### Question: 1

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

(i)  $a^{2}$ (ii)  $a^{2} - b^{2}$ (iii)  $x^{3} + y^{3} + z^{3}$ (iv)  $x^{3} + y^{3} + z^{3} + 3xyz$ (v) 7 + 5 (vi) abc + 1 (vii) 3x - 2 + 5 (viii) 2x - 3y + 4 (ix) xy + yz + zx (x)  $ax^{3} + bx^{2} + cx + d$ 

# Solution:

The monomials, binomials, trinomials and quadrinomials are as follows.

(i)  $a^{2}$  is a monomial expression as it contains one term only. (ii)  $a^{2} - b^{2}$  is a binomial expression as it contains two terms. (iii)  $x^{3} + y^{3} + z^{3}$  is a trinomial expression as it contains three terms. (iv)  $x^{3} + y^{3} + z^{3} + 3xyz$  is a quadrinomial expression as it contains four terms. (v) 7 + 5 = 12 is a monomial expression as it contains one term only. (vi) abc + 1 is a binomial expression as it contains two terms. (vii) 3x - 2 + 5 = 3x + 3 is a binomial expression as it contains two terms. (viii) 2x - 3y + 4 is a trinomial expression as it contains three terms. (ix) xy + yz + zx is a trinomial expression as it contains three terms. (ix) xy + yz + zx is a trinomial expression as it contains three terms. (x)  $ax^{3} + bx^{2} + cx + d$  is a quadrinomial expression as it contains four terms.

### Question: 2

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

(i) 3x

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

#### Solution:

The terms of each of the given algebraic expressions are as follows.

(i) 3x is the only term of the given algebraic expression.

(ii) 2x and -3 are the terms of the given algebraic expression.

(iii)  $2x^2$  and -7 are the terms of the given algebraic expression.

(iv)  $2x^2$ ,  $y^2$ , -3xy and 4 are the terms of the given algebraic expression.

Identify the terms and also mention the numerical coefficients of those terms:

(i) 4xy, -5x<sup>2</sup>y, -3yx, 2xy<sup>2</sup> (ii) 7a<sup>2</sup>bc,-3ca<sup>2</sup>b,-(5/2) abc<sup>2</sup>, 3/2abc<sup>2</sup>,-4/3cba<sup>2</sup>

# Solution:

(i) Like terms - 4xy, -3yx and Numerical coefficients - 4, -3 (i) Like terms -  $\{7a^{2}bc, -3ca^{2}b\}$  and Numerical coefficients - 7, -3  $\{-5/2abc^{2}\}$   $\{-5/2\}$   $\{3/2 abc^{2}\}$   $\{3/2\}$  $\{-4/3cba^{2}\}$   $\{-4/3\}$ 

# Question: 4

Identify the like terms in the following algebraic expressions: (i)  $a^2 + b^2 - 2a^2 + c^2 + 4a$ 

(ii) 3x + 4xy - 2yz + 52zy(iii)  $abc + ab^{2}c + 2acb^{2} + 3c^{2}ab + b^{2}ac - 2a^{2}bc + 3cab^{2}$ 

# Solution:

The like terms in the given algebraic expressions are as follows.

(i) The like terms in the given algebraic expressions are  $a^2$  and  $-2a^2$ .

(ii) The like terms in the given algebraic expressions are -2yz and 5/2zy.

(iii) The like terms in the given algebraic expressions are  $ab^2c$ ,  $2acb^2$ ,  $b^2ac$  and  $3cab^2$ .

# **Question: 5**

Write the coefficient of x in the following:

(i) –12x

(ii) -7xy

(iii) xyz

(iv) -7ax

# Solution:

The coefficients of x are as follows.

(i) The numerical coefficient of x is -12.

(ii) The numerical coefficient of x is -7y.

(iii) The numerical coefficient of x is yz.

(iv) The numerical coefficient of x is -7a.

# Question: 6

```
Write the coefficient of 2 in the following:

(i) -3x^{2}

(ii) 5x^{2}yz

(iii) 5/7x^{2}z
```

$$(iv) - (3/2) ax^{2} + yx$$

# Solution:

The coefficient of  $x^2$  are as follows.

(i) The numerical coefficient of  $x^2$  is -3.

(ii) The numerical coefficient of  $x^2$  is 5yz.

(iii) The numerical coefficient of  $x^2$  is 57z.

(iv) The numerical coefficient of  $x^2$  is – (3/2) a.

# **Question: 7**

Write the coefficient of:

(i) y in -3y

(ii) a in 2ab

(iii) z in –7xyz

(iv) p in -3pqr(v) y<sup>2</sup> in  $9xy^2z$ (vi) x<sup>3</sup> in x<sup>3</sup> +1 (vii) x<sup>2</sup> in  $-x^2$ 

# Solution:

The coefficients are as follows.

(i) The coefficient of y is -3.

(ii) The coefficient of a is 2b.

(iii) The coefficient of z is -7xy.

(iv) The coefficient of p is -3qr.

(v) The coefficient of  $y^2$  is 9xz.

(vi) The coefficient of  $x^3$  is 1.

(vii) The coefficient of  $-x^2$  is -1.

