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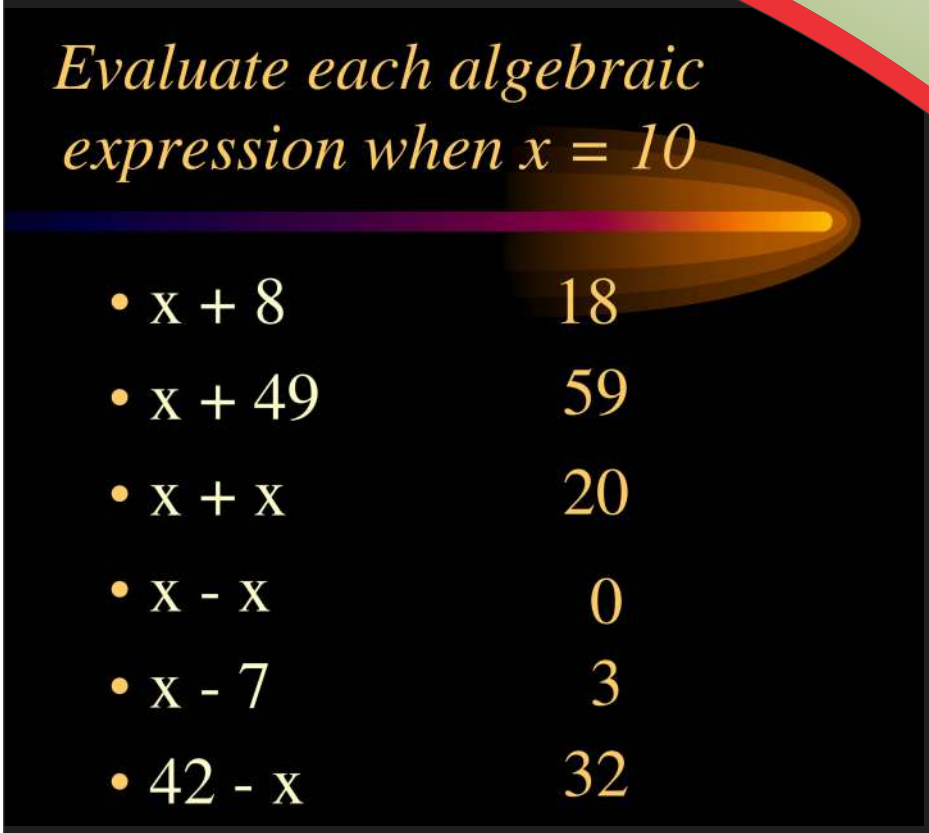

CHAPTER
15

ALGEBRAIC EXPRESSIONS AND IDENTITIES

FOUNDATION COURSE
CLASS : 8th
MATHEMATICS

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INTRODUCTION

Algebra is the branch of mathematics concerning the study of the rules of operations and relations. Elementary algebra is the most basic form of algebra. It is taught to students who are presumed to have no knowledge of mathematics beyond the basic principles of arithmetic. In arithmetic, only numbers and their arithmetical operations (such as +, –, ×, ÷) occur. In algebra, numbers are often denoted by symbols (such as *a*, *x*, or *y*). This is useful because:

- It allows the general formulation of arithmetical laws
- It allows the formulation of functional relationships. For example : "If you sell x tickets, then your profit will be ₹$(3x-10)$, or $f(x)=3x-10$, where f is the function, and x is the number to which the function is applied.

ALGEBRAIC EXPRESSIONS

Algebra can be considered as generalisation of arithmetic, where we use letters in place of numbers, which allows to write rules and form in general way.

Variable : A quantity that does not have a fixed numerical value is called a variable. It is represented by the letters like x, y, … .

Constant : A symbol which has a fixed numerical value is called a **constant**.

Algebraic expressions : When variables and constants are combined with the help of mathematical operations of addition, subtraction, multiplication and division, we get an algebraic expression. For example, $3x+7$, $15y-23$ are algebraic expression.

Terms: Look at the expression $(3x+7)$. This is formed by first forming $3x$ as product of 3 and x and then adding 7 to the product. Such parts of an expression which are formed first and then added are called **terms**.

Consider $(9y^2-8x)$, here we can say that $9y^2$ and $-8x$ are two terms of given expressions.

Factors of a term : Now we know that an expression consist of terms. $(9y^2-8x)$ has two terms $9y^2$ and $(-8x)$. The term $9y^2$ is a product of 9, y and y. Here we say that 9, y and y are factors of term $9y^2$. A term is represented as product of its factors.

For term $(-8x)$, -8 and x are factors.

Coefficients of a term : We know that any term of an expression can be expressed as product of its factors. These factors are numeric or variables. The numerical factor is called numerical **coefficient** or **coefficient** of the term.

In $9y^2$, 9 is the coefficient of the term. It is also called coefficient of y^2. In $-10y^2z^2$, -10 is the coefficient of y^2z^2.

If the coefficient of any term is $+1$, we omit it.

$1y^2$ can be written as y^2, $1xy$ is written as xy coefficient (-1) is indicated by minus $(-)$ sign, $(-1)y^2$ is written as $-y^2$, $(-1)\,y^2z^2$ as $-y^2-z^2$ etc.

For example: In the following expressions identify the terms, factors and coefficients.

$(4x+3y)$, $3xy^2-4x$, $3p^2q+7pq-8pq^2$

Expression	Terms	Factors	Coefficients
$4x+3y$	$4x$	$4,x$	4
	$3y$	$3,y$	3
$3xy^2-4x$	$3xy^2$	$3,x,y,y$	3
	$-4x$	$-4,x$	-4
$3p^2q+7pq$ $-8pq^2$	$3p^2q$	$3p,p,q$	3
	$7pq$	$7,p,q$	7
	$-8pq^2$	$-8,p,q,q$	-8

Like and Unlike Terms: In any algebraic expression, terms which have same variable(s) factor(s) are called like terms. Terms which have different variable(s) factors are called unlike terms. Take example of expression $3y^2+2x-2y^2+5$, in this expression, factors of $3y^2$ are 3, y and y, factors of $-2y^2$ are -2, y and y. Thus their variables factors are same so $3y^2$ and $-2y^2$ are like terms whereas $3y^2$ and $2x$ are unlike terms because their variable factors are different, similarly $2x$ and 5 are also unlike terms.

Types of Algebraic Expressions:

(i) An algebraic expression that has only one term is called a **monomial**. For example, x, $4x^2y$, $-3p^2q^2$ etc.

(ii) An algebraic expression that contains two unlike terms is called a **binomial**. For example, $x+y$, $3x+4y$, $x-10$, $-y-5$. etc.

(iii) An algebraic expression that contains three unlike terms is called a **trinomial**. For example, $a+b+5$, x^2-y^2+6, x^2y+xy^2+xy etc. $2y+10-y$ is not a trinomial as $2y$ and $-y$ are like terms.

ADDITION OF ALGEBRAIC EXPRESSIONS

To add two algebraic expressions, we collect different groups of like terms and find the sum of like terms in each group.

ILLUSTRATION : 1

Add; $7x^2-4x+5$, $-3x^2+2x-1$ and $5x^2-x+9$.

SOLUTION :

$$(7x^2-4x+5)+(-3x^2+2x-1)+(5x^2-x+9)$$
$$=7x^2-4x+5-3x^2+2x-1+5x^2-x+9$$
$$=7x^2-3x^2+5x^2-4x+2x-x+5-1+9$$
$$=(7-3+5)x^2+(-4+2-1)x+(5-1+9)$$
$$=9x^2-3x+13$$

SUBTRACTION OF ALGEBRAIC EXPRESSIONS

In order to subtract an algebraic expression from another, we change the signs (from – to + or + to –) of all the terms of the expression which is to be subtracted and then the two expressions are added.

ILLUSTRATION : 2

Subtract $(2x^3-4x^2+3x+5)$ from $(4x^3+x^2+x+6)$

SOLUTION :

$(4x^3+x^2+x+6)-(2x^3-4x^2+3x+5)$

$= 4x^3+x^2+x+6-2x^3+4x^2-3x-5$

$=2x^3+5x^2-2x+1$

MULTIPLICATION OF ALGEBRAIC EXPRESSIONS

In the multiplication of algebraic expressions, we shall be using the following rules:

(1) The product of two factors with like signs is positive and the product of two factors with unlike signs is negative.

(i) $(+)\times(+)=+$

(ii) $(-)\times(-)=+$

(iii) $(+)\times(-)=-$

(iv) $(-)\times(+)=-$

(2) If x is any variable and a, b are positive integers, then

$x^a \times x^b = x^{a+b}$

For example : $x^4 \times x^3 = x^{4+3} = x^7$

MULTIPLICATION OF TWO OR MORE MONOMIALS

While multiplying two or more monomials, we have the following two rules:

(1) Multiply the coefficients of given monomials to find the coefficient of the product of monomials.

(2) Multiply the variable parts in the given monomials to find the variable part of the product of monomials.

ILLUSTRATION : 3

Multiply : (i) $3x^2y^2z$ by $4xy^2z^2$ (ii) $\frac{-8}{5}x^2yz^3$ by $\frac{-3}{4}xy^2z$

SOLUTION :

(i) $3x^2y^2z \times 4xy^2z^2 = (3\times4)\times(x^2\times x)\times(y^2\times y^2)\times(z\times z^2) = 12x^3y^4z^3$

(ii) $\frac{-8}{5}x^2yz^3 \times \frac{-3}{4}xy^2z = \left(\frac{-8}{5}\times\frac{-3}{4}\right)\times(x^2\times x)\times(y\times y^2)\times(z^3\times z) = \frac{6}{5}x^3y^3z^4$

ILLUSTRATION : 4

Find the product of $4s^2t$, $3s^3t^3$, $2st^4$ and (-2)

SOLUTION :

$(4s^2t)\times(3s^3t^3)\times(2st^4)\times(-2)$

$= (4\times3\times2\times(-2))\times(s^2\times s^3\times s\times t\times t^3\times t^4)$

$=-48s^6t^8$

MULTIPLICATION OF A MONOMIAL BY A BINOMIAL

To multiply a binomial by a monomial, we shall use the following properties:

(i) $P\times(Q+R)=(P\times Q)+(P\times R)$

(ii) $P\times(Q-R)=(P\times Q)-(P\times R)$

ILLUSTRATION : 5

Multiply xz by (x^2+y^2)

SOLUTION :

$xz \times (x^2+y^2) = (xz \times x^2) + (xz \times y^2) = x^3z + xzy^2$

ILLUSTRATION : 6

Multiply $\frac{-3a^2b}{5}$ by $\left(\frac{2a}{3}-b\right)$

SOLUTION :

$$\left(\frac{-3a^2b}{5}\times\frac{2a}{3}\right)-\left(\frac{-3a^2b}{5}\times b\right)=\frac{-2a^3b}{5}-\left(\frac{-3a^2b^2}{5}\right)=\frac{-2a^3b}{5}+\frac{3a^2b^2}{5}=\frac{3a^2b^2}{5}-\frac{2a^3b}{5}$$

MULTIPLICATION OF A MONOMIAL BY A TRINOMIAL

To multiply a monomial by a trinomial, we use the following property:

$P \times (Q+R+S) = (P \times Q) + (P \times R) + (P \times S)$

ILLUSTRATION : 7

Multiply $2z\,(z-x-y)$

SOLUTION :

$2z(z-x-y) = (2z \times z) - (2z \times x) - (2z \times y) = 2z^2 - 2xz - 2zy$

MULTIPLICATION OF TWO BINOMIALS

In order to multiply two binomials, we will use the distributive property of multiplication.

