# **Chapter 3**

# Algebra

## Ex 3.1

Question 1.

## Fill in the blanks

(i) The variable in the expression 16x - 7 is \_\_\_\_\_
(ii) The constant term of the expression 2y - 6 is \_\_\_\_\_\_
(iii) In the expression 25m + 14M, the type of the terms are \_\_\_\_\_\_ terms
(iv) The number of terms in the expression 3ab + 4c - 9 is \_\_\_\_\_\_
Hint: Terms are 3ab, 4c - 9.
(v) The numerical co-efficient of the term -xy is \_\_\_\_\_\_
Hint: -x,y = (-1)xy.

## Solution:

(i) x (ii) -6 (iii) unlike (iv) three (v) -1

# Question 2.

Say true or False (i) x + (-x) = 0. (ii) The co-efficient of ab in the term 15 abc is 15. Hint: Coefficient of ab is 15c (iii) 2pq and – 7qp are like terms. (iv) When y = -1, the value of the expression 2y - 1 is 3. Hint: 2(-1) - 1 = -2 - 1 = -3

# Solution:

(i) True(ii) False(iii) True(iv) False

# Question 3.

Fing the numerical co-efficient of each of the following terms: -3yx, 12k, y, 121bc, -x, 9pq, 2ab.

## Solution:

(i) Numerical co-efficient of-3yx is - 3
(ii) Numerical co-efficient of 12k is 12
(iii) Numerical coefficient of y is 1
(iv) Numerical co-efficient of 1216c is 121
(v) Numerical co-efficient of - x is - 1
(vi) Numerical co-efficient of 9pg is 9

(vii) Numerical co-efficient of 2ab is 2

# Question 4.

Write the variables, constants and terms of the following expressions,

(i) 18 + x - y(ii) 7p - 4q + 5(iii) 29x + 13y(iv) b + 2

## Solution:

S. No	Expression	Variables	Constant	Terms
(i)	18 + x - y	x, y	18	18, x, -y
(ii)	7p - 4q + 5	<i>p</i> , <i>q</i>	5	7p, -4q, 5
(iii)	29x + 13y	<i>x</i> , <i>y</i>	0	29x, 13y
(iv)	<i>b</i> + 2	b	Z	<i>b</i> , 2

Question 5.

Identify the like terms among the following 7x, 5y, -8x, 12y, 6z, z, -12x, -9y, 11 z

Solution:

x-terms	y-terms	z-terms
7 <i>x</i>	5y	6z
-8x	12y	Z
-12x	- 9y	11 <i>z</i>

Question 6.

If x = 2 and y = 3, then find the value of the following expressions,

(i) 2x - 3y

(ii) x + y

(iii) 4y - x

(iv) x + 1 - y

#### Solution:

Given x = 2; y = 3. (i) 2x - 3y = 2(2) - 3(3) = 4 - 9 = 4 + (Additive inverse of 9) = 4 + (-9) = -5(ii) x + y = 2 + 3 = 5(iii) 4y - x = 4(3) - 2 = 12 - 2 = 10(iv) x + 1 - y = 2 + 1 - 3 = 3 - 3 = 0

#### **Objective Type Questions**

#### Question 1.

An algebraic statement which is equivalent to the verbal statement "Three times the sum of 'x' and 'y' is

(i) 3(x + y)(ii) 3 + x + y(iii) 3x + y(iv) 3 + xy

## Solution:

(i) 3[(x + y)]

#### Question 2.

The numerical co-efficient of -7mn is (i) 7 (ii) -7 (iii) p

(iv) -p

#### Solution:

(ii) -7

**Question 3. Choose the pair of like terms** (i) 7p, 7x (ii) 7r, 7x (iii) – 4x, 4 (iv) – 4x, 7x

### Solution:

(iv) -4x, 7x

## Question 4. The value of 7a – 4b when a = 3, b = 2 is (i) 21 (ii) 13 (iii) 8 (iv) 32

# Solution:

(ii) 13 Hint: 7(3) - 4(2) = 21 - 8 = 13

# Ex 3.2

# Question 1.

# Fill in the blanks

(i) The addition of – 7b and 2b is \_\_\_\_\_
(ii) The subtraction of 5m from -3m is \_\_\_\_\_
(iii) The additive inverse of -37xyz is \_\_\_\_\_

## Solution:

(i) -5b (ii) -8m (iii) 37xyz

# Question 2.

Say True or False (i) The expressions 8x + 3y and 7x + 2y cannot be added (ii) If x is a natural number, then x + 1 is its predecessor. Hint: x - 1 is its predecessor. (iii) Sum of a - b + c and -a + b - c is zero

