**Sub: Algebra and Geometry** **Class: 7** **Date: 08.05.20**

# STUDY MATERIAL: ALGEBRAIC EXPRESSIONS

## Concepts, Explanations and Solved Numerical Problems

Introduction to Algebraic Expressions

Constant

**Constant** is a quantity which has a fixed value.

Definition of Variables

- Any algebraic expression can have any number of variables and constants.
  - Variable
    - A variable is a quantity that is prone to change with the context of the situation.
    - a,x,p,… are used to denote variables.
  - Constant
- It is a quantity which has a fixed value.
- In the expression 5x+4, the variable here is x and the constant is 4.
- The value 5x and 4 are also called terms of expression.
- In the term 5x, 5 is called the coefficient of x. Coefficients are any numerical factor of a term.

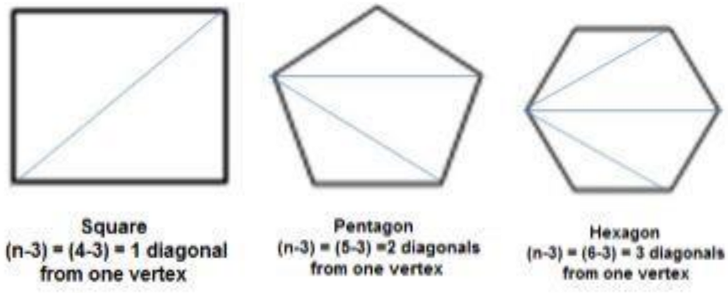
**Algebra as Patterns**

Writing Number patterns and rules related to them

- If a natural number is denoted by n, its successor is (n + 1).
  Example: Successor of n=10 is n+1 =11.
- If a natural number is denoted by n, 2n is an even number and (2n+1) an odd number.
  Example: If n=10, then 2n = 20 is an even number and 2n+1 = 21 is an odd number.

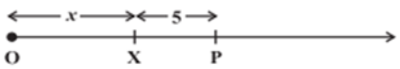
Writing Patterns in Geometry

- Algebraic expressions are used in writing patterns followed by geometrical figures. Example: Number of diagonals we can draw from one vertex of a polygon of n sides is (n – 3).




**Algebraic Expressions:**
Any expression containing constants, variables, and the operations like addition, subtraction, etc. is called as an algebraic expression.
***Example*:** 5x, 2x – 3, $x^2$ + 1, etc.

**Relation between number line and expression:**
For any given expression of the form *(a + b)* ,where *a* is variable and *b* is constant then the value of this expression will always lie at *b* units after the point a on the number line.
***Example 1*:** The following figure shows a number line drawn for the expression x + 5.




Here, X represents the variable x which is unknown. Thus, the final point will definitely be at 5 units from X which is denoted by P.

**Formation of Algebraic Expressions**

- Variables and numbers are used to construct terms.
- These terms along with a combination of operators constitute an algebraic expression.
- The algebraic expression has a value that depends on the values of the variables.
- For example, let $6p^2-3p+5$) be an algebraic expression with variable p
  The value of the expression when p=2 is,
  $6(2)^2-3(2)+5\rightarrow6(4)-6+5=23$
  The value of the expression when p=1 is,
  $6(1)^2-3(1)+5\rightarrow6-3+5=8$

**1. Term:**
A term is either a single number or variable and it can be combination of numbers and variable. They are usually separated by different operators like +, -, etc.

***Example 1*:** Some example of terms are y, 5, 2x, etc.

***Example 2*:** Consider an expression 6x - 7 = 2.
Then, the terms in this expression are 6x, -7 and 2.

***Example 3*:** Identify the terms for 0.7a – 1.2b + 0.5ab.
*Solution*: The terms for given expression are 0.7a, -1.2b and 0.5ab.

**2. Factors:**
Factors can be product of numbers or number and variable.

***Example 1*****:** Term 7x is made of two factors 7 and x.

***Example 2*****:** Number 6 is made of two factors 2 and 3, 1 and 6.

**3. Coefficient**
The number multiplied to variable is called as coefficient.

***Example 1*****:** The coefficient of the term 2x will be 2.

***Example 2*****:** The coefficient of the term 5ab will be 5.

***Example 3*****:** Identify the coefficients for 0.7a – 1.2b + 0.5ab.
*Solution*: The coefficients for the given expression are 0.7, -1.2 and 0.5.

**Degree of a Polynomial (with one variable)**

A polynomial looks like this:

The **Degree** (for a polynomial with one variable, like ***x***) is:

the **largest exponent** of that variable.