Consider $(a+b)(c+d)$.

Step 1 : Apply distributive property and we get; $a(c+d) + b(c+d)$

Step 2 : Multiply further to get : $ac + ad + bc + bd$.

ILLUSTRATION : 8

Multiply $(2x+3y)$ and $(4x-5y)$

SOLUTION :

$(2x+3y)(4x-5y) = 2x(4x-5y) + 3y(4x-5y) = 8x^2 - 10xy + 12xy - 15y^2 = 8x^2 + 2xy - 15y^2$

ALGEBRAIC IDENTITIES

Consider the equality $(x+2)(x+3) = x^2+5x+6$

Let us evaluate both sides of this equality for some value of variable x say $x=4$

$\therefore$ For $x=4$

LHS $\Rightarrow (x+2)(x+3) = (4+2)(4+3) = 6 \times 7 = 42$

RHS $\Rightarrow (4)^2 + 5 \times 4 + 6 = 16 + 20 + 6 = 42$

So for $x=4$

LHS = RHS

Let us calculate LHS & RHS for $x=-3$

LHS $\Rightarrow (-3+2)(-3+3) = 0$

RHS $\Rightarrow (-3)^2 + 5(-3) + 6 = 9 - 15 + 6 = 0$

$\therefore$ for $x=-3$, LHS = RHS

If we take any value of variable x, we find that LHS = RHS

Such an equality which is true for every value of variable present in it is called an identity thus $(x+2)(x+3)=x^2+5x+6$ is an identity.

Identities differ from equations in the following manners. An equation is a statement of equality of two algebraic expression involving one or more variable. An equation is true for certain values of the variable.

For example:

$4x+3=x-3$ .....(1)

$\Rightarrow \quad 3x=-6 \Rightarrow x=-2$

Thus eq^n (1) is true only for $x=-2$, no other value of x satistfy eq^n (1).

Standard Identities:

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

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

(iii) $\left(a^2-b^2\right)=(a+b)(a-b)$

(iv) $(x+a)(x+b)=x^2+(a+b)x+ab$

ILLUSTRATION : 9

Simplify the following:

(i) $(2a+b)^2$ (ii) $(3x-4y)^2$

SOLUTION :

(i) $(2a+b)^2=(2a)^2+(b)^2+2(2a)(b)$
$=4a^2+b^2+4ab$

(ii) $(3x-4y)^2=(3x)^2+(4y)^2-2(3x)(4y)$
$=9x^2+16y^2-24xy$

CONNECTING TOPIC

Some More Identities

We have dealt with identities involving squares. Now we will see how to handle identities involving cubes.

(i) $(a+b+c)^2=a^2+b^2+c^2+2ab+2bc+2ca$

(ii) $(a+b)^3=a^3+b^3+3ab(a+b)$

(iii) $(a-b)^3=a^3-b^3-3ab(a-b)$

ILLUSTRATION : 10

Simplify the following:

(i) $(2a-5b)^3$ (ii) $(3x+4y-z)^2$ (iii) $(28)^3+(-15)^3+(-13)^3$

SOLUTION :

(i) $(2a-5b)^3$

Here, $(a-b)^3=a^3-b^3-3ab(a-b)$

$\therefore (2a-5b)^3=(2a)^3-(5b)^3-3(2a)(5b)(2a-5b)$
$=8a^3-125b^3-30ab(2a-5b)$
$=8a^3-125b^3-60a^2b+150ab^2$

(ii) $(3a+4y-z)^2$

Here, $(a+b+c)^2=a^2+b^2+c^2+2ab+2bc+2ca$

$(3x+4y-z)^2=(3x)^2+(4y)^2+(-z)^2+2(3x)(4y)+2(4y)(-z)+2(-z)(3x)$
$=9x^2+16y^2+z^2+24xy-8yz-6xz$

(iii) $(28)^3+(-15)^3+(-13)^3$

Let $a=28, b=-15, c=-13$

Here we see that $a+b+c=28+(-15)+(-13)=0$

$\therefore a^3+b^3+c^3=3abc$

$\therefore (28)^3+(-15)^3+(-13)^3=3(28)(15)(-13)$

$(28)^3+(-15)^3+(-13)^3=16380$

MISCELLANEOUS SOLVED EXAMPLES

1. Evaluate: $\left(\frac{x}{2}+\frac{y}{3}\right)\left(\frac{x}{2}+\frac{y}{3}\right)$

Sol. $\left(\frac{x}{2}+\frac{y}{3}\right)\left(\frac{x}{2}+\frac{y}{3}\right)=\left(\frac{x}{2}+\frac{y}{3}\right)^2=\left(\frac{x}{2}\right)^2+2\left(\frac{x}{2}\right)\times\left(\frac{y}{3}\right)+\left(\frac{y}{3}\right)^2$

$\Rightarrow\left(\frac{x}{2}+\frac{y}{3}\right)\left(\frac{x}{2}+\frac{y}{3}\right)=\frac{x^2}{4}+\frac{xy}{3}+\frac{y^2}{9}$

2. Evaluate: $\left(2x^2-5y^2\right)^2$

Sol. $\left(2x^2-5y^2\right)^2=\left(2x^2\right)^2-2\left(2x^2\right)\left(5y^2\right)+\left(5y^2\right)^2$

$\left(2x^2-5y^2\right)^2=4x^4-20x^2y^2+25y^4$

3. Evaluate: $(1-6x)(1+6x)+(2+x)(2-x)$

Sol. $(1-6x)(1+6x)+(2+x)(2-x)=\left\{1^2-(6x)^2\right\}+\left(2^2-x^2\right)=1-36x^2+4-x^2$

$(1-6x)(1+6x)+(2+x)(2-x)=5-37x^2$

4. Evaluate: (a) $(204)^2$ (b) $(148)^2$

Sol. (a) $(204)^2 = (200+4)^2=200^2+2\times200\times4+4^2$

$= (204)^2=41616$

(b) $(148)^2 = (148)^2=(150-2)^2=(150)^2-2\times150\times$ $(148)^2=(150-2)^2=(150)^2-2\times150\times2+2^2$

$= 22500-600+4$

$(148)^2 = 21904$

5. If $x+y=9$ and $xy=16$, find (i) x^2+y^2 (ii) $(x-y)^2$

Sol. (i) $(x+y)=9$

$\Rightarrow (x+y)^2=9^2=81$ [By squaring both sides]

$\Rightarrow x^2+2xy+y^2=81$

$\Rightarrow x^2+y^2+2\times16=81$

$\Rightarrow x^2+y^2=81-32$

$\Rightarrow x^2+y^2=49$

(ii) $(x-y)^2=x^2-2xy+y^2$

$=x^2+y^2-2xy=49-2\times16$

$=49-32$

$(x-y)^2=17$

6. If $\left(x-\frac{1}{x}\right)=9$, find $\left(x+\frac{1}{x}\right)^2$.

Sol. Given $x-\frac{1}{x}=9$

$\left(x-\frac{1}{x}\right)^2=81$ [By squaring both sides]

$x^2-2.x.\frac{1}{x}+\frac{1}{x^2}=81$

$\Rightarrow x^2+\frac{1}{x^2}-2=81$

$x^2+\frac{1}{x^2}=83$ ..... (1)

Now, $\left(x+\frac{1}{x}\right)^2=x^2+2.\cancel{x}.\frac{1}{\cancel{x}}+\frac{1}{x^2}=x^2+\frac{1}{x^2}+2$

$=83+2$ [from (1)]

$\left(x+\frac{1}{x}\right)^2=85$

7. **Evaluate the following products without direct multiplication. (a) 103×107 (b) 104×96**

Sol. (a) $103\times107=(100+3)(100+7)=(100)^2+(3+7)\times100+3\times7$ $\left[\text{using } (x+a)(x+b)=x^2+(a+b)x+ab\right]$

$=10000+1000+21=11021$

(b) $104\times96=(100+4)(100-4)$

$=100^2-4^2$ [using $(x+a)(x-a)=x^2-a^2$]

$=10000-16=9984$

8. **Simplify:**

(i) $(2x-3)(x^3-2x^2+5x-7)$ **(ii)** $(3x-2)(2x-3)+(5x-3)(x+1)$

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

$=2x(x^3-2x^2+5x-7)-3(x^3-2x^2+5x-7)$

$=2x^4-4x^3+10x^2-14x-3x^3+6x^2-15x+21$

$=2x^4-4x^3-3x^3+10x^2+6x^2-14x-15x+21$

$=2x^4-7x^3+16x^2-29x+21$

(ii) $(3x-2)(2x-3)+(5x-3)(x+1)$

$=[3x(2x-3)-2(2x-3)]+[5x(x+1)-3(x+1)]$

$=(6x^2-9x-4x+6)+(5x^2+5x-3x-3)$

$=6x^2-13x+6+5x^2+2x-3$

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

SOLVED EXAMPLES BASED ON CONNECTING TOPICS

9. Expand : $(2x-y+z)^2$

Sol. $(2x-y+z)^2 = (2x)^2 + (-y)^2 + (z)^2 + 2(2x)(-y) + 2(-y)(z) + 2(2x)(z)$

$\left[\text{using } (a+b+c)^2 = a^2+b^2+c^2+2ab+2bc+2ca\right]$

$\therefore (2x-y+z)^2 = 4x^2 + y^2 + z^2 - 4xy - 2yz + 4zx$

10. Evaluate: 103^3

Sol. $(103)^3 = (100+3)^3$

Here, $a = 100, b = 3$

Using $(a+b)^3 = a^3 + 3ab(a+b) + b^3$

$= (100)^3 + 3 \times 100 \times 3(100+3) + (3)^3 = 1000000 + 900 \times 103 + 27$

