

Chapter 8

Algebraic Expressions

Exercise 8.1

Question 1.

From the algebraic expressions using variables, constants, and arithmetic operations:

- (i) 6 more than thrice a number x .
- (ii) 5 times x is subtracted from 13.
- (iii) The numbers x and y both squared and added.
- (iv) Number 7 is added to 3 times the product of p and q .
- (v) Three times of x is subtracted from the product of x with itself.
- (vi) Sum of the numbers m and n is subtracted from their product.

Solution:

- (i) 6 more than thrice a number $x = 3x + 6$
- (ii) 5 times x is subtracted from 13 $= 13 - 5x$
- (iii) The numbers x and y both squared and added $= x^2 + y^2$
- (iv) Number 7 is added to 3 times the product of p and $q = 3pq + 7$
- (v) Three times of x is subtracted from the product of x with itself $= x^2 - 3x$
- (vi) Sum of the numbers m and n is subtracted from their product $= mn - (m + n)$

Question 2.

A taxi charges ₹ 9 per km and a fixed charge of ₹ 50. If the taxi is hired for x km, write an algebraic expression for this situation.

Solution:

Charges of a taxi = ₹ 9 per km

Fixed charges = ₹ 50

and taxi is hired for x km $= (9x + 50)$ rupees

Question 3.

Write down the algebraic expression whose terms are:

- (i) $5a$, $-3b$, c
- (ii) x^2 , $-5x$, 6
- (iii) x^2y , xy , $-xy^2$

Solution:

(i) $5a - 3b + c$

(ii) $x^2 - 5x + 6$

(iii) $x^2y + xy - xy^2$

Question 4.

Write all the terms of each of the following algebraic expressions:

(i) $3 - 7x$

(ii) $2 - 5a + 12b$

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

Solution:

(i) $3 - 7x = 3, -7x$

(ii) $2 - 5a + \frac{3}{2}b = 2, -5a, \frac{3}{2}b$

(iii) $3x^5 + 4y^3 - 7xy^2 + 3 = 3x^5, 4y^3, -7xy^2, 3$

Question 5.

Identify the terms and their factors in the algebraic expressions given below:

(i) $-4x + 5y$

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

(iii) $1.2ab - 2.4b + 3.6a$

Solution:

(i) $-4x + 5y$

$-4x = -4, x$

$5y = 5, y$

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

$xy = x, y$

$2x^2y^2 = 2, x, x, y, y$

(iii) $1.2ab - 2.4b + 3.6a$

$1.2ab = 1.2, a, b$

$-2.4b = -2.4, b$

$3.6a = 3.6, a$

Question 6.

Show the terms and their factors by tree diagrams of the following algebraic expressions:

(i) $8x + 3y^2$

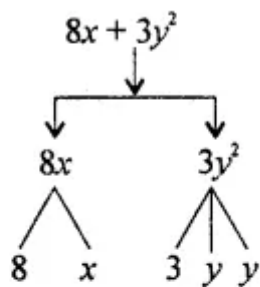
(ii) $y - y^3$

(iii) $5xy^2 + 7x^2y$

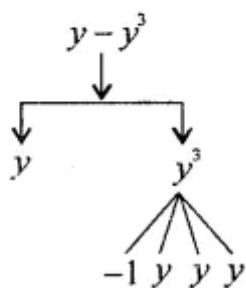
(iv) $-ab + 2b^2 - 3a^2$

Solution:

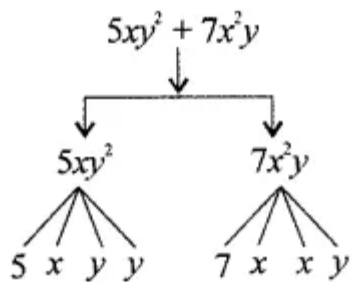
(i) $8x + 3y^2$



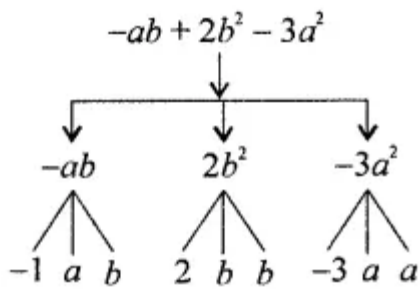
(ii) $y - y^3$



(iii) $5xy^2 + 7x^2y$



(iv) $-ab + 2b^2 - 3a^2$



Question 7.

Write down the numerical coefficient of each of the following:

- (i) $-7x$
- (ii) $-2x^3y^2$
- (iii) $6abcd^2$
- (iv) $\frac{2}{3}pq^2$

Solution:

Numerical co-efficient

- (i) $-7x$ – numerical co-efficient is -7
- (ii) $-2x^3y^2$ – numerical co-efficient is -2
- (iii) $6abcd^2$ – numerical co-efficient is 6
- (iv) $\frac{2}{3}pq^2$ – numerical co-efficient is $\frac{2}{3}$

Question 8.

Write down the coefficient of x in the following:

- (i) $-4bx$
- (ii) $5xyz$
- (iii) $-x$
- (iv) $-3x^2y$

Solution:

coefficient of x

- (i) $-4bx$ – $-4b$
- (ii) $5xyz$ – $5yz$
- (iii) $-x$ – -1
- (iv) $-3x^2y$ – $-3xy$

Question 9.

In $-7xy^2z^3$, write down the coefficient of:

- (i) $7x$
- (ii) $-xy^2$
- (iii) xyz
- (iv) $7yz^2$

Solution:

In $-7xy^2z^3$

- (i) Co-efficient of $7x = -y^2z^3$
- (ii) Co-efficient of $-xy^2 = 7z^3$
- (iii) Co-efficient of $xyz = -7yz^2$
- (iv) Co-efficient of $7yz^2 = -xyz$

Question 10.

Identify the terms (other than constants) and write their numerical coefficients in each of the following algebraic expressions:

(i) $3 - 7x$

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

(iii) $1.2a + 0.8b$

Solution:

Expression	Non-constant terms	Numerical co-efficient
(i) $3 - 7x$	$-7x$	-7
(ii) $1 + 2x - 3x^2$	$2x$	2
	$-3x^2$	-3
(iii) $1.2a + 0.8b$	$1.2a$	1.2
	$0.8b$	0.8

Question 11.

Identify the terms which contain x and write the coefficient of x in each of the following expressions:

(i) $13y^2 - 8xy$

(ii) $7x - xy^2$

(iii) $5 - 7xyz + 4x^2y$

Solution:

Expression	Term(s) Containing x	Co-efficient of x
(i) $13y^2 - 8xy$	$-8xy$	$-8y$
(ii) $7x - xy^2$	$7x$	7
	$-xy^2$	$-y^2$
(iii) $5 - 7xyz + 4x^2y$	$-7xyz$	$-7yz$
	$4x^2y$	$4xy$

Question 12.

Identify the term which contain y^2 and write the coefficient of y^2 in each of the following expressions:

(i) $8 - xy^2$

(ii) $5y^2 + 7x - 3xy^2$

(iii) $2x^2y - 15xy^2 + 7y^2$

Solution:

Expression	Term(s) Containing y^2	Co-efficient of y^2
(i) $8 - xy^2$	$-xy^2$	$-x$
(ii) $5y^2 + 7x - 3xy^2$	$5y^2$	5
	$-3xy^2$	$-3x$
(iii) $2x^2y - 15xy^2 + 7y^2$	$-15xy^2$	$-15x$
	$7y^2$	7

Question 13.

