ALGEBRAIC EXPRESSIONS

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CONTENTS

CONSTANTS AND VARIABLES

To deal with the problems of finding unknown numbers we use letters to represent numbers. These letters are called **literal numbers**.

We use letters x, y, z, t,…etc. to denote variables. The values of these letters x, y, z, t,…etc. are not fixed, these can take different values that's why these are called variables.

On the other hand, 1, 2, 3, 10, 20, … etc. are called constants as they are fixed, their values can not be changed.

For example, The perimeter of rectangle

$P = 2\,(l + b)$

P = perimeter

l = length

b = breadth

Here, P, l, b are variables and 2 is a constant.

ALGEBRAIC EXPRESSION

Any combination of literal numbers or variables and numbers (numerals) connected by +, –, × or ÷ sings is called an **algebraic expression**.

For example,

5, 6x, $a + b \times c$, $4 \times m + n$, $x - y \div z$ are algebraic expressions. The perimeter P of a triangle whose sides are a, b and c is given by $P = a + b + c$, area of square is $x \times x$ i.e., x^2 are algebraic expressions.

A repeated product of a number with itself is written in exponential form.

$$2 \times 2 \times 2 \times 2 = 2^4, \text{ etc}$$

The same is true for literal numbers also. Thus, if x is a literal, then we have

$x \times x \times x = x^3$ (Third power of x or x cube)

$x \times x \times x \times x = x^4$ and so on.

Also, $7 \times x \times x = 7x^2$

$4 \times x \times x \times y \times y = 4x^2\,y^2$, etc.

$x \times x \times x$ ……, n times = x^n and read as n-th power of x. Here x is called base and n, exponent.

❖ EXAMPLES ❖

Ex.1 Write the following in product form :

(i) $(9p)^7$

(ii) $9p^7$

Sol. (i) $(9p)^7 = 9p \times 9p \times 9p \times 9p \times 9p \times 9p \times 9p$

(ii) $9p^7 = 9 \times p \times p \times p \times p \times p \times p \times p$

Ex.2 Write the following in the exponential form :

(i) $x \times x \times x$

(ii) $-2 \times 3 \times 3 \times x \times y \times y \times y \times y$

Sol. (i) $x \times x \times x = x^3$

(ii) $-2 \times 3 \times 3 \times x \times y \times y \times y \times y$

$= -2 \times 3^2 \times x \times y^4 = -18xy^4$

➤ FACTORS

When two or more numbers are multiplied together, the numbers themselves are called the factors of the product. The factors of 34 are 2 and 17. The factors of $18x^2$ are 2, 3 and x, factors of *l*n are *l* and n (8 is numerical factor of 8x and x is variable factor of 8x)

➤ COEFFICIENT

Any factor of a product is the coefficient of the remaining factors. In the product of 8 × 5, the number 8 is coefficient of 5 and 5 is coefficient of 8. In the product 5yz, 5 is the (numerical) coefficient of yz, 5y is the coefficient of z and 5z is coefficient of y and yz is the variable coefficient of 5.

Note : If a letter has no coefficient written before it, the coefficient 1 is understood. Thus y means 1y and yz means 1yz, similarly, –y means –1(y).

➤ TERMS

An algebraic expression is a combination of numbers, literals and arithmetical operations. One or more sings (+ and –) separates an expression into several parts. Each part along with its sign is called a term.

Type of Algebraic Expression	Definition	Examples
1. Monomial	A monomial is an expression having one term.	$6, -5xy, -6x^2$ etc.
2. Binomial	A binomial is an algebraic expression having two terms.	$2x - 3y, x - y, 3x^2 - 6x, (x - y)^2 + 3xy, 3x^2 + 5$ etc.
3. Trinomial	A trinomial is an algebraic expression having three terms.	$2a - 3b - 5c, 5y^2 - 3x + 9, a^3 + b^3 + c^3$ etc.
4.Tetranomial or Quadrinomial	A quadrinomial is an algebraic expression having four terms.	$a + b + c - 3, a^3 + b^3 + c^3 + 3abc$, etc.
5. Polynomial	Binomial, trinomials and all algebraic expressions having more than three terms are called polynomials.	$2a - 3b, x + y - 3yz + 4x^2 - 6y^2$ etc.

Note :

(i) The words 'mono', 'bi', 'tri' and 'poly' mean one, two, three and many.

(ii) A term of an algebraic expression having no literal factor is called a constant term, for example, in $x^2 + 9x - 8$, the constant term is –8.