# Solution:

(i) False (ii) False (iii) True

Question 3. Add: (i) 8x, 3x (ii) 7mn, 5mn (iii) -9y, 11y, 2y

# Solution:

(i) 8x + 3x = (8 + 3) x = 11x(ii) 7mn + 5mn = (7 + 5)mn = 12mn(iii) -9y + 11y + 2y = (-9 + 11 + 2)y = (2 + 2)y = 4y

Question 4. Subtract: (i) 4k from 12k (ii) 15q from 25q (iii) 7xyz from 17xyz

#### Solution:

(i) 4k from 12k
12k - 4k = (12 - 4) k = 8k
(ii) 15q from 25q
25q - 15q = (25 - 15)q = 10q
(iii) 7xyz from 17xyz
17xyz - 7xyz = (17 - 7)xyz = 10xyz

Question 5. Find the sum of the following expressions (i) 7p + 6q, 5p - q, q + 16p

Solution: (7p + 6q) + (5p - q) + (q + 16p) = 7p + 6q + 5p - q + q + 16p = (7p + 5p + 16p) + (6q - q + q) = (7 + 5 + 16) p + (6 - 1 + 1) q= (12 + 16) p + 6q = 28p + 6q

(ii) a + 5b + 7c, 2a + 106 + 9c

Solution: (a + 5b + 7c) + (2a + 10b + 9c) = a + 5b + 7c + 2a + 10b + 9c = a + 2a + 5b + 10b + 7c + 9c = (1 + 2)a + (5 + 10)b + (7 + 9)c= 3a + 15b + 16c

#### (iii) mn + t, 2mn – 2t, – 3t + 3mn

Solution: (mn + t) + (2mn - 2t) + (-3t + 3mn) = mn + t + 2mn - 2t + (-3t) + 3mn = (mn + 2mn + 3mn) + (t - 2t - 3t) = (1 + 2 + 3) mn + (1 - 2 - 3) t= 6mn + (1 - 5)t = 6mn + (-4) t= 6mn - 4t

(iv) u + v, u - v, 2u + 5v, 2u - 5v

#### Solution:

(u + v) + (u - v) + (2u + 5v) + (2u - 5v)= u + v + u - v + 2u + 5v + 2u - 5v = u + u + 2u + 2u + v - v + 5v - 5v = (1 + 1 + 2 + 2) u + (1 - 1 + 5 - 5)v = 6u + 0v = 6u

(v) 5xyz – 3xy, 3zxy – 5yx

#### Solution:

5xyz - 3xy + 3zxy - 5yx = 5xyz + 3xyz - 3xy - 5xy= (5 + 3) xyz + [(-3) + (-5)] xy = 8xyz + (-8) xy= 8xyz - 8xy

Question 6. Subtract (i) 13x + 12y - 5 from 27x + 5y - 43

#### Solution:

27x + 5y - 43 - (13x + 12y - 5) = 27z + 5y - 43 + (-13x - 12y + 5)= 27x + 5y - 43 - 13x - 12y + 5 = (27 - 13) x + (5 - 12)y + (-43) + 5 = 14x + (-7) y + (-38) = 14x - 7y - 38

(ii) 3p + 5 from p - 2q + 7

Solution: p - 2q + 7 - (3p + 5) = p - 2q + 7 + (-3p - 5) = p - 2q + 7 - 3p - 5 = p - 3p - 2q + 7 - 5= (1 - 3)p - 2q + 2 = -2p - 2q + 2

(iii) m + n from 3m - 7n

Solution: 3m - 7n - (m + n) = 3m - 7n + (-m - n) = 3m - 7n - m - n = (3m - m) + (-7n - n) = (3 - 1)m + (-7 - 1)n = 2m + (-8)n= 2m - 8n (iv) 2y + z from 6z - 5y

Solution: 6z - 5y - (2y + z) = 6z - 5y + (-2y - z) = 6z - 5y - 2y - z = 6z - z - 5y - 2y = (6 - 1) z + (-5 - 2) y = 5z + (-7) y= 5z - 7y = -7y + 5z

Question 7. Simplify (i) (x + y - z) + (3x - 5y + 7z) - (14x + 7y - 6z)

#### Solution:

(x + y - z) + (3x - 5y + 7z) - (14x - 7y - 6z)= (x + y - z) + (3x - 5y + 7z) + (-14x - 7y + 6z) = (x + 3x - 14x) + (y - 5y - 7y) + (-z + 7z + 6z) = (1 + 3 - 14) x + (1 - 5 - 7)y + (-1 + 7 + 6) z = -10x - 11y + 12z