Classify into monomials, binomials and trinomials:

(i) $4y - 7z$

(ii) $-5xy^2$

(iii) $x + y - xy$

(iv) $ab^2 - 5b - 3a$

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

(vi) 2017

(vii) $1 + x + x^2$

(viii) $5x^2 - 7 + 3x + 4$

Solution:

Expression	Number of terms	Kind
(i) $4y - 7z$	Two terms	Binomial
(ii) $-5xy^2$	One term	Monomial
(iii) $x + y - xy$	Three terms	Trinomial
(iv) $ab^2 - 5b - 3a$	Three terms	Trinomial
(v) $4p^2q - 5pq^2$	Two terms	Binomial
(vi) 2017	One term	Monomial
(vii) $1 + x + x^2$	Three terms	Trinomial
(viii) $5x^2 - 7 + 3x + 4$ $= 5x^2 + 3x - 3$	Three terms	Trinomial

Question 14.

State whether the given pair of terms is of like or unlike terms:

(i) $-7x, \frac{5}{2}x$

(ii) $-29x, -29y$

- (iii) $2xy, 2xyz$
- (iv) $4m^2p, 4mp^2$
- (v) $12xz, 12x^2z^2$
- (vi) $-5pq, 7qp$

Solution:

- (i) $-7x, \frac{5}{2}x$ – Like
- (ii) $-29x, -29y$ – Unlike
- (iii) $2xy, 2xyz$ – Unlike
- (iv) $4m^2p, 4mp^2$ – Unlike
- (v) $12xz, 12x^2z^2$ – Unlike
- (vi) $-5pq, 7qp$ – Like

Question 15.

Identify like terms in the following:

- (i) $x^2y, 3xy^2, -2x^2y, 4x^2y^2$
- (ii) $3a^2b, 2abc, -6a^2b, 4abc$
- (iii) $10pq, 7p, 8q - p^2q^2, -7qp, -100q, -23, 12q^2p^2, -5p^2, 41, 2405p, 78qp, 13p^2q, qp^2, 701p^2$

Solution:

- (i) x^2y and $-2x^2y$ are like terms.
- (ii) $3a^2b, -6a^2b$ and $2abc, 4abc$ are pairs of like terms.
- (iii) $10pq, -7qp, 78qp$ and $7p, 2405p$ and $8q, -100q$,
and $-p^2q^2, 12q^2p^2$ and $-23, 41$ and $-5p^2, 701p^2$
and $13p^2q, qp^2$ are groups of like terms.

Question 16.

Write down the degree of following polynomials in x:

- (i) $x^2 - 6x^7 + x^8$
- (ii) $3 - 2x$
- (iii) -2
- (iv) $1 - x^2$

Solution:

- (i) $x^2 - 6x^7 + x^8$; degree is 8
- (ii) $3 - 2x$; degree is 1
- (iii) -2 ; degree is 0
- (iv) $1 - x^2$; degree is 2

Question 17.

Write the degree of the following polynomials:

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

(ii) $xy^2 - y^3 + 3y^4 - 2$

(iii) $7 - 2x^3 - 5xy^3 + 9y^5$

Solution:

(i) $3x^2 - 5xy^2 + 1$; degree is $1 + 2 = 3$

(ii) $xy^2 - y^3 + 3y^4 - 2$; degree is 4

(iii) $7 - 2x^3 - 5xy^3 + 9y^5$; degree is 5

Question 18.

State true or false:

(i) If 5 is constant and y is variable, then 5y and 5 + y are variables

(ii) 7x has two terms, 7 and x

(iii) 5 + xy is a trinomial

(iv) 7a × bc is a binomial

(v) $7x^3 + 2x^2 + 3x - 5$ is a polynomial

(vi) $2x^2 - 3x$ is a polynomial

(vii) Coefficient of x in -3xy is -3

Solution:

(i) True.

(ii) False. Correct: 7x has one term.

(iii) False. Correct: It is binomial.

(iv) False. Correct: It is 7abc monomial.

(v) True.

(vi) False. Correct: It is binomial.

(vii) False. Correct: It is -3y.

Exercise 8.2

Question 1.

Add:

(i) $7x, -3x$

(ii) $6x, -11x$

(iii) $5x^2, -9x^2$

(iv) $3ab^2, -5ab^2$

(v) $\frac{1}{2}pq, -\frac{1}{3}pq$

(vi) $5x^3y, -23x^3y$

Solution:

$$(i) 7x + (-3x) = 7x - 3x = 4x$$

$$(ii) 6x + (-11x) = 6x - 11x = -5x$$

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

$$(iv) 3ab^2 + (-5ab^2) = 3ab^2 - 5ab^2 = -2ab^2$$

$$(v) \frac{1}{2}pq + \left(-\frac{1}{3}pq\right) = \frac{1}{2}pq - \frac{1}{3}pq$$

$$= \frac{3pq - 2pq}{6} = \frac{pq}{6} = \frac{1}{6}pq$$

$$(vi) 5x^3y + \left(-\frac{2}{3}x^3y\right) = 5x^3y - \frac{2}{3}x^3y$$

$$= \frac{15x^3y - 2x^3y}{3} = \frac{13x^3y}{3}$$

$$= \frac{13}{3}x^3y$$

Question 2.

Add:

(i) $3x, -5x, 7x$

(ii) $7xy, 2xy, -8xy$

(iii) $-2abc, 3abc, abc$

(iv) $3mn, -5mn, 8mn, -4mn$

(v) $2x^3, 3x^3, -4x^3, -5x^3$

Solution:

$$\begin{aligned}
 & \text{(i) } 3x, -5x, 7x \\
 & = 3x - 5x + 7x \\
 & = (3 - 5 + 7)x \\
 & = (10 - 5)x \\
 & = 5x
 \end{aligned}$$

$$\begin{aligned}
 & \text{(ii) } 7xy, 2xy, -8xy \\
 & = 7xy + 2xy - 8xy \\
 & = (7 + 2 - 8)xy \\
 & = (9 - 8)xy \\
 & = xy
 \end{aligned}$$

$$\begin{aligned}
 & \text{(iii) } -2abc, 3abc, abc \\
 & = -2abc + 3abc + abc \\
 & = (-2 + 3 + 1) abc \\
 & = (4 - 2) abc \\
 & = 2abc
 \end{aligned}$$

$$\begin{aligned}
 & \text{(iv) } 3mn, -5mn, 8mn, -4mn \\
 & = 3mn - 5mn + 8mn - 4mn \\
 & = (3 - 5 + 8 - 4) mn \\
 & = (11 - 9) mn \\
 & = 2mn
 \end{aligned}$$

$$\begin{aligned}
 & \text{(v) } 2x^3, 3x^3, -4x^3, -5x^3 \\
 & = 2x^3 + 3x^3 - 4x^3 - 5x^3 \\
 & = (2 + 3 - 4 - 5) x^3 \\
 & = (5 - 9) x^3 \\
 & = -4x^3
 \end{aligned}$$

Question 3.