More Examples:

| | |
|---|---|
| $4x$ | The Degree is **1** (a variable without an exponent actually has an exponent of 1) |
| $4x^3 - x + 3$ | The Degree is **3** (largest exponent of x) |
| $x^2 + 2x^5 - x$ | The Degree is **5** (largest exponent of x) |
| $z^2 - z + 3$ | The Degree is **2** (largest exponent of z) |

**Names of Degrees**

When we know the degree we can also give it a name!

| Degree | Name | Example |
|---|---|---|
| 0 | Constant | 7 |
| 1 | Linear | x+3 |

| | | |
|---|---|---|
| 2 | Quadratic | $x^2-x+2$ |
| 3 | Cubic | $x^3-x^2+5$ |
| 4 | Quartic | $6x^4-x^3+x-2$ |
| 5 | Quintic | $x^5-3x^3+x^2+8$ |

Example: **$y = 2x + 7$** has a degree of 1, so it is a **linear** equation

Example: **$5w^2 - 3$** has a degree of 2, so it is **quadratic**

Higher order equations are **usually** harder to solve:

- Linear equations are **easy** to solve
- Quadratic equations are **a little harder** to solve
- Cubic equations are harder again, but **there are formulas** to help
- Quartic equations can also be solved, but the formulas are **very complicated**
- Quintic equations have no formulas, and **can sometimes be unsolvable**!

**Degree of a Polynomial with More Than One Variable**

When a polynomial has more than one variable, we need to look at **each term**. Terms are separated by + or – signs.

For **each term**:

- Find the degree by **adding the exponents of each variable** in it,

The **largest** such degree is the degree of the polynomial.

Example: what is the degree of this polynomial:

Checking each term:

- **$5xy^2$** has a degree of **3** (x has an exponent of 1, y has 2, and 1+2=3)
- **$3x$** has a degree of **1** (x has an exponent of 1)
- **$5y^3$** has a degree of **3** (y has an exponent of 3)
- **3** has a degree of 0 (no variable)

The largest degree of those is 3 (in fact two terms have a degree of 3), so the polynomial has a degree of **3**

Example: what is the degree of this polynomial:

$$4z^3 + 5y^2z^2 + 2yz$$

Checking each term:

- **$4z^3$** has a degree of **3** (z has an exponent of 3)
- **$5y^2z^2$** has a degree of **4** (y has an exponent of 2, z has 2, and 2+2=4)
- **$2yz$** has a degree of **2** (y has an exponent of 1, z has 1, and 1+1=2)

The largest degree of those is 4, so the polynomial has a degree of **4**

**Writing it Down**

Instead of saying "*the degree of (whatever) is 3*" we write it like this:

$$deg(5xy^2 - 3x) = 3$$

**4. Monomials:**
The expressions which have only one term are called as monomials.

***Example*****:** 10, 3x, 5xy, $2x^2$, etc. are some monomials.

**5. Binomials:**
The expressions which have two terms are called as binomials.

***Example*****:** x + 10, 3x + 1, a + b , $7x^2 + y^2$ etc. are some binomials.

**6. Trinomials:**
The expressions which have three terms are called as trinomials.

***Example*****:** 2x + y+ 10, 3y + 3x, a + b + c , $7x^2 + y^2 + 7$ etc. are some trinomials.

**7. Polynomials:**
The expression which contains one or more terms with non-zero coefficient is called a polynomial. A polynomial can have any number of terms.

***Example 1*****:** 10, a + b, 7x + y + 5, w + x + y + z, etc.

***Example 2*****:** Classify following polynomials into monomials, binomials, trinomials or others:
(a) a +b (b) 7 (c) ab + bc + cd + da (d) 5x – 5y + 13xy
*Solution*: (a) Binomial (b) Monomial (c) Polynomial (d) Trinomial

**8. Like terms:**
The terms which have same variables are known as like terms.

***Example*****:** 5x and 7x; 2xy and 3yx; $4x^2$, $7x^2$, $9x^2$ and $x^2$; etc. are some like terms.

**9. Unlike terms:**
The terms which do not have the same variables are known as unlike terms.
***Example*****:** 5x and 7y; 2xy and 3ax; $4x^2$, $7y^2$and $9z^2$; etc. are some unlike terms.