➤ LIKE (SIMILAR) AND UNLIKE (DISSIMILAR) TERMS

These terms are defined as follows:

Like (Similar terms)	Unlike (Dissimilar terms)
These are terms whose literal (variable) factors are the same.	These are terms whose literal (variable) factors are not same.
For example,	For example,
(i) $5x^2, -6x^2, +3x^2$	(i) 2x and 5y
(ii) $2(a + b), -4(a + b), 6(a + b)$	(ii) $6xy^2$ and $8x^2y$
(iii) $6xy^2, -8xy^2, xy^2$	(iii) $(x + y), (x^2 + y), 5(x^2 + y^2)$

➤ FINDING THE VALUE OF AN ALGEBRAIC EXPRESSION

An algebraic expression contains literal (variable) numbers. If we know the numerical values of these variables and substitute them in the given algebraic expression we get a numerical expression which can be simplified by the methods of arithmetic to get a number, called the value of the algebraic expression.

❖ EXAMPLES ❖

Ex.3 Evaluate the following expression if

$a = 2, b = -1, c = 1$:

$a^2 + b^2 + c^2 - ab - bc - ca$.

Sol. $a^2 + b^2 + c^2 - ab - bc - ca$

$= (2)^2 + (-1)^2 + (1)^2 - 2 \times (-1) - (-1) \times 1 - 1 \times 2$

$= 4 + 1 + 1 + 2 + 1 - 2$

$= 9 - 2 = 7$

So, $a^2 + b^2 + c^2 - ab - bc - ca$ at $a = 2, b = -1, c = 1$ has value 7.

Ex.4 Get the algebraic expressions in the following cases using variables, constants and arithmetic operations:

(i) Subtraction of z from y.

(ii) One-fourth of the product of numbers p and q.

(iii) Number 5 added to three times the product of numbers m and n.

(iv) Sum of number a and b subtracted from their product.

Sol. (i) Subtraction of z from y = y – z.

(ii) One-fourth of the product of numbers p & q = $\frac{1}{4}pq$.

(iii) Number 5 added to three times the product of numbers m and n = 3mn + 5.

(iv) Sum of numbers a and b subtracted from their product = ab – (a + b)

Ex.5 Identify the terms and their factors in the following expressions:

(i) $y - y^3$ (ii) $-ab + 2b^2 - 3a^2$

Sol. (i) $y - y^3$ (expression)

terms → y, $-y^3$

Factors: y → 1, y; $-y^3$ → –1, y, y, y (factors)

(ii) $-ab + 2b^2 - 3a^2$ (expression)

terms → $-ab$, $2b^2$, $-3a^2$

Factors: $-ab$ → –1, a, b; $2b^2$ → 2, b, b; $-3a^2$ → –3, a, a

Ex.6 Classify into monomials, binomials and trinomials : $4y - 7z$, y^2, $x + y - xy$, 100, $ab - a - b$, $5 - 3t$, $4p^2q - 4pq^2$, 7mn, $z^2 - 3z + 8$, $a^3 + b^3$, $z^2 + z$, $1 + x + x^2$.

Sol. Monomials → y^2, 100, 7mn

Binomials → $4y - 7z$, $5 - 3t$, $4p^2q - 4pq^2$, $a^3 + b^3$, $z^2 + z$

Trinomials → $x + y - xy$, $ab - a - b$, $z^2 - 3z + 8$, $1 + x + x^2$.

Ex.7 Identify like and unlike terms in the following :

(i) 1, 100 (ii) –29x, –29y

(iii) $4m^2p$, $4mp^2$ (iv) 14xy, 42yx

Sol. (i) 1, 100 → like

(ii) –29x, –29y → unlike

(iii) $4m^2p$, $4mp^2$ → unlike

(iv) 14xy, 42yx → like

Ex.8 Identify like terms in the following :

(i) $-xy^2$, $-4yx^2$, $8x^2$, $2xy^2$, $7y$, $-11x^2$, $-100x$, $-11yx$, $20x^2y$, $-6x^2$, y, $2xy$, $3x$.

(ii) $10pq$, $7p$, $8q$, $-p^2q^2$, $-7qp$, $-100q$, -23, $-12q^2p^2$, $-5p^2$, 41, $2405p$, $78qp$, $13p^2q$, qp^2, $701p^2$.

