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 $= 3pq + 1$

(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:
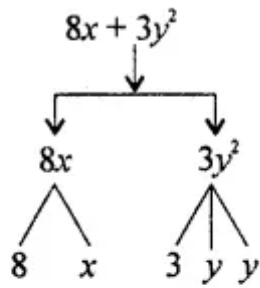(i) $8x + 3y^2$
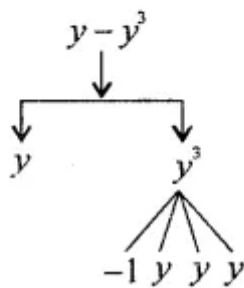(ii) $y - y^3$
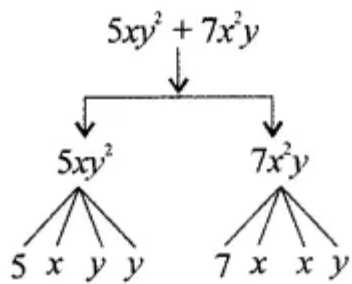(iii) $5xy^2 + 7x^2y$
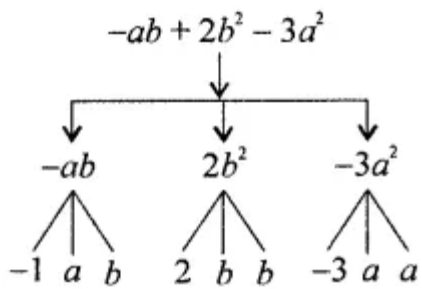(iv) $-ab + 2b^2 - 3a^2$

Solution:

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

$$8x + 3y^2$$

$$8x \qquad 3y^2$$

$$8 \quad x \qquad 3 \quad y \quad y$$

(ii) $y - y^3$

$$y - y^3$$

$$y \qquad y^3$$

$$-1 \ y \ y \ y$$

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

$$5xy^2 + 7x^2y$$

$$5xy^2 \qquad 7x^2y$$

$$5 \ x \ y \ y \qquad 7 \ x \ x \ y$$

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

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

$$-ab \qquad 2b^2 \qquad -3a^2$$

$$-1 \ a \ b \qquad 2 \ b \ b \qquad -3 \ a \ a$$

Question 7.
Write down the numerical coefficient of each of the following:
(i) -7x
(ii) -2x³y²
(iii) 6abcd²
(iv) 2/3 pq²
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) -3x²y
Solution:

coefficient of x

(i) -4bx — -4b

(ii) 5xyz — 5yz

(iii) -x — -1

(iv) $-3x^2y$ — -3xy

Question 9.
In -7xy²z³, write down the coefficient of:
(i) 7x
(ii) -xy²
(iii) xyz
(iv) 7yz²
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 y2 and write the coefficient of y2 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	Bionomial
(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	Bionomial
(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) $-7x$, $5/2\ x$
(ii) $-29x$, $-29y$

(iii) 2xy, 2xyz
(iv) 4m²p, 4mp²
(v) 12xz, 12x²z²
(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) x²y, 3xy², -2x²y, 4x²y²
(ii) 3a²b, 2abc, -6a²b, 4abc
(iii) 10pq, 7p, 8q – p²q², -7qp, -100q, -23, 12q²p², -5p², 41, 2405p, 78qp, 13p²q, qp², 701p²
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) x² – 6x⁷ + x⁸
(ii) 3 – 2x
(iii) -2
(iv) 1 – x²
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) 3x² – 5xy² + 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 andy 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 bionomial.

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

(v) True.

(vi) False. Correct: It is bionomial.

