

CHAPTER 6

ALGEBRAIC EXPRESSIONS

Question 1. Using variables, constants and arithmetic operations, give the algebraic expression in the following cases.

- Give the algebraic expression for the subtraction of z from y .
 - Give an algebraic expression of one-half of the sum of numbers x and y .
 - Give an algebraic expression of the number z multiplied by itself.
 - Give an algebraic expression of one-fourth of the product of numbers p and q .
 - Give an algebraic expression of numbers x and y which are the numbers and both squared and added.
 - Give the algebraic expression for number 5 added to three times the product of numbers m and n .
 - Give the algebraic expression for products of numbers y and z subtracted from 10.
1. Give an algebraic expression of the sum of numbers a and b subtracted from their product.

Answer 1: The solution for the above options is given below:

1. $Y - z$
2. $\frac{1}{2} (x + y) = (x+y)/2$
3. $z \times z = z^2$
4. $\frac{1}{4} (p \times q) = pq/4$
5. $x^2 + y^2$
6. $3mn + 5$
7. $10 - (y \times z) = 10 - yz$
8. $(a \times b) - (a + b) = ab - (a + b)a$

Question 2. Identify in the following expressions the terms and their factors.

- $x - 3$
- $1 + x + x^2$
- $y - y^3$
- $5xy^2 + 7x^2y$
- $-ab + 2b^2 - 3a^2$
- $-4x + 5$
- $-4x + 5y$
- $5y + 3y^2$
- $xy + 2x^2y^2$

- $pq + q$
- $1.2 ab - 2.4 b + 3.6 a$
- $\frac{3}{4} X + \frac{1}{4}$
- $0.1 p^2 + 0.2 q^2$

Expression	Terms	Factors
$x - 3$	$x, -3$	$x, -3$
$1 + x + x^2$	$1, x, x^2$	$1; x; x, x$
$y - y^3$	$y, -y^3$	$y; -y, -y, -y$
$5xy^2 + 7x^2y$	$5xy^2, 7x^2y$	$5, x, y, y; 7, x, x, y$
$-ab + 2b^2 - 3a^2$	$-ab, 2b^2, -3a^2$	$-a, b; 2, b, b; -3, a, a$
$-4x + 5$	$-4x, 5$	$-4, x, 5$
$-4x + 5y$	$-4x, 5y$	$-4, x; 5, y$
$5y + 3y^2$	$5y, 3y^2$	$5, y; 3, y, y$
$xy + 2x^2y^2$	$xy, 2x^2y^2$	$x, y; 2, x, x, y, y$
$pq + q$	pq, q	p, q, q
$1.2 ab - 2.4 b + 3.6 a$	$1.2 ab, 2.4 b, 3.6 a$	$1.2, a, b, 2.4, b, 3.6, a$
$\frac{3}{4} X + \frac{1}{4}$	$\frac{3}{4} X, \frac{1}{4}$	$\frac{3}{4}, X, \frac{1}{4}$
$0.1 p^2 + 0.2 q^2$	$0.1 p^2, 0.2 q^2$	$0.1, p, p, 0.2, q, q$

Question 3. What is an expression, and a coefficient? Identify the numerical coefficient of terms other than constants in the following expressions.

- $5 - 3t^2$
- $1 + t + t^2 + t^3$

- $x + 2xy + 3y$
- $100m + 100n$
- $-p^2q^2 + 7pq$
- $1.2a + 0.8b$
- $3.14r^2$
- $2(I + b)$
- $0.1y + 0.01y^2$

Answer 3:

An algebraic expression is the combination of variables and constants which are connected by the signs of fundamental operations means $+$, $-$, $\times$, $\div$

Some of the examples of algebraic expression are:

$$2x + 3y$$

$$5m \times n - 2q$$

$$5a \div b + 3c$$

Coefficient is defined as the number multiplied by a variable or variables.

In $3x$, the coefficient is 3

In $5yz$, coefficient is 5

Expression	Terms	Coefficients
$5 - 3t^2$	$-3t^2$	-3
$1 + t + t^2 + t^3$	t	1
	t^2	1
	t^3	1
$x + 2xy + 3y$	$x, 2xy, 3y$	1, 2, 3
$100m + 1000n$	$100m, 1000n$	100, 1000
$-p^2q^2 + 7pq$	$-p^2q^2, 7pq$	-1, 7

$$1.2a + 0.8b$$

$$1.2a, 0.8b$$

$$1.2, 0.8$$

$$3.14r^2$$

$$3.14r^2$$

$$3.14$$

$$2(I + b)$$

$$2I, 2b$$

$$2, 2$$

$$0.1y + 0.01y^2$$

$$0.1y, 0.01y^2$$

$$0.1, 0.01$$

Question 4. Identify the terms which contain x (1 to 7) or y (8 to 10) separately and give the coefficient for x or y in the table form.