# **Question: 8**

Write the numerical coefficient of each in the following

(i) xy

- (ii) -6yz
- (iii) 7abc

(iv) -2x3y2z

# Solution:

The numerical coefficient of each of the given terms is as follows.

(i) The numerical coefficient in the term xy is 1.

(ii) The numerical coefficient in the term - 6yz is - 6.

- (iii) The numerical coefficient in the term 7abc is 7.
- (iv) The numerical coefficient in the term  $-2x^{3}y^{2}z$  is -2.

# **Question: 9**

Write the numerical coefficient of each term in the following algebraic expressions:

(i) 
$$4x^{2}y - (3/2)xy + 5/2 xy^{2}$$
  
(ii)  $-(5/3)x^{2}y + (7/4)xyz + 3$ 

# Solution:

The numerical coefficient of each term in the given algebraic expression is as follows.

	Term	Coefficient
(i)	4x2y	4
	$-rac{3}{2}xy$	$-\frac{3}{2}$
	$\frac{5}{2}xy2$	$\frac{5}{2}$
(ii)	$-rac{5}{3}x2y$	$-\frac{5}{3}$
	$rac{7}{4}xyz$	$\frac{7}{4}$
	3	3

Write the constant term of each of the following algebraic expressions:

(i) 
$$x^{2}y - xy^{2} + 7xy - 3$$
  
(ii)  $a^{3} - 3a^{2} + 7a + 5$ 

# Solution:

The constant term of each of the given algebraic expressions is as follows.

- (i) The constant term in the given algebraic expressions is -3.
- (ii) The constant term in the given algebraic expressions is 5.

# **Question: 11**

Evaluate each of the following expressions for x = -2, y = -1, z = 3:

(i) 
$$\frac{x}{y} + \frac{y}{z} + \frac{z}{x}$$

(ii) 
$$x^2 + y^2 + z^2 - xy - yz - zx$$

# Solution:

(i) 
$$\frac{x}{y} + \frac{y}{z} + \frac{z}{x} = \frac{-2}{-1} + \frac{-1}{3} + \frac{3}{-2} = \frac{12 - 2 - 9}{6} = \frac{1}{6}$$
  
(ii)  $(-2)^2 + y^2 + z^2 - xy - yz - zx$   
 $= (-2)^2 + (-1)^2 + (3)^2 - (-2)(-1) - (-1)(3) - (3)(-2)$   
 $= 4 + 1 + 9 - 2 + 3 + 6$   
 $= (4 + 1 + 9 + 3 + 6) - 2$   
 $= 23 - 2$   
 $= 21$ 

# **Question: 12**

Evaluate each of the following algebraic expressions for x = 1, y = -1, z = 2, a = -2, b = 1, c = -2: (i) ax + by + cz(ii)  $ax^2 + by^2 - cz$ 

(iii) axy + byz + cxy

# Solution:

We have x = 1, y = -1, z = 2, a = -2, b = 1 and c = -2.

Thus,

```
(i) ax + by + cz

= (-2)(1) + (1)(-1) + (-2)(2)

= -2 - 1 - 4

= -7

(ii) ax^{2} + by^{2} - cz

= (-2) × 1<sup>2</sup> + 1 × (-1)<sup>2</sup> - (-2) × 2

= 4 + 1 - (-4)

= 5 + 4

= 9

(iii) axy + byz + cxy

= (-2) × 1 × -1 + 1 × -1 × 2 + (-2) × 1 × (-1)

= 2 + (-2) + 2
```

= 2

= 4 - 2

### **Question: 1**

Simplify, the algebraic expressions by removing grouping symbols.

2x + (5x - 3y)

### Solution:

We have

2x + (5x - 3y)

Since the '+' sign precedes the parentheses, we have to retain the sign of each term in the parentheses when we remove them.

= 2x + 5x - 3y

= 7x – 3y

# Question: 2

Simplify, the algebraic expressions by removing grouping symbols.

3x - (y - 2x)

# Solution:

We have

3x - (y - 2x)

Since the '-' sign precedes the parentheses, we have to change the sign of each term in the parentheses when we remove them. Therefore, we have

3x - y + 2x

= 5x – y

# **Question: 3**

Simplify, the algebraic expressions by removing grouping symbols.

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

### Solution:

We have

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

Since the '-' sign precedes the parentheses, we have to change the sign of each term in the parentheses when we remove them.

= 5a - 3b + 2a - 4c

= 7a - 3b - 4c

# **Question: 4**

Simplify, the algebraic expressions by removing grouping symbols.

$$-2(x^{2} - y^{2} + xy) - 3(x^{2} + y^{2} - xy)$$

# Solution:

We have  $-2(x^{2} - y^{2} + xy) - 3(x^{2} + y^{2} - xy)$ 

Since the '-' sign precedes the parentheses, we have to change the sign of each term in the parentheses when we remove them. Therefore, we have

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

# **Question: 5**

Simplify, the algebraic expressions by removing grouping symbols.

 $3x + 2y - \{x - (2y - 3)\}$ 

# Solution:

We have

 $3x + 2y - \{x - (2y - 3)\}$ 

First, we have to remove the small brackets (or parentheses): ( ). Then, we have to remove the curly brackets (or braces): { }.