Sol. Like terms are :

(i) $(-xy^2, 2xy^2)$, $(-4yx^2, 20x^2y)$, $(8x^2, -11x^2, -6x^2)$, $(7y, y)$, $(-100x, 3x)$, $(-11yx, 2xy)$

(ii) $(10pq, -7qp, 78qp)$, $(7p, 2405p)$, $(8q, -100q)$, $(-p^2q^2, -12q^2p^2)$, $(-23, 41)$, $(-5p^2, 701p^2)$, $(13p^2q, qp^2)$

Ex.9 If m = 2, find the value of

(i) m – 2 (ii) 9 – 5m

(iii) $3m^2 - 2m - 7$ (iv) $\frac{5m}{2} - 4$

Sol. (i) m – 2 = 2 – 2 = 0

(ii) 9 – 5m = 9 – 5 × 2 = 9 – 10 = – 1

(iii) $3m^2 - 2m - 7 = 3 \times (2)^2 - 2 \times 2 - 7$

$= 3 \times 4 - 4 - 7 = 12 - 11 = 1$

(iv) $\frac{5m}{2} - 4 = \frac{5 \times 2}{2} - 4 = 5 - 4 = 1$

Ex.10 If a = 2, b = – 2, find the value of

(i) $a^2 + b^2$ (ii) $a^2 + ab + b^2$

Sol. If a = 2, b = – 2, then

(i) $a^2 + b^2 = (2)^2 + (-2)^2 = 4 + 4 = 8$

$\Rightarrow a^2 + b^2 = 8$

(ii) $a^2 + ab + b^2 = (2)^2 + 2 \times (-2) + (-2)^2$

$= 4 - 4 + 4 = 4 \Rightarrow a^2 + ab + b^2 = 4$

Ex.11 When $a = 0, b = -1$, find the value of

(i) $2a^2 + b^2 + 1$ (ii) $2a^2b + 2ab^2 + ab$

(iii) $a^2 + ab + 2$

Sol. (i) $2a^2 + b^2 + 1 = 2(0)^2 + (-1)^2 + 1$

$= 2 \times 0 + 1 + 1 = 0 + 1 + 1 = 2$

$\Rightarrow 2a^2 + b^2 + 1 = 2$

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

$= 2(0)^2 \times (-1) + 2 \times 0 \times (-1)^2 + 0 \times (-1)$

$= 0 + 0 + 0 = 0 \Rightarrow 2a^2b + 2ab^2 + ab = 0$

(iii) $a^2 + ab + 2 = (0)^2 + 0 \times (-1) + 2$

$= 0 + 0 + 2 = 2 \Rightarrow a^2 + ab + 2 = 2$

Ex.12 If $z = 10$, find the value of $z^3 - 3(z - 10)$.

Sol. If $z = 10$, then $z^3 - 3(z - 10)$

$= (10)^3 - 3 \times (10 - 10) = 1000 - 3 \times 0 = 1000$

Hence, $z^3 - 3(z - 10) = 1000$.

➤ ADDITION AND SUBTRACTION OF ALGEBRAIC EXPRESSIONS

◈ Like Terms :

(1) The sum of two or more like terms is a like term with a numerical coefficient equal to the sum of the numerical coefficients of all the like terms.

(2) The difference between two like terms is a like term with a numerical coefficient equal to the difference between the numerical coefficients of the two like terms.

❖ EXAMPLES ❖

Ex.13 Add $2x^2$, $5x^2$ and x^2.

Sol. The three like terms are $2x^2$, $5x^2$ and x^2

Adding these terms, we have $2x^2 + 5x^2 + x^2$

$= (2 + 5 + 1)x^2$ (Distributive property)

$= 8x^2$

Ex.14 Add $-xy$, $-5xy$, $-2xy$.

Sol. Adding the given three like terms, we have

$= -xy + (-5xy) + (-2xy) = -xy - 5xy - 2xy$

$= (-1 - 5 - 2)xy = -8xy$

Ex.15 Add $-7x$, $-5x$, $8x$, $9x$.

Sol. Positive terms are $8x$, $9x$

Negative terms are $-7x$, $-5x$

Sum of positive terms $= 8x + 9x = 17x$

Sum of negative terms $= -7x + (-5x)$

$= -7x - 5x = -12x$

Adding these two terms, we have

$17x + (-12)x = 17x - 12x = (17 - 12)x = 5x$

Ex.16 Add $4x + 3y - 5z$, $-7z + 5x - 8y$ and $-y - 3x + 2z$.