Simplify the following combining like terms:

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

(ii) $12m^2 - 9m + 5m - 4m^2 - 7m + 10$

(iii) $-z^2 + 13z^2 - 5z + 7z^2 - 15z$

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

(v) $p - (p - q) - (q - p) - q$

(vi) $3a - 2b - ab - (a - b + ab) + 3ab + b - a$

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

Solution:

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

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

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

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

$$= 8b - 32$$

$$(ii) 12m^2 - 9m + 5m - 4m^2 - 7m + 10$$

$$= 12m^2 - 4m^2 - 9m + 5m - 7m + 10$$

$$= (12 - 4)m^2 - (9 - 5 + 7)m + 10$$

$$= 8m^2 - 11m + 10$$

$$(iii) -z^2 + 13z^2 - 5z + 7z^3 - 15z$$

$$= 7z^3 - z^2 + 13z^2 - 5z - 15z$$

$$= 7z^3 + 12z^2 - 20z$$

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

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

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

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

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

$$(v) p - (p - q) - (q - p) - q$$

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

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

$$= p - q$$

$$(vi) 3a - 2b - ab - (a - b + ab) + 3ab + b - a$$

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

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

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

$$= a + ab$$

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

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

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

$$= 4y^2 - 3y$$

Question 4.

Find the sum of the following algebraic expressions:

(i) $5xy, -7xy, 3x^2$

(ii) $4x^2y, -3xy^2, -5xy^2, 5x^2y$

(iii) $-7mn + 5, 12mn + 2, 8mn - 8, -2mn - 3$

(iv) $a + b - 3, b - a + 3, a - b + 3$

(v) $14x + 10y - 12xy - 13, 18 - 7x - 10y + 8xy, 4xy$

(vi) $5m - 7n, 3n - 4m + 2, 2m - 3mn - 5$

(vii) $3x^3 - 5x^2 + 2x + 1, 3x - 2x^2 - x^3, 2x^2 - 7x + 9$

(viii) $7a^2 - 5a + 2, 3a^2 - 7, 2a + 9, 1 + 2a - 5a^2$

Solution:

(i) $5xy, -7xy, 3x^2$

$$= 5xy - 7xy + 3x^2$$

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

(ii) $4x^2y, -3xy^2, -5xy^2, 5x^2y$

$$= 4x^2y + 5x^2y - 3xy^2 - 5xy^2$$

$$= 9x^2y - 8xy^2$$

(iii) $-7mn + 5, 12mn + 2, 8mn - 8, -2mn - 3$

$$\begin{array}{r} -7mn + 5 \\ 12mn + 2 \\ 8mn - 8 \\ -2mn - 3 \\ \hline 11mn - 4 \end{array}$$

$$11mn - 4$$

(iv) $a + b - 3, b - a + 3, a - b + 3$

$$\begin{array}{r} a + b - 3 \\ -a + b + 3 \\ a - b + 3 \\ \hline a + b + 3 \end{array}$$

$$a + b + 3$$

(v) $14x + 10y - 12xy - 13$, $18 - 7x - 10y + 8xy$, $4xy$

$$\begin{array}{r} 14x + 10y - 12xy - 13 \\ -7x - 10y + 8xy + 18 \\ + 4xy \\ \hline 7x \qquad \qquad \qquad + 5 \end{array}$$

$$7x + 5$$

(vi) $5m - 7n$, $3n - 4m + 2$, $2m - 3mn - 5$

$$\begin{array}{r} 5m - 7n \\ -4m + 3n + 2 \\ 2m \qquad - 5 - 3mn \\ \hline 3m - 4n - 3 - 3mn \end{array}$$

$$3m - 4n - 3mn - 3$$

(vii) $3x^3 - 5x^2 + 2x + 1$, $3x - 2x^2 - x^3$, $2x^2 - 7x + 9$

$$\begin{array}{r} 3x^3 - 5x^2 + 2x + 1 \\ -x^3 - 2x^2 + 3x \\ 2x^2 - 7x + 9 \\ \hline 2x^3 - 5x^2 - 2x + 10 \end{array}$$

$$2x^3 - 5x^2 - 2x + 10$$

(viii) $7a^2 - 5a + 2$, $3a^2 - 7$, $2a + 9$, $1 + 2a - 5a^2$

$$\begin{array}{r} 7a^2 - 5a + 2 \\ 3a^2 \qquad - 7 \\ 2a + 9 \\ -5a^2 + 2a + 1 \\ \hline 5a^2 - a + 5 \end{array}$$

Question 5.

Simplify the following:

(i) $2x^2 + 3y^2 - 5xy + 5x^2 - y^2 + 6xy - 3x^2$

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

(iii) $5x^4 - 7x^2 + 8x - 1 + 3x^3 - 9x^2 + 7 - 3x^4 + 11x - 2 + 8x^2$

Solution:

$$(i) 2x^2 + 3y^2 - 5xy + 5x^2 - y^2 + 6xy - 3x^2$$

$$= 2x^2 + 5x^2 - 3x^2 + 3y^2 - y^2 - 5xy + 6xy$$

$$= 4x^2 + 2y^2 + xy$$

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

$$= 3xy^2 - 8xy^2 - 5x^2y + 6x^2y + 7xy - 4xy$$

$$= -5xy^2 + x^2y + 3xy$$

$$(iii) 5x^4 - 7x^2 + 8x - 1 + 3x^3 - 9x^2 + 7 - 3x^4 + 11x - 2 + 8x^2$$

$$= 5x^4 - 3x^4 + 3x^3 - 7x^2 - 9x^2 + 8x^2 + 8x + 11x - 1 + 7 - 2$$

$$= 2x^4 + 3x^3 - 8x^2 + 19x + 4$$

Question 6.

Subtract:

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

(ii) $-7xy$ from $-2xy$

(iii) $a(b - 5)$ from $b(5 - a)$

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

(v) $5a^2 - 7ab + 5b^2$ from $3ab - 2b - 2b^2$

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

(vii) $7xy + 5x^2 - 7y^2 + 3$ from $7x^2 - 8xy + 3y^2 - 5$

(viii) $2x^4 - 7x^2 + 5x + 3$ from $x^4 - 3x^3 - 2x^2 + 3$

Solution:

$$-5y^2 \text{ from } y^2$$

$$= y^2 - (-5y^2)$$

$$= y^2 + 5y^2$$

$$= 6y^2$$

$$(ii) -7xy \text{ from } -2xy$$

$$= -2xy - (-7xy)$$

$$= -2xy + 7xy$$

$$= 5xy$$

$$(iii) a(b - 5) \text{ from } b(5 - a)$$

$$= b(5 - a) - a(b - 5)$$

$$= 5b - ab - ab + 5a$$

$$= 5a + 5b - 2ab$$

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

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

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

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

(v) $5a^2 - 7ab + 5b^2$ from $3ab - 2a^2 - 2b^2$

$$= (3ab - 2a^2 - 2b^2) - (5a^2 - 7ab + 5b^2)$$

$$= 3ab - 2a^2 - 2b^2 - 5a^2 + 7ab - 5b^2$$

$$= -7a^2 - 7b^2 + 10ab$$

$$= 10ab - 7a^2 - 7b^2$$

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

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

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

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

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

(vii) $7xy + 5x^2 - 7y^2 + 3$ from $7x^2 - 8xy + 3y^2 - 5$

$$= (7x^2 + 3y^2 - 8xy - 5) - (7xy + 5x^2 - 7y^2 + 3)$$

$$= 7x^2 + 3y^2 - 8xy - 5 - 7xy - 5x^2 + 7y^2 - 3$$

$$= 7x^2 - 5x^2 + 3y^2 + 7y^2 - 8xy - 7xy - 5 - 3$$

$$= 2x^2 + 10y^2 - 15xy - 8$$

(viii) $2x^4 - 7x^2 + 5x + 3$ from $x^4 - 3x^3 - 2x^2 + 3$

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

$$= x^4 - 3x^3 - 2x^2 + 3 - 2x^4 + 7x^2 - 5x - 3$$

$$= x^4 - 2x^4 - 3x^3 - 2x^2 + 7x^2 - 5x + 3 - 3$$

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

Question 7.

