

UNIT-6 ALGEBRAIC EXPRESSIONS



- Concept of Expressions
- Terms of expressions, factors of terms and coefficients.
- Like terms and Unlike terms
- Degree of expressions.
- Concept of monomial, binomial and trinomial expressions.
- Addition and subtraction of Algebraic expressions.
- To find out the value of Algebraic expressions.
- Use of brackets

6.1 Introduction

In the previous chapter, we have seen that in Algebra, letters (alphabets) are used in place of unknown numbers. In Ancient India mathematicians used symbols to represent different values. They had yavat-eavat and other word-combinations to represent unknown values. 300 before christ alphabets and exponents of alphabets was very much common in use. Great Indian mathematician Aryabhatt /Brahmagupta; Mahaveer, Sridhar, Bhasakcharya etc. had contributed a lot in the study of Algebra. In bhaskar's book "Lilavati" excellent examples and problems in algebra are written. In algebra different mathematical operations were exactly used on alphabets and symbols. Algebra is very useful in solving daily and complex mathematical problems. Like, numbers, multiplication of letter number can be expressed in their exponential form. We have also learned to differentiate between variable and constant. Now in this unit we will learn to create the algebraic expression by performing the operations of sum, difference, multiplication and division on numerical numbers and letter numbers. Also we will learn about terms of algebraic expressions, binomial and trinomial expressions, value of algebraic expression, addition-subtraction of algebraic expressions and use of brackets.

6.2 Concept of Expressions

The teacher will ask students to mix certain items in a bag without seeing them before and now will ask to know the objects and using the examples of daily life on variables and constant quantities, will teach mathematical operations to create expressions.

Let us know how these expressions are formed.

1. Expression $(x + 5)$ is obtained by adding of x and 5.

Length of rod = $(x + 5)$ cm. (Fig 1)

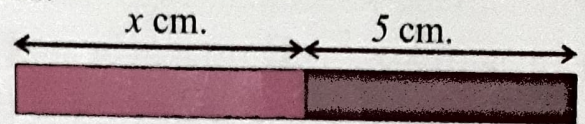


Fig. (1)

2. Expression $(x - 12)$ is obtained by subtracting 12 from x .

Length of Pen-lid = $(x - 12)$ cm (Fig2)

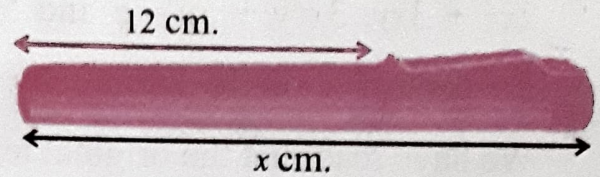


Fig. (2)

3. If the cost of a rubber is ₹2, then the cost of x rubbers is ₹ $2x$ and it is obtained by multiplication of x and 2.



Fig. (3)

4. Expression $\frac{x}{4}$ is obtained by dividing x by 4.

Length of each equal part of Box = $\frac{x}{4}$ cm. (Fig 4)

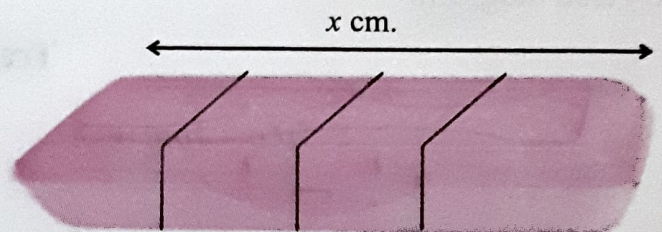


Fig. (4)

Try it :

How do you get expressions from the following statement :

- (1) the sum of x and 7
- (2) Product of multiplying x with 5
- (3) 3 times of sum of a and b
- (4) sum of 4 times of a and b .

Any variable or constant number or their group consisting of symbols of mathematical operations are called algebraic expressions.

6.3 Terms of Expressions

1. $5x^2 + 7xy - 1$ is an expression in which x and y are variables and 5, 7 and -1 are constant. This is formed by the sum of $5x^2$, $7xy$ and -1 , where expression $5x^2 = 5 \times x \times x$ and $7xy = 7 \times x \times y$.
2. $5p^2q - 4pq^2 + 7$ is an expression in which p and q are variables and 5, -4 and 7 are constants. This is formed by the sum of expressions $5p^2q$, $-4pq^2$ and 7, where $5p^2q = 5 \times p \times p \times q$ and $-4 \times p \times q \times q = -4pq^2$.

Here, we see that the above expressions are made of sum of expressions $5x^2$, $7xy$, -1 and $5p^2q$, $-4pq^2$, 7 respectively. These are parts of expressions which are called the terms of original expression.

A numerical number or letter number or its product or quotient is called a **term**.