Sol. **Column method :**

Re-write the expressions so that their like terms are in a column as

$$\begin{array}{l} 4x + 3y - 5z \\ 5x - 8y - 7z \\ \underline{-3x - y + 2z} \\ \underline{6x - 6y - 10z} \quad \text{Sum} \end{array}$$

Horizontal Method :

Sum $= (4x + 3y - 5z) + (-7z + 5x - 8y) + (-y - 3x + 2z)$

$= 4x + 3y - 5z - 7z + 5x - 8y - y - 3x + 2z$

$= (4x + 5x - 3x) + (3y - 8y - y) + (-5z - 7z + 2z)$

$= (4 + 5 - 3)x + (3 - 8 - 1)y + (-5 - 7 + 2)z$

$= 6x - 6y - 10z$

Ex.17 Subtract $10x^2$ from $-8x^2$.

Sol. Minuend $\rightarrow -8x^2$

Subtrahend $\rightarrow 10x^2$ (change sign and add)

Hence, difference $\rightarrow -18x^2$

$$\begin{array}{l} -8x^2 \\ \underline{-10x^2} \\ \underline{-18x^2} \quad \text{Sum} \end{array}$$

Ex.18 How much is $t^2 - 5t + 6$ greater than $t^2 + 5t - 6$?

Sol. minuend $\rightarrow t^2 - 5t + 6$

subtrahend $\rightarrow t^2 + 5t - 6$

(Change the sign of each term and add)

$$\begin{array}{r} t^2 - 5t + 6 \\ \underline{-t^2 - 5t + 6} \\ \underline{0.t^2 - 10.t + 12} \end{array}$$

difference $\rightarrow 0.t^2 - 10t + 12$

Hence, difference $\rightarrow -10t + 12$

Ex.19 Simplify, combining like terms :

(i) $21b - 32 + 7b - 20b$

(ii) $p - (p - q) - q - (q - p)$

(iii) $5x^2y - 5x^2 + 3yx^2 - 3y^2 + x^2 - y^2 + 8xy^2 - 3y^2$

(iv) $(3y^2 + 5y - 4) - (8y - y^2 - 4)$

Sol. (i) $21b - 32 + 7b - 20b$

$= 21b + 7b - 20b - 32$

(combining like terms)

$= 8b - 32$

(ii) $p - (p - q) - q - (q - p)$

$= p - p + q - q - q + p$

(removing the brackets)

$= p - p + p + q - q - q$

(combining like terms)

$= p - q$

(iii) $5x^2y - 5x^2 + 3yx^2 - 3y^2 + x^2 - y^2 + 8xy^2 - 3y^2$

$= 5x^2y + 3yx^2 - 5x^2 + x^2 - 3y^2 - y^2 - 3y^2 + 8xy^2$ (Combining like terms)

$= x^2y(5 + 3) + x^2(-5 + 1) - y^2(3 + 1 + 3) + 8xy^2$

$= 8x^2y - 4x - 7y^2 + 8xy^2$

(iv) $3y^2 + 5y - 4 - (8y - y^2 - 4)$

$= 3y^2 + 5y - 4 - 8y + y^2 + 4$

$= 3y^2 + y^2 + 5y - 8y - 4 + 4$

$= 4y^2 - 3y$.

Ex.20 Simplify these expressions and find their values if $x = 2$:

(i) $3(x + 2) + 5x - 7$ (ii) $4(2x - 1) + 3x + 11$

Sol. (i) $3(x + 2) + 5x - 7$

$= 3x + 3 \times 2 + 5x - 7$

$= 3x + 6 + 5x - 7$

$= 3x + 5x + 6 - 7 = 8x - 1$

So, $3(x + 2) + 5x - 7 = 8x - 1$

At $x = 2$, the value of $8x - 1 = 8 \times 2 - 1$

$= 16 - 1 = 15$

Hence, value of given expression at $x = 2$ is 15.

(ii) $4(2x - 1) + 3x + 11$

$= 4 \times 2x - 4 \times 1 + 3x + 11$

$= 8x - 4 + 3x + 11$

$= 11x + 7$

So, $4(2x - 1) + 3x + 11 = 11x + 7$

at $x = 2$ the value of $11x + 7 = 11 \times 2 + 7 = 29$

Hence, value of given expression at $x = 2$ is 29.