Therefore,

 $= 3x + 2y - \{x - 2y + 3\}$ = 3x + 2y - x + 2y - 3= 2x + 4y - 3

#### **Question: 6**

Simplify, the algebraic expressions by removing grouping symbols.

 $5a - {3a - (2 - a) + 4}$ 

# Solution:

We have

 $5a - {3a - (2 - a) + 4}$ 

First, we have to remove the small brackets (or parentheses): ( ). Then, we have to remove the curly brackets (or braces): { }.

Therefore,

- = 5a {3a 2 + a + 4} = 5a - 3a + 2 - a - 4 = 5a - 4a - 2
- = a 2

### **Question: 7**

Simplify, the algebraic expressions by removing grouping symbols.

 $a - [b - {a - (b - 1) + 3a}]$ 

#### Solution:

First we have to remove the parentheses, or small brackets, ( ), then the curly brackets, { }, and then the square brackets [ ].

Therefore, we have

 $a - [b - {a - (b - 1) + 3a}]$ = a - [b - {a - b + 1 + 3a}] = a - [b - {4a - b + 1}] = a - [b - 4a + b - 1] = a - [2b - 4a - 1] = a - 2b + 4a + 1

```
= 5a – 2b + 1
```

Simplify, the algebraic expressions by removing grouping symbols.

a - [2b - {3a - (2b - 3c)}]

### Solution:

First we have to remove the small brackets, or parentheses, ( ), then the curly brackets, { }, and then the square brackets, [ ].

Therefore, we have

a - [2b - {3a - (2b - 3c)}]

- = a [2b {3a 2b + 3c}]
- = a [2b 3a + 2b 3c]
- = a [4b 3a 3c]
- = a 4b + 3a + 3c
- = 4a 4b + 3c

# **Question: 9**

Simplify, the algebraic expressions by removing grouping symbols.

 $-x + [5y - {2x - (3y - 5x)}]$ 

### Solution:

First we have to remove the small brackets, or parentheses, ( ), then the curly brackets { }, and then the square brackets, [ ].

Therefore, we have

 $-x + [5y - {2x - (3y - 5x)}]$ = -x + [5y - {2x - 3y + 5x)] = -x + [5y - {7x - 3y}] = -x + [5y - 7x + 3y] = -x + [8y - 7x] = -x + 8y - 7x = -8x + 8y

### **Question: 10**

Simplify, the algebraic expressions by removing grouping symbols.

2a - [4b - {4a - 3(2a - b)}]

#### Solution:

First we have to remove the small brackets, or parentheses, ( ), then the curly brackets, { }, and then the square brackets, [ ].

Therefore, we have

 $2a - [4b - {4a - 3(2a - b)}]$ = 2a - [4b - {4a - 6a + 3b}] = 2a - [4b - {- 2a + 3b}] = 2a - [4b + 2a - 3b] = 2a - [b + 2a] = 2a - b - 2a = -b

### **Question: 11**

Simplify, the algebraic expressions by removing grouping symbols.

-a - [a + {a + b - 2a - (a - 2b)} - b]

### Solution:

First we have to remove the small brackets, or parentheses, ( ), then the curly brackets, { }, and then the square brackets, [ ].

Therefore, we have  $- a - [a + {a + b - 2a - (a - 2b)} - b]$   $= - a - [a + {a + b - 2a - a + 2b} - b]$   $= - a - [a + {- 2a + 3b} - b]$  = - a - [a - 2a + 3b - b] = - a - [- a + 2b] = - 2b

### **Question: 12**

Simplify, the algebraic expressions by removing grouping symbols.

 $2x - 3y - [3x - 2y - \{x - z - (x - 2y)\}]$ 

### Solution:

First we have to remove the small brackets, or parentheses, ( ), then the curly brackets, { }, and then the square brackets, [ ].

Therefore, we have

```
2x - 3y - [3x - 2y - \{x - z - (x - 2y)\})
= 2x - 3y - [3x - 2y - {x - z - x + 2y}]
= 2x - 3y - [3x - 2y - {- z + 2y}]
= 2x - 3y - [3x - 2y + z - 2y]
= 2x - 3y - [3x - 4y + z]
= 2x - 3y - 3x + 4y - z
= -x + y - z
```

#### **Question: 13**

Simplify, the algebraic expressions by removing grouping symbols.

 $5 + [x - \{2y - (6x + y - 4) + 2x\} - \{x - (y - 2)\}]$ 

#### Solution:

First we have to remove the small brackets, or parentheses, ( ), then the curly brackets, { }, and then the square brackets, [ ].

Therefore, we have

$$5 + [x - {2y - (6x + y - 4) + 2x} - {x - (y - 2)}]$$
  
= 5 + [x - {2y - 6x - y + 4 + 2x} - {x - y + 2}]  
= 5 + [x - {y - 4x + 4} - {x - y + 2}]  
= 5 + [x - y + 4x - 4 - x + y - 2]  
= 5 + [4x - 6]  
= 5 + 4x - 6  
= 4x - 1

# Question: 14

Simplify, the algebraic expressions by removing grouping symbols.

$$x^{2} - [3x + [2x - (x^{2} - 1)] + 2]$$

# Solution:

First we have to remove the small brackets, or parentheses, ( ), then the curly brackets, { }, and then the square brackets, [ ].