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

Exercise 8.2

Question 1.
Add:
(i) 7x, -3x
(ii) 6x, -11x
(iii) 5x², -9x²
(iv) 3ab², -5ab²
(v) 1/2 pq, −1/3 pq
(vi) 5x³y, −23 x³y
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) $\dfrac{1}{2}pq + \left(-\dfrac{1}{3}pq\right) = \dfrac{1}{2}pq - \dfrac{1}{3}pq$

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

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

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

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

Question 2.
Add:
(i) 3x, -5x, 7x
(ii) 7xy, 2xy, -8xy
(iii) -2abc, 3abc, abc
(iv) 3mn, -5mn, 8mn, -4mn
(v) 2x³, 3x³, -4x³, -5x³

Solution:

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

= 3x − 5x + 7x

= (3 − 5 + 7)x

= (10 − 5)x

= 5x

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

= 7xy + 2xy − 8xy

= (7 + 2 − 8)xy

= (9 − 8)xy

= xy

(iii) -2abc, 3abc, abc

= -2abc + 3abc + abc

= (-2 + 3 + 1) abc

= (4 − 2) abc

= 2abc

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

= 3mn − 5mn + 8mn − 4mn

= (3 − 5 + 8 − 4) mn

= (11 − 9) mn

= 2mn

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

= $2x^3 + 3x^3 − 4x^3 − 5x^3$

= $(2 + 3 − 4 − 5) x^3$

= $(5 − 9) x^3$

= $-4x^3$

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

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

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

$= 18m^2 - 11m + 10$

(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, 3x²
(ii) 4x²y, -3xy², -5xy², 5x²y
(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) 3x³ – 5x² + 2x + 1, 3x – 2x² – x³, 2x² – 7x + 9
(viii) 7a² – 5a + 2, 3a² – 7, 2a + 9, 1 + 2a – 5a²
Solution:

(i) 5xy, -7xy, 3x²

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

$= 3x^2 - 2xy$

(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

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

11mn – 4

(iv) a + b – 3, b – a + 3, a – b + 3

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

a + b + 3

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

$$14x + 10y - 12xy - 13$$
$$-7x - 10y + 8xy + 18$$
$$+ 4xy$$
$$\overline{7x + 5}$$

7x + 5

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

$$5m - 7n$$
$$-4m + 3n + 2$$
$$2m - 5 - 3mn$$
$$\overline{3m - 4n - 3 - 3mn}$$

3m − 4n − 3mn − 3

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

$$3x^3 - 5x^2 + 2x + 1$$
$$-x^3 - 2x^2 + 3x$$
$$2x^2 - 7x + 9$$
$$\overline{2x^3 - 5x^2 - 2x + 10}$$

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

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

$$7a^2 - 5a + 2$$
$$3a^2 - 7$$
$$2a + 9$$
$$-5a^2 + 2a + 1$$
$$\overline{5a^2 - a + 5}$$

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:

$-5y^2$ from y^2

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

$= y^2 + 5y^2$

$= 6y^2$

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

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

$= -2xy + 7xy$

$= 5xy$

(iii) $a(b - 5)$ 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

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

$= 15p + 2q - r$

Now, $(15p + 2q - r) - (p - 2q + r)$

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

$= 14p + 4q - 2r$

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:

Sum of $(4 + 3x) + (5 - 4x + 2x^2)$

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

$= 2x^2 - x + 9$

and sum of $3x^2 - 5x - x^2 + 2x + 5$

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

Now, $(2x^2 - x + 9) - (2x^2 - 3x + 5)$

$= 2x^2 - x + 9 - 2x^2 + 3x - 5$

$= 2x + 4$

Question 9.
What should be added to $x^2 - y^2 + 2xy$ to obtain $x^2 + y^2 + 5xy$?
Solution:

Let the term added = Z term

i.e., Z term $+ x^2 - y^2 + 2xy = x^2 + y^2 + 5xy$

Z term $= (x^2 + y^2 + 5xy) - (x^2 - y^2 + 2xy)$

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

$= 2y^2 + 3xy$

The required term is $2y^2 + 3xy$

Question 10.
What should be subtracted from $-7mn + 2m^2 + 3n^2$ to get $m^2 + 2mn + n^2$?
Solution:

Let the term subtracted = Z term

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

Z term $= (-7mn + 2mn + 3n^2) - (m^2 + 2mn + n^2)$

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

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

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

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

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

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

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

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

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

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

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

Question 1.
If m = 2, find the value of:
(i) 3m – 5
(ii) 9 – 5m
(iii) 3m² – 2m – 1
(iv) 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) $3m^2 - 2m - 7$

$= 3(2)^2 - 2 \times 2 - 7$

$= 12 - 4 - 7$

$= 12 - 11$

$= 1$

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

Question 2.
If p = – 2, find the value of:
(1) 4p + 7
(ii) -3p² + 4p + 7
(iii) -2p³ – 3p² + 4p + 7

Solution:

$p = -2$

(i) $4p + 7$

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

$= -8 + 7$

$= -1$

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

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

$= -12 - 8 + 7$

$= -20 + 7$

$= -13$

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

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

$= 16 - 12 - 8 + 7$

$= 23 - 20$

$= 3$

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:

$z = 10$

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

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

$= 1000 - 3 \times o$

$= 1000 - 0$

$= 1000$

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 × 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 × 2 − 10

= 22 − 10

= 12

(iv) 4(2x − 1) + 3x + 11

= 8x − 4 + 3x + 11

= 11x + 7

= 11 × 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(a² + 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 × 1 + 2 + 3

= 2 + 2 + 3

= 7

Question 1.
If m = 2, find the value of:
(i) 3m – 5
(ii) 9 – 5m
(iii) 3m² – 2m – 1
(iv) 52 m – 4
Solution:

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

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

(iii) $3m^2 - 2m - 7$

$= 3(2)^2 - 2 \times 2 - 7$

$= 12 - 4 - 7$

$= 12 - 11$

$= 1$

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

Question 2.
If p = – 2, find the value of:
(1) 4p + 7
(ii) -3p² + 4p + 7
(iii) -2p³ – 3p² + 4p + 7
Solution:

$p = -2$

(i) $4p + 7$

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

$= -8 + 7$

$= -1$

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

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

$= -12 - 8 + 7$

$= -20 + 7$

$= -13$

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

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

$= 16 - 12 - 8 + 7$

$= 23 - 20$

$= 3$

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:

$z = 10$

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

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

$= 1000 - 3 \times o$

$= 1000 - 0$

$= 1000$

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 × 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 × 2 − 10

= 22 − 10

= 12

(iv) 4(2x − 1) + 3x + 11

= 8x − 4 + 3x + 11

= 11x + 7

= 11 × 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 × 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 bionomial.

(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

$2x^2 - 3xy - 7$ is 7. (False)

Correct:

$2x^2 - 3xy - 7$ 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(x² + y²) is 9$\frac{1}{9}$. (True)

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

$$= 1\left(9 + \frac{1}{9}\right) = 9\frac{1}{9}$$

(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 x² + x and y² + y is 2x² + 2y². (False)

Correct:

Sum of x² + x and y² + y = x² + y² + x + y not 2x² + 2y²

(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 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

$2x - (7 + 2x) = 2x - 2 - 2x = -7$ 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) a²bc
(c) -a²bc
(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 + x²) are
(a) 9x and 2x²
(b) -6xy and 2xy
(c) 9x and 2xy
(d) -6xy and 2x²
Solution:

Like terms in the expression

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

are -6xy and 2xy (b)

Question 8.
Identify the binomial out of the following:
(a) 3xy² + 5y – x²y
(b) 2x²y – 5y – 2x²y
(c) 3xy² + 5y – xy²
(d) xy + yz + zx
Solution:

(a) $3xy^2 + 5y - x^2y$ trinomial
(b) $2x^2y - 5y - 2x^2y = -5y$ monomial
(c) $3xy^2 + 5y - xy^2 = 2xy2 + 5y$ 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
$= 3xy^2 + 2y^2z - y^2x + y(xz + yz) - 5$
$= 3xy^2 + 2y^2z - y^2x + xyz + y^2z - 5$
$= 2xy^2 + 3y^2z^2 + xyz - 5$
$= 4$ (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:
Value of $x^3 + y^3 = (2)^3 + (-2)^3 = 8 - 8 = 0$ (a)