Ex.21 Simplify these expressions and find their values if $x = 3, a = -1, b = -2$

(i) $3x - 5 - x + 9$

(ii) $10 - 3b - 4 - 5b$

Sol. (i) $3x - 5 - x + 9 = 3x - x - 5 + 9 = 2x + 4$

So, $3x - 5 - x + 9 = 2x + 4$

The value of $3x - 5 - x + 9$ i.e., $2x + 4$ at $x = 3$ is $2 \times 3 + 4 = 6 + 4 = 10$.

Hence, simplified form is $2x + 4$ and its value at $x = 3$ is 10

(ii) $10 - 3b - 4 - 5b$

$= 10 - 4 - 3b - 5b$

$= 6 - 8b$

So, $10 - 3b - 4 - 5b = 6 - 8b$

The value of $6 - 8b$ at $b = -2$

$= 6 - 8 \times (-2) = 6 + 16 = 22$

Hence, simplified form is $6 - 8b$ and its value at $b = -2$ is 22

Ex.22 Subtract :

(i) $-5y^2$ from y^2

(ii) 6xy from –12xy

(iii) a (b – 5) from b (5 – a)

(iv) $-m^2 + 5mn$ from $4m^2 - 3mn + 8$

(v) $4pq - 5q^2 - 3p^2$ from $5p^2 + 3q^2 - pq$

Sol. (i) Required difference $= y^2 - (-5y^2)$

$= y^2 + 5y^2$

$= (1 + 5)y^2$

$= 6y^2$

(ii) Required difference $= -12xy - (6xy)$

$= -12xy - 6xy$

$= (-12 - 6)xy$

$= -18xy$

(iii) Required difference $= b(5 - a) - a(b - 5)$

$= 5b - ba - ba + 5a$

$= 5b + 5a - ba - ba$

$= 5b + 5a - 2ab$

(iv) Required difference

$= 4m^2 - 3mn + 8 - (-m^2 + 5mn)$

$= 4m^2 - 3mn + 8 + m^2 - 5mn$

$= 4m^2 + m^2 - 3mn - 5mn + 8$

$= (4 + 1)m^2 + (-3 - 5)\, mn + 8$

$= 5m^2 - 8mn + 8$

(v) Required difference

$= 5p^2 + 3q^2 - pq - (4pq - 5q^2 - 3p^2)$

$= 5p^2 + 3q^2 - pq - 4pq + 5q^2 + 3p^2$

$= 5p^2 + 3p^2 + 3q^2 + 5q^2 - pq - 4pq$

$= (5 + 3)p^2 + (3 + 5)q^2 + (-1 - 4)\, pq$

$= 8p^2 + 8q^2 - 5pq$

Ex.23 What should be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$?

Sol. The answer is obtained by subtracting the first expression $x^2 + xy + y^2$ from the second expression $2x^2 + 3xy$.

$\therefore\ 2x^2 + 3xy - (x^2 + xy + y^2)$

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

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

Ex.24 What should be subtracted from 2a + 8b + 10 to get –3a + 7b + 16 ?

Sol. The answer is obtained by subtracting the second expression –3a + 7b + 16 from the first expression 2a + 8b + 10.

$\therefore\ 2a + 8b + 10 - (-3a + 7b + 16)$

$= 2a + 8b + 10 + 3a - 7b - 16$

$= 2a + 3a + 8b - 7b + 10 - 16$

$= (2 + 3)a + (8 - 7)b + 10 - 16 = 5a + b - 6$

Ex.25 From the sum of 3x – y + 11 and – y – 11, subtract 3x – y – 11.

Sol. Sum of 3x – y + 11 and – y – 11

$= 3x - y + 11 + (-y - 11)$

$= 3x - y + 11 - y - 11$

$= 3x - y - y + 11 - 11 = 3x - 2y$

Now subtracting 3x – y – 11 from 3x –2y

Required difference $= 3x - 2y - (3x - y - 11)$

$= 3x - 2y - 3x + y + 11$

$= 3x - 3x - 2y + y + 11$

$= -y + 11$

Note :

Unlike terms cannot be added or subtracted as the like terms are added or subtracted.

➤ TYPES OF BRACKETS

( ) = Parentheses

[ ] = Square brackets

{ } = Curly brackets or braces

— = Vinculum brackets

➤ RULE FOR SOLVING ALGEBRAIC EXPRESSIONS

BODMAS represents the order of Performance of operations namely

B = Brackets; O = Of; D = Division;

M = Multiplication; A = Addition; S = Subtraction

❖ EXAMPLES ❖

Ex.26 Simplify : $3(a + b) – 2(2a – b) + 4a – 7$.