Try it :

Sort the terms in the following expression :

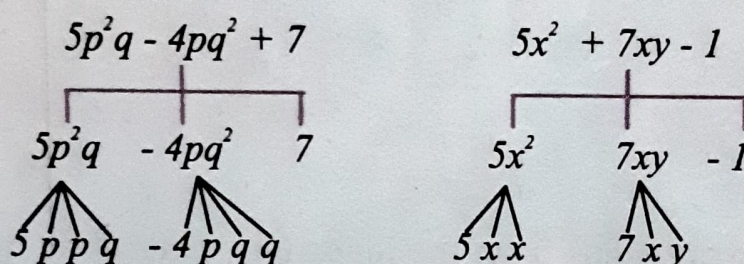
$$2x^2 + 3xy, 3x^2y + 5y - z \text{ and } 5x^2y - 4xy^2 + 3.$$

Factors of a single Term :

We have read that the original terms of $5x^2 + 7xy - 1$ are $5x^2$, $7xy$ and -1 . Term $5x^2$ is the product of 5, x and x or 5, x and x are factors of $5x^2$. Each term is factor of its product. Term $7xy$ is the product of 7, x and y and term, -1 is constant. We can represent, the terms of an expression and factors of terms tree diagram.

Tree Diagram : Here expression $5p^2q - 4pq^2 + 7$ and $5x^2 + 7xy - 1$ are represented by tree diagram.

Tree Diagram



Try it :

1. Write terms of expressions $ax^2 + bx + c$ and $ax^2 + 2hxy + by^2$ and draw their Tree Diagram.
2. Write 3 expressions each consisting of 4 terms.

6.4 Coefficients of Terms

We have learned that the term is written as the product of the factors. One factor from this can be numerical and other algebraic. This numerical factor is called numerical coefficient or only coefficient. It is also called coefficient of the remaining algebraic term. Thus, the coefficient of xy in $5xy$ is 5. The coefficient of xyz in $7xyz$ is 7 and in $-8xy^2$, coefficient of xy^2 is -8 . It is important to note that while coefficient $+1$ is written $(+1)$ is skipped and (-1) is only represented by $(-)$. Thus, $+1x$ is written as x and $(-1)x$ is written as $-x$.

Some times coefficient is used in a expanded form. For example, the coefficient of xy in $5xy$ is 5, coefficient of $5y$ is x and coefficient of $5x$ is y . In term $10xy^2$, coefficient of xy^2 is 10. Coefficient of $10y^2$ is x and coefficient of $10x$ is y^2 . This is called the coefficients of product of remaining factors.

Try it :

Write numerical coefficients in the terms of expressions $6x^2 + 9xy + 10y^2$ and $p^2 + pq - q^2$.

Exercise 6(a)

Write the terms of following expression :

1. $5x + 6$
2. $a^2 - 3ab - 4$
3. $4ax + 6$
4. $x^2 - 3x - 7$
5. $5a - b$
6. xy^2
7. Coefficient of xyz in xyz is
8. Coefficient of y^2 in $-3y^2$ is
9. Coefficient of $\frac{-2}{3}$ in $-\frac{-2}{3}xy^2$ is
10. Following statement are True or False :
 - (i) coefficient of x^2y in $8x^2y$ is 8
 - (ii) Coefficient of xyz^2 in $1/6xyz^2$ is 1.

6.5 Like (Homogeneous) and Unlike (non-homogeneous) Terms

Look at the terms $2xy$ and $5xy$ in the expression $2xy - 3x + 5xy - 4$. Factors of $2xy$ are 2, x and y and factors of $5xy$ are 5, x and y . Thus their algebraic factors are the same, so these are the homogenous (like) terms. Therefore, in the same expression it can be simplified by adding homogenous terms.

- The terms whose algebraic factors are similar called homogenous terms or like terms, whereas their numerical coefficients could be different.
Again, in the expression $2xy - 3x + 5xy - 4$, the algebraic factors of $2xy$ and $-3x$ are different. That is why they are non-homogeneous or unlike terms. In the same way, the terms $2xy$ and 4 and $-3x$ and 4 are unlike terms.
- The terms whose algebraic factors are not same are called **unlike terms or non-homogeneous terms**.

Activity

Teacher will write different types of variable and non variable on the flash card and ask the students to sort the same types of variables and non variable and explain the difference between like and unlike terms and encourage them to compute the terms in the expressions.