Subtract $p - 2q + r$ from the sum of $10p - r$ and $5p + 2q$.

Solution:

Subtract $p - 2q + r$ from the sum of $10p - r$ and $5p + 2q$

By adding $10p - r + 5p + 2q$ and $5p + 2q$, we get

$$= 10p - r + 5p + 2q$$

$$= 15p + 2q - r$$

$$\begin{aligned}
 &\text{Now, } (15p + 2q - r) - (p - 2q + r) \\
 &= 15p + 2q - r - p + 2q - r \\
 &= 14p + 4q - 2r
 \end{aligned}$$

Question 8.

From the sum of $4 + 3x$ and $5 - 4x + 2x^2$, subtract the sum of $3x^2 - 5x$ and $-x^2 + 2x + 5$.

Solution:

$$\begin{aligned}
 &\text{Sum of } (4 + 3x) + (5 - 4x + 2x^2) \\
 &= 4 + 3x + 5 - 4x + 2x^2 \\
 &= 2x^2 - x + 9 \\
 &\text{and sum of } 3x^2 - 5x - x^2 + 2x + 5 \\
 &= 2x^2 - 3x + 5 \\
 &\text{Now, } (2x^2 - x + 9) - (2x^2 - 3x + 5) \\
 &= 2x^2 - x + 9 - 2x^2 + 3x - 5 \\
 &= 2x + 4
 \end{aligned}$$

Question 9.

What should be added to $x^2 - y^2 + 2xy$ to obtain $x^2 + y^2 + 5xy$?

Solution:

$$\begin{aligned}
 &\text{Let the term added} = Z \text{ term} \\
 &\text{i.e., } Z \text{ term} + x^2 - y^2 + 2xy = x^2 + y^2 + 5xy \\
 &Z \text{ term} = (x^2 + y^2 + 5xy) - (x^2 - y^2 + 2xy) \\
 &= x^2 + y^2 + 5xy - x^2 + y^2 - 2xy \\
 &= 2y^2 + 3xy \\
 &\text{The required term is } 2y^2 + 3xy
 \end{aligned}$$

Question 10.

What should be subtracted from $-7mn + 2m^2 + 3n^2$ to get $m^2 + 2mn + n^2$?

Solution:

$$\begin{aligned}
 &\text{Let the term subtracted} = Z \text{ term} \\
 &-7mn + 2m^2 + 3n^2 - Z \text{ term} = m^2 + 2mn + n^2 \\
 &Z \text{ term} = (-7mn + 2m^2 + 3n^2) - (m^2 + 2mn + n^2) \\
 &= (-7mn + 2m^2 + 3n^2) - (m^2 + 2mn + n^2)
 \end{aligned}$$

$$= -7mn + 2m^2 + 3n^2 - m^2 - 2mn - n^2$$

$$= m^2 + 2n^2 - 9mn$$

The required term is $m^2 + 2n^2 - 9mn$

Question 11.

How much is $y^4 - 12y^2 + y + 14$ greater than $17y^3 + 34y^2 - 51y + 68$?

Solution:

The required expression

$$= (y^4 - 12y^2 + y + 14) - (17y^3 + 34y^2 - 51y + 68)$$

$$= y^4 - 12y^2 + y + 14 - 17y^3 - 34y^2 + 51y - 68$$

$$= y^4 - 17y^3 - 46y^2 + 52y - 54$$

Question 12.

How much does $93p^2 - 55p + 4$ exceed $13p^3 - 5p^2 + 17p - 90$?

Solution:

The required expression

$$= (93p^2 - 55p + 4) - (13p^3 - 5p^2 + 17p - 90)$$

$$= 93p^2 - 55p + 4 - 13p^3 - 5p^2 - 17p + 90$$

$$= -13p^3 + 98p^2 - 72p + 94$$

Question 13.

What should be taken away from $3x^2 - 4y^2 + 5xy + 20$ to obtain $-x^2 - y^2 + 6xy + 20$?

Solution:

The required expression

$$= (3x^2 - 4y^2 + 5xy + 20) - (-x^2 - y^2 + 6xy + 20)$$

$$= 3x^2 - 4y^2 + 5xy + 20 + x^2 + y^2 - 6xy - 20$$

$$= 4x^2 - 3y^2 - xy$$

Question 14.

From the sum of $2y^2 + 3yz$, $-y^2 - yz - z^2$ and $yz + 2z^2$, subtract the sum of $3y^2 - z^2$ and $-y^2 + yz + z^2$.

Solution:

Sum of $2y^2 + 3yz$, $-y^2 - yz - z^2$ and $yz + 2z^2$

$$= 2y^2 + 3yz - y^2 - yz - z^2 + yz + 2z^2$$

$$= y^2 + z^2 + 3yz$$

and sum = $3y^2 - z^2 + (-y^2 + yz + z^2)$

$$= 3y^2 - z^2 - y^2 + yz + z^2$$

$$= 2y^2 + yz$$

Now, $(y^2 + z^2 + 3yz) - (2y^2 + yz)$

$$= y^2 + z^2 + 3yz - 2y^2 - yz$$

$$= -y^2 + z^2 + 2yz$$

$$= -y^2 + 2yz + z^2$$

Exercise 8.3

Question 1.

If $m = 2$, find the value of:

(i) $3m - 5$

(ii) $9 - 5m$

(iii) $3m^2 - 2m - 1$

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

Solution:

(i) $3m - 5 = 3 \times 2 - 5 = 6 - 5 = 1$

(ii) $9 - 5m = 9 - 5 \times 2 = 9 - 10 = -1$

(iii) $3m^2 - 2m - 1$

$= 3(2)^2 - 2 \times 2 - 1$

$= 12 - 4 - 1$

$= 12 - 5$

$= 7$

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

Question 2.

If $p = -2$, find the value of:

(i) $4p + 7$

(ii) $-3p^2 + 4p + 7$

(iii) $-2p^3 - 3p^2 + 4p + 7$

Solution:

$p = -2$

(i) $4p + 7$

$= 4 \times (-2) + 7$

$= -8 + 7$

$= -1$

(ii) $-3p^2 + 4p + 7$

$= -3(-2)^2 + 4(-2) + 7$

$= -12 - 8 + 7$

$= -20 + 7$

$= -13$

$$\begin{aligned}
 & \text{(iii) } -2p^3 - 3p^2 + 4p + 7 \\
 & = -2(-2)^3 - 3(-2)^2 + 4(-2) + 7 \\
 & = 16 - 12 - 8 + 7 \\
 & = 23 - 20 \\
 & = 3
 \end{aligned}$$

Question 3.

