out the terms the signs of the terms will automatically change)
- Now solve the problem below the line.

$$\begin{array}{rrrrr} & 12a & -\ 9ab & +\ 5b & -\ 3 \\ - & 4a & -\ 7ab & +\ 3b & +\ 12 \\ & (-) & (+) & (-) & (-) \\ \hline & 8a & -\ 2ab & +\ 2b & -\ 15 \end{array}$$

Method 2

- Write the question in one line.
- Open the brackets, taking care of the signs.
- When opened the brackets, the next step is to bring all the like terms together.
- Then the last step is to solve the problem.

$$(12a - 9ab + 5b - 3) - (4a - 7ab + 3b - 12)$$
$$= 12a - 9ab + 5b - 3 - 4a + 7b - 3b - 12$$
$$= 12a - 4a - 9ab + 7ab + 5b - 3b - 3 - 12$$
$$= 8a - 2ab + 2b - 15$$

Multiplication Of Algebraic Expressions

- Multiplication of algebraic expression most commonly has the same pattern for most of its types.
- For example,
  - Multiplying a monomial by a monomial
    - Multiplying two monomials
    - Multiplying three or more monomials
  - Multiplying a monomial by a polynomial
    - Multiplying a monomial by a binomial
    - Multiplying a monomial by a trinomial
  - Multiplying a polynomial by a polynomial
    - Multiplying a binomial by a binomial
    - Multiplying a binomial by a trinomial

Multiplying Monomials

- To multiply monomials, multiply the co-efficients and add the exponents with the same bases.

$$3x * 15y * 2ab$$
$$= (3 * 15 * 2)(x * y * ab)$$
$$= 90 * xyab$$
$$= 90abxy$$

MULTIPLYING POLYNOMIALS

- To multiply two polynomials, we multiply each monomial of one polynomial (with its sign) by each monomial (with its sign) of the other polynomial.
- Write these products one after the other (with their signs) and then add like monomials to form the complete product.

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

IDENTITY

- An equality, true for every value of the variable in it, is called an IDENTITY.
- There mainly four (4) Standard Identities :
  - $(a + b)^2 = a^2 + 2ab + b^2$
  - $(a - b)^2 = a^2 - 2ab + b^2$
  - $(a + b)\ (a-b) = a^2 - b^2$
  - $(x + a)\ (x + b) = x^2 + (a + b)\ x + ab$

Identity 1

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

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

$$(2y + 5)(2y + 5) = (2y + 5)^2$$
$$= (2y)^2 + (5)^2 + (2 * 2y * 5)$$
$$= 4y^2 + 25 + 20y$$

Identity 2

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

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

$$(2a - 7)(2a - 7) = (2a - 7)^2$$
$$= (2a)^2 + (7)^2 - (2 * 2a * 7)$$
$$= 4a^2 + 49 - 28a$$

IDENTITY 3

$(a - b)(a + b)$

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

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

$= a^2 - b^2$

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

$(1.1m - 0.4)(1.1m + 0.4)$

$= (1.1m)^2 - (0.4)^2$

$= 1.21m^2 - 0.16$

IDENTITY 4

$$
\begin{aligned}
&(x + a)(x + b) \\
&\quad = x(x + b) + a(x + b) \\
&\quad = x^2 + xb + ax + ab \\
&\quad = x^2 + x(a + b) + ab
\end{aligned}
$$

Therefore, $(x + a)(x + b) = x^2 + (a + b)x + ab$

$$
\begin{aligned}
&(xyz + (-4))(xyz + (-2)) \\
&= (xyz - 4)(xyz - 2) \\
&= (xyz)^2 + (-4 - 2)xyz + (-4 * (-2)) \\
&= x^2y^2z^2 + (-6xyz) + 8 \\
&= x^2y^2z^2 - 6xyz + 8
\end{aligned}
$$