Try it :

Sort out like and unlike terms in the following :

$10x, -8y, 5, 6xy, -12, x^2, 5y, -11xy, -9x, 1, x, y, xy.$

Example : Sort out the like and unlike, combinations of terms in the following combinations :

- | | | |
|-------------------|--------------------|----------------------|
| (i) $6x, 7y$ | (ii) $13x, -7x$ | (iii) $-5ab, 7ba$ |
| (iv) $3x, 6xy$ | (v) $6pq^2, 7p^2q$ | (vi) $7py^2, -4py^2$ |
| (vii) $mn^2, 9mn$ | (viii) $-p, 10p$ | |

- Solution :**
- (i) Variables of both are different, so this pair is mutually unlike.
 - (ii) Variable of both are same, so this pair is like.
 - (iii) $-5ab, 7ba$, variables of both are same because $ab = ba$, so this pair is like.
 - (iv) The variables of $3x$ and $6xy$ are different, so this pair is unlike.
 - (v) $6pq^2, 7p^2q$, algebraic variables are different so this pair is unlike.
 - (vi) $7py^2, -4py^2$, both are algebraically same so this pair is like.
 - (vii) In $mn^2, 9mn$, algebraic variables different, so this pair is unlike.
 - (viii) $-p, 10p$ have same variables, so this pair is like.

Pay Attention

To know the like and unlike terms, we should focus only on algebraic part of the term but not on their coefficient.

Exercise 6(b)

1. Sort the like (homogenous) terms in the following :
 - (i) $6x^2y, -6xyz, 8x^2y, -7xyz.$
 - (ii) $-3pq, -5pq^2, 4q_2p, 9qp.$
2. Mark the right (✓) on the homogenous (like) pairs :

(i) $5x, -3x$

(ii) $3ab, 7a^2$

(iii) b^2ac, ab^2c

(iv) a^2bc, ab^2c

6.6 Degree of Expressions

The degree of any expression is a non-negative integer. Also, the degree of expression is the highest power of the variable used in that expression. i.e. there is also a degree of terms in the expression. As in $3x^2 + 5x + 1$, degree of expression is 2, whereas the degree of terms $3x^2$, $5x$ and 1 are 2, 1 and 0 respectively.

6.7 Monomial, Binomial and Trinomial Expression

We have read in relation to the terms of expression, the algebraic expression in which there is only one term, is called a monomial expression, like $5x, -xy, 4z^2, 7$ etc. An expression in which there are only two term and they are unequal, is called binomial.

For example, $3x + 2m, m - 5, xy + 4z, a^2 - b^2$ are binomials. Note that $9pq$ is not binomial, it is monomial. Expression $x^2 + 2hxy + y^2$ has three unequal terms, hence it is called Trinomial.

Try it :

Classify the following expressions as monomial, binomial and trinomial :

$xyz, x + y + z, 5p^2 + 6pq + 7, 5x, x^2 - y^2, a + b, -x,$
 $3z, 4mn + 3, a + 5b - c, mn - 5, x^2 + xy + 3y^2, 7 + 6pq.$

Exercise 6(c)

- Describe the number of terms in following expressions :
 (i) $13x$, (ii) $x + y$, (iii) $ax^2 - bx + c$ (iv) $3x - 5z$
- Describe the degree of the following expressions and degrees of their terms :
 (i) $x^2 + 2y + 3$ (ii) $3x^3 + 4x^2y$
 (iii) $5x^4 + 7xy^2 + 2x + 3$ (iv) $y^2 + 5.$
- Tell the correct statement from the following :
 (i) $5x^2yz$ is a binomial expression
 (ii) $x^2 - 8x + 10$ is binomial expression
 (iii) $2x^2 + 7xy$ is a binomial expression
 (iv) $ax^2 + bx - C$ is binomial expression.

4. Describe the monomial, binomial and trinomial expressions in the following :
 (i) $3xy + 7$ (ii) $15x^3$
 (iii) $2x^2 + 7x - 3$ (iv) $3x^2 - 10xy$ (v) $px^2 + qx - r$
5. What type of expression is according to numbers of terms, $x^2y - 7xy + 10$.
6. Nasrin has $3x$ mangoes. He gave $2y$ mangoes to his sister Abina. Find out :
 (i) How many mangoes remains with Nasrin ?
 (ii) How many terms in remaining mangoes expression ?
 (iii) What kind of expression would it call according to the number of terms.

6.8 Addition and Subtraction of Algebraic Expression

Let us consider some problems to understand it :

1. David, Shalu and Salim play together. In the game David tells Shalu that you have 12 marbles more than Salim and I have 5 marbles more than both of you. How would you know the number of marbles David have ?

Since, the number of marbles pairs by Salim is not known here, therefore, we assume the number of marbles as x .

Now, Shalu has 12 marbles more than Salim, so numbers of marbles of Shalu will be $(x + 12)$. Again, David have 5 more marbles than sum of marbles both having i.e. $[x + (x + 12)]$.