Question 11.
$-xy - (-5xy)$ is equal to
(a) -6xy
(b) 6xy
(c) -4xy
(d) 4xy
Solution:
$-xy - (-5xy) = -xy + 5xy = 4xy$ (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:

$(5y - 3x - 9) - (7x + 5y - 3)$

$= 5y - 3x - 9 - 7x - 5y + 3$

$= -10x - 6$ (b)

Question 13.
The value of the expression 53 x^2 + 1 when x = -2 is
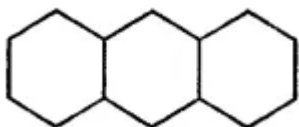(a) −173
(b) −73
(c) 213
(d) 233

Solution:

$$\frac{5}{3}x^2 + 1 = \frac{5}{3}(-2)^2 + 1 = \frac{5}{3} \times 4 + 1$$

$$= \frac{20}{3} + 1 = \frac{23}{3} \qquad\qquad (d)$$

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
$-5xy^4 = 1 + 4 = 5$ (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:

Length of rectangle = 3x – 4y + 6z

2 × length = 6x – 8y + 12z

and perimeter = 7x + 8y + 17z = 2(Length + Breadth)

2 × Breadth = 7x + 8y + 17z – 6x + 8y – 12z = x + 5 z + 16y

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

Question 2.

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

Solution:

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

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

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

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

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

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) $\left(\dfrac{b}{a}\right)^b$

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

Solution:

$a = 3, b = -1$

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

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

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

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

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

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

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

uestion 1.
Consider the expression 32 x²y − 12 xy² + 6x²y².
(i) How many terms are there? What do you call such an expression?
(ii) List out the terms.
(iii) In the term −12 xy², write down the numerical coefficient and the literal coefficient.
(iv) In the term −12 xy², what is the coefficient of x?
Solution:

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

(i) It has 3 terms : Trinomial

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

(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) 25 x³ − 7x² − 12 x + 3
(ii) 23 xy² − 5xy + 35 y²x² + 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 × y
(ii) 3 − 5x
(iii) 12 (7x − 3y + 5z)
(iv) 3x² − 1.2xy
(v) -3x³y⁴z⁵
(vi) 5x(2x − 3y) + 7x²

Solution:

(i) $5x \times y = 5xy$ Monomial

(ii) $3 - 5x$ Binomial

(iii) $\dfrac{1}{2}(7x - 3y + 5z)$ Trinomial

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

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

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

$\quad = 10x^2 - 15xy + 7x^2$

$\quad = 17x^2 - 15xy$ 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:

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

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

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

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

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

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

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

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

Question 6.
The sides fo a triangle are $5a - 3b$, $3a + 2b$ and $5b - 2a$, find its perimeter.

Solution:

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

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 $3y - x$

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,

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

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

$$
\begin{aligned}
3a^2 - 5ab + 7b^2 + 3 \\
2a^2 + 2ab \quad\quad + 5 \\
\underline{---} \\
a^2 - 7ab + 7b^2 - 2
\end{aligned}
$$

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

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

Now,

$$ab + 2b^2 + 3b^2 - a^2$$
$$ab + 5b^2 - a^2$$
$$21ab + 2b^2 - 4a^2$$
$$\underline{\quad - \qquad - \qquad + \qquad}$$
$$\overline{-20ab + 3b^2 + 3a^2}$$

Question 14.
when a = 3, b = 0, c = -2, find the values of:
(i) ab + 2bc + 3ca + 4abc
(ii) a³ + b³ + c³ – 3abc
Solution:
a = 3, b = 0, c = -2

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

= 3 × 0 + 2 × 0 × (-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 nth term of the number pattern 13, 23, 33, 43, ...
Solution:
13, 23, 33, 43

13 = 10 × 1 + 3

23 = 10 × 2 + 3

33 = 10 × 3 + 3

43 = 10 × 4 + 3

10 × n + 3 = 10n + 3

Where n is a natural number.