$= 1092727$

11. $(x-2y)^3 + (2y-3z)^3 + (3z-x)^3$ is

Sol. Let $x-2y = a, 2y-3z = b$ and $3z-x = c$

$\therefore \quad a+b+c = x-2y+2y-3z+3z-x = 0$

$\Rightarrow \quad a^3+b^3+c^3 = 3abc$

Hence $(x-2y)^3 + (2y-3z)^3 + (3z-x)^3$

$= 3(x-2y)(2y-3z)(3z-x)$

1 EXERCISE

Fill in the Blanks :

DIRECTIONS : *Complete the following statements with an appropriate word / term to be filled in the blank space(s).*

1. _____ are a combination of terms connected by the operations of addition, subtraction, multiplication or division.
2. The numerical factor of the term is called _____.
3. In expression $2x^2 + 4x$, the coefficient of x^2 is ___ and coefficient of x is _____.
4. $5x + 4y$ is an expression having _____ term.
5. An algebraic expression is called a _____ if there is only one term in it.
6. Trinomial is an algebraic expression with ____ terms.
7. $(-5\ ab^2c) \times (3a^3\ bc^2d) =$ _____.
8. Each term in an algebraic expression is a product of one or more numbers, numerical. These numbers are called the ____ of that term.

True / False :

DIRECTIONS : *Read the following statements and write your answer as true or false.*

1. In the term $5ab$, 5, a and b are the factors of this term.
2. $(3y^2 + 3xyz) - (2x^2 - 3y^2 + 4z^2 - xyz)$ is $-2x^2 + y^2 - z^2 + xyz$.
3. A constant term contains only variables.
4. Only like terms can be added or subtracted.
5. The terms of the expression having no literal factors is called a constant term.
6. 3xy, 2xy, 9yx, 6xy are examples of like terms.
7. An expression which contains two terms is called binomial.
8. The product of $-\frac{6}{7}xy^3$ and $-\frac{4}{3}x^2y$ is $+\frac{8}{7}x^3y^4$

Match the Columns :

DIRECTIONS : *Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in column-I have to be matched with statements (p, q, r, s) in column-II.*

1.

Column-I	Column-II
(A) $\left(\frac{2}{3}a^2b\right)\left(\frac{-9}{4}ab^2\right)$	(p) $\frac{-4}{9}p^5q^5$
(B) $(-pq)(-2.3\ p^2q^2)(-0.1\ p^2q)$	(q) $0.225\ a^4b^4c$
(C) $(-1.5\ a^2b)(0.3\ ab^2)(-0.5\ abc)$	(r) $\frac{-3}{2}a^3b^3$
(D) $\left(\frac{-3}{7}p^3q^2\right)\left(\frac{-14}{9}pq^2\right)\left(\frac{-2}{3}pq\right)$	(s) $-0.23\ p^5q^4$

2.

Column-I (Expression)	Column-II (Solution)
(A) $(2x^2 + 3y^2)(-2x^2 - 3y^2)$	(p) $-4x^4 - 12x^2y^2 - 9y^4$
(B) $(x^3 + 5)(x - 5) + 5$	(q) $6x^2 + 3x - 2xy + 9y - 6y^2$
(C) $6x^2 + (x + 3y)(3 - 2y)$	(r) $2x^2 + 9xy + 9y^2 + 2x + 4y$
(D) $(x + 3y)(2x + 3y) + (x + 5y) + (x - y)$	(s) $x^4 - 5x^3 + 5x - 20$

Very Short Answer Questions:

DIRECTIONS : *Give answer in one word or one sentence.*

1. Find the product of $\frac{-3}{4}x^4y^5z^8$ and $\frac{-16}{9}xy^2z^3$.
2. Multiply
   (i) $(a^2b^2 - 2ab + 4)$ by $(a + 2)$
   (ii) $(x^2 + y^2 + z^2)$ by $(x + y + z)$
3. Find the volume of the rectangular boxes with following length, breadth and height:

	Length	Breadth	Height
(i)	2ax	3by	5cz
(ii)	m^2n	n^2p	p^2m
(iii)	2q	$4q^2$	$8q^3$

4. Multiply : $\{2m + (-n)\}$ by $\{-3m + (-5)\}$
5. If $x^2 + \frac{1}{x^2} = 53$, find the value of $x - \frac{1}{x}$
6. $\left(p + \frac{1}{3}\right)\left(p - \frac{5}{3}\right) =$ .....
7. The sum of two binomials is $5x^2 - 6x$. If one of the binomial is $3x^2 - 2x$. What is the other binomial?
8. What is the value of $3(x^2 - 4x)$ when $x = 5$?
9. Simplify each of the following expressions:
   (i) $12x^2 - 12x(x - 1) + x(7 + 3x)$
   (ii) $pq(p - q) - 6p(p + q) + 2pq\ (2p - 2q)$
10. The value of $16.1^2 - 8.9^2$ is _____.

DIRECTIONS : *Give answer in 2-3 sentences.*

1. Subtract

(i) $a+b+c$ from $a^2+b^2+c^2$

(ii) $\frac{2}{3}a^2b-\frac{1}{9}ab^2+\frac{2}{5}ab-1$ from $-a^2b+2$.

2. Add :

(i) $a^2+b^2-3c^2$,
$3b^2+c^2$,
$\frac{2}{3}c^2-\frac{4}{5}b^2$ and $a^2+b^2+c^2$

(ii) $3ax-4ax^2+1, 5+9ax^2-4ax$.

3. Determine the literal part in the product of the monomials

$\frac{187}{395}x^3y^2z^7, \frac{-2691}{1297}x^7y$ and $\frac{39251}{3931}xy^2z^3$

4. Evaluate :

(i) $(-3.5\,a^2b)\times(2ab^2)+(-7ab)\times(-a^2b^2)$

(ii) $(5ab)\times(-2ab^2)\times(-2a)+(2a^2b^2)\times\left(\frac{-1}{2}a\right)\times(-4b)$

5. The sides of a rectangle are given by x^2+3y^2 and x^3-y^2. Find its perimeter.

6. The sides of a triangle are given by :
$3x^2-y^2, 4x^2-7xy+4y^2, -3x^2+7xy+8y^2$. Find its perimeter.

7. Answer the following questions :–

(i) How much smaller is $2x^3-2x+5$ than $7+5x^2+3x$?

(ii) How much larger is $8x^2-9y^2$ than $3x^2-2y^2$?

(iii) What should be taken away from $3x^2+4x+1$ to get $2x^2-4x+35$?

8. Subtract $2x^2-4y^2+3xy-5$ from the sum of $-2y^2+5x^2+9$ and $7xy-3x^2+11$.

9. If $a=2p-5q+7, b=-3p+2q-1$ and $c=p-q-3$ then find.

(i) $b-a-c$ (ii) $a-b+c$

In terms of p and q

10. Identify terms, factors and coefficients for each of the following expressions.

(i) $8x^2y-5zy$ (ii) $\frac{x}{3}-\frac{y}{2}+1$

(iii) $0.5x^2-3y^2$ (iv) z^2-z+1

11. Which of the following are monomials bionmials, or Trinomials?

(i) 3 (ii) $x+y$

(iii) x^3+y^2+3 (iv) $x^2+y^2+z^2+10$

12. Simplify the following using identities

(i) $\frac{58^2-42^2}{16}$ (ii) $1.73\times1.73-0.27\times0.27$

DIRECTIONS : *Give answer in four to five sentences.*

1. If $a=\frac{3}{2}x^2-\frac{1}{4}y^2+\frac{5}{3}xy-1$ and

$b=\frac{-1}{2}x^2+\frac{5}{3}y^2-xy+\frac{5}{3}$ then calculate $a+b$ and $a-b$.

2. Find the value of $\left(\frac{-5}{2}x^3y^2\right)\times\left(\frac{2}{-25}xy^2\right)$.

3. Simplify and state the degree of the polynomial.

(a) $6m(2mn-n^2)-3(m^2n-19mn^2)+6n(-5mn-7m^2)$

(b) $4x(5x^2-2xy+y^2)-9x(2x^2+6y^2-xy)$
$+3x(x^2-5xy-y^2)$

(c) $5s(3s^2-7s+2)+2s(5s^2+s-6)+9s(2s^2+6s-4)$

4. Evaluate 19.8×20.2

5. The expression

$$\frac{bx(a^2x^2+2a^2y^2+b^2y^2)+ay(a^2x^2+2b^2x^2+b^2y^2}{(ax+by)^2}$$

6. By how much is the sum of $(a-5)(a-2)$ and (a^2+6a+7) is greater than $-a^2-2a+1$?

7. $x^2+\frac{1}{x^2}=25$, find the values of each of the following :

(i) $x+\frac{1}{x}$ (ii) $x-\frac{1}{x}$

8. Find the value of x, if

(i) $6x=23^2-17^2$ (ii) $4x=98^2-88^2$

9. Show that:

(i) $(3x+7)^2-84x=(3x-7)^2$

(ii) $(9p-5q)^2+180pq=(9p+5q)^2$

(iii) $\left(\frac{4}{3}m-\frac{3}{4}n\right)^2+2mn=\frac{16}{9}m^2+\frac{9}{16}n^2$