Therefore, Number of marbles of David = $x + x + 12 + 5 = 2x + 17$.

2. The present age of Rahul's father is 4 times the age of Rahul. His Uncle's age is 6 years less than the sum of ages of his father and his. How would you know the age of Rahul's uncle.

Since, the age of Rahul is not known, therefore, assume that Rahul's current age be y years. Now, his father's age will be $4y$. Now, to know the age of Rahul's Uncle, sum of the ages of Rahul and his father as $(y + 4y)$ and subtract 6 from it.

Hence, Rahul's uncle age = $y + 4y - 6 = 5y - 6$ years. In this way, we see that many situations in our daily life comes before us, which are required to operations of arithmetic on them.

Try it :

Write two situations, which are needed to make binomial expression and needed to add and subtract them.

6.8.1 Addition or Subtraction of Like Terms :

We have learned to identify like terms in this chapter. Now, we will learn to add and subtract like (homogeneous) terms.

- Let's add $5x$ and $7x$. We know that x is an algebraic number. Therefore, $5x$ and $7x$ are like term numbers.

$$\begin{aligned}\therefore 5x + 7x &= (5 + 7)x \\ &= 12x.\end{aligned}$$

- Similarly, add $6xy$, $7xy$ and xy

$$\begin{aligned}6xy + 7xy + xy &= (6 + 7 + 1) xy \\ &= 14xy\end{aligned}$$

- Subtract 5mm from, 10 mm .

$$\begin{aligned}10\text{ mm} - 5\text{mm} &= (10 - 5) \text{ mm} \\ &= 5\text{mm}\end{aligned}$$

- Subtract $3pq^2$ from $7pq^2$

$$\begin{aligned}7pq^2 - 3pq^2 &= (7 - 3)pq^2 \\ &= 4pq^2\end{aligned}$$

In this way, the sum of two or more like terms is a like term (homogeneous), whose numerical coefficient is equal to the sum of the coefficients of all the like terms.

Now, we have learnt with the process adding and subtracting the same algebraic terms. Let us learn the process of adding extensive algebraic expression through some example :

- Add, $3a + 7$ and $8a - 5$

$$\text{Sum} = 3a + 7 + 8a - 5$$

Here $3a$ and $8a$ are like terms. In the same way 7 and -5 are like terms.

$$\begin{aligned}&= 3a + 8a + 7 + (-5) \\ &= (3 + 8)a + 7 - 5 \\ &= 11a + 2.\end{aligned}$$

Hence, $3a + 7 + 8a - 5 = 11a + 2$.

- Add, $3x^2 + 5xy + 7y$ and $2xy - 5y$

- Sum
$$\begin{aligned} &= 3x^2 + 5xy + 7y + 2xy - 5y \\ &= 3x^2 + 5xy + 2xy + 7y - 5y \\ &= 3x^2 + (5 + 2)xy + (7 - 5)y \\ &\quad \text{(taking like terms together and unlike term } 3x^2 \text{ as it is)} \\ &= 3x^2 + 7xy + 2y \end{aligned}$$

- Subtract $(x - y)$ from $(4x - y + 5z)$.

$$\begin{aligned} \text{Difference} &= 4x - y + 5z - (x - y) \\ &= 4x - y + 5z - x + y \\ &= 4x - x - y + y + 5z \\ &= (4 - 1)x + (-1 + 1)y + 5z \\ &= 3x + 0y + 5z \\ &= 3x + 5z \end{aligned}$$

By law of brackets

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

Example 1 Simplify the expression

$$\begin{aligned} &5x^2 + 7xy + 3xy - 7x^2 - 2xy - 6z - 10. \\ &= 5x^2 + 7xy + 8z + 3xy - 7x^2 - 2xy - 6x - 10 \\ &= (5 - 7)x^2 + (7 + 3 - 2)xy + (8 - 6)z - 10 \\ &= -2x^2 + 8xy + 2z - 10 \end{aligned}$$

Try it :

Add and Subtract

(i) $p - 29$, $p + q$

(ii) $3pq + 5p - 2$, $pq - 4$.

Exercise 6(d)

1. Add the algebraic expression :

(i) $8a - 2b$ and $2a + 2b$

(ii) $7a - 4b$, $5a + 2b$ and $-2a - 3b$

(iii) $19x^2 - 5y^2$, $3x^2 + 5y^2$ and $-2a - 3b$.

(iv) $2x^2 - y^2$, $x^2 + 3y^2$ and $x^2 - y^2$.