If $a = 2$, $b = -2$, find the value of:

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

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

(iii) $a^2 - b^2$

Solution:

$$a = 2, b = -2$$

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

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

$$= 4 + 4$$

$$= 8$$

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

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

$$= 4 - 4 + 4$$

$$= 8 - 4$$

$$= 4$$

(iii) $a^2 - b^2$

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

$$= 4 - 4$$

$$= 0$$

Question 4.

When $a = 0$, $b = -1$, find the value of the given expressions:

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

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

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

Solution:

$$a = 0, b = -1$$

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

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

$$= 0 + 1 + 1$$

$$= 2$$

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

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

$$= 0 + 0 + 2$$

$$= 2$$

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

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

$$= 0 + 0 + 0$$

$$= 0$$

Question 5.

If $p = -10$, find the value of $p^2 - 2p - 100$.

Solution:

$$p = -10,$$

$$p^2 - 2p - 100$$

$$= (-10)^2 - 2(-10) - 100$$

$$= 100 + 20 - 100$$

$$= 20$$

Question 6.

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

Solution:

$$z = 10$$

$$z^3 - 3(z - 10)$$

$$= (10)^3 - 3(10 - 10)$$

$$= 1000 - 3 \times 0$$

$$= 1000 - 0$$

$$= 1000$$

Question 7.

Simplify the following expressions and find their values when $x = 2$:

(i) $x + 7 + 4(x - 5)$

(ii) $3(x + 2) + 5x - 7$

(iii) $6x + 5(x - 2)$

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

Solution:

$$x = 2$$

(i) $x + 7 + 4(x - 5)$

$$= x + 7 + 4x - 20$$

$$= 5x - 13$$

$$= 5 \times 2 - 13$$

$$= 10 - 13$$

$$= -3$$

(ii) $3(x + 2) + 5x - 7$

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

$$= 8x - 1$$

$$= 8(2) - 1$$

$$= 16 - 1$$

$$= 15$$

(iii) $6x + 5(x - 2)$

$$= 6x + 5x - 10$$

$$= 11x - 10$$

$$= 11 \times 2 - 10$$

$$= 22 - 10$$

$$= 12$$

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

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

$$= 11x + 7$$

$$= 11 \times 2 + 7$$

$$= 22 + 7$$

$$= 29$$

Question 8.

Simplify the following expressions and find their values when $a = -1$, $b = -2$:

(i) $2a - 2b - 4 - 5 + a$

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

Solution:

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

(i) $2a - 2b - 4 - 5 + a$

$$= 3a - 2b - 9$$

$$= 3(-1) - 2(-2) - 9$$

$$= -3 + 4 - 9$$

$$= -12 + 4$$

$$= -8$$

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

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

$$= 2a^2 + ab + 3$$

$$= 2(-1)^2 + (-1)(-2) + 3$$

$$= 2 \times 1 + 2 + 3$$

$$= 2 + 2 + 3$$

$$= 7$$

Exercise 8.4

Question 1.

If $m = 2$, find the value of:

(i) $3m - 5$

(ii) $9 - 5m$

(iii) $3m^2 - 2m - 1$

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

Solution:

(i) $3m - 5 = 3 \times 2 - 5 = 6 - 5 = 1$

(ii) $9 - 5m = 9 - 5 \times 2 = 9 - 10 = -1$

(iii) $3m^2 - 2m - 1$

$= 3(2)^2 - 2 \times 2 - 1$

$= 12 - 4 - 1$

$= 12 - 5$

$= 7$

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

Question 2.

If $p = -2$, find the value of:

(i) $4p + 7$

(ii) $-3p^2 + 4p + 7$

(iii) $-2p^3 - 3p^2 + 4p + 7$

Solution:

$p = -2$

(i) $4p + 7$

$= 4 \times (-2) + 7$

$= -8 + 7$

$= -1$

(ii) $-3p^2 + 4p + 7$

$= -3(-2)^2 + 4(-2) + 7$

$= -12 - 8 + 7$

$= -20 + 7$

$= -13$

$$\begin{aligned}
 & \text{(iii) } -2p^3 - 3p^2 + 4p + 7 \\
 & = -2(-2)^3 - 3(-2)^2 + 4(-2) + 7 \\
 & = 16 - 12 - 8 + 7 \\
 & = 23 - 20 \\
 & = 3
 \end{aligned}$$

Question 3.

If $a = 2$, $b = -2$, find the value of:

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

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

(iii) $a^2 - b^2$

Solution:

$$a = 2, b = -2$$

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

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

$$= 4 + 4$$

$$= 8$$

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

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

$$= 4 - 4 + 4$$

$$= 8 - 4$$

$$= 4$$

(iii) $a^2 - b^2$

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

$$= 4 - 4$$

$$= 0$$

Question 4.

When $a = 0$, $b = -1$, find the value of the given expressions:

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

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

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

Solution:

$$a = 0, b = -1$$

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

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

$$= 0 + 1 + 1$$

$$= 2$$

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

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

$$= 0 + 0 + 2$$

$$= 2$$

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

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

$$= 0 + 0 + 0$$

$$= 0$$

Question 5.

If $p = -10$, find the value of $p^2 - 2p - 100$.

Solution:

$$p = -10,$$

$$p^2 - 2p - 100$$

$$= (-10)^2 - 2(-10) - 100$$

$$= 100 + 20 - 100$$

$$= 20$$

Question 6.

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

Solution:

$$z = 10$$

$$z^3 - 3(z - 10)$$

$$= (10)^3 - 3(10 - 10)$$

$$= 1000 - 3 \times 0$$

$$= 1000 - 0$$

$$= 1000$$

Question 7.

Simplify the following expressions and find their values when $x = 2$:

(i) $x + 7 + 4(x - 5)$

(ii) $3(x + 2) + 5x - 7$

(iii) $6x + 5(x - 2)$

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

Solution:

$$x = 2$$

(i) $x + 7 + 4(x - 5)$

$$= x + 7 + 4x - 20$$

$$= 5x - 13$$

$$= 5 \times 2 - 13$$

$$= 10 - 13$$

$$= -3$$

(ii) $3(x + 2) + 5x - 7$

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

$$= 8x - 1$$

$$= 8(2) - 1$$

$$= 16 - 1$$

$$= 15$$

(iii) $6x + 5(x - 2)$

$$= 6x + 5x - 10$$

$$= 11x - 10$$

$$= 11 \times 2 - 10$$

$$= 22 - 10$$

$$= 12$$

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

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

$$= 11x + 7$$

$$= 11 \times 2 + 7$$

$$= 22 + 7$$

$$= 29$$

Question 8.

Simplify the following expressions and find their values when $a = -1$, $b = -2$:

(i) $2a - 2b - 4 - 5 + a$

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

Solution:

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

(i) $2a - 2b - 4 - 5 + a$

$$= 3a - 2b - 9$$

$$= 3(-1) - 2(-2) - 9$$

$$= -3 + 4 - 9$$

$$= -12 + 4$$

$$= -8$$

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

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

$$= 2a^2 + ab + 3$$

$$= 2(-1)^2 + (-1)(-2) + 3$$

$$= 2 \times 1 + 2 + 3$$

$$= 2 + 2 + 3$$

$$= 7$$

Objective Type Questions

Question 1.