(iv) $(4pq+3q)^2-(4pq-3q)^2=48pq^2$

(v) $(a-b)(a+b)+(b-c)(b+c)+(c-a)(c+a)=0$

10. Using identities, evaluate:

(i) 71^2 (ii) 99^2

(iii) 998^2 (iv) 5.2^2

(v) 78×82 (vi) 8.9^2

(vii) 1.05×9.5

11. Using $(x+a)(x+b)=x^2+(a+b)x+ab$, find

(i) 103×104 (ii) 5.1×5.2

(iii) 103×98 (iv) 9.7×9.8

2 EXERCISE

Text Book Exercise

1. Add: $7xy+5yz-3zx, 4yz+9zx-4y, -3xz+5x-2xy$.
2. Subtract $5x^2-4y^2+6y-3$ from $7x^2-4xy+8y^2+5x-3y$.
3. Find the volume for given dimensions :

	length	breadth	height
(i)	$2ax$	$3by$	$5cz$
(ii)	m^2n	n^2p	p^2m
(iii)	$2q$	$4q^2$	$8q^3$

4. Simplify the expressions and evaluate them as directed:
   (i) $x(x-3)+2$ for $x=1$,
   (ii) $3y(2y-7)-3(y-4)-63$ for $y=-2$
5. Add:
   (i) $5m(3-m)$ and $6m^2-13m$
   (ii) $4y(3y^2+5y-7)$ and $2(y^3-4y^2+5)$
6. Subtract $3pq(p-q)$ from $2pq(p+q)$.
7. Simplify $(a+b)(2a-3b+c)-(2a-3b)c$.
8. (i) $(a+b)(c-d)+(a-b)(c+d)+2(ac+bd)$
   (ii) $(x+y)(2x+y)+(x+2y)(x-y)$
   (iii) $(x+y)(x^2-xy+y^2)$
   (iv) $(1.5x-4y)(1.5x+4y+3)-4.5x+12y$
   (v) $(a+b+c)(a+b-c)$
9. Simplify:
   (i) $(a^2-b^2)^2$
   (ii) $(7m-8n)^2+(7m+8n)^2$
   (iii) $(2.5p-1.5q)^2-(1.5p-2.5q)^2$
   (iv) $(ab+bc)^2-2ab^2c$
10. Show that:
    (i) $(3x+7)^2-84x=(3x-7)^2$
    (ii) $(9p-5q)^2+180pq=(9p+5q)^2$
    (iii) $\left(\frac{4}{3}m-\frac{3}{4}n\right)^2+2mn=\frac{16}{9}m^2+\frac{9}{16}n^2$
    (iv) $(4pq+3q)^2-(4pq-3q)^2=48pq^2$
    (v) $(a-b)(a+b)+(b-c)(b+c)+(c-a)(c+a)=0$
11. Using $a^2-b^2=(a+b)(a-b)$, find
    (i) 51^2-49^2 (ii) $(1.02)^2-(0.98)^2$
    (iii) 153^2-147^2 (iv) $12.1^2-7.9^2$
12. Using $(x+a)(x+b)=x^2+(a+b)x+ab$, find
    (i) 103×104 (ii) 5.1×5.2
    (iii) 103×98 (iv) 9.7×9.8

Exemplar Questions

1. Simplify : $-pqr(p^2+q^2+r^2)$
2. Simplify : $(px+qy)(ax-by)$
3. Evaluate using suitable identities : 497×505
4. Evaluate using suitable identities : 2.07×1.93
5. Find the value of x, if $10000x=(9982)^2-(18)^2$
6. By using suitable identity, evaluate $x^2+\frac{1}{x^2}$, if $x+\frac{1}{x}=5$.
7. Simplify : $(a-b)(a^2+b^2+ab)-(a+b)(a^2+b^2-ab)$
8. Simplify : (i) $(x^2+y^2)(x^2-y^2)$
   (ii) $(a^2+b^2)^2$
9. If $x-y=13$ and $xy=28$, then find x^2+y^2.
10. If $m-n=16$ and $m^2+n^2=400$, then find mn.
11. What should be added to $4c(-a+b+c)$ to obtain $3a(a+b+c)-2b(a-b+c)$?
12. Find the value of a, if
    $8a=35^2-27^2$

HOTS Questions :

1. How much should $3xy-4a^2+5b^2+2$ be increased to get $-5+4a^2+2b^2-7xy$?
2. find the value of $(5a^6)\times(-10ab^2)\times(-2.1a^2b^3)$ for $a=1$ and $b=\frac{1}{2}$.
3. Simplify : (i) $15a^2-6a(a-2)+a(3+7a)$
   (ii) $x^2(1-3y^2)+x(xy^2-2x)-3y(y-4x^2y)$
4. Simplify : $(3x-2)(x-1)(3x+5)$
5. Simplify :
   $2a^2+2b^2+2c^2-2ab-2bc-2ca=(a-b)^2+(b-c)^2+c-a)^2$

3 EXERCISE

Single Option Correct :

DIRECTIONS : *This section contains multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.*

1. The expanded form of $(x+y)^2$ is a _____.
(a) monomial (b) binomial
(c) trinomial (d) cubic

2. The product of (x^2+3x+5) and (x^2-1) is
(a) $x^4+3x^3-4x^2-3x-5$
(b) $x^4+3x^3+4x^2-3x-5$
(c) $x^4+3x^3+4x^2+3x-5$
(d) None of these

3. Evaluate : $\left(2x^2-5y^2\right)^2$
(a) $4x^2+20xy+25y$
(b) $4x^2+20x^2y^2+25y^4$
(c) $4x^4-20x^2y^2+25y^4$
(d) $(4x^4-25y^4)(4x^4+25y^4)$

4. Subtract : $3a-3b+c$ from $4a+5b-3c$
(a) $2a+3b+c$ (b) $a+2b+3c$
(c) $a+8b-4c$ (d) $-5x^2+5x+5$

5. Find the product of $5m^2n$, $-3mnp$ and $-5n^2p$.
(a) $75m^3n^3p^2$ (b) $75m^3n^4p^2$
(c) $75mn^3p^3$ (d) $75m^3np^2$

6. Simplify $3x^2y^2(5x^2-4xy+6y^2)$
(a) $15x^4y^2-12x^3y^3+18y^4$ x^2
(b) $15x^2y^2-12x^3y^3+18y^2$ x^2
(c) $15x^2y^3-12x^2y^2+6y^2y^2$
(d) $15xy^3-12x^3y^3+18x^2y^4$

7. What must be subtracted form $3a^2-6ab-3b^2-1$ to get $4a^2-7ab-4b^2+1$?
(a) $-a^2+ab+b^2-2$ (b) a^2+ab+b^2+2
(c) a^2-ab-b^2+2 (d) $a^2-ab-4b^2-2$

8. The value of the product $\left(3+\frac{5}{x}\right)\left(9-\frac{15}{x}+\frac{25}{x^2}\right)$ at $x=1$ is
(a) 150 (b) 148
(c) 152 (d) None of these

9. The value of $(0.9)^2-(0.6)^2$ is
(a) 0.54 (b) -0.54
(c) -0.45 (d) 0.45

10. The value of $(a+b)^2+(a-b)^2$ is:
(a) $2a+2b$ (b) $2a-2b$
(c) $2a^2+2b^2$ (d) $2a^2-2b^2$

11. The value of $(a+b)^2-(a-b)^2$ is:
(a) $4ab$ (b) $-4ab$
(c) $2a^2+2b^2$ (d) $2a^2-2b^2$

12. Subtract $4p^2-2q+7r^3-3$ from $3q+7p^2-2r^3+4$.
(a) $p^2+2q+5r^3+1$ (b) $11p^2+q+5r^3+1$
(c) $-3p^2-5q+9r^3-7$ (d) $3p^2+5q-9r^3+7$

13. Find the product of $3a^2-4ax+x^2$ by $5x^2-2ax$
(a) $14a^3x+23a^2x^2-22ax^3+5x^4$
(b) $14a^2x+23a^3x^2-22ax^3+5x^4$
(c) $16a^3x+25a^2x^2-22x^3+5x^4$
(d) $-6a^3x+23a^2x^2-22ax^3+5x^4$

14. The sum of two binomials is $5x^2-6x$. If one of the binomial is $3x^2-2x$. What is the other binomial?
(a) $2x^2-4x$ (b) $2x^2-8x$
(c) $8x^2-4x$ (d) $8x^2-8x$

15. The cost of a notebook is ₹ $3a^2-4ab+6b^2$. How much does $5a^2b^2$ notebooks cost?
(a) ₹ $15a^4b^2-20a^3b^3+30a^2b^4$
(b) ₹ $15a^4b^2+20a^3b^3+30a^2b^4$
(c) ₹ $15a^4b^2-20a^3b^3-30a^2b^4$
(d) ₹ $15a^4b^2+20a^3b^3-30a^2b^4$

16. Simplify : $(0.8m+1.1n)(0.8m-1.1n)$
(a) $0.64m^2+1.12n^2$ (b) $0.64m^2+1.21n^2$
(c) $0.64m^2-1.21n^2$ (d) $0.64m^2-11.2n^2$

17. By how much is the sum of $(a-5)$ $(a-2)$ and a^2+6a+7 is greater than $-a^2-2a+1$?
(a) a^2-a+16 (b) a^2-a-16
(c) $3a^2+a+16$ (d) $2a^2+a+16$

More than One Option Correct :

DIRECTIONS : *This section contains multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONE or MORE may be correct.*

1. Which of the following expressions are binomials and trinomials?
   (a) $\frac{3}{x^2}, 5x$ (b) $x+\frac{2}{x}, x^2+2x-5$
   (c) $x^2+2x-5, 9x^3+5x$ (d) $\frac{7x}{5}-\frac{9}{8}, 3x^2-4x+5$
2. Which of the following terms are like terms?
   (a) $8ab, -9ab^2$ (b) $3x^2y, -4yx^2$
   (c) $8xy^2, -11x^3y$ (d) $\frac{7}{4}xy, -\frac{5}{3}xy$
3. Which of the following terms are unlike terms?
   (a) $\frac{3}{4}a^2bx, \frac{3}{4}ab^2x, \frac{3}{4}abx^2$
   (b) $-9xy, 5$
   (c) $-9x^2, -10x^2, 5x^2$
   (d) None of these
4. In the term $\frac{25}{3}a^2bc^3$, which of the following is/are correct?
   (a) Coefficient of $a^2 = \frac{25}{3}bc^3$
   (b) Numerical coefficient $= \frac{25}{3}$
   (c) Coefficient of $c^3 = \frac{25}{3}a^2b$
   (d) Coefficient of $a^2bc^3 = \frac{25}{3}$
5. The value of $23^2 - 22^2$ is
   (a) 45 (b) 55
   (c) 23×22 (d) $(23+22)(23-22)$
6. The value of $(60-4)(60-6)$ is
   (a) 3204 (b) 3024
   (c) $3600+600-24$ (d) $3600-600+24$

Passage Based Questions :

DIRECTIONS : *Study the given paragraph(s) and answer the following questions.*

PASSAGE - I

$\frac{-11}{3}-9x^2y+6y^2x^3-\frac{5}{6}x^2y^2+15x^2y^2$ is an algebraic expression.