Sol. $3(a + b) – 2(2a – b) + 4a – 7$

$= 3a + 3b – 4a + 2b + 4a – 7$

$= 3a – 4a + 4a + 3b + 2b – 7$

$= (3 – 4 + 4) a + (3 + 2) b – 7 = 3a + 5b – 7$

Ex.27 Simplify : $2x – [3y – \{2x – (y – x)\}]$.

Sol. We have, $2x – [3y – \{2x – (y – x)\}]$

We first remove the inner most bracket.

$2x – [3y – \{2x – y + x\}]$

Next inner most is the curly bracket.

$2x – [3y – 2x + y – x]$

Now we remove the square bracket.

$2x – 3y + 2x – y + x$

$= (2x + 2x + x) – 3y – y$

$= (2x + 2x + x) – (3y + y)$

$= (2 + 2 + 1) x – (3 + 1) y = 5x – 4y$

Ex.28 From the sum of $2p^2 + 3pq$, $– p^2 – pq – q^2$ and $pq + 2q^2$ subtract the sum of $3p^2 – q^2$ and $– p^2 + pq + q^2$.

Sol. We have,

$[(2p^2 + 3pq) + (–p^2 – pq – q^2) + (pq + 2q^2)] – [(3p^2 – q^2) + (–p^2 + pq + q^2)]$

$= [2p^2 + 3pq – p^2 – pq – q^2 + pq + 2q^2) – [3p^2 – q^2 – p^2 + pq + q^2]$

$= (2p^2 – p^2 + 3pq – pq + pq – q^2 + 2q^2) – (3p^2 – p^2 – q^2 + q^2 + pq)$

$= (p^2 + 3pq + q^2) – (2p^2 + pq)$

$= p^2 + 3pq + q^2 – 2p^2 – pq$

$= – p^2 + 2pq + q^2$

Alternatively : Sum of $2p^2 + 3pq$, $– p^2 – pq – q^2$ and $pq + 2q^2$ is

$$\begin{array}{r} 2p^2 + 3pq \\ – p^2 – pq – q^2 \\ + pq + 2q^2 \\ \hline p^2 + 3pq + q^2 \\ \hline \end{array}$$

Sum of $3p^2 – q^2$ & $– p^2\ pq + q^2$

$$\begin{array}{r} 3p^2 – q^2 \\ – p^2 + q^2 + pq \\ \hline 2p^2 + 0q^2 + pq \\ \hline \end{array}$$

Now required difference :

Sum I – Sum II

$$\text{i.e.,}\quad \begin{array}{r} p^2 + 3pq + q^2 \\ 2p^2 + pq \\ – \quad – \\ \hline – p^2 + 2pq + q^2 \\ \hline \end{array}$$

Ex.29 Simplify : $5a – [a^2 – \{2a (1 – a + 4a^2) –3a (a^2 – 5a – 3)\}] – 8a$.

Sol. We first remove the inner most grouping symbol ( ), the { } and then [ ].

Thus we have,

$5a – [a^2 – \{2a (1 – a + 4a^2) –3a (a^2 – 5a – 3)\}] – 8a$

$= 5a –[a^2 –\{2a –2a^2 + 8a^3 – 3a^3 + 15a^2 + 9a\}] – 8a$

$= 5a –[a^2 – 2a + 2a^2 – 8a^3 + 3a^3 – 15a^2 – 9a] – 8a$

$= 5a – a^2 + 2a – 2a^2 + 8a^3 – 3a^3 + 15a^2 + 9a – 8a$

$= 5a^3 + 12a^2 + 8a.$

IMPORTANT POINTS TO BE REMEMBERED

(i) A combination of literals numbers or variables and numbers (numerals) connected by +, –, × or ÷ signs is called an algebraic expression.

(ii) Expressions are made up of terms. Terms are added to make an expression.

(iii) The literals and numbers in a term are called factors. The numerical factor is called the coefficient of the term. In some cases, any one factor is called the coefficient of the remaining part of the term.

(iv) An expression with only one term is called a monomial, with two terms is called a binomial, with three terms is called a trinomial. In general, an expression is called a polynomial.

(v) Terms with same algebraic factors are called like terms.

(vi) To add (or subtract) two algebraic expressions, add (or subtract) the like terms and unlike terms are left as they are. Take care, that the sum of two like terms is a like term with coefficients equal to the sum (or difference) of the coefficients of the two like terms. Also in subtraction do not forget to change the sign of the subtrahend.