Fill in the blanks:

- (i) The terms with different algebraic factors are called
- (ii) The number of terms in a monomial is
- (iii) An algebraic expression having two unlike terms is called a
- (iv) $3a^2b$ and $-7ba^2$ are terms.
- (v) $-6a^2b$ and $-6ab^2$ are terms.
- (vi) The number of unlike terms in the algebraic expression $3x^2 - 2xy + 5x^2$ is
- (vii) The factors of the term $-3p^2q^2$ are
- (viii) The perimeter of a triangle whose sides measure $2a$, b and $a + b$ is
- (ix) The value of the expression $2x^3 - 7x^2 + 5x - 3$ when $x = 1$ is
- (x) In the term $-7a^2bc$, the coefficient of a is
- (xi) The degree of the polynomial $3 - 5x^2 + 7x^3 - x^4$ is
- (xii) The degree of the polynomial $3x^2 - 2xy^2 + 5$ is

Solution:

- (i) The terms with different algebraic factors are called unlike terms.
- (ii) The number of terms in a monomial is one.
- (iii) An algebraic expression having two unlike terms is called a binomial.
- (iv) $3a^2b$ and $-7ba^2$ are like terms.
- (v) $-6a^2b$ and $-6ab^2$ are unlike terms.
- (vi) The number of unlike terms in the algebraic expression $3x^2 - 2xy + 5x^2$ is 2.
- (vii) The factors of the term $-3p^2q^2$ are -3 , p , p , q , q .
- (viii) The perimeter of a triangle whose sides measure $2a$, b and $a + b$ is $2a + b + a + b = 3a + 2b$.
- (ix) The value of the expression $2x^3 - 7x^2 + 5x - 3$ when $x = 1$ is -3 .
$$2(1)^3 - 7(1)^2 + 5(1) - 3$$
$$= 2 - 7 + 5 - 3$$
$$= -3$$

- (x) In the term $-7a^2bc$, the coefficient of a is $-7abc$.
- (xi) The degree of the polynomial $3 - 5x^2 + 7x^3 - x^4$ is 4.
 $3 - 5x^2 + 7x^3 - x^4$ is 4
- (xii) The degree of the polynomial $3x^2 - 2xy^2 + 5$ is 3.
 $3x^2 - 2xy^2 + 5$ is $1 + 2 = 3$

Question 2.

State whether the following statements are true (T) or false (F).

- (i) The expression $5x + 7 - 2x$ is a trinomial.
- (ii) $(7x - 10) - (3x - 5) = 4x - 15$.
- (iii) The coefficient of $3x$ in $-3x^3y$ is $-xy$.
- (iv) The constant term in the expression $2x^2 - 3xy - 7$ is 7.
- (v) If $x = 3$ and $y = 13$ then the value of $xy (x^2 + y^2)$ is 919.
- (vi) $(3x - y + 5) - (x + y)$ is a binomial.
- (vii) Sum of 2 and p is $2p$.
- (viii) Sum of $x^2 + x$ and $y^2 + y$ is $2x^2 + 2y^2$.
- (ix) In like terms, variables and their powers are the same.
- (x) Every polynomial is a monomial.
- (xi) If we add a monomial and a binomial, then answer can never be a monomial.
- (xii) If we subtract a monomial from a binomial, then the answer is at least a binomial.
- (xiii) if we add a monomial and a trinomial, then the answer can be a monomial.
- (xiv) If we add a monomial and a binomial, then the answer can be a trinomial.

Solution:

- (i) The expression $5x + 7 - 2x$ is a trinomial. (False)

Correct:

As $5x + 7 - 2x = 3x + 7$ which has two terms.

- (ii) $(7x - 10) - (3x - 5) = 4x - 15$. (False)

Correct:

$$(7x - 10) - (3x - 5) = 4x - 5$$

- (iii) The coefficient of $3x$ in $-3x^3y$ is $-xy$. (False)

Correct:

As co-efficient of $3x$ is $-x^2y$

- (iv) The constant term in the expression

$$2x^2 - 3xy - 7 \text{ is } 7. \text{ (False)}$$

Correct:

$$2x^2 - 3xy - 7 \text{ is } -7$$

- (v) If $x = 3$ and $y = \frac{1}{3}$

(v) If $x = 3$ and $y = \frac{1}{3}$

then the value of $xy(x^2 + y^2)$ is $9\frac{1}{9}$. (True)

$$\begin{aligned}xy(x^2 + y^2) &= 3 \times \frac{1}{3} \left[(3)^2 + \left(\frac{1}{3}\right)^2 \right] \\&= 1 \left(9 + \frac{1}{9} \right) = 9\frac{1}{9}\end{aligned}$$

(vi) $(3x - y + 5) - (x + y)$ is a binomial. (False)

Correct:

$$= 3x - y + 5 - x + y$$

$$= 2x - 2y + 5$$

It is trinomial.

(vii) Sum of 2 and p is 2p. (False)

Correct:

Sum of 2 and p is $2 + p$ not $2p$.

(viii) Sum of $x^2 + x$ and $y^2 + y$ is $2x^2 + 2y^2$. (False)

Correct:

Sum of $x^2 + x$ and $y^2 + y = x^2 + y^2 + x + y$ not $2x^2 + 2y^2$

(ix) In like terms, variables and their powers are same. (True)

(x) Every polynomial is a monomial. (False)

It could be binomial, trinomial or polynomial.

(xi) If we add a monomial and a binomial,
then answer can never be a monomial. (False)

Correct:

It can be monomial.

For example :

$$3x + (5 - 3x) = 3x + 5 - 3x = 5 \text{ which is monomial.}$$

(xii) If we subtract a monomial from a binomial,
then the answer is at least a binomial. (False)

Correct:

It can be monomial also, for example

$$2x - (7 + 2x) = 2x - 7 - 2x = -7 \text{ which is a monomial.}$$

(xiii) if we add a monomial and a trinomial,
then the answer can be a monomial. (False)

Correct:

It can be binomial also.

(xiv) If we add a monomial and a binomial,
then the answer can be a trinomial. (True)

Multiple Choice Questions

Choose the correct answer from the given four options (3 to 16):

Question 3.

The algebraic expression for the statement 'Thrice square of a number x subtracted from five times the sum of y and 2' is

- (a) $5y + 2 - 3x^2$
- (b) $3x^2 - (5y + 2)$
- (c) $5(y + 2) - 3x^2$
- (d) $5(y + 2) - (3x)^2$

Solution:

For the statement, thrice square of a number x
subtracted from five times the sum of y and 2 is $5(y + 2) - 3x^2$ (c)

Question 4.

The expression $7x - 5(x^2 + y^2)$ is a

- (a) monomial
- (b) binomial
- (c) trinomial
- (d) none of these

Solution:

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

It is trinomial. (c)

Question 5.

The coefficient of $5a^2$ in $-5a^3bc$ is

- (a) $-bc$
- (b) a^2bc
- (c) $-a^2bc$
- (d) $-abc$

Solution:

Co-efficient of $5a^2$ in $-5a^3bc$ is $-abc$ (d)

Question 6.