1. Write the like terms given in the expression
   (a) $-9x^2y, -\frac{5}{6}x^2y^2$ (b) $\frac{5}{6}x^2y^2, 15x^2y^2$
   (c) $6y^2x^3, 9x^2y$ (d) $6y^2x^3, -\frac{5}{6}x^2y^{-2}$
2. Which is the constant term?
   (a) $\frac{-11}{3}$ (b) $\frac{-5}{6}$
   (c) -9 (d) 6
3. What is the coefficient of xy^2 in the term $\frac{-5}{6}x^2y^2$?
   (a) $\frac{-5}{6}$ (b) $\frac{5}{6}$
   (c) $\frac{-5}{6}x$ (d) $\frac{5}{6}x$

PASSAGE - II

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

4. The value of x if $25x = 536^2 - 136^2$ is
   (a) 10752 (b) 10572
   (c) 10257 (d) 10725
5. $(10000)^2 - (9999)^2$ is
   (a) 1999 (b) 19999
   (c) 199999 (d) 999
6. $(4000)^2 + (9000)^2 - (3999)^2 - (8999)^2$ equals
   (a) 9989 (b) 24997
   (c) 43998 (d) 25998

Assertion & Reason :

DIRECTIONS : *Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.*

(a) If both **Assertion** and **Reason** are **correct** and Reason is the **correct explanation** of Assertion.
(b) If both **Assertion** and **Reason** are correct, but Reason is **not the correct explanation** of Assertion.
(c) If **Assertion** is **correct** but **Reason** is **incorrect**.
(d) If **Assertion** is **incorrect** but **Reason** is **correct**.

1. **Assertion :** In the expression $3x^2+7y^2-2xy+4x^2+8xy+9y^2$, $3x^2$, $4x^2$ are like terms, $-2xy$, $8xy$ are like terms and $7y^2$, $9y^2$ are like terms.
   Reason : When the terms have same literal factors they are called unlike terms.
2. **Assertion :** In an algebraic expression $3x-5$, 3 and -5 are called constants.
   Reason : Constants does not have a fixed value.
3. **Assertion :** $99 \times 101 = (100-1)(100+1) = 9999$.
   Reason : $(a-b)(a+b) = a^2-b^2$
4. **Assertion :** $-8abc+4bac$ is a binomial.
   Reason : If an expression contains two terms it is called a binomial.

Multiple Matching Question :

DIRECTIONS : *Following question has three statements (A, B and C) given in Column-I and five statements (p, q, r, s and t) in Column-II. Any given statement in Column-I can have correct matching with one or more statement(s) given in Column-II.*

1.

Column-I		Column-II	
(A)	Monomials	(p)	$\sqrt{6ab}-\frac{a^2b}{5}$
(B)	Binomials	(q)	$a^2+2ab+b^2$
(C)	Trinomials	(r)	p^2q^3y
		(s)	$3xy+4x^2y$
		(t)	$\frac{3}{4}xy$

Integer Type Questions :

DIRECTIONS : *Answer the following questions. The answer to each of the question is a single digit integer, ranging from 0 to 9.*

1. Find the value of $(25a^2 + 16b^2 + 9 + 40ab - 24b - 30a)$ at $a = -1$ and $b = 2$.

2. The value of $25x^2 + 16y^2 + 40xy$ at $x = 1$ and $y = -1$ is _____.

3. $3x - \frac{1}{2}x + \frac{3}{2}x - 4x =$ _____.

4. The units digit of 34×36 is _____.

5. The value of the product $(4a^2 + 3b)(4a^2 + 3b)$ at $a = 1$, $b = 2$ is k. The value of $k \div 100$ is _____.

6. Find the value of $\frac{(997+496)^2-(997-496)^2}{997\times496}$

4 ADVANCED EXERCISE
BASED ON CONNECTING TOPICS

DIRECTIONS (Qs. 1-4) : *This section contains multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.*

1. If $a + b + c = 15$ and $a^2 + b^2 + c^2 = 77$, then the value of $ab + bc + ca$ is

(a) 32 (b) 28

(c) 74 (d) 70

2. If $x - \frac{1}{x} = 7$, then the value of $x^3 - \frac{1}{x^3}$ is

(a) 333 (b) 243

(c) 364 (d) None

3. Value of $(25)^3 + (-10)^3 + (-15)^3$ is

(a) 11250 (b) –11250

(c) 12150 (d) –12150

4. Value of

$(a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$ is

(a) $a^3 + b^3 + c^3 - 3abc$ (b) $a^3 + b^3$

(c) $a^3 - b^3$ (d) $a^4 - b^4$

SOLUTIONS

Brief Explanations of Selected Questions

1 EXERCISE

Fill in the Blanks :

1. Algebraic expressions. 2. coefficient.
3. 2, 4 4. two
5. monomial 6. three
7. $-15\,a^4\,b^3\,c^3\,d$. 8. factors.

True / False :

1. True
2. False, $-2x^2+6y^2-4z^2+4xyz$.
3. False, A constant term contains only a number.
4. True
5. True, 2 is a constant as it has no variable.
6. True, it has same literal factors.
7. True
8. True, $-\frac{6}{7}xy^3\times\left(-\frac{4}{3}x^2y\right)=\frac{8}{7}x^3y^4$

Match the Columns :

1. (A) → (r); (B) → (s); (C) → (q); (D) → (p)
2. (A) → (p); (B) → (s); (C) → (q); (D) → (r)

(A) $(2x^2+3y^2)(-2x^2-3y^2)$
$=-(2x^2+3y^2)(2x^2+3y^2)$
$=-(2x^2+3y^2)^2$
$=-[(2x^2)^2+(3y^2)^2+2(2x^2)(3y^2)]$
$=-[4x^4+9y^4+12x^2y^2]$
$=-4x^4-12x^2y^2-9y^4$

(B) $(x^3+5)(x-5)+5$
$=x^3(x-5)+5(x-5)+5$
$=x^4-5x^3+5x-25+5$
$=x^4-5x^3+5x-20$

(C) $6x^2+(x+3y)(3-2y)$
$=6x^2+x(3-2y)+3y(3-2y)$
$=6x^2+3x-2xy+9y-6y^2$

(D) $(x+3y)(2x+3y)+(x+5y)+(x-y)$
$=x(2x+3y)+3y(2x+3y)+x+5y+x-y$
$=2x^2+3xy+6yx+9y^2+2x+4y$
$=2x^2+9xy+9y^2+2x+4y$

Very Short Answer Questions :

1. $\left(-\frac{3}{4}x^4y^5z^8\right)\times\left(\frac{-16}{9}xy^2z^3\right)=\frac{4}{3}x^5y^7z^{11}$
2. (i) $(a^2b^2-2ab+4)\times(a+2)$
$=a^3b^2-2a^2b+4a+2a^2b^2-4ab+8$

(ii) $(x^2+y^2+z^2)\times(x+y+z)$
$=x^3+y^3+z^3+x^2y+x^2z+xy^2+y^2z+xz^2+yz^2$

3. Volume $=l\times b\times h$
(i) $l=2ax,\ b=3by,\ h=5cz$
$V=2ax\times3by\times5cz=30\,abcxyz$
(ii) $l=m^2n,\ b=n^2p,\ h=p^2m$
$V=m^2n\times n^2p\times p^2m$
$V=m^3n^3p^3$
(iii) $l=2q,\ b=4q^2,\ h=8q^3$
$V=l\times b\times h=2q\times4q^2\times8q^3=64q^6$.

4. $(2m+(-n))\times(-3m+(-5))$
$=2m(-3m-5)-n(-3m-5)$
$=-6m^2-10m+3mn+5n$

5. $\left(x-\frac{1}{x}\right)^2=x^2+\frac{1}{x^2}-2=53-2=51$
$\Rightarrow\quad x-\frac{1}{x}=\sqrt{51}$

6. $\left(p+\frac{1}{3}\right)\left(p-\frac{5}{3}\right)=p^2-\frac{5p}{3}+\frac{p}{3}-\frac{5}{9}$
$=p^2-\frac{4p}{3}-\frac{5}{9}$

7. Let the other binomial be b(x)
$3x^2-2x+b(x)=5x^2-6x$
$\Rightarrow\quad b(x)=5x^2-6x-3x^2+2x$
$=2x^2-4x$

8. $3(x^2-4x)=3x^2-12x=3(5)^2-12(5)$
$=75-60=15$

9 (i) $12x^2-12x(x-1)+x(7+3x)$
$=12x^2-12x^2+12x+7x+3x^2$
$=19x+3x^2$

(ii) $pq(p-q)-6p(p+q)+2pq(2p-2q)$
$=p^2q-pq^2-6p^2-6pq+4p^2q-4pq^2$
$=5p^2q-5pq^2-6p^2-6pq$

10. $(16.1)^2-(8.9)^2=[16.1+8.9][16.1-8.9]$
[Using the identity $a^2-b^2=(a+b)(a-b)$]
$=25\times7.2=180$

Short Answer Questions :

1. (i) $a^2+b^2+c^2-a-b-c$

(ii) $\frac{1}{9}ab^2-\frac{5}{3}a^2b-\frac{2}{5}ab+3$

2. (i) $(a^2+b^2-3c^2)+(3b^2+c^2)+\left(\frac{2}{3}c^2-\frac{4}{5}b^2\right)+(a^2+b^2+c^2)$

$=2a^2+\frac{21}{5}b^2-\frac{1}{3}c^2$

(ii) $(3ax-4ax^2+1)+(5+9ax^2-4ax)$
$=5ax^2-ax+6$

3. $x^{11}y^5z^{10}$.