**Addition and Subtraction of Algebraic Expressions:**

When performing addition or subtraction, we can perform the operations only for the like terms. Let us understand it by an example:

***Example 1*:** Add 7x + y + 7 to 3x + 2y + 1.
*Solution*: Write down both the given expression into separate rows such that like terms fall below each other

$$\begin{array}{r} 7x + y + 7 \\ \underline{+\ 3x + 2y + 1} \\ 10x + 3y + 8 \end{array} \quad \text{Ans.}$$

***Example 2*:** Subtract $2x^2 + 5xy + 1$ from $7x^2 + 2xy + 2y + 3$.
*Solution*:

$$\begin{array}{l} 7x^2 + 2xy + 2y + 3 \\ \underline{-\ 2x^2 + 5xy \qquad + 1} \\ 5x^2 - 3xy + 2y + 2 \end{array} \quad \text{Ans}$$

***Example 3*:** Add a – b + ab, b – c + bc and c – a + ac.
*Solution*:

$$\begin{array}{lllllll} & a & -b & & + ab & & \\ + & & b & -c & & + bc & \\ \underline{+} & \underline{-a} & & \underline{c} & & & \underline{+ ac} \\ & & & & ab & + bc & + ac \end{array} \quad \text{Ans}$$

***Example 4*:** Subtract $4a^2b – 3ab + 5ab^2 – 8a + 7b – 10$ from $18 – 3a – 11b + 5ab – 2ab^2+5a^2b$.
*Solution*:

$$\begin{array}{l} 18 – 3a – 11b + 5ab – 2ab^2 + 5a^2b \\ \underline{-10 – 8a – 7b – 3ab + 5ab^2 + 4a^2b} \\ 28 + 5a – 4b + 8ab – 7ab^2 + a^2b \end{array} \quad \text{Ans}$$

**Multiplication of Algebraic Expressions:**
***(i) Take note of following points for like terms:***
(a) The coefficients will get multiplied.
(b) The power of the resultant variable will be the addition of the individual powers.

***Example 1*:** Product of 2x and 3x will be $6x^2$.

***Example 2*:** Product of 2x, 3x and 4x will be $24x^3$.

***(ii) Take note of following points for unlike terms:***
(a) The coefficients will get multiplied.
(b) If all the variables are different then there will be no change in the power of variables.
(c) If some of the variables are same then the respective power of variables will be added.

***Example 1*:** Product of 2x and 3y will be 6xy.

***Example 2*****:** Product of 2x, 3y and 4z will be 24xyz.

***Example 3*****:** Product of $2x^2$, 3x and 4y will be $24x^3y$.

**1. Multiplying a Monomial by a Monomial:**

**(a) Multiplication of two monomials:**
Let us look at some examples:

***Example 1*****:** Multiplication of terms 4 and y will be 4y.

***Example 2*****:** Multiplication of terms 4x and 3y will be 12xy.

***Example 3*****:** Multiplication of terms 4x and x will be $4x^2$.

**(b) Multiplication of three or more monomials:**
Let us look at some examples:

***Example 1*****:** Multiplication of terms 4, x, and y will be 4xy.

***Example 2*****:** Multiplication of terms 4x, 3y, 2 and z will be 24xyz.

***Example 3*****:** Multiplication of terms $4x^3$, $x^4$, $y^4$ and 2y will be $8x^7y^5$

**2. Multiplying a Monomial by a Polynomial:**

**(a) Multiplication of Monomial by a Binomial**
Let us look at some examples:

***Example 1*****:** Multiplication of 4 and (x + y) will be (4x + 4y).

***Example 2*****:** Multiplication of 5x and (3y + 2) will be (15xy + 10x).

***Example 3*****:** Multiplication of $7x^3$ and $(2x^4+ y^4)$ will be $(14x^7+7x^3y^4)$.

**(b) Multiplication of Monomial by a Binomial:**
Let us look at some examples:

***Example 1*****:** Multiplication of 4 and (x + y + z) will be (4x + 4y + 4z).

***Example 2:*** Multiplication of 2x and (2x + y + z) will be $(4x^2 + 2xy + 2xz)$.

***Example 3:*** Multiplication of $7x^3$ and $(2x^4 + y^4 + 2)$ will be $(14x^7 + 7x^3y^4 + 14x^3)$.

**Examples based on Multiplying a Monomial by a Polynomial:**

***Example 1:*** Simplify 2a(4a – 2) + 7 and find its values for a) x = 2 b) x =1/2
*Solution:* On simplifying, 2a(4a – 2) + 7 ,we get, $8a^2 - 4a + 7$
(a) For x = 2, $8a^2 - 4a + 7 = 8(2)^2 - 4(2) + 7$
$= 31$
(b) For x =1/2, $8a^2 - 4a + 7 = 8(1/2)^2 - 4(1/2) + 7$
$= 7$

***Example 2*****:** Multiply (5/7 x ab) and $(-21/10 \text{ x } a^2b^2)$.
*Solution*: $(5/7 \text{ x } ab) \text{ x}(-21/10 \text{ x } a^2b^2) = (5/7) \text{ x } (-21/10) \text{ x } ab \text{ x } a^2b^2$
$= (-3/2)\, a^3b^3$