Which of the following is a pair of like terms?

- (a) $-5xy, 5x$
- (b) $-5xy, 3yz$
- (c) $-5xy, -5y$
- (d) $-5xy, 7yx$

Solution:

$-5xy, 7yx$ is a pair of like terms. (d)

Question 7.

The like terms is the expressions $3x(3 - 2y)$ and $2(xy + x^2)$ are

- (a) $9x$ and $2x^2$
- (b) $-6xy$ and $2xy$
- (c) $9x$ and $2xy$
- (d) $-6xy$ and $2x^2$

Solution:

Like terms in the expression

$$3x(3 - 2y) = 9x - 6xy \text{ and } 2(xy + x^2) = 2xy + 2x^2$$

are $-6xy$ and $2xy$ (b)

Question 8.

Identify the binomial out of the following:

- (a) $3xy^2 + 5y - x^2y$
- (b) $2x^2y - 5y - 2x^2y$
- (c) $3xy^2 + 5y - xy^2$
- (d) $xy + yz + zx$

Solution:

(a) $3xy^2 + 5y - x^2y$ trinomial

(b) $2x^2y - 5y - 2x^2y = -5y$ monomial

(c) $3xy^2 + 5y - xy^2 = 2xy^2 + 5y$ binomial (c)

Question 9.

The number of (unlike) terms in the expression $3xy^2 + 2y^2z - y^2x + y(xz + yz) - 5$

(a) 3

(b) 4

(c) 5

(d) 6

Solution:

The number of unlike terms in the expression

$$= 3xy^2 + 2y^2z - y^2x + y(xz + yz) - 5$$

$$= 3xy^2 + 2y^2z - y^2x + xyz + y^2z - 5$$

$$= 2xy^2 + 3y^2z^2 + xyz - 5$$

$$= 4 \text{ (b)}$$

Question 10.

The value of the expression $x^3 + y^3$ when $x = 2$ and $y = -2$ is

(a) 0

(b) 8

(c) 16

(d) -16

Solution:

$$\text{Value of } x^3 + y^3 = (2)^3 + (-2)^3 = 8 - 8 = 0 \text{ (a)}$$

Question 11.

$-xy - (-5xy)$ is equal to

(a) $-6xy$

(b) $6xy$

(c) $-4xy$

(d) $4xy$

Solution:

$$-xy - (-5xy) = -xy + 5xy = 4xy \text{ (d)}$$

Question 12.

On subtracting $7x + 5y - 3$ from $5y - 3x - 9$, we get

(a) $10x + 6$

(b) $-10x - 6$

(c) $10x + 10y - 12$

(d) $-10x - 12$

Solution:

$$\begin{aligned} & (5y - 3x - 9) - (7x + 5y - 3) \\ &= 5y - 3x - 9 - 7x - 5y + 3 \\ &= -10x - 6 \text{ (b)} \end{aligned}$$

Question 13.

The value of the expression $5x^2 + 1$ when $x = -2$ is

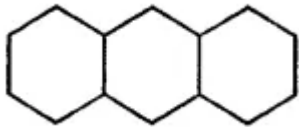
- (a) -173
- (b) -73
- (c) 213
- (d) 233

Solution:

$$\begin{aligned} \frac{5}{3}x^2 + 1 &= \frac{5}{3}(-2)^2 + 1 = \frac{5}{3} \times 4 + 1 \\ &= \frac{20}{3} + 1 = \frac{23}{3} \quad \text{(d)} \end{aligned}$$

Question 14.

The number of sides in a pattern having 3 hexagons arranged in a row as shown in the given figure is



- (a) 18
- (b) 17
- (c) 16
- (d) 15

Solution:

Number of sides are = 16 (c)

Question 15.

The degree of the polynomial $3x^3y - 5xy^4 - 2x + 1$ is

- (a) 5
- (b) 4
- (c) 3
- (d) 2

Solution:

The degree of the polynomial

$3x^3y - 5xy^4 - 2x + 1$ is of

$$-5xy^4 = 1 + 4 = 5 \text{ (a)}$$

Higher Order Thinking Skills (HOTS)

Question 1.

The length of a rectangle is $3x - 4y + 6z$ and the perimeter is $7x + 8y + 17z$, find the breadth of the rectangle.

Solution:

$$\text{Length of rectangle} = 3x - 4y + 6z$$

$$2 \times \text{length} = 6x - 8y + 12z$$

$$\text{and perimeter} = 7x + 8y + 17z = 2(\text{Length} + \text{Breadth})$$

$$2 \times \text{Breadth} = 7x + 8y + 17z - 6x - 8y - 12z = x + 5z + 5y$$

$$\text{Breadth} = \frac{x}{2} + 8y + \frac{5}{2}z$$

Question 2.

$$\text{Simplify : } \frac{3x}{5} + \frac{2x}{3} - \left(\frac{x}{2} + \frac{2x}{5} \right).$$

Solution:

$$\frac{3x}{5} + \frac{2x}{3} - \left(\frac{x}{2} + \frac{2x}{5} \right)$$

$$\frac{3x}{5} + \frac{2x}{3} - \frac{x}{2} - \frac{2x}{5}$$

$$= \frac{18x + 20x - 15x - 12x}{30}$$

$$= \frac{38x - 27x}{30} = \frac{11x}{30}$$

$$= \frac{11}{30}x$$

Question 3.

If $a = 3$, $b = -1$, then find the value of each of the following:

(i) a^b

(ii) b^a

(iii) $(ab)^b$

(iv) $(a + b)^b$

(v) $\left(\frac{b}{a}\right)^b$

(vi) $\left(\frac{a}{b} + \frac{b}{a}\right)^b$

Solution:

$$a = 3, b = -1$$

$$(i) a^b = 3^{-1} = \frac{1}{3}$$

$$(ii) b^a = (-1)^3 = -1$$

$$(iii) (ab)^b = [3 \times (-1)]^{-1} = (-3)^{-1} = \frac{1}{-3}$$

$$(iv) (a + b)^b = (3 - 1)^{-1} = (2)^{-1} = \frac{1}{2}$$

$$(v) \left(\frac{b}{a}\right)^b = \left(\frac{-1}{3}\right)^{-1} = \frac{3}{-1} = -3$$

$$(vi) \left(\frac{a}{b} + \frac{b}{a}\right)^b = \left(\frac{3}{-1} + \frac{-1}{3}\right)^{-1} = \left(-3 - \frac{1}{3}\right)^{-1}$$

$$= \left(\frac{-10}{3}\right)^{-1} = \frac{-3}{10}$$

Check Your Progress

Question 1.

Consider the expression $32x^2y - 12xy^2 + 6x^2y^2$.

- (i) How many terms are there? What do you call such an expression?
- (ii) List out the terms.
- (iii) In the term $-12xy^2$, write down the numerical coefficient and the literal coefficient.
- (iv) In the term $-12xy^2$, what is the coefficient of x ?

Solution:

$$\frac{3}{2}x^2y - \frac{1}{2}xy^2 + 6x^2y^2$$

(i) It has 3 terms : Trinomial

(ii) $\frac{3}{2}x^2y$, $\frac{-1}{2}xy^2$, $6x^2y^2$

(iii) In $\frac{-1}{2}xy^2$,

numerical coefficient = $\frac{-1}{2}$

Literal coefficient = xy^2

(iv) In the term $\frac{-1}{2}xy^2$

coefficient of $x = \frac{-1}{2}y^2$

Question 2.