4. (i) $-7a^3b^3+7a^3b^3=0$
(ii) $20a^3b^3+4a^3b^3=24a^3b^3$

5. Perimeter $=2[(x^2+3y^2)+(x^3-y^2)]$
$=2x^3+2x^2+4y^2$

6. Perimeter $=(3x^2-y^2)+(4x^2-7xy+4y^2)+(-3x^2+7xy+8y^2)$
$=4x^2+11y^2$

7. (i) $7+5x^{2+3x}-(2x^3-2x+5)=-2x^3+5x^2+5x+2$
(ii) $(8x^2-9y^2)-(3x^2-2y^2)=5x^2-7y^2$
(iii) $(3x^2+4x+1)-(2x^2-4x+35)=x^2+8x-34$

8. $2y^2+25+4xy$.

9. (i) $-6p+8q-5$ (ii) $6p-8q+5$.

10.

	Expression	Terms	Factors	Coefficients
(i)	$8x^2y-5zy$	$8x^2y$ $-5zy$	$8, x, y$ $-5, z, y$	8 3
(ii)	$\frac{x}{3}-\frac{y}{z}+1$	$\frac{x}{3}$ $-\frac{y}{z}$ 1	$\frac{1}{3}, x$ $-\frac{1}{2}, y$ 1	$\frac{1}{3}$ $-\frac{1}{2}$ 1
(iii)	$0.5x^2-3y^2$	$0.5x^2$ $-3y^2$	$0.5, x$ $-3, y$	0.5 -3
(iv)	z^2-z+1	z^2 $-z$ 1	$1, z$ $-1, z$ 1	1 -1 1

11. (i) Monomial (ii) Binomial
(iii) Trinomial (iv) Polynomial

12. (i) $\frac{58^2-42^2}{16}=\frac{(58-42)(58+42)}{16}$

$=\frac{16\times100}{16}=100$

(ii) $1.73\times1.73-0.27\times0.27$
$=(1.73)^2-(0.27)^2$
$=(1.73+0.27)(1.73-0.27)$
$=2\times1.46=2.92$

Long Answer Questions :

1. $a+b=\frac{3}{2}x^2-\frac{1}{4}y^2+\frac{5}{3}xy-1+\frac{-1}{2}x^2+\frac{5}{3}y^2-xy+\frac{5}{3}$

$=x^2+\frac{17}{12}y^2+\frac{2}{3}xy+\frac{2}{3}$

$a-b=\frac{3}{2}x^2-\frac{1}{4}y^2+\frac{5}{3}xy-1+\frac{1}{2}x^2-\frac{5}{3}y^2+xy-\frac{5}{3}$

$=2x^2-\frac{23}{12}y^2+\frac{8}{3}xy-\frac{8}{3}$

2. Product $=\frac{1}{5}x^4y^4$

3. (a) $21mn^2-33m^2n$, degree $=3$
(b) $5x^3-14x^2y-53xy^2$, degree $=3$
(c) $43s^3+21s^2-38s$, degree $=3$

4. 399.96

5. $\frac{bx(a^2x^2+2a^2y^2+b^2y^2)+ay(a^2x^2+2b^2x^2+b^2y^2)}{(ax+by)^2}$

$=\frac{a^2x^2(ay+bx)+2abxy(ay+bx)+b^2y^2(bx+ay)}{(ax+by)^2}$

$=\frac{(ay+bx)(a^2x^2+2abxy+b^2y^2)}{(ax+by)^2}$

$=\frac{(ay+bx)(ax+by)^2}{(ax+by)^2}=ay+bx$

6. Sum of $(a-5)$ $(a-2)$ and (a^2+6a+7) is
$(a^2-2a-5a+10)+(a^2+6a+7)$
$(a^2-7a+10)+a^2+6a+7$
$2a^2-a+17$
Required number
$=2a^2-a+17+a^2+2a-1$
$=3a^2+a+16$

7. (i) $x^2+\frac{1}{x^2}=25$

$\left(x+\frac{1}{x}\right)^2=x^2+\frac{1}{x^2}+2=25+2=27$

$\Rightarrow x+\frac{1}{x}=\sqrt{27}=3\sqrt{3}$

(ii) $x^2+\frac{1}{x^2}=25$ (given)

$\left(x-\frac{1}{x}\right)^2=x^2+\frac{1}{x^2}-2=25-2=23$

$\Rightarrow x-\frac{1}{x}=\sqrt{23}$

8. (i) $6x=23^2-17^2$

[Using $a^2-b^2=(a-b)(a+b)$]

$6x=(23-17)(23+17)$
$6x=6\times40=240 \Rightarrow x=40$

(ii) $4x=98^2-88^2=(98-88)(98+88)$

$\Rightarrow 4x = (10) \times 186$

$\Rightarrow x = \frac{10 \times 186}{4} = 465$

9. (i) $(3x+7)^2 - 84x = (3x-7)^2$

L.H.S. $= (3x+7)^2 - 84x$

$= \{(3x)^2 + 2(3x)(7) + (7)^2\} - 84x$

$= (9x^2 + 42x + 49) - 84x$

$= 9x^2 + (42x - 84x) + 49$

Combining the like terms

$= 9x^2 - 42x + 49$ ...(1)

R.H.S. $= (3x-7)^2$

$= (3x)^2 - 2(3x)(7) + (7)^2$

$= 9x^2 - 42x + 49$ ...(2)

From equations (1) and (2),

$(3x-7)^2 - 84x = (3x-7)^2$

(ii) $(9p-5q)^2 + 180pq = (9p+5q)^2$

L.H.S. $= (9p-5q)^2 + 180pq$

$= \{(9p)^2 - 2(9p)(5q) + (5q)^2\} + 180pq$

$= (81p^2 - 90pq + 25q^2) + 180pq$

$= 81p^2 + (180pq - 90pq) + 25q^2$

Combining the like terms

$= 81p^2 + 90pq + 25q^2$ ...(1)

R.H.S. $= (9p+5q)^2$

$= (9p)^2 + 2(9p)(5q) + (5q)^2$

$= 81p^2 + 90pq + 25q^2$ ...(2)

From equations (1) and (2),

$(9p-5q)^2 + 180pq = (9p+5q)^2$

(iii) $\left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn = \frac{16}{9}m^2 + \frac{9}{16}n^2$

L.H.S. $= \left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn$

$= \left(\frac{4}{3}m\right)^2 - 2\left(\frac{4}{3}m\right)\left(\frac{3}{4}n\right) + \left(\frac{3}{4}n\right)^2 + 2mn$

$= \frac{16}{9}m^2 - 2mn + \frac{9}{16}n^2 + 2mn$

$= \frac{16}{9}m^2 + (2mn - 2mn) + \frac{9}{16}n^2$

Combining the like terms

$= \frac{16}{9}m^2 + \frac{9}{16}n^2 = \text{R.H.S}$

(iv) $(4pq+3q)^2 - (4pq-3q)^2 = 48pq^2$

L.H.S. $= (4pq+3q)^2 - (4pq-3q)^2$

$= \{(4pq)^2 + 2(4pq)(3q) + (3q)^2\}$

$- \{(4pq)^2 - 2(4pq)(3q) + (3q)^2\}$

$= 16p^2q^2 + 24pq^2 + 9q^2 - (16p^2q^2 - 24pq^2 - 9q^2)$

$= 16p^2q^2 + 24pq^2 + 9q^2 - 16p^2q^2 + 24pq^2 - 9q^2$

$= (16p^2q^2 - 16p^2q^2) + (24pq^2 + 24pq^2) + (9q^2 - 9q^2)$

Combining the like terms

$= 48pq^2 = \text{R.H.S.}$

(v) $(a-b)(a+b) + (b-c)(b+c) + (c-a)(c+a) = 0$

L.H.S. $= (a-b)(a+b) + (b-c)(b+c)$

$+ (c-a)(c+a)$

$= a^2 - b^2 + b^2 - c^2 + c^2 - a^2$

Using identity III

$= (a^2 - a^2) + (b^2 - b^2) + (c^2 - c^2)$

Combining the like terms

$= 0 = \text{R.H.S.}$

10. (i) 71^2

$71^2 = (70+1)^2$

$= (70)^2 + 2(70)(1) + (1)^2$

$= 4900 + 140 + 1 = 5041$

(ii) 99^2

$99^2 = (100-1)^2$

$= (100)^2 - 2(100)(1) + (1)^2$

$= 10000 - 200 + 1 = 9801$

(iii) 998^2

$998^2 = (1000-2)^2$

$= (1000)^2 - 2(1000)(2) + (2)^2$

$= 1000000 - 4000 + 4 = 996004$

(iv) 5.2^2

$5.2^2 = (5+0.2)^2$

$= (5)^2 + 2(5)(0.2) + (0.2)^2$

$= 25 + 2 + 0.04 = 27.04$

(vi) 78×82

$78 \times 82 = (80-2) \times (80+2)$

$= (80)^2 - (2)^2$

$= 6400 - 4 = 6396$

(vii) 8.9^2

$8.9^2 = (9-0.1)^2$

$= (9)^2 - 2(9)(0.1) + (0.1)^2$

$= 81 - 1.8 + 0.01 = 79.21$

(viii) 1.05×9.5

$1.05 \times 9.5 = \frac{1}{10} \times 10.5 \times 9.5$

$= \frac{1}{10}(10+0.5) \times (10-0.5)$

$= \frac{1}{10} \times \{(10)^2 - (0.5)^2\}$

$= \frac{1}{10} \times (100 - 0.25)$

$= \frac{1}{10} \times 99.75 = 9.975$

11. (i) 103×104

$103 \times 104 = (100+3) \times (100+4)$

$= (100)^2 + (3+4)(100) + (3)(4)$

$= 10000 + 700 + 12 = 10712$

(ii) 5.1×5.2

$5.1 \times 5.2 = (5+0.1) \times (5+0.2)$

$= (5)^2 + (0.1+0.2)(5) + (0.1)(0.2)$

$= 25 + 1.5 + 0.02$

$= 26.52$

(iii) 103×98

$103 \times 98 = (100+3) \times (100-2)$

$= (100+3) \times \{(100+(-2)\}$

$= (100)^2 + \{3 + (-2)\}(100) + (3)(-2)$
$= 10000 + 100 - 6 = 10094$

(iv) 9.7×9.8
$9.7 \times 9.8 = (10 - 0.3)(10 - 0.2)$
$= (10)^2 - (0.3 + 0.2)(10) + (0.3)(0.2)$
$= 100 - 5 + 0.06 = 95.06$

2 EXERCISE

Text-Book Exercise :

1. Writing the three expressions in separate rows, with like terms one below the other, we have

$7xy + 5yz - 3zx$
$+ \quad 4yz + 9zx - 4y$
$+ \quad -2xy - 3zx + 5x$ (Note xz is same as zx)

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

Thus, the sum of the expressions is $5xy + 9yz + 3zx + 5x - 4y$.