**3. Multiplying a Polynomial by a Polynomial:**

**(a) Multiplication of Binomial by a Binomial:**
Let us look at some examples:

***Example 1*****:** Multiplication of (4x + y) and (x + y) will be $(4x^2 + 5xy + y^2)$.

***Example 2*****:** Multiplication of $(5x^2 + 3y)$ and (3y + 2) will be $(15x^2y + 10x^2 + 9y^2 + 6y)$.

**(b) Multiplication of Binomial by a Trinomial:**
Let us look at some examples:

***Example 1*****:** Multiplication of (4x + 2) and (x + y + z) will be $(4x^2 + 4xy + 4xz + 2x + 2y + 2z)$.

***Example 2*****:** Multiplication of $(2x^2 + 2xy)$ and (2x + y + z) will be $(4x^3 + 6x^2y + 2x^2z + 2xy^2 + 2xyz)$.

**Examples based on Multiplying a Polynomial by a Polynomial**

***Example 1*****:** Multiply the binomials $(2ab + 3b^2)$ and $(3ab - 2b^2)$.
*Solution*: $(2ab + 3b^2) \text{ x } (3ab - 2b^2) = 2ab \text{ x } (3ab - 2b^2) + 3b^2 \text{ x } (3ab - 2b^2)$
$= 6a^2b^2 - 4ab^3 + 9ab^3 - 6b^4$
$= 6a^2b^2 + 5ab^3 - 6b^4$

***Example 2*****:** Simplify (a + b + c)(a + b – c)
*Solution*: (a + b + c)(a + b – c) = a(a + b – c) + b(a + b – c) + c(a + b – c)
$= a^2 + ab - ac + ab + b^2 - bc + ac + bc - c^2$
$= a^2 + b^2 - c^2 + 2ab$

**Identity:**
It is a relation which satisfies A =B, where A and B will contain some variables and for any values of these variables the relation A = B will always be true.

***Example*****:** Consider $(x + 1)(x + 3) = x^2 + 4x + 3$.
Let us take x = 2,
LHS = $(2 + 1)(2 + 3) = 3 \times 5 = 15$.
RHS = $2^2 + 4 \times 2 + 3 = 4 + 8 + 3 = 15$.
Hence, LHS = RHS.
Similarly, for any values of x the relation will always be true i.e. LHS = RHS.

**Standard Identities:**
(i) $(a + b)^2 = (a^2 + 2ab + b^2)$
(ii) $(a - b)^2 = (a^2 - 2ab + b^2)$
(iii) $(a + b)(a - b) = (a^2 - b^2)$

***Example 1*****:** Find square of 102.
*Solution*: We can use $(a + b)^2 = (a^2 + 2ab + b^2)$ identity to simplify the problem.
We can split 102 as (100+2). Let a = 100 and b =2.
Substituting these values in identity, we have,
LHS = $(100 + 2)^2 = (102)^2$
RHS = $(100^2 + 2 \times 100 \times 2 + 2^2) = (10000 + 400 + 4) = 10404$.
Thus, square of 102 is 10404.

***Example 2*****:** Using $(x + a)(x + b) = x^2 + (a + b)x + ab$, find 105 x 107.
*Solution*: Using given identity, we can write
$105 \times 107 = (100 + 5)(100 + 7)$
$= 100^2 + (5 + 7) \times 100 + 5 \times 7$
$= 11235$

***Example 3*****:** Prove that $(3a + 7)^2 - 84a = (3a - 7)^2$.
*Solution*: LHS $= (3a + 7)^2 - 84a$
$= (3a)^2 + 2(3a)(7) + (7)^2 - 84a$
$= 9a^2 + 42a + 49 - 84a$
$= 9a^2 - 42a + 49$
RHS $= (3a - 7)^2$
$= (3a)^2 - 2(3a)(7) + (7)^2$
$= 9a^2 - 42a + 49$
Since, LHS = RHS, it is proved that $(3a + 7)^2 - 84a = (3a - 7)^2$.