2. Subtract the second algebraic expression from the first algebraic expression :
 - (i) $2xy - 2y^2 + 3x^2 + 5y^2$; $xy + 3xz - y^2$
 - (ii) $4x - 3y + 7z$; $-2x - 3y + 7z$.
 - (iii) $a^2 - 3b^2 + 7ab$; $-a^2 - 3b^2 + 7ab$.
3. Write correct option of following questions :
 - (a) The value of $x - y + 2x - 4y$ will be ?
 - (i) $3x - 4y$ (ii) $3x - 6y$ (iii) $3x + 5y + z$ (iv) $3x + 3y$.
 - (b) The value of $2x + y - z - (3x + y - 2z)$ will be :
 - (i) $2x + y - z$ (ii) $x + 2y + 3z$ (iii) $-x + z$ (iv) $x - 2z$.
4. Subtract $(-3x + 2y - 4z)$ from 1.
5. What we should add to $(a - b)$, that the sum will be $(2a + b)$?
6. $(2x + y)$ is how much more than $(x - 2y)$?
7. The number of males in a villages is $6xy + 5y^2 - 8z$ and number of females is $2x + yx - 2y$. Tell how much greater number of males to the number of females ?
8. David spends ₹ $(4x^2 + 7y - 2xy)$ on food, ₹ $(-2x^2 + 4x + 5xy)$ on education and ₹ $(x^2 + 3xy)$ on rent. If his monthly income is ₹ $(-5x^2 + 4x + 5xy)$, find out :
 - (i) David's monthly expenses
 - (ii) David's monthly savings.

To find out the values of Algebraic Expression

We know that the value of algebraic expression depends on the value of the variables that make the expression. In many situations, the value of the expressions will need to be known.

When we use formulae in mathematics or geometry, we need to know the values of the expressions. For e.g., Area of a square, with side l cm is l^2 cm². If $l = 10$ cm, area of the square = 10^2 cm² = 100 square cm. Let's understand with some other examples.

Example 2 : Find the values of the following expressions for $x = 3$:

- (i) $x - 5$ (ii) $7x - 5$ (iii) $17 - x^2$ (iv) $35 - 2x^3$

Solution : (i) Putting $x = 3$ in $x - 5$

$$\text{Value} = 3 - 5 = -2.$$

(ii) Putting $x = 3$ in $7x - 5$

$$\text{Value} = 7 \times 3 - 5 = 21 - 5 = 16$$

(iii) Putting $x = 3$ in $17 - x^2$

$$\text{Value} = 17 - (3 \times 3) = 8.$$

(iv) Putting $x = 3$ in $35 - 2x^3$

$$\begin{aligned}\text{Value} &= 35 - 2 \times 3^3 = 35 - 2 \times 3 \times 3 \times 3 \\ &= 35 - 54 = -19.\end{aligned}$$

Example 3 : If $a = -2$, find value of following expressions :

(i) $5a^2 + 4a - 2$ and (ii) $a^3 + 4a^2 + 3a - 7$.

Solution

(i) Putting $a = -2$ in $5a^2 + 4a - 2$,

$$\begin{aligned}\text{Value} &= 5(-2)^2 + 4(-2) - 2 \\ &= 20 - 8 - 2 \\ &= 10\end{aligned}$$

(ii) Putting $a = -2$ in $a^3 + 4a^2 + 3a - 7$,

$$\begin{aligned}\text{Value} &= (-2)^3 + 4(-2)^2 + 3(-2) - 7 \\ &= -8 + 16 - 6 - 7 \\ &= 16 - 21 \\ &= -5\end{aligned}$$

Exercise 6(e)

1. If $x = 7$, $y = 3$, find the value of following :

(i) $x + y$

(ii) $2x - y$

(iii) $3xy$

(iv) $2x^2$

(v) $5x^3y$.

2. Pick the correct option :

(a) If $l = 3$, then value of $(2l)^3$ is :

(i) 27

(ii) 216

(iii) 32

(iv) 81

(b) If $x = 2$, $y = 1$, then the value of $(5xy)^2$ is :

(i) 100

(ii) 10

(iii) 50

(iv) 150

(c) If $x = 3$, $y = 1$, $z = 2$, the value of $(x + y + z)^2$ is :