2.

$7x^2 - 4xy + 8y^2 + 5x - 3y$
$5x^2 - 4y^2 + 6y - 3$
$(-) \quad (+) \quad (-) \quad (+)$

$2x^2 - 4xy + 12y^2 + 5x - 9y + 3$

3. Volume = length × breadth × height

Hence, for (i) volume $= (2ax) \times (3by) \times (5cz)$
$= 2 \times 3 \times 5 \times (ax) \times (by) \times (cz) = 30abcxyz$

for (ii) volume $= m2n \times n2p \times p2m$
$= (m^2 \times m) \times (n \times n^2) \times (p \times p^2) = m^3n^3p^3$

for (iii) volume $= 2q \times 4q^2 \times 8q^3$
$= 2 \times 4 \times 8 \times q \times q^2 \times q^3 = 64q^6$

4. (i) $x(x-3) + 2 = x^2 - 3x + 2$
For $x = 1$, $x^2 - 3x + 2 = (1)^2 - 3(1) + 2$
$= 1 - 3 + 2 = 3 - 3 = 0$

(ii) $3y(2y-7) - 3(y-4) - 63 = 6y^2 - 21y - 3y + 12 - 63$
$= 6y^2 - 24y - 51$
For $y = -2$, $6y^2 - 24y - 51 = 6(-2)^2 - 24(-2) - 51$
$= 6 \times 4 + 24 \times 2 - 51$
$= 24 + 48 - 51 = 72 - 51 = 21$

5. (i) First expression $= 5m(3-m) = (5m \times 3) - (5m \times m)$
$= 15m - 5m^2$
Now adding the second expression to it, $15m - 5m^2 + 6m^2 - 13m = m^2 + 2m$

(ii) The first expression $= 4y(3y^2 + 5y - 7) = (4y \times 3y^2) + (4y \times 5y) + (4y \times (-7))$
$= 12y^3 + 20y^2 - 28y$
The second expression $= 2(y^3 - 4y^2 + 5) = 2y^3 + 2 \times (-4y^2) + 2 \times 5$
$= 2y^3 - 8y^2 + 10$

Adding the two expressions,

$12y^3 + 20y^2 - 28y$
$+ \quad 2y^3 - 8y^2 + 10$

$14y^3 + 12y^2 - 28y + 10$

6. We have $3pq(p-q) = 3p^2q - 3pq^2$ and
$2pq(p+q) = 2p^2q + 2pq^2$

$2p^2q + 2pq^2$
$3p^2q - 3pq^2$

Subtracting, $- \quad +$

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

7. We have
$(a+b)(2a-3b+c) = a(2a-3b+c) + b(2a-3b+c)$
$= 2a^2 - 3ab + ac + 2ab - 3b^2 + bc$
$= 2a^2 - ab - 3b^2 + bc + ac$
(Note, $-3ab$ and $2ab$ are like terms)
and $(2a-3b)c = 2ac - 3bc$
Therefore,
$(a+b)(2a-3b+c) - (2a-3b)c = 2a^2 - ab - 3b^2 + bc + ac - (2ac - 3bc)$
$= 2a^2 - ab - 3b^2 + bc + ac - 2ac + 3bc$
$= 2a^2 - ab - 3b^2 + (bc + 3bc) + (ac - 2ac)$
$= 2a^2 - 3b^2 - ab + 4bc - ac$

8. (i) $4ac$ (ii) $3x^2 + 4xy - y^2$ (iii) $x^3 + y^3$
(iv) $2.25x^2 - 16y^2$ (v) $a^2 + b^2 - c^2 + 2ab$

9. (i) $a^4 - 2a^2b^2 + b^4$ (ii) $98m^2 + 128n^2$
(iii) $4p^2 - 4q^2$ (vi) $a^2b^2 + b^2c^2$

10. (i) L.H.S. $= (3x+7)^2 - 84x$
$= \{(3x)^2 + 2(3x)(7) + (7)^2\} - 84x$
$= (9x^2 + 42x + 49) - 84x$
$= 9x^2 + (42x - 84x) + 49$
Combining the like terms
$= 9x^2 - 42x + 49$ ...(1)
R.H.S. $= (3x-7)^2$
$= (3x)^2 - 2(3x)(7) + (7)^2$
$= 9x^2 - 42x + 49$ ...(2)
From equation (1) and (2),
$(3x+7)^2 - 84x = (3x-7)^2$

(ii) L.H.S. $= (9p - 5q)^2 + 180pq$
$= \{(9p)^2 - 2(9p)(5q) + (5q)^2\} + 180pq$
$= (81p^2 - 90pq + 25q^2) + 180pq$
$= 81p^2 + (180pq - 90pq) + 25q^2$
Combining the like terms
$= 81p^2 + 90pq + 25q^2$
R.H.S. $= (9p + 5q)^2$
$= (9p)^2 + 2(9p)(5q) + (5q)^2$
$= 81p^2 + 90pq + 25q^2$ ...(2)

From eqns. (1) and (2),
$(9p-5q)^2+180pq=(9p+5q)^2$

(iii) L.H.S. $=\left(\frac{4}{3}m-\frac{3}{4}n\right)^2+2mn$

$=\left(\frac{4}{3}m\right)^2-2\left(\frac{4}{3}m\right)\left(\frac{3}{4}m\right)+\left(\frac{3}{4}m\right)^2+2mn$

$=\frac{16}{9}m^2-2mn+\frac{9}{16}n^2+2mn$

$=\frac{16}{9}m^2+(2mn-2mn)+\frac{9}{16}n^2$

Combining the like terms

$=\frac{16}{9}m^2+\frac{9}{16}n^2=$ R.H.S.

(iv) L.H.S. $=(4pq+3q)^2-(4pq-3q)^2$
$=\{(4pq)^2+2(4pq)(3q)+(3q)^2\}$
$-\{(4pq)^2-2(4pq)(3q)+(3q)^2\}$
$=(16p^2q^2+24pq^2+9q^2)-(16p^2q^2-24pq^2+9q^2)$
$=(16p^2q^2+24pq^2+9q^2)-16p^2q^2+24pq^2-9q^2$
$=(16p^2q^2-16p^2q^2)+(24pq^2+24pq^2)+(9q^2-9q^2)$

Combining the like terms

$=48pq^2=$ R.H.S.

(v) L.H.S. $=(a-b)(a+b)+(b-c)(b+c)+(c-a)(c+a)$
$=a^2-b^2+b^2-c^2+c^2-a^2$ Using identity III
$=(a^2-a^2)+(b^2-b^2)+(c^2-c^2)$

Combining the like terms

$=0=$ R.H.S.

11. (i) 200 (ii) 0.08 (iii) 1800 (iv) 84

12. (i) 10712 (ii) 26.52 (iii) 10094 (iv) 95.06

Exemplar Questions :

1. $-pqr(p^2+q^2+r^2)$
$=-(pqr)\times p^2-(pqr)\times q^2-(pqr)\times r^2$
$=-p^3qr-pq^3r-pqr^3$

2. $(px+qy)(ax-by)$
$=px(ax-by)+qy(ax-by)$
$=apx^2-pbxy+aqxy-qby^2$

3. $497\times505=(500-3)(500+5)$
$=500^2+(-3+5)\times500+(-3)(5)$
[using] $(x+a)(x+b)=x^2+(a+b)x+ab$]
$=250000+1000-15=250985$

4. $2.07\times1.93=(2+0.07)(2-0.07)$
$=2^2-(0.07)^2=3.9951$

5. R.H.S $=(9982)^2-(18)^2$
$=(9982+18)(9982-18)$
[Since $(a^2-b^2)=(a+b)(a-b)$]
$=(10000)\times(9964)$
L.H.S $=(10000)\times x$
Comparing L.H.S and R.H.S, we get
$10000x=10000\times9964$
or $x=\frac{10000\times9964}{10000}=9964$

6. Given that $x+\frac{1}{x}=1$

So, $\left(x+\frac{1}{x}\right)^2=25$

Now, $\left(x+\frac{1}{x}\right)^2=x^2+2\times x\times\frac{1}{x}+\left(\frac{1}{x}\right)^2$ [Using Identity

$(a+b)^2=a^2+2ab+b^2$, with $a=x$ and $b=\frac{1}{x}$]

$=x^2+2+\left(\frac{1}{x^2}\right)\Rightarrow x^2+\frac{1}{x^2}=25-2=23$

7. $-2b^3$[Using identify $a^3-b^3=(a-b)(a^2+b^2+ab)$]

8. (i) x^4-y^4 (ii) $a^4+2a^2b^2+b^4$

9. 225

10. 72

11. $3a^2+ab\ \ 7ac+2b^2-6bc-4c^2$

12. 62

HOTS Questions :

1.
$$\begin{array}{r} 4a^2+2b^2-7xy-5 \\ -4a^2+5b^2+3xy+2 \\ +\quad -\quad -\quad - \\ \hline 8a^2-3b^2-10xy-7 \end{array}$$

2. We have,
$(5a^6)\times(-10ab^2)\times(-2.1a^2b^3)$
$=(5\times-10\times-2.1)\times(a^6\times a\times a^2\times b^2\times b^3)$
$=\left(5\times-10\times-\frac{21}{10}\right)\times(a^6\times a\times a^2\times b^2\times b^3)$
$=105a^{6+1+2}b^{2+3}=105a^9b^5$

Putting $a=1$ and $b=\frac{1}{2}$, we have

$105a^9b^5=1045\times(1)^9\times\left(\frac{1}{2}\right)^5=105\times1\times\frac{1}{32}=\frac{105}{32}$

3. (i) We have,
$15a^2-6a(a-2)+a(3+7a)$
$=15a^2-6a^2+12a+3a+7a^2$
$=15a^2-6a^2+7a^2+12a+3$
$=16a^2+15a$

(ii) We have,
$x^2(1-3y^2)+x(xy^2-2x)-3y(y-4x^2y)$
$=x^2\times1-3y^2\times x^2+x\times xy^2-x\times2x-3y\times y+3y\times4x^2y$
$=x^2-3x^2y^2+x^2y^2-2x^2-3y^2+12x^2y^2$
$=(x^2-2x^2)+(-3x^2y^2+x^2y^2+12x^2y^2)-3y^2$
$=-x^2+10x^2y^2-3y^2$