# Previous Years Solution

2019

1st Term

(i) Which of the following is a binomial?
(a) $8x + x$; (b) $12a^2 + 7b + 5c$; (c) $5a \times 7b \times 8c$; (d) $12(a^3 + a)$.
Ans: (d) $12(a^3 + a)$.
(ii) 3x, 4xy are _______ terms.
(a) like; (b) unlike; (c) binomial; (d) trinomial.
Ans: (b) unlike
(iii) The sum of $a + b + ab$; $- b + c - bc$ and $-c - a + ac$ is:
(a) $2c + ab - bc + ac$; (b) $ab - bc - ac$; (c) $ab - bc + ac$; (d) $2a + 2b - 2c + ab - ac - bc$.
Ans: (c) $ab - bc + ac$

(iv) $(\frac{1}{2}+\frac{2}{3})$ abc = ________.
Ans: 7/6abc
(v) $11y^2z - 5y^2z$ = _______.
Ans: $6y^2z$

(iii) The terms having different variable parts are called unlike terms.
Ans: True
(iv) A binomial is a sum or difference of two monomials.
Ans: True
(v) Dividend = Divisor × Quotient + Remainder.
Ans: True

(i) x-2y+3z c)trinomial

(i) Add: 4a-6c+2b, 2a+12c and -8b+5c.
Ans: 6a-6b+11c
(ii) Find the product of $-7x^2y$ and $5x^3y^3$.
Ans: $-35x^5y^4$

(i) Simplify: 5x+3-[2x-{x-3(5x-6)}]
Ans: 5x+3-[2x-{x-3(5x-6)}]
= 5x+3-[2x-{x-15x+18}]
=5x+3-[2x-x+15x-18]
=5x+3-2x+x-15x+18
= -11x+21

(i) Simplify: 3m – 2(m + 3) + 4(m – 1)
Ans: 3m – 2(m + 3) + 4(m – 1)
= 3m-2m-6+4m-4
=5m-10
=5(m-2)
(ii) Divide: $6x^3 - x + 19x^2 - 29$ by 2x + 3.
Ans: $6x^3 - x + 19x^2 - 29$ by 2x + 3.
Let us arrange the dividend in descending powers of x.
$6x^3 + 19x^2 - x - 29$ by 2x+3
The quotient is $3x^2+5x-8$ with a remainder of -5.

OR

Divide: $2x^2 - 11x + 12$ by x – 4.
Ans: The quotient is 2x-3 and remainder is 0.

(iii) Simplify: (a + 1)(a + 2)(a + 3).
Ans: (a + 1)(a + 2)(a + 3)
=(a+1) {(a+2) (a+3)}
=(a+1) $\{a^2+3a+2a+6\}$
=(a+1) $\{a^2+5a+6\}$
=$(a^3+5a^2+6a) + (a^2+5a+6)$
= $a^3+6a^2+11a+6$

## 2nd Term

ii) The sum of a+b+ab, -b+c-bc and -c-a+ac is

c)ab-bc+ac

iii) Which of the following is a binomial?

d) $12(a^3 + a)$

iv) The length and breadth of a rectangle are (x+8) and (x-9) Units respectively. Then area of the rectangle is

b) $x^2$-x-72

i) A _trinomial is the sum or difference of three monomials.

i) Multiply: (5x-9y) and (3x+11y) Ans- $15x^2+28xy-99y^2$.

ii) Subtract : a-b+c from 2a+b-c Ans- a+2b-2c.

i) Divide $6x^3 - x + 19x^2 - 29$ by 2x + 3. Ans- Q-$3x^2$+5x-8 and R= -5.

## 3rd Term

i) Which of the following is a binomial?
a) 8x+x b) $12a^2$+7b+5c c) 5a x 7b x 8c d) $12(a^3 + a)$
Ans: d) $12(a^3 + a)$

ix) The degree of $8a^3b^5 + a^2b^2$ is ________.
Ans: 8
x) If a=2, b=1 and c=10 then find the value of $3b(a^3-c)$
Ans: (-6)

iv) Subtract a-b+c from 2a+b-c.
Ans: (2a+b-c)-(a-b+c)
= 2a+b-c-a+b-c
=a+2b-2c

i)What must be added to $3a^3-4a+6$ to get $7a^3-4a^2+10a-6$
Ans: $(7a^3-4a^2+10a-6) - (3a^3-4a+6)$
= $4a^3-4a^2+ 14a-12$

i) Simplify $8x^3y + 7x^2y(3x-4y)+ 2xy(-3x^2+4y)$
Ans: $8x^3y + 21\,x^3y - 28x^2y^2 - 6\,x^3y + 8xy^2$
= $23\,x^3y - 28x^2y^2+ 8xy^2$
ii) Divide $x^4 + x^3 - 2x^2 + 4x-10$ by (x-2)
Ans: Quotient= $x^3+3x^2+4x+12$ and Remainder = 14

2018

1st Term

i)Degree of this polynomial $3x^7+ 15 +x -2x^{10}$ is
b) 10

ii)Arranging $8x^2-3x^4-12+6x^3$ in order of decreasing degree in x we get $-3x^4+6x^3+8x^2-12$

i) $\frac{x}{y} - 2x^3+4x^4y^{-2} -7$ is a polynomial. False

v)In a polynomial exponents of the variables are always positive integers. True

(i) Add: 8a – 3b and 2a + 6b.
(ii) Find the product of $-8x^2y$ and $3x^3y^3$.