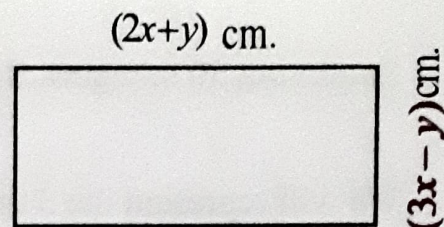
(i) 48

(ii) 24

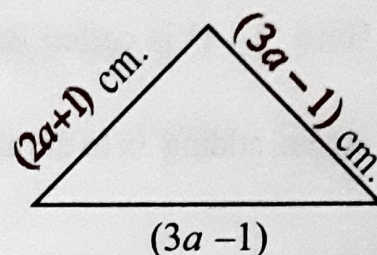
(iii) 36

(iv) 6

3. If $x = 4$ and $y = 3$, then find the sides of the rectangle in the figure given along side.



4. If $a = 4$, then find the sides of the triangle in the figure given along side



5. If $y = -1$, then find the value of the algebraic expression $(2y^3 + 3y^2 + y - 3)$.
6. If $a = -2$, $b = 2$ and $c = 1$, find the value of the algebraic expression $(4a^3 - 2abc + 3bc + b^2)$.
7. If $a = 3$, and $b = 2$, verify the following :
- $(a + b)^2 = a^2 + 2ab + b^2$
 - $(a - b)^2 = a^2 - 2ab + b^2$
 - $(a^2 - b^2) = (a + b)(a - b)$

6.10 Brackets

We saw while studying the expression how to write a condition or a statement in the form of algebraic expression. When many event sequences together in a statement make a joint event, different types of brackets are used as necessary to connect such type of statements with each other.

Suppose, Nikhil has $2x$ mangoes. He gave $3y$ mangoes from $2x$ to his sister. After that he divided the remaining mangoes into half and removed 30 from that. After removing, triple the remaining mangoes and again add $3x$. After adding, dividend the received number of mangoes by y . Let us write this Statement in the form of algebraic expression. Let's see how we will combine according to the sequences :

Number of mangoes, Nikhil have $= 2x$

Number of mangoes his sister have $= 3y$

Remaining mangoes $= 2x - 3y$

Half of remaining $= (2x - 3y)/2$

Here we used ' $\frac{1}{2}(2x - 3y)$ ' symbol to show combined of $2x - 3y$. This is called small brackets ' $()$ ' or Round brackets or parentheses.

Removing 30 mangoes from remaining mangoes = $\frac{1}{2}(2x - 3y) - 30$

We will represent the 3 times of this statement by $3\left\{\frac{1}{2}(2x - 3y) - 30\right\}$.

Here '{ }' is called Braces or Curly Bracket.

Again, adding 3x to the above algebraic expression written as $3x + 3\left\{\frac{1}{2}(2x - 3y) - 30\right\}$.

Lastly, multiplying whole statement by y is represented by $y\left[3x + 3\left\{\frac{1}{2}(2x - 3y) - 30\right\}\right]$

Here '[]' is called Square Bracket.

Example 4. Simplify

$$\begin{aligned} & 4x^3 - [9x^2 - \{-5x^3 - (2 - 7x^2) + 6x\}] \\ &= 4x^3 - [9x^2 + 5x^3 + 2 - 7x^2 - 6x] \\ &= 4x^3 - [5x^3 + 2x^2 - 6x + 2] \\ &= 4x^3 - 5x^3 - 2x^2 + 6x - 2 \\ &= -x^3 - 2x^2 + 6x - 2. \end{aligned}$$

Note : We often insert the line brackets and the round bracket () in the middle, then the curly bracket { } and square bracket [] in the last.

- While opening the bracket, if there is a positive (+) sign, the signs of the terms inside the bracket do not change.
- If there is a sign of negative (–) outside the bracket, the signs of the terms are changes on opening the bracket.
- If more than one brackets have been used in an expression, then we first open the inner brackets and simplify the terms within it. This is how the steps are done untill all the brackets are removed.
- If there is no sign between two or more brackets, then we assume the multiplication sign there.

Try it :

Simplifiy : $2x - [5y - \{-3x + y(7 - x)\}]$

Exercise 6(f)

1. Use parentheses in the following statement :

(i) Subtract $5y$ from the sum of $3x$ and $4z$.

(ii) Add $7r$ to $4pq$ and half of this value.

(iii) Add $3z^2y$ to the one-third of the sum of $3xy$ and $7yz$.

2. Four answers to each question are given.

Write the correct answer in your exercise copy :

(i) On simplifying $5x + (2x - 3)$, we get

(a) $3 - 7x$ (b) $3x - 3$ (c) $7x + 3$ (d) $7x - 3$

(ii) On simplifying $a - (b - 2a)$, we get

(a) $3a - b$ (b) $3b - a$ (c) $a - b$ (d) $3a - b$

(iii) On simplifying $(a + b + c) - (a + b - c)$, we get

(a) $2a + 2b$ (b) $2c$ (c) $2b + 2a$ (d) $2c - b$.

(iv) On simplifying $-2x^2 - (-x^2 + 4x)$, we get

(a) $-x^2 - 4x$ (b) $x^2 - 4x$ (c) $-x^2 + 4x$ (d) $x^2 + 4x$.