- $y^2x + y$
- $13y^2 - 8yx$
- $x + y + 2$
- $5 + z + zx$
- $1 + x + xy$
- $12xy^2 + 25$
- $7x + xy^2$
- $8 - xy^2$
- $5y^2 + 7x$
- $2x^2y - 15xy^2 + 7y^2$

Answer 4:

Expression

Terms

Coefficient of x

$$y^2x + y$$

$$y^2x$$

$$y^2$$

$$13y^2 - 8yx$$

$$-8yx$$

$$-8y$$

$$x + y + 2$$

$$x$$

$$1$$

$$5 + z + zx$$

$$x, zx$$

$$1, z$$

$$1 + x + xy$$

$$xy$$

$$y$$

$12xy^2 + 25$	$12xy^2$	$12y^2$
$7x + xy^2$	$7x, xy^2$	$7, y^2$
Expression	Term	Coefficient of y^2
$8 - xy^2$	$-xy^2$	$-x$
$5y^2 + 7x$	$5y^2$	5
$2x^2y - 15xy^2 + 7y^2$	$-15xy^2, 7y^2$	$-15x, 7$

Question 5. Identify the like terms in the following:

- $-xy^2, 3x, 2xy, -4yx^2, y, 8x^2, 2xy^2, -6x^2, 20x^2y, -11yx, -11 \times 2, -100x, 2xy^2, 7y$
- $10pq, 100q, 701p^2, qp^2, 13p^2q, 7p, 8q, -7qp, -p^2q^2, -23, 12q^2p^2, -5p^2, 41, 2405p, 78qp$

Answer 5: In the questioned mentioned above, when term have the same algebraic factors, they are like terms. Based on this, the like term can be written as:

1. $-xy^2, 2xy^2$
 $-4yx^2, 20x^2y$
 $8x^2, -11x^2, -6x^2$
 $7y, y$
 $-100x, 3x$
 $-11yx, 2xy$
2. $10pq, -7qp, 78qp$
 $7p, 2405p$
 $8q, -100q$
 $-p^2q^2, 12q^2p^2$
 $-23, 41$
 $-5p^2, 701p^2$
 $13p^2q, qp^2$

Question 6. The pairs are given below, choose like and unlike terms from them and mention reason.

- 1, 100
- $-7x, \frac{5}{2}x$
- $-29x, -29y$
- $14xy, 42yx$
- $4m^2p, 4mp^2$
- $12xz, 12x^2z^2$

Answer 6:

1. This is the pair of like terms because they have the same algebraic factors.
2. This is the pair of like terms because they have the same algebraic factors.
3. This is the pair of unlike terms because the algebraic factors are different.
4. This is the pair of like terms because they have the same algebraic factors.
5. This is the pair of unlike terms because the algebraic factors are different.
6. This is the pair of unlike terms because the algebraic factors are different.

Question 7. What are monomials, binomials, and trinomials. Classify the following into these with reason.

- $4y - 7z$
- y^2
- $x + y - xy$
- 100
- $Ab - a - b$
- $5 - 3t$
- $4p^2q - 4pq^2$
- $7mn$
- $z^2 - 3z + 8$
- $A^2 + b^2$
- $Z^2 + z$
- $1 + x + x^2$

Answer 7:

An expression which contains only one term is known as a monomial. When two terms are present in an expression it is called binomial. A Trinomial is when the expression contains three terms.

If a trinomial is a perfect square, then it is the square of a binomial.

Question	Category	Reason
$4y - 7z$	Binomial	Two unlike terms
y^2	Monomial	Only one term
$x + y - xy$	Trinomial	Has three terms
100	Monomial	One term
$ab - a - b$	Trinomial	Three term
$5 - 3t$	Binomial	Has two unlike terms
$4p^2q - 4pq^2$	Binomial	Has two unlike terms
$7mn$	Monomial	Has only one term
$z^2 - 3z + 8$	Trinomial	Has three terms
$a^2 + b^2$	Binomial	Has two unlike terms
$z^2 + z$	Binomial	Has two unlike terms
$1 + x + x^2$	Trinomial	Has three terms

Question 8. Fill in the blanks:

- An algebraic expression in which the variables involved have only non-negative integer powers is called a _____.
- Terms having the same literal coefficients are called _____.
- _____ are those terms having different literal coefficients.
- Every polynomial is an _____, but every expression need not be a _____
- The polynomial degree is the highest degree of a _____ which is present in the polynomial.