Write the Degree of the following polynomials:

(i) $25x^3 - 7x^2 - 12x + 3$

(ii) $23xy^2 - 5xy + 35y^2x^2 + 2x$

Solution:

$$(i) \frac{2}{5}x^3 - 7x^2 - \frac{1}{2}x + 3$$

Degree is 3.

$$(ii) \frac{2}{3}xy^2 - 5xy + \frac{3}{5}y^2x^2 + 2x$$

Degree is $2 + 2 = 4$

Question 3.

Identify monomials, binomials and trinomials from the following algebraic expressions:

(i) $5x \times y$

(ii) $3 - 5x$

(iii) $12(7x - 3y + 5z)$

(iv) $3x^2 - 1.2xy$

(v) $-3x^3y^4z^5$

(vi) $5x(2x - 3y) + 7x^2$

Solution:

- (i) $5x \times y = 5xy$ Monomial
(ii) $3 - 5x$ Binomial
(iii) $\frac{1}{2}(7x - 3y + 5z)$ Trinomial
(iv) $3x^2 - 1.2xy$ Binomial
(v) $-3x^3y^4z^5$ Monomial
(vi) $5x(2x - 3y) + 7x^2$
 $= 10x^2 - 15xy + 7x^2$
 $= 17x^2 - 15xy$ Binomial

Question 4.

Using horizontal method:

- (i) Add $x^2 + y^2 - 2xy$, $-2x^2 - y^2 - 2xy$ and $3x^2 + y^2 + xy$
(ii) Subtract $-x^2 + y^2 + 2xy$ from $2x^2 - 3y^2$.

Solution:

$$\begin{aligned} \text{(i)} \quad & x^2 + y^2 - 2xy - 2x^2 - y^2 - 2xy + 3x^2 + y^2 + xy \\ &= x^2 - 2x^2 + 3x^2 + y^2 - y^2 + y^2 - 2xy - 2xy + xy \\ &= 2x^2 + y^2 - 3xy \\ \text{(ii)} \quad & (2x^2 - 3y^2) - (-x^2 + y^2 + 2xy) \\ &= 2x^2 - 3y^2 + x^2 - y^2 - 2xy \\ &= 3x^2 - 4y^2 - 2xy \end{aligned}$$

Question 5.

Using column method, add $ab + 2bc - ca$ and $2ab - bc - ca$ and subtract $4ab + 5bc - 3ca$.

Solution:

$$\begin{array}{r} ab + 2bc - ca \\ 2ab - bc - ca \\ \hline 3ab + bc - 2ca \\ 4ab + 5bc - 3ca \\ - \quad - \quad + \\ \hline -ab - 4bc + ca \end{array}$$

Question 6.

The sides of a triangle are $5a - 3b$, $3a + 2b$ and $5b - 2a$, find its perimeter.

Solution:

Sides of a triangle are $5a - 3b$, $3a + 2b$ and $5b - 2a$

$$\text{Perimeter} = 5a - 3b + 3a + 2b + 5b - 2a$$

$$= 8a - 2a + 4b$$

$$= 6a + 4b$$

Question 7.

If two adjacent sides of a rectangle are $4x + 7y$ and $3y - x$, find its perimeter.

Solution:

Two adjacent sides of a rectangle are $4x + 7y$ and $3y - x$

$$\text{Perimeter} = 2(4x + 7y + 3y - x) = 2(3x + 10y) = 6x + 20y$$

Question 8.

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

Solution:

Sum of $3x^2 + 2xy - 2y^2$ and $5y^2 - 7xy$

$$= 3x^2 + 2xy - 2y^2 + 5y^2 - 7xy$$

$$= 3x^2 - 5xy + 3y^2$$

Now,

$$\begin{array}{r} 5x^2 + 2y^2 - 3xy \\ 3x^2 + 3y^2 - 5xy \\ \hline - \quad - \quad + \\ 2x^2 - y^2 + 2xy \end{array} = 2x^2 + 2xy - y^2$$

Question 9.

What must be added to $5x^3 - 2x^2 + 3x + 7$ to get $7x^3 + 7x - 5$?

Solution:

Required expression

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

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

$$= 2x^3 + 2x^2 + 4x - 12$$

Question 10.

How much is $3p - 4q + r$ less than $4p + 3q - 5r$?

Solution:

Required expression

$$= (4p + 3q - 5r) - (3p - 4q + r)$$

$$= 4p + 3q - 5r - 3p + 4q - r$$

$$= p + 7q - 6r$$

Question 11.

How much is $3a^2 - 5ab + 7b^2 + 3$ greater than $2a^2 + 2ab + 5$?

Solution:

Required expression

$$\begin{array}{r} 3a^2 - 5ab + 7b^2 + 3 \\ 2a^2 + 2ab \quad + 5 \\ \hline a^2 - 7ab + 7b^2 - 2 \end{array}$$

Question 12.

How much should $5x^3 + 3x^2 - 2x + 1$ be increased to get $6x^2 + 7$?

Solution:

Required expression

$$= 6x^2 + 7 - (5x^3 + 3x^2 - 2x + 1)$$

$$= 6x^2 + 7 - 5x^3 - 3x^2 + 2x - 1$$

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

Question 13.

Subtract the sum of $12ab - 10b^2 - 18a^2$ and $9ab + 12b^2 + 14a^2$ from the sum of $ab + 2b^2$ and $3b^2 - a^2$.

Solution:

Sum of $12ab - 10b^2 - 18a^2$

and $9ab + 12b^2 + 14a^2$

$$\begin{array}{r} 12ab - 10b^2 - 18a^2 \\ 9ab + 12b^2 + 14a^2 \\ \hline 21ab + 2b^2 - 4a^2 \end{array}$$

Now,

$$\begin{array}{r}
 ab + 2b^2 + 3b^2 - a^2 \\
 ab + 5b^2 - a^2 \\
 21ab + 2b^2 - 4a^2 \\
 \hline
 -20ab + 3b^2 + 3a^2
 \end{array}$$

Question 14.

when $a = 3$, $b = 0$, $c = -2$, find the values of:

(i) $ab + 2bc + 3ca + 4abc$

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

Solution:

$$a = 3, b = 0, c = -2$$

(i) $ab + 2bc + 3ca + 4abc$

$$= 3 \times 0 + 2 \times 0 \times (-2) + 3(-2)(3) + 4(3)(0)(-2)$$

$$= 0 + 0 - 18 + 0$$

$$= -18$$

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

$$= (3)^3 + (0)^3 + (-2)^3 - 3 \times 3 \times 0 \times (-2)$$

$$= 27 + 0 - 8 - 0$$

$$= 19$$

Question 15.

Write the algebraic expression for the n th term of the number pattern 13, 23, 33, 43,

Solution:

$$13, 23, 33, 43$$

$$13 = 10 \times 1 + 3$$

$$23 = 10 \times 2 + 3$$

$$33 = 10 \times 3 + 3$$

$$43 = 10 \times 4 + 3$$

$$10 \times n + 3 = 10n + 3$$

Where n is a natural number.