3. Simplify following :

(i) $(a^2 + 8ab + 5) + (3ab - 4a^2 + 8)$

(ii) $(x + y + z) - (x - y + z)$

(iii) $x^2 + \{2x^2 + (x^2 - y^2)\}$

(iv) $2p - \{3q + (5p - q + 2p)\}$

(v) $5xy + [3z - \{2x - (2z - 3y)\}]$

(vi) $2x^2yz - [3x^2 - \{2y - (x^2yz - \overline{y^2 + x^2})\}]$

(vii) $a - [(a^2 - 5b) - 2\{2a^2 - (3c - 2b)\}]$

4. In the following expressions, write last two terms in the bracket and put the negative sign $(-)$ in such a way that the value of the expression should not change :

(i) $-p + r + x^2 + q^2 - a^2$

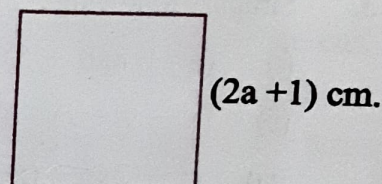
(ii) $a + b + c - ab - bc - ca$

(iii) $3xy - 5pq + 3y^2 - 4x + 7$.

Efficiency Exercise 6

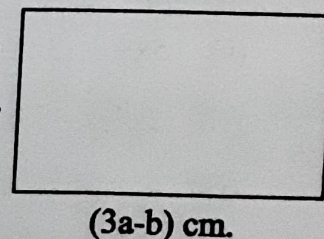
1. Write all terms of the following algebraic expressions :
 (i) $3x - 7y + 9$ (ii) $2a^2 + 5a - 3b^2$
2. Tell the coefficient of x in following :
 (i) $3x$ (ii) $-a^2x$ (iii) $5xy^2$ (iv) $-pqx$
3. Sort the like terms (homogeneous terms) in the following :
 (i) $a^2, b^2, 3a^2, c^2$
 (ii) $-3xy, yz, 7x, 2xy$
 (iii) $cab^2, a^2bc, b^2ac, ab^2, acb^2$
 (iv) $7m^2n, m^2n, -nm^2, m^2n^2, 7nm^2$
4. Simplify
 (i) $(x - 2y) + (3y - x) - (3x - 2y)$
 (ii) $3mn^2 - (5m^2n^2) + (-7mn^2) - (2m^2n^2)$
 (iii) $15x - [8x^3 + 3x^2 - \{8x^2 - (4 - 2x - x^3) - 5x^3\} - 2x]$.
5. If $a = 3, b = 2$, find the value of perimeter of given shapes (figures) :

(i) side of the square is given in the attached figure

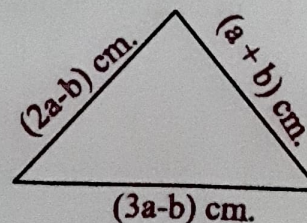


(ii) Sides of rectangle are given in the attached figure

$(4a - 3b) \text{ cm.}$



(iii) Sides of triangle are given in the attached figure.



6. If $a = -4$, $b = -2$, $c = -1$, $d = 6$ then find the value of $c^2 - d^2/a + b + c$.
7. If $A = 7a^2 + 5ab - 9b^2$, $B = -4a^2 + ab + 5b^2$, $C = 4b^2 - 3a^2 - 6ab$ then prove that $A + B + C = 0$,
8. Simplify
 - (i) $3abc - 2ab^2 - 5abc + 3ab^2$
 - (ii) $5x^2 - 2xy + 3x^2 + 5xy - 9x^2$.
9. If $a = 2$, $b = 1$ and $c = 3$, find the value of $(2a + 4b - c)^3$.
10. Simplify the expression given in Column A and match the correct answer with Column B:

Column A

1. $(x + y) + (2x - 3y)$
2. $(x - y) - (x + y)$
3. $x^2 + 2xy + y^2 - (x^2 + y^2 - 2xy)$
4. $2(x^2 + y^2) - (x^2 + y^2)$
5. $(3x^2 - y^2) - 2(x^2 + y^2/3)$

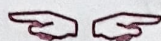
Column B

- (i) $x^2 - 5/3 y^2$
- (ii) $3x - 2y$
- (iii) $x^2 + 3y^2$
- (iv) $-2y$
- (v) $4xy$

We Learnt in this Unit :

1. The group of variables or non-variables, including any variable or non-variables or signs of fundamental mathematical operations, is called algebraic expressions.
2. A numerical number or letter number or their product or quotient is called a term.
3. In a term, the numerical factor is called the numerical coefficient of the remaining factors and remaining factor is called the algebraic factor of the numerical factor.
4. The terms in which the algebraic factors are the same, are called like terms or homogeneous term, whereas their numerical factors can be different.
5. The terms in which the algebraic factors are not the same respectively, are called unlike or non-homogeneous terms.
6. The highest non-negative integral power of the variable in an expression is called the degree of the expression.
7. The expressions in which there is only one term, are called monomial expression.
8. The expression having two terms, are called binomial expressions.