Therefore, we have

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

# Question: 15

Simplify, the algebraic expressions by removing grouping symbols.

 $20 - [5xy + 3]x^{2} - (xy - y) - (x - y)]]$ Solution:  $20 - [5xy + 3]x^{2} - (xy - y) - (x - y)]]$  $= 20 - [5xy + 3]x^{2} - xy + y - x + y]]$  $= 20 - [5xy + 3]x^{2} - xy + 2y - x]]$  $= 20 - [5xy + 3x^{2} - 3xy + 6y - 3x]$  $= 20 - [2xy + 3x^{2} + 6y - 3x]$  $= 20 - 2xy - 3x^{2} - 6y + 3x$  $= - 3x^{2} - 2xy - 6y + 3x + 20$ 

#### **Question: 16**

Simplify, the algebraic expressions by removing grouping symbols.

 $85 - [12x - 7(8x - 3) - 2\{10x - 5(2 - 4x)\}]$ 

#### Solution:

First we have to remove the small brackets, or parentheses, ( ), then the curly brackets, { }, and then the square brackets, [ ].

Therefore, we have

 $85 - [12x - 7(8x - 3) - 2\{10x - 5(2 - 4x)\}]$ =  $85 - [12x - 56x + 21 - 2\{10x - 10 + 20x\}]$ =  $85 - [12x - 56x + 21 - 2\{30x - 10\}]$ = 85 - [12x - 56x + 21 - 60x + 20]= 85 - [12x - 116x + 41]= 85 - [-104x + 41]= 85 + 104x - 41= 44 + 104x

#### Question: 17

Simplify, the algebraic expressions by removing grouping symbols.

 $xy[yz - zx - \{yx - (3y - xz) - (xy - zy)\}]$ 

### Solution:

First we have to remove the small brackets, or parentheses, ( ), then the curly brackets, { }, and then the square brackets, [ ].

Therefore, we have

 $xy - [yz - zx - {yx - (3y - xz) - (xy - zy)}]$ =  $xy - [yz - zx - {yx - 3y + xz - xy + zy}]$ =  $xy - [yz - zx - {-3y + xz + zy}]$ 

- = xy [yz zx + 3y xz zy]
- = xy [-zx + 3y xz]
- = xy [- 2zx + 3y]
- = xy + 2xz 3y

# Question: 1

Place the last two terms of the following expressions in parentheses preceded by a minus sign:

(i) x + y - 3z + y(ii) 3x - 2y - 5z - 4(iii) 3a - 2b + 4c - 5(iv) 7a + 3b + 2c + 4(v)  $2a^{2} - b^{2} - 3ab + 6$ (vi)  $a^{2} + b^{2} - c^{2} + ab - 3ac$ 

#### Solution:

We have

(i) x + y - 3z + y = x + y - (3z - y)(ii) 3x - 2y - 5z - 4 = 3x - 2y - (5z + 4)(iii) 3a - 2b + 4c - 5 = 3a - 2b - (-4c + 5)(iv) 7a + 3b + 2c + 4 = 7a + 3b - (-2c - 4)(v)  $2a^{2} - b^{2} - 3ab + 6 = 2a^{2} - b^{2} - (3ab - 6)$ (vi)  $a^{2} + b^{2} - c^{2} + ab - 3ac = a^{2} + b^{2} - c^{2} - (-ab + 3ac)$ 

# **Question: 2**

Write each of the following statements by using appropriate grouping symbols:

- (i) The sum of a b and 3a 2b + 5 is subtracted from 4a + 2b 7.
- (ii) Three times the sum of 2x + y [5 (x 3y)] and 7x 4y + 3 is subtracted from 3x 4y + 7

(iii) The subtraction of  $x^2 - y^2 + 4xy$  from  $2x^2 + y^2 - 3xy$  is added to  $9x^2 - 3y^2 - xy$ .

### Solution:

(i) The sum of a - b and 3a - 2b + 5 = [(a - b) + (3a - 2b + 5)].

This is subtracted from 4a + 2b - 7.

Thus, the required expression is (4a + 2b - 7) - [(a - b) + (3a - 2b + 5)]

(ii) Three times the sum of  $2x + y - \{5 - (x - 3y)\}$  and  $7x - 4y + 3 = 3[(2x + y - \{5 - (x - 3y)\}) + (7x - 4y + 3)]$ 

This is subtracted from 3x - 4y + 7.

Thus, the required expression is  $(3x - 4y + 7) - 3[(2x + y - {5 - (x - 3y)}) + (7x - 4y + 3)]$ (iii) The product of subtraction of  $x^2 - y^2 + 4xy$  from  $2x^2 + y^2 - 3xy$  is given by  $\{(2x^2 + y^2 - 3xy) - (x^2 - y^2 + 4xy)\}$ 

When the above equation is added to  $9x^2 - 3y^2 - xy$ , we get  $\{(2x^2 + y^2 - 3xy) - (x^2 - y^2 + 4xy)\} + (9x^2 - 3y^2 - xy)\}$ 

### **Question: 1**

Add the following:

(i) 3x and 7x

(ii) -5xy and 9xy

# Solution:

We have (i) 3x + 7x = (3 + 7) x = 10x (ii) -5xy + 9xy = (-5 + 9)xy = 4xy

# Question: 2

Simplify each of the following: (i)  $7x^{3}y + 9yx^{3}$ (ii)  $12a^{2}b + 3ba^{2}$ 

# Solution:

Simplifying the given expressions, we have (i)  $7x^{3}y + 9yx^{3} = (7 + 9)x^{3}y = 16x^{3}y$ (ii)  $12a^{2}b + 3ba^{2} = (12 + 3)a^{2}b = 15a^{2}b$ 

# **Question: 3**

Add the following:

(i) 7abc, -5abc, 9abc, -8abc (ii)  $2x^{2}y$ ,  $-4x^{2}y$ ,  $6x^{2}y$ ,  $-5x^{2}y$ 

# Solution:

Adding the given terms, we have

```
(i) 7abc + (-5abc) + (9abc) + (-8abc)
```

= 7abc - 5abc + 9abc - 8abc

= (7 - 5 + 9 - 8)abc

= (16 – 13)abc

= 3abc (ii)  $2x^{2}y + (-4x^{2}y) + (6x^{2}y) + (-5x^{2}y)$ =  $2x^{2}y - 4x^{2}y + 6x^{2}y - 5x2y$ =  $(2 - 4 + 6 - 5) \times 2y$ =  $(8 - 9) \times 2y$ =  $-x^{2}y$ 

# **Question: 4**

Add the following expressions: (i)  $x^{3}-2x^{2}y+3xy^{2}-y^{3}$ ,  $2x^{3}-5xy^{2}+3x^{2}y-4y^{3}$ 

(ii) 
$$a^4 - 2a^3b + 3ab^3 + 4a^2b^2 + 3b^4$$
,  $-2a^4 - 5ab^3 + 7a^3b - 6a^2b^2 + b^4$ 

#### Solution:

Adding the given expressions, we have

(i)  $x^{3}$  -2 $x^{2}y$  + 3 $xy^{2}$  -  $y^{3}$ , 2 $x^{3}$  - 5 $xy^{2}$  + 3 $x^{2}y$  - 4 $y^{3}$ 

Collecting positive and negative like terms together, we get

 $x^{3} + 2x^{3} - 2x^{2}y + 3x^{2}y + 3xy^{2} - 5xy^{2} - y^{3} - 4y^{3}$ =  $3x^{3} + x^{2}y - 2xy^{2} - 5y^{3}$ (ii)  $a^{4} - 2a^{3}b + 3ab^{3} + 4a^{2}b^{2} + 3b^{4}, -2a^{4} - 5ab^{3} + 7a^{3}b - 6a^{2}b^{2} + b^{4}$  $a^{4} - 2a^{3}b + 3ab^{3} + 4a^{2}b^{2} + 3b^{4} - 2a^{4} - 5ab^{3} + 7a^{3}b - 6a^{2}b^{2} + b^{4}$ 

Collecting positive and negative like terms together, we get

 $a^{4} - 2a^{4} - 2a^{3}b + 7a^{3}b + 3ab^{3} - 5ab^{3} + 4a^{2}b^{2} - 6a^{2}b^{2} + 3b^{4} + b^{4}$ = -  $a^{4} + 5a^{3}b - 2ab^{3} - 2a^{2}b^{2} + 4b^{4}$ 

### **Question: 5**

Add the following expressions:

(i) 8a - 6ab + 5b, -6a - ab - 8b and -4a + 2ab + 3b(ii)  $5x^3 + 7 + 6x - 5x^2$ ,  $2x^2 - 8 - 9x$ ,  $4x - 2x^2 + 3x + 3x^2 - 3x - 9x - x^2$  and  $x - x^2 - x^3 - 4$ 

### Solution:

(i) Required expression = (8a - 6ab + 5b) + (-6a - ab - 8b) + (-4a + 2ab + 3b)

Collecting positive and negative like terms together, we get

8a - 6a - 4a - 6ab - ab + 2ab + 5b - 8b + 3b

= 8a - 10a - 7ab + 2ab + 8b - 8b

= -2a - 5ab

(ii) Required expression =  $(5 \times 3 + 7 + 6x - 5x^2) + (2 \times 2 - 8 - 9x) + (4x - 2x^2 + 3 \times 3) + (3 \times 3 - 9x - x^2) + (x - x^2 - x^3 - 4)$ 

Collecting positive and negative like terms together, we get

 $5x^{3} + 3x^{3} + 3x^{3} - x^{3} - 5x^{2} + 2x^{2} - 2x^{2} - x^{2} + 6x - 9x + 4x - 9x + x + 7 - 8 - 4$ = 10x<sup>3</sup> - 7x<sup>2</sup> - 7x - 5

#### **Question: 6**

Add the following:

(i) x - 3y - 2z 5x + 7y - 8z 3x - 2y + 5z(ii) 4ab - 5bc + 7ca -3ab + 2bc - 3ca5ab - 3bc + 4ca

#### Solution:

(i) Required expression = (x - 3y - 2z) + (5x + 7y - 8z) + (3x - 2y + 5z)

Collecting positive and negative like terms together, we get

x + 5x + 3x - 3y + 7y - 2y - 2z - 8z + 5z

= 9x - 5y + 7y - 10z + 5z

= 9x + 2y - 5z

(ii) Required expression = (4ab - 5bc + 7ca) + (-3ab + 2bc - 3ca) + (5ab - 3bc + 4ca)

Collecting positive and negative like terms together, we get

4ab - 3ab + 5ab - 5bc + 2bc - 3bc + 7ca - 3ca + 4ca

= 9ab - 3ab - 8bc + 2bc + 11ca - 3ca

= 6ab - 6bc + 8ca

# **Question: 7**

Add  $2x^2$  - 3x + 1 to the sum of  $3x^2$  - 2x and 3x + 7.