(i) (8a – 3b) + (2a + 6b)
= 10a + 3b.

(ii) $-8x^2y \times 3x^3y^3$
= $-24x^5y^4$

(i) Divide: $-54x^4y^3z$ by $6x^2y^2z$.

(i) $\frac{-54\,x^4\,y^3\,z}{6\,x^2\,y^2\,z} = -9\,x^2y$.

(i) Simplify : 5x + 3 – [ 2x – { x – 3(5x – 6)}]

(ii) Divide: $2x^2 - 11x + 12$ by x – 4.

Or

Divide: $x^3 - 8$ by x – 2, x ≠ 2.

(i) 5x + 3 – [ 2x – { x – 3(5x – 6)}]
= 5x + 3 – [ 2x – { x – 15x + 18}]
= 5x + 3 – [ 2x – x + 15x – 18]
= 5x + 3 – [ 16x – 18]
= 5x + 3 – 16x + 18
= - 11x + 21

(ii)
```
            2x - 3
x – 4 | 2x² – 11x + 12
      | 2x² – 8x
      | (-)  (+)
          - 3x + 12
          - 3x + 12
           xxxxxx
```

Divide: $x^3 - 8$ by $x - 2$, $x \neq 2$.

$$
\begin{array}{r|l}
 & x^2 + 2x + 4 \\
\hline
x - 2 & x^3 \qquad\quad - 8 \\
 & x^3 - 2x^2 \\
 & \underline{(-)\ (+)} \\
 & \quad 2x^2 \qquad - 8 \\
 & \quad 2x^2 - 4x \\
 & \quad \underline{(-)\quad (+)} \\
 & \qquad 4x - 8 \\
 & \qquad \underline{4x - 8} \\
 & \qquad \text{xxxxx}
\end{array}
$$

(iii) Simplify: $(x^2 - 4xy - 4y^2)(2x^2 + 8xy + 2y^2)$.

(iii) $(x^2 - 4xy - 4y^2)(2x^2 + 8xy + 2y^2)$.

$= x^2(2x^2 + 8xy + 2y^2) - 4xy(2x^2 + 8xy + 2y^2) - 4y^2(2x^2 + 8xy + 2y^2)$

$= 2x^4 + 8x^3y + 2x^2y^2 - 8x^3y - 32x^2y^2 - 8xy^3 - 8x^2y^2 - 32xy^3 - 8y^4$

$= 2x^4 - 38x^2y^2 - 40xy^3 - 8y^4$.

## $2^{nd}$ Term

**i) degree of $8a^3b^5 + a^2b^2$ is**

**a) 8**

**ii) The product of $-3abc$, $-4a^2bc^3$ and $4a^3b^4c^3$ is $48a^6b^6c^7$. True**

**iv)Arranging $x^2y - 3y^3 + 4x^3 - 2xy^2$ in order of decreasing degree in x we have $4x^3 + x^2y - 2xy^2 - 3y^3$**

| | | | |
|---|---|---|---|
| **i)** | **$7x^2-4y$** | **i)** | **Is a binomial** |