9. The expression having three terms are called trinomial expression.
10. The sum or difference of like terms in another like term, whose numerical coefficients are derived from the sum of difference of the numerical coefficients of the term.
11. Four types of brackets are used, line bracket '_____', round bracket, '()' curly bracket '{ }' and square bracket '[]'.
12. While opening the bracket, if the bracket has a '+' sign, then the '+' and '-' signs of the terms within the bracket do not change but if the outside of bracket, there is negative '-' sign, then '+' and '-' sign within the bracket are changed to '-' and '+' sign respectively.
13. If more than one bracket has been used in an expression, then we first open the inner bracket and simplify the terms within it. This is how the action ends until all the brackets are removed.
14. If there is no sign between two or more brackets, then we assume multiplication sign there.



Answers

Exercise 6 (a)

1. $5x$, 6 pencils , 2. a^2 , $-3ab$, -4 , 3. $4ax$, 6 , 4. x^2 , $-3x$, -7 , 5. $5a$, $-b$, 6. xy^2 , 7. 1, 8. -3 , 9. xy^2 , 10. (i) true (ii) false.

Exercise 6 (b)

1. (i) $(6x^2y, 8x^2y)$, $(-6xyz, -7xyz)$ (ii) $(-3pq, 9qp)$, $(-5pq^2, 4pq^2)$
2. (i), (iii),

Exercise 6 (c)

1. (i) one, (ii) two, (iii) three, (iv) two, 2. (i) 2, 2, 1, 0 (ii) 3, 3, 3 (iii) 4, 4, 2, 1, 0 (iv) 2, 2, 0 3. (i) false, (ii) false, (iii) true, (iv) false 4. (i) binomial (ii) monomial (iii) trinomial (iv) binomial (v) trinomial 5. trinomial, 6. (i) $3x - 2y$ (ii) 2, (iii)

Exercise 6 (d)

1. (i) $10a$, (ii) $10a - 5b$, (iii) $22x^2 - 2a - 3b$, (iv) $4x^2 + y^2$, 2. (i) $3x^2 + 4y^2 + xy - 3xz$, (ii) $6x$, (iii) $2a^2$, 3. (a) (ii), (b) (iii), 4. $1 + 3x - 2y + 4z$, 5. $a + 2b$, 6. $x + 3y$, 7. $5y^2 + 5xy - 8z - 2x + 2y$, 8. (i) monthly expenditure $3x^2 + 4x + 7y + 6xy$, (ii) monthly

savings $-8x^2 - xy - 7y$ l

Exercise 6 (e)

1. (i) 10, (ii) 11, (iii) 63, (iv) 98, (v) 5145, 2. (a) ii, (b) i, (c) iii, 3. length 11 cm., width 9 cm., 4. 9 cm., 13 cm., 11 cm., 5. 1; 6. -14

Exercise 6 (f)

1. (i) $(3x+4z)-5y$, (ii) $\frac{(4pq+7r)}{2}$, (iii) $\frac{(3xy+7yz)}{3} + 3z^2y$, 2. (i) d, (ii) d, (iii) b, (iv) a, 3. (i) $-3a^2 + 11ab + 13$, (ii) $2y$, (iii) $4x^2 - y^2$, (iv) $(-5p-2q)$, (v) $-2x-3y+5z+5xy$, (vi) $x^2yz-2x^2+y^2+2y$, (vii) $3a^2 + a + 9b - 6c$, 4. (i) $-p+r+x^2-(-q^2+a^2)$, (ii) $a+b+c-ab-(bc+ca)$, (iii) $3xy-5pq+3y^2-(4x-7)$

Efficiency Exercise 6

1. (i) $3x, -7y, 9$, (ii) $2a^2, 5a, -3b^2$, 2. (i) 3, (ii) $-a^2$, (iii) $5y^2$, (iv) $-pq$, 3. (i) $a^2, 3a^2$, (ii) $-3xy, 2xy$, (iii) cab^2, b^2ac, acb^2 , (iv) $7m^2n, m^2n, -nm^2, 7nm^2$, 4. (i) $-3x+3y$, (ii) $-7m^2n^2-4mn^2$, (iii) $-12x^3+5x^2+19x-4$, 5. (i) 28 cm., (ii) 26 cm., (iii) 16 cm., 6. 5, 8. (i) ab^2-2abc (ii). $-x^2+3xy$ 9. 125, 10. 1. $\rightarrow$ (ii), 2. $\rightarrow$ (iv), 3. $\rightarrow$ (iv), 4. $\rightarrow$ (iii), 5. $\rightarrow$ (i)