# Solution:

Sum of  $3x^2 - 2x$  and 3x + 7=  $(3x^2 - 2x) + (3x + 7)$ =  $3x^2 - 2x + 3x + 7$ =  $(3x^2 + x + 7)$ Now, required expression =  $2x^2 - 3x + 1 + (3x^2 + x + 7)$ =  $2x^2 + 3x^2 - 3x + x + 1 + 7$ =  $5x^2 - 2x + 8$ 

# **Question: 8**

Add  $x^{2} + 2xy + y^{2}$  to the sum of  $x^{2} - 3y^{2}$  and  $2x^{2} - y^{2} + 9$ .

# Solution:

Sum of 
$$x^2 - 3y^2$$
 and  $2x^2 - y^2 + 9$   

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

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

$$= 3x^2 - 4y^2 + 9$$
Now, required expression =  $(x^2 + 2xy + y^2) + 3x^2 - 4y^2 + 9$ 

$$= x^2 + 3x^2 + 2xy + y^2 - 4y^2 + 9$$

$$= 4x^2 + 2xy - 3y^2 + 9$$

# **Question: 9**

Add  $a^{3} + b^{3} - 3$  to the sum of  $2a^{3} - 3b^{3} - 3ab + 7$  and  $-a^{3} + b^{3} + 3ab - 9$ .

# Solution:

First, we need to find the sum of  $2a^3 - 3b^3 - 3ab + 7$  and  $-a^3 + b^3 + 3ab - 9$ =  $(2a^3 - 3b^3 - 3ab + 7) + (-a^3 + b^3 + 3ab - 9)$ Collecting positive and negative like terms together, we get =  $2a^3 - a^3 - 3b^3 + b^3 - 3ab + 3ab + 7 - 9$ =  $a^3 - 2b^3 - 2$ Now, the required expression =  $(a^3 + b^3 - 3) + (a^3 - 2b^3 - 2)$ =  $a^3 + a^3 + b^3 - 2b^3 - 3 - 2$ =  $2a^3 - b^3 - 5$ 

# **Question: 10**

Subtract: (i) 7a<sup>2</sup>b from 3a<sup>2</sup>b (ii) 4xy from -3xy

# Solution:

(i) Required expression =  $3a^2b - 7a^2b$ =  $(3 - 7)a^2b$ =  $-4a^2b$ 

```
(ii) Required expression = -3xy - 4xy
```

= -7xy

# Question: 11

Subtract:

(i) - 4x from 3y

(ii) - 2x from - 5y

# Solution:

(i) Required expression = (3y) - (-4x)

= 3y + 4x

(ii) Required expression = (-5y) - (-2x)

= -5y + 2x

# Question: 12

Subtract: (i)  $6x^{3}-7x^{2}+5x-3$  from  $4-5x+6x^{2}-8x^{3}$ (ii)  $-x^{2}-3z$  from  $5x^{2}-y+z+7$ (iii)  $x^{3}+2x^{2}y+6xy^{2}-y^{3}$  from  $y^{3}-3xy^{2}-4x^{2}y$ 

# Solution:

(i) Required expression =  $(4 - 5x + 6x^2 - 8x^3) - (6x^3 - 7x^2 + 5x - 3)$ =  $4 - 5x + 6x^2 - 8x^3 - 6x^3 + 7x^2 - 5x + 3$ =  $-8x^3 - 6x^3 + 7x^2 + 6x^2 - 5x - 5x + 3 + 4$ =  $-14x^3 + 13x^2 - 10x + 7$ (ii) Required expression =  $(5x^2 - y + z + 7) - (-x^2 - 3z)$ =  $5x^2 - y + z + 7 + x^2 + 3z$ =  $5x^2 + x^2 - y + z + 3z + 7$ =  $6x^2 - y + 4z + 7$ (iii) Required expression =  $(y^3 - 3xy^2 - 4x^2y) - (x^3 + 2x^2y + 6xy^2 - y^3)$ =  $y^3 - 3xy^2 - 4x^2y - x^3 - 2x^2y - 6xy^2 + y^3$   $y^3 + y^3 - 3xy^2 - 6xy^2 - 4x^2y - 2x^2y - x^3$ =  $2y^3 - 9xy^2 - 6x^2y - x^3$ 

# **Question: 13**

From (i)  $p3 - 4 + 3p^{2}$ , take away  $5p^{2} - 3p^{3} + p - 6$ (ii)  $7 + x - x^{2}$ , take away  $9 + x + 3x^{2} + 7x^{3}$ (iii)  $1 - 5y^{2}$ , take away  $y^{3} + 7y^{2} + y + 1$ (iv)  $x^{3} - 5x^{2} + 3x + 1$ , take away  $6x^{2} - 4x^{3} + 5 + 3x$ 