**iii)Divide: $\frac{3}{7}a^3b^2$ by $(-\frac{9}{14}ab)$. Ans: $-2/3\ a^2b$**

**iv)Why is $x^3+7x^2-2x+\frac{9}{x}$ not a polynomial?Ans: power of x is negative.**

**6.i)Ans:$(-2-1+10)^2 = (7)^2 = 49$**

**ii)Ans: $-a+12b$**

**iii)$(5x-9y)(3x+11y) = 15x^2+55xy - 27xy - 99y^2$**

**$= 15x^2+28xy - 99y^2$**

**7i)** $\frac{-12x^2y^2}{-4x} + \frac{4x^3y}{-4x} + \frac{5xy}{-4x} - \frac{9xy^3}{-4x}$

**$= 3xy^2 - x^2y - \frac{5}{4}y + \frac{9}{4}y^3$**

## $3^{rd}$ Term

**i)Degree of $5+2y+2y^2$ is c)2**

**ii) Product of $-8x^2y$ and $3x^3y^3$ is a) $-24x^5y^4$**

**iii)By how much is $a^4 - 6a^2b^2 + b^4$ more than $a^4 + 4a^2b^2 + b^4$?**

**c) $-10a^2b^2$**

**ii)Arranging $8x^2 - 3x^4 - 12 + 6x^3$ in order of decreasing degree in x we have $-3x^4 + 6x^3 + 8x^2 - 12$**

**i)Simplify: $(4a - 3b + 11c)(a+b) - (16b - 13c + 2a)(a-c)$**

**Ans.$4a^2 + 4ab - 3ab - 3b^2 + 11ac + 11bc - (16ab - 16bc - 13ac + 13c^2 + 2a^2 - 2ac)$**

**$= 2a^2 - 13c^2 - 3b^2 - 15ab + 26ac + 27bc$**

**v)Divide: a) $x^2 - 3x + 2$ by $x-2$**

**Ans.** $\frac{x2-3x+2}{x-2}$ **$= x-1$**

**b) $-48x^2yz$ by $-60xy^2z^3$**

**Ans.** $\frac{-48x2yz}{-60xy2z3}$ **$= 4x/5yz^2$**

# Exercise Problems

**Question 1**

Identify the terms, their coefficients for each of the following expressions.

(i)$xyz^2 + 3xy$

(ii)$1 - x -2x^2$

(iii)$4p^2q^2 - 4p^2q^2r^2+ r^2$

(iv)$4 - xy + yz - xz$

(v) $(x/4) - (y/5) -y$

(vi)$1.3a - 2.6ab + 1.5b$

**Question 2**

Classify the following polynomials as monomials, binomials, trinomials. Which polynomials do not fit in any of these three categories?

a)$x^2 + y^2$

b)$1000-x$

c)$x + x^2+ x^3 + x^4 + x^5$

d)$8 - y -5x$

e) $2y -3y^2$

f) $2y - 3y+ 4y^3$

g) $5x -8y + 3xy$

h) $4 -15z^2$

i) $ab + bc + cd + da+ 2ab$

j) $pqr+2pq+5pqr$

k) $p^2q + pq^2$

l) $2p + 2q+1$

**Question 3**

Add the following.

(i) $ab - bc+ ac$, $bc - ca+ ab$, $ca - ab-2bc$

(ii)$p - q + pq$, $q - r + qr$, $r - p + pr$ , $p+q+r$

(iii)$2p^2q^2- 3pq + 4$, $5 + 7pq - 3p^2q^2$ ,$4p^2q^2 + 10pq$

(iv)$a^2+ b^2$, $b^2+ c^2$, $c^2+ a^2$, $2ab + 2bc + 2ac$

**Question 4.**

(a) Subtract $8a - 7ab + 3b - 20$ from $20a - 9ab + 5b - 20$

(b) Subtract $3pq + 5qr - 7pr+1$ from $-4pq +2qr - 2pr + 5pqr+1$

(c) Subtract $4p^2q - 4pq - 5pq^2 - 8p + 7q - 18$
from $18 - 3p - 11q + 5pq - 2pq^2+ 5p^2q$

**Question 5**

What are the coefficient of each term in the below expression?

$4p^2q^2 + 4p^2q^2r^2 - r^2 +5$

a)4,4,-1,5

b)4,4,1,5

c) $4,4r^2 ,-r^2, 5$

d) None of these

**Question 6**

The product of a monomial and trinomial will be a

a)monomial

b)trinomial

c)binomial

d) None of these

**Question 7**

The exponents of a variable term in the polynomial is a
a) integers
b)negative integers
c) positive integers
d) non -negative integers

**Question 8**
The expression pqr +rqp+qpr is a
a) Monomial
b)trinomial
c) binomial
d) none of these

**Question 9**
Find the product of the following expression
(a) 11, 7x
(b) - 4x, y
(c) - 4p, pq, pr
(d)$4p^3$, - 3p, $p^2$
(e) 3mn, 4n
f) 51p, $p^2$, $p^8$
g) 2p, 4q, 8r
h) xy, $2x^2y$, $2xy^2$, xy
i) a, 2b, 3c
j) xy, yz, zx
k) 2, 4y, $8y^2$,$16y^3$
l) a, 2b, 3c, 6abc
m) p, - pq, pqr

**Question 10**
Volume of the cuboid with Length as 2x,breath as 2y and Height as 2 z is given by
a) xyz
b) 8xyz
c) 2x+2y+2z
d) None of these

**Question 11**
The sum of area of the squares of side 2a and 2b will be
a) 2a+ 2b
b) $4a^2 + 4b^2$
c) ab
d) None of these
**Question 12**
Identify the terms, their coefficients for each of the following expressions.
(i) $xyz^2 + 3xy$
(ii) $1 - x - 2x^2$
(iii) $4p^2q^2 – 4p^2q^2r^2 + r^2$
(iv) 4 – xy + yz – xz
(v) (x/4) –(y/5) -y
(vi) 1.3a – 2.6ab + 1.5b
**Question 13**
Classify the following polynomials as monomials, binomials, trinomials. Which polynomials do not fit in any of these three categories?
$x^2 + y^2$
1000-x
$x + x^2 + x^3 + x^4 + x^5$

8 - y +-5x
$2y - 3y^2$
$2y - 3y + 4y^3$
$5x - 8y + 3xy$
$4 - 15z^2$
$ab + bc + cd + da + 2ab$
$pqr + 2pq + 5pqr$
$p^2q + pq^2$
$2p + 2q + 1$

**Question 14**

Add the following.