4. We have,
$(3x-2)(x-1)(3x+5)$
$=\{(3x-2)(x-1)\}\times(3x+5)$
$=\{3x(x-1)-2(x-1)\}\times(3x+5)$
$=(3x^2-3x-2x+2)\times(3x+5)$
$=(3x^2-5x+2)\times(3x+5)$
$=3x^2\times(3x+5)-5x(3x+5)+2\times(3x+5)$
$=(9x^3+15x^2)+(-15x^2-25x)+(6x+10)$
$=9x^3+15x^2-15x^2-25x+6x+10$
$=9x^3-19x+10$

5. We have,
LHS $=2a^2+2b^2+2c^2-2ab-2bc-2ca$
$=(a^2-2ab+b^2)+(b^2-2bc+c^2)+(c^2-2ca+a^2)$
[Re-arranging the terms]
$=(a-b)^2+(b-c)^2+(c-a)^2$
$=$R.H.S.
Hence, $2a^2+2b^2+2c^2-2ab-2bc-2ca=(a-b)^2+(b-c)^2+(c-a)^2$

3 EXERCISE

Single Option Correct

1. (c) $(x+y)^2=x^2+2xy+y^2$
$\therefore$ Expanded from of $(x+y)^2$ is a trinomial

2. (b) $(x^2+3x+5)\times(x^2-1)$
$=(x^2\times x^2)+(3x\times x^2)+(5\times x^2)+[x^2\times(-1)]+[3x\times(-1)]+[5(-1)]$
$=x^4+3x^3+5x^2-x^2-3x-5$
$=x^4+3x^3+4x^2-3x-5$

3. (c) $(2x^2-5y^2)^2=(2x^2)^2-2(2x^2)(5y^2)+(5y^2)^2$
$(2x^2-5y^2)^2=4x^4-20x^2y^2+25y^4$

4. (c)
$$\begin{array}{r} 4a+5b-3c \\ \pm 3a\mp 3b\pm c \\ \hline a+8b-4c \end{array}$$

5. (b) $5m^2n\times(-3mnp)\times(-5n^2p)=75m^3n^4p^2$.

6. (a) $3x^2y^2(5x^2-4xy+6y^2)$
$=15x^4y^2-12x^3y^3+18y^4x^2$

7. (a)
$$\begin{array}{r} 3a^2-6ab-3b^2-1 \\ \pm 4a^2\mp 7ab\mp 4b^2\pm 1 \\ \hline -a^2+ab\ \ +b^2-2 \end{array}$$

8. (c) $\left(3+\frac{5}{x}\right)\left(9-\frac{15}{x}+\frac{25}{x^2}\right)=3^3+\left(\frac{5}{x}\right)^3$
$=27+\frac{125}{x^3}$
At $x=1$,
$27+\frac{125}{x^3}=27+\frac{125}{1^3}=27+125=152.$

9. (d) $(0.9)^2-(0.6)^2=(0.9+0.6)(0.9-0.6)$
$=(1.5)(0.3)$
$=0.45$

10. (a) $(a+b)^2+(a-b)^2$
$=a^2+b^2+2ab+a^2+b^2-2ab$
$=2a^2+2b^2$.

11. (a) $(a+b)^2-(a-b)^2$
$=a^2+b^2+2ab-(a^2+b^2-2ab)$
$=a^2+b^2+2ab-a^2-b^2+2ab$
$=4ab$.

12. (d) $3q+7p^2-2r^3+4-[4p^2-2q+7r^3-3]$
$=3q+7p^2-2r^3+4-4p^2+2q-7r^3+3$
$=3p^2-9r^3+5q+7$

13. (d) $(3a^2-4ax+x^2)\times(5x^2-2ax)$
$=(3a^2-4ax+x^2)\times5x^2-(3a^2-4ax+x^2)\times2ax$
$=15a^2x^2-20ax^3+5x^4-6a^3x+8a^2x^2-2ax^3$
$=23a^2x^2-22ax^3+5x^4-6a^3x$

14. (a) Other binomial $=5x^2-6x-(3x^2-2x)$
$=5x^2-6x-3x^2+2x$
$=2x^2-4x$

15. (a) Cost of a notebook
$=₹\,3a^2-4ab+6b^2$
Cost of $5a^2b^2$ notebooks
$=₹\,[3a^2-4ab+6b^2)(5a^2b^2)]$
$=₹\,(15a^4b^2-20a^3b^3+30a^2b^4)$

16. (c) $(0.8m+1.1n)(0.8m-1.1n)$
$=(0.8m)^2-(1.1n)^2$
$=0.64m^2-1.21n^2$
[Using identity $a^2-b^2=(a+b)(a-b)$]

17. (c) Sum of $(a-5)(a-2)+(a^2+6a+7)$
$=a^2-2a-5a+10+a^2+6a+7$
$=2a^2-7a+6a+10+7$
$=2a^2-a+17$
$\therefore 2a^2-a+17-(-a^2-2a+1)$
$=2a^2-a+17+a^2+2a-1$
$=3a^2+a+16$

More Than One Option Correct :

1. (c, d)
2. (b, d)
3. (a, b)
4. (a, b, c, d)
5. (a,d) : $23^2-22^2=(23+22)(23-22)=45$
[Using identity $(a^2-b^2)=(a+b)(a-b)$]
6. (b, d) $(60-4)(60-6)$
$=[60+(-4)][60+(-6)]$
[Using identity : $(x+a)(x+b)=x^2+(a+b)x+ab$]
$=(60)^2+(-4-6)\times60+(-4)\times(-6)$
$=3600-600+24=3024$

Passage Based Questions :

1. **(b)** Yes, it is a polynomial in x and y degree = 5.
2. **(a)** Constant term = $\frac{-11}{3}$
3. **(c)** $\frac{-5}{6}x$
4. **(a)** $25x = (536-136)(536+136) = (400)(672)$

   $\Rightarrow 25x = 268800 \quad \Rightarrow x = 10752$
5. **(b)** $(10000)^2 - (9999)^2$

   $(10000+9999)(10000-9999) = 19999$
6. **(d)** $(4000)^2 - (3999)^2 + (9000)^2 - (8999)^2$

   $= (4000+3999)(4000-3999) + (9000-8999)(9000+8999)$

   $= 7999 + 17999 = 25998$

Assertion & Reason :

1. (c) Assertion is true but Reason is false. When the terms have same literal factors they are called like terms.
2. (c) Constant terms are terms of the expression having no literal factor. It has fixed numerical value.
3. (a) $99 \times 101 = (100-1)(100+1) = (100)^2 - 1^2$

   $= 10000 - 1 = 9999$

   [Using identity : $a^2 - b^2 = (a+b)(a-b)$]
4. (d) $-8abc + 4bac = -8abc + 4abc = -4abc$ is a monomial.

Multiple Matching Questions :

1. (A) $\rightarrow$ (r, t); (B) $\rightarrow$ (p, s); (C) $\rightarrow$ (q)

Integer Type Questions :

1. **(0)** Using the identity

   $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

   $25a^2 + 16b^2 + 9 + 40ab - 24b - 30a$

   $= (5a)^2 + (4b)^2 + (-3)^2 + 2 \times 5a \times 4b + 2 \times 4b \times (-3) + 2 \times 5a \times (-3)$

   $= (5a + 4b - 3)^2$

   $\therefore$ Required value $= (5 \times (-1) + 4 \times 2 - 3)^2$

   $= (-5 + 8 - 3)^2 = (-8+8)^2 = 0$
2. **(1)** $25x^2 + 16y^2 + 40xy$

   At $x = 1$ and $y = -1$

   $25(1)^2 + 16(-1)^2 + 40(1)(-1)$

   $= 25 + 16 - 40 = 1.$
3. **(0)** $3x - \frac{1}{2}x + \frac{3}{2}x - 4x = -x + \frac{2x}{2} = -x + x = 0$
4. **(4)** $36 \times 34 = (30+6)(30+4)$

   [Using $(x+a)(x+b) = x^2 + (a+b)x + ab$

   $= (30)^2 + (6+4) \times 30 + 24$

   $= 900 + 300 + 24 = 1224.$
5. **(1)** $(4a^2 + 3b)(4a^2 + 3b) = (4a^2 + 3b)^2$

   $= 16a^4 + 9b^2 + 24a^2b$

   When $a = 1, b = 2$

   $16(1)^4 + 9(2)^2 + 24 \times (1)^2 \times 2$

   $16 + 36 + 48 = 100.$

   $k \div 100 = 100 \div 100 = 1$
6. **(4)** $\frac{(997+496)^2 - (997-496)^2}{997 \times 496}$

   $= \frac{(997)^2 + (496)^2 + 2 \times 997 \times 496 - (997)^2 - (496)^2 + 2 \times 997 \times 496}{997 \times 496}$

   $= \frac{4 \times 997 \times 496}{997 \times 496} = 4$

4 ADVANCED EXERCISE BASED ON CONNECTING TOPICS

1. **(c)** $a + b + c = 15$

   $\Rightarrow (a+b+c)^2 = 15^2$

   $\Rightarrow a^2 + b^2 + c^2 + 2(ab + bc + ca) = 225$

   $\Rightarrow 77 + 2(ab + bc + ca) = 225 \Rightarrow ab + bc + ca = 74$
2. **(c)** Given $x - \frac{1}{x} = 7$

   Cubing both the sides

   $\left(x - \frac{1}{x}\right)^3 = 7^3$

   $\Rightarrow x^3 - 3.x.\frac{1}{x}\left(x - \frac{1}{x}\right) - \left(\frac{1}{x}\right)^3 = 343$

   $\Rightarrow x^3 - 3(7) - \left(\frac{1}{x}\right)^3 = 343$

   $\Rightarrow x^3 - \frac{1}{x^3} = 343 + 21$

   $\Rightarrow x^3 - \frac{1}{x^3} = 364$
3. **(a)** If $a + b + c = 0$, then

   $a^3 + b^3 + c^3 = 3abc$

   $(25)^3 + (-10)^3 + (-15)^3$

   $= 3(25)(-10)(-15)$

   $= 11250$
4. **(a)** $(a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$

   $= a^3 + b^3 + c^3 - 3abc$