# Solution:

(i) Required expression =  $(p^3-4+3p^2)-(5p^2-3p^3+p-6)$  $= p^3 - 4 + 3p^2 - 5p^2 + 3p^3 - p + 6$  $= p^3 + 3p^3 + 3p^2 - 5p^2 - p - 4 + 6$  $=4p^{3}-2p^{2}-p+2$ (ii) Required expression =  $(7 + x - x^2) - (9 + x + 3x^2 + 7x^3)$  $= 7 + x - x^2 - 9 - x - 3x^2 - 7x^3$  $=-7x^3-x^2-3x^2+7-9$  $= -7x^3 - 4x^2 - 2$ (iii) Required expression =  $(1 - 5y^2) - (y^3 + 7y^2 + y + 1)$  $= 1 - 5y^2 - y^3 - 7y^2 - y - 1$  $= -y^3 - 5y^2 - 7y^2 - y$  $= -y^3 - 12y^2 - y$ (iv) Required expression =  $(x^3 - 5x^2 + 3x + 1) - (6x^2 - 4x^3 + 5 + 3x)$  $=x^{3}-5x^{2}+3x+1-6x^{2}+4x^{3}-5-3x$  $=x^{3}+4x^{3}-5x^{2}-6x^{2}+1-5$  $=5x^3-11x^2-4$ 

# Question: 14

From the sum of  $3x^2 - 5x + 2$  and  $-5x^2 - 8x + 9$  subtract  $4x^2 - 7x + 9$ .

### Solution:

Required expression = 
$$[(3x^2 - 5x + 2) + (-5x^2 - 8x + 9)] - (4x^2 - 7x + 9)$$
  
=  $[3x^2 - 5x + 2 - 5x^2 - 8x + 9] - (4x^2 - 7x + 9)$   
=  $[3x^2 - 5x^2 - 5x - 8x + 2 + 9] - (4x^2 - 7x + 9)$   
=  $[-2x^2 - 13x + 11] - (4x^2 - 7x + 9)$   
=  $-2x^2 - 13x + 11 - 4x^2 + 7x - 9$   
=  $-2x^2 - 4x^2 - 13x + 7x + 11 - 9$   
=  $-6x^2 - 6x + 2$ 

## **Question: 15**

Subtract the sum of 13x - 4y + 7z and -6z + 6x + 3y from the sum of 6x - 4y - 4z and 2x + 4y - 7.

# Solution:

Sum of (13x - 4y + 7z) and (-6z + 6x + 3y)= (13x - 4y + 7z) + (-6z + 6x + 3y)= (13x - 4y + 7z - 6z + 6x + 3y)= (13x + 6x - 4y + 3y + 7z - 6z)= (19x - y + z)Sum of (6x - 4y - 4z) and (2x + 4y - 7)= (6x - 4y - 4z) + (2x + 4y - 7)= (6x - 4y - 4z + 2x + 4y - 7)= (6x + 2x - 4z - 7)= (6x - 4z - 7)Now, required expression = (8x - 4z - 7) - (19x - y + z)= 8x - 4z - 7 - 19x + y - z= 8x - 19x + y - 4z - z - 7= -11x + y - 5z - 7

From the sum of  $x^2 + 3y^2 - 6xy$ ,  $2x^2 - y^2 + 8xy$ ,  $y^2 + 8$  and  $x^2 - 3xy$  subtract  $-3x^2 + 4y^2 - xy + x - y + 3$ .

# Solution:

Sum of  $(x^2 + 3y^2 - 6xy)$ ,  $(2x^2 - y^2 + 8xy)$ ,  $(y^2 + 8)$  and  $(x^2 - 3xy)$ =  $(x^2 + 3y^2 - 6xy) + (2x^2 - y^2 + 8xy) + (y^2 + 8) + (x^2 - 3xy)$ =  $(x^2 + 3y^2 - 6xy + 2x^2 - y^2 + 8xy + y^2 + 8 + x^2 - 3xy)$ =  $(x^2 + 2x^2 + x^2 + 3y^2 - y^2 + y^2 - 6xy + 8xy - 3xy + 8)$ =  $(4x^2 + 3y^2 - xy + 8)$ Now, required expression =  $(4x^2 + 3y^2 - xy + 8) - (-3x^2 + 4y^2 - xy + x - y + 3)$ =  $4x^2 + 3y^2 - xy + 8 + 3x^2 - 4y^2 + xy - x + y - 3$ =  $4x^2 + 3x^2 + 3y^2 - 4y^2 - xy + xy - x + y - 3 + 8$ =  $7x^2 - y^2 - x + y + 5$ 

# Question: 17

What should be added to xy - 3yz + 4zx to get 4xy - 3zx + 4yz + 7?

### Solution:

The required expression can be got by subtracting xy - 3yz + 4zx from 4xy - 3zx + 4yz + 7.