(i) ab – bc+ ac, bc – ca+ ab, ca – ab-2bc

(ii) p – q + pq, q – r + qr, r – p + pr , p+q+r

(iii) $2p^2q^2 - 3pq + 4$, $5 + 7pq - 3p^2q^2$ ,$4p^2q^2 + 10pq$

(iv) $a^2 + b^2$, $b^2 + c^2$, $c^2 + a^2$, $2ab + 2bc + 2ac$

**Question 15**

(a) Subtract $8a - 7ab + 3b - 20$ from $20a - 9ab + 5b - 20$

(b) Subtract $3pq + 5qr - 7pr + 1$ from $-4pq + 2qr - 2pr + 5pqr + 1$

(c) Subtract $4p^2q - 4pq - 5pq^2 - 8p + 7q - 18$
from $18 - 3p - 11q + 5pq - 2pq^2 + 5p^2q$

**Question 16**

What are the coefficient of each term in the below expression?

$4p^2q^2 + 4p^2q^2r^2 - r^2 + 5$

a) 4,4,-1,5
b) 4,4,1,5
c) $4, 4r^2, -r^2, 5$
d) None of these

**Question 17**

The product of a monomial and trinomial will be a

a) monomial
b) trinomial
c) binomial
d) None of these

**Question 18**

The exponents of a variable term in the polynomial is a

a) integers
b) negative integers
c) positive integers
d) non -negative integers

**Question 19**

The expression pqr +rqp+qpr is a

a) Monomial
b) trinomial
c) binomial
d) none of these

**Question 20**

Use a suitable identity to get each of the following products.

a) (p - 11) (p + 11)
b) (2y + 5) (2y - 5)
c) (12a - 9) (12a +9)
d) (2a-1/2)(2a-1/2)
e) (1.1m - 0.4) (1.1m + 0.4)
f) $(a^2 + b^2)(-a^2 + b^2)$

g) $(6x - 7)(6x + 7)$
h) $(-a/2 + c/2)(-a/2 + c/2)$
i) $[(p/8)+(3q/4)][(p/8)+(3q/4)]$
j) $(3a + 9b)(3a - 9b)$
k) $2(a - 9)^2$
l) $5(xy - 3z)^2$
m) $(6x+ 5y)^2$
n) $36[(3p/2\}) + (2q/3)]^2$
o) $(x - 0.5y)^2$
p) $(2xy - 5y)^2$

**Question 21**
Use the identity $(x + a)(x + b) = x^2 + (a + b)x + ab$ to find the following products.
(i) $(p + 10)(p + 11)$
(ii) $(4x + 9)(4x + 12)$
(iii) $(x - 5)(x - 1)$
(iv) $(9x - 5)(9x - 1)$
(v) $(2x + 5y)(2x + 3y)$
(vi) $(2a^2+ 9)(2a^2+ 5)$

**Question 22**
Simplify the following
(i) $(x^2- y^2)^2 + 4x^2y^2$
(ii) $(p + q)^2- (p - q)^2 + p^2q^2$
(iii) $(2m - 8n)^2+ (2m + 8n)^2$
(iv) $(4m + 5n)^2+ (5m + 4n)^2 + (4m + 5n)(4m -5n)$
(v) $(.5p - 1.5q)^2- (.5p - 1.5q)^2 +p^2q^2$
(vi) $(ab - bc)^2+2ab^2c$
(vii) $(m^2- n^2m)^2+ 2m^2n^2$

**Question 23**
Using identities, evaluate.
a) $91^2$
b) $89^2$
c) $202^2$
d) $999^2$
e) $1.2^2$
f) 397 x 403
g) 48 x 52
h) $5.1^2$
i) $61^2- 59^2$
j) $11.1^2- 9.9^2$
k) 503 x 504
l) 2.1 x 2.2
m) 103 x 98
n) 9.7 x 9.8
o) $729^2- 271^2$

**Question 24**
Find the value of x if $8x=35^2 -27^2$

**Question 25**
a) If $a -1/a =4$, find the value of $a^2 + 1/a^2$
b) If $p +q =13$ and $pq =22$, then $p^2 + q^2$