- The number for which the value of a polynomial is zero is called _____.
- If a trinomial is a perfect square, then it is the square of a _____.
- The parts of an algebraic expression are separated by the _____.
- _____ is the number multiplied by a variable or variables.
- If the sum of the coefficient is zero then the whole term becomes _____
- _____ in mathematics are written in a concise manner.
- The value of expression depends on the value of _____
- Algebraic expressions are formed from _____ and _____
- The operations used on the variables are _____, _____, _____ and _____
- Expressions are made up of _____
- A term is a _____
- The numerical factor in the term is called the _____
- Terms add and make _____

Answer 8:

1. An algebraic expression in which the variables involved have only non-negative integer powers

is called a polynomial.

 1. Terms having the same literal coefficients are called like terms.
 2. Unlike terms are those terms having different literal coefficients.
 3. Every polynomial is an expression, but every expression need not be a polynomial.
 4. The polynomial degree is the highest degree of a monomial which is present in the

polynomial.
1. The number for which the value of a polynomial is zero is called zero of the polynomial.
2. If a trinomial is a perfect square, then it is the square of a binomial.
3. The parts of an algebraic expression are separated by the operational.
4. Co-efficient is the number multiplied by a variable or variables.
5. If the sum of the coefficients is zero then the whole term becomes zero
6. Algebraic expressions in mathematics are written in a concise manner.
7. The value of the expression depends on the value of the variables.
8. Algebraic expressions are formed from variables and constants.
9. The operations used on the variables are addition, subtraction, multiplication and division.
10. Expressions are made up of terms
11. A term is a product of factors
12. The numerical factor in the term is called the coefficient
13. Terms add and make expressions.

Question 9. Simplify combining the terms given below:

- $21b - 32 + 7b - 20b$
- $a - (a - b) - b - (b - a)$
- $3a - 2b - ab - (a - b + ab) + 3ab + b - a$

Solution:

1. They are like terms as they have the same algebraic factors. So it can be presented as

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

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

$$= b(28 - 20) - 32$$

$$= b(8) - 32$$

$$= 8b - 32$$

1. These are like terms as the terms have the same algebraic factors. So it could be presented as:

$$= a - a + b - b - b + a$$

$$= a - b$$

1. When the terms have the same algebraic factors then they are like terms. So it could be presented as:

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

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

$$= a(1 - 1 - 1) + b(-2 + 1 + 1) + ab(-1 - 1 + 3)$$

$$= a(1 - 2) + b(-2 + 2) + ab(-2 + 3) = a(1) + b(0) + ab(1) = a + ab$$

Question 10. Add the following given below:

- $3mn, -5mn, 8mn, -4mn$
- $t - 8tz, 3tz - z, z - t$
- $-7mn + 5, 12mn + 2, 9mn - 8, -2mn - 3$
- $a + b - 3, b - a + 3, a - b + 3$

Answer 10:

1. In the given question, all are the like terms as they have the same algebraic factors so when the like terms are added, it could be presented as:

$$3mn + (-5mn) + 8mn + (-4mn) = 3mn - 5mn + 8mn - 4mn$$

$$=mn (3 - 5 + 8 - 4)$$

$$=mn (11 - 9)$$

$$=mn (2) = 2mn$$

- In the given question, all are the like terms as they have the same algebraic factors so when the like terms are added, it could be presented as:

$$= t - 8tz + (3tz - z) + (z - t)$$

$$= t - 8tz + 3tz - z + z - t$$

$$= t - t - 8tz + 3tz - z + z$$

$$= t (1 - 1) + tz (-8 + 3) + z (-1 + 1)$$

$$= t (0) + tz (-5) + z (0)$$

$$= -5tz$$

- In the given question, all are the like terms as they have the same algebraic factors so when the like terms are added, it could be presented as:

$$= -7mn + 5 + 12mn + 2 + (9mn - 8) + (-2mn - 3)$$

$$= -7mn + 5 + 12mn + 2 + 9mn - 8 - 2mn - 3$$

$$= -7mn + 12mn + 9mn - 2mn + 5 + 2 - 8 - 3$$

$$= mn (-7 + 12 + 9 - 2) + (5 + 2 - 8 - 3)$$

$$= mn (-9 + 21) + (7 - 11)$$

$$= mn (12) - 4$$

$$= 12mn - 4$$

- In the given question, all are the like terms as they have the same algebraic factors so when the like terms are added, it could be presented as:

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

$$= a + b - 3 + b - a + 3 + a - b + 3$$

$$= a - a + a + b + b - b - 3 + 3 + 3$$

$$= a(1 - 1 + 1) + b(1 + 1 - 1) + (-3 + 3 + 3)$$

$$= a(2 - 1) + b(2 - 1) + (-3 + 6)$$

$$= a(1) + b(1) + (3)$$

$$= a + b + 3$$