Therefore, required expression = (4xy - 3zx + 4yz + 7) - (xy - 3yz + 4zx)

- = 4xy 3zx + 4yz + 7 xy + 3yz 4zx
- = 4xy xy 3zx 4zx + 4yz + 3yz + 7
- = 3xy 7zx + 7yz + 7

### Question: 18

What should be subtracted from  $x^2 - xy + y^2 - x + y + 3$  to obtain  $-x^2 + 3y^2 - 4xy + 1$ ?

### Solution:

Let 'M' be the required expression. Then, we have

$$x^2 - xy + y^2 - x + y + 3 - M = -x^2 + 3y^2 - 4xy + 1$$

Therefore,

$$egin{aligned} M &= (x^2 - xy + y^2 - x + y + 3) - (-x^2 + 3y^2 - 4xy + 1) \ &= x^2 - xy + y^2 - x + y + 3 + x^2 - 3y^2 + 4xy - 1 \end{aligned}$$

Collecting positive and negative like terms together, we get

$$egin{aligned} &x^2+x^2-xy+4xy+y^2-3y^2-x+y+3-1\ &=2x^2+3xy-2y^2-x+y+2 \end{aligned}$$

### Question: 19

How much is x - 2y + 3z greater than 3x + 5y - 7?

### Solution:

Required expression = (x - 2y + 3z) - (3x + 5y - 7)

Collecting positive and negative like terms together, we get

x - 3x - 2y + 5y + 3z + 7= -2x - 7y + 3z + 7

How much is  $x^2 - 2xy + 3y^2$  less than  $2x^2 - 3y^2 + xy$ ?

# Solution:

Required expression = 
$$(2x^2 - 3y^2 + xy) - (x^2 - 2xy + 3y^2)$$
  
=  $2x^2 - 3y^2 + xy - x^2 + 2xy - 3y^2$ 

Collecting positive and negative like terms together, we get

$$egin{aligned} & 2x^2-x^2-3y^2-3y^2+xy+2xy\ & x^2-6y^2+3xy \end{aligned}$$

# Question: 21

How much does  $a^2 - 3ab + 2b^2$  exceed  $2a^2 - 7ab + 9b^2$ ?

#### Solution:

Required expression =  $(a^2 - 3ab + 2b^2) - (2a^2 - 7ab + 9b^2)$ =  $a^2 - 3ab + 2b^2 - 2a^2 + 7ab - 9b^2$ Collecting positive and negative like terms together, we get =  $a^2 - 2a^2 - 3ab + 7ab + 2b^2 - 9b^2$ =  $-a^2 + 4ab - 7b^2$ 

# Question: 22

What must be added to  $12x^3 - 4x^2 + 3x - 7$  to make the sum  $x^3 + 2x^2 - 3x + 2?$ 

## Solution:

Let 'M' be the required expression. Thus, we have

$$12x^3 - 4x^2 + 3x - 7 + M = x^3 + 2x^2 - 3x + 2$$

Therefore,

$$egin{aligned} M &= (x^3+2x^2-3x+2) ext{-}(12x^3-4x^2+3x-7) \ M &= x^3+2x^2-3x+2-12x^3+4x^2-3x+7 \end{aligned}$$

Collecting positive and negative like terms together, we get

$$egin{aligned} M &= x^3 - 12x^3 + 2x^2 + 4x^2 - 3x - 3x + 7 + 2\ x^3 - 12x^3 + 2x^2 + 4x^2 - 3x - 3x + 7 + 2\ &= -11x^3 + 6x^2 - 6x + 9 \end{aligned}$$

Question: 23  
If P = 
$$7x^2 + 5xy - 9y^2$$
, Q =  $4y^2 - 3x^2 - 6xy$  and R =  $-4x^2 + xy + 5y^2$ , show that P + Q + R = 0

# Solution:

We have  
P + Q + R = 
$$(7x^2 + 5xy - 9y^2)$$
 +  $(4y^2 - 3x^2 - 6xy)$  +  $(-4x^2 + xy + 5y^2)$   
=  $7x^2 + 5xy - 9y^2 + 4y^2 - 3x^2 - 6xy - 4x^2 + xy + 5y^2$ 

Collecting positive and negative like terms together, we get

$$7x^2 - 3x^2 - 4x^2 + 5xy - 6xy + xy - 9y^2 + 4y^2 + 5y^2$$
  
=  $7x^2 - 7x^2 + 6xy - 6xy - 9y^2 + 9y^2$ 

If  $P = a^2 - b^2 + 2ab$ ,  $Q = a^2 + 4b^2 - 6ab$ ,  $R = b^2 + b$ ,  $S = a^2 - 4ab$  and  $T = -2a^2 + b^2 - ab + a$ . Find P + Q + R + S - T.

# Solution:

We have

$$\begin{array}{l} P+Q+R+S-T=[(a^2-b^2+2ab)+(a^2+4b^2-6ab)+(b^2+b)\\ +(a^2-4ab)]-(-2a^2+b^2-ab+a)\\ =[a^2-b^2+2ab+a^2+4b^2-6ab+b^2+b+a^2-4ab]\\ -(-2a^2+b^2-ab+a)\\ =[3a^2+4b^2-8ab+b]-(-2a^2+b^2-ab+a)\\ =3a^2+4b^2-8ab+b+2a^2-b^2+ab-a \end{array}$$

Collecting positive and negative like terms together, we get