(ii) p + p + 2 + p + 3 + p - 4 - p - 5 + p + 10

Solution:

p + p + 2 + 3 - p - 4 - p - 5 + p + 10 = (p + p + p - p - p + p) + (2 + 3 - 4 - 5 + 10)= (1 + 1 + 1 - 1 - 1 + 1) p + 6 = 2p + 6

(iii) n + (m + 1) + (n + 2) + (m + 3) + (n + 4) + (m + 5)

#### Solution:

n + (m + 1) + (n + 2) + (m + 3) + (n + 4) + (m + 5)= n + m + 1 + n + 2 + m + 3 + n + 4 + m + 5 = n + n + n + m + m + 1 + 2 + 3 + 4 + 5 = (1 + 1 + 1)n + (1 + 1 + 1)m + 15 = 3n + 3m + 15 = 3m + 3n + 15

**Objective Type Questions** 

Question 8. The addition of 3mn, -5mn, 8mn and – 4mn is (i) mn (ii) – mn (iii) 2mn (iv) 3mn

### Solution:

(iii) 2mnHint: = 3mn + 8mn - 5mn - 4mn = 11mn - 9mn = 2mn

### Question 9.

When we subtract 'a' from '-a', we get \_\_\_\_\_

(i) a (ii) 2a (iii) -2a (iv) -a

## Solution:

(iii) -2a Hint: – a – a = – 2a

## Question 10.

In an expression, we can add or subtract only \_\_\_\_\_ (i) like terms (ii) unlike terms (iii) all terms (iv) None of the above

#### Solution:

(i) like terms

# Ex 3.3

Question 1.
Fill in the blanks.
(i) An expressions equated to another expression is called \_\_\_\_\_\_.
(ii) If a = 5, the value of 2a + 5 is \_\_\_\_\_\_.
(iii) The sum of twice and four times of the variable x is \_\_\_\_\_.

#### Solution: (i) an equation (ii) 15 (iii) 6x

Question 2:
Say True or False

(i) Every algebraic expression is an equation.
(ii) The expression 7x + 1 cannot be reduced without knowing the value of x.
(iii) To add two like terms, its coefficients can be added.

Solution: (i) False (ii) True (iii) True Question 3. Solve (i) x + 5 = 8(ii) p - 3 = 1(iii) 2x = 30(iv) m6 = 5(v) 7x + 10 = 80Solution: (i) Given x + 5 = 8; Subtracting 5 on both the sides x + 5 - 5 = 8 - 5x = 3(ii) Given p - 3 = 7; Adding 3 on both the sides, p - 3 + 3 = 7 + 3p = 10(iii) Given 2x = 30; Dividing both the sides by 2, 2x2=302 x = 15(iv) Given m6 = 5; Multiplying both the sides by 6,  $m6 \times 6 = 5 \times 6$ m = 30(v) Given 7x + 10 = 80; Subtracting 10 from both the sides, 7x + 10 - 10 = 80 - 107x = 70Dividing both sides by 7, 7x7=707 x = 10**Question 4.** 

What should be added to 3x + 6y to get 5x + 8y?

#### Solution:

To get the expression we should subtract 3x + 6y from 5x + 8y5x + 8y - (3x + 6y) = 5x + 8y + (-3x - 6y)= 5x + 8y - 3x - 6y = (5 - 3) x + (8 - 6) y = 2x + 2ySo 2x + 2y should be added.

# Question 5.

Nine added to thrice a whole number gives 45. Find the number

# Solution:

Let the whole number required be x. Thrice the whole number = 3xNine added to it = 3x + 9Given 3x + 9 = 45 3x + 9 - 9 = 45 - 9 [Subtracting 9 on both sides] 3x = 36 3x3=363 x = 12 $\therefore$  The required whole number is 12

## Question 6. Find the two consecutive odd numbers whose sum is 200

# Solution:

Let the two consecutive odd numbers be x and x + 2  $\therefore$  Their sum = 200 x + (x + 2) = 200 x + x + 2 = 200 2x + 2 = 200 2x + 2 - 2 = 200 - 2 [ $\because$  Subtracting 2 from both sides] 2x = 198 2x2=1982 [Dividing both sides by 2] x = 99The numbers will be 99 and 99 + 2.  $\therefore$  The numbers will be 99 and 101.

# Question 7.

The taxi charges in a city comprise of a fixed charge of ₹ 100 for 5 kms and ₹ 16 per km for ever additional km. If the amount paid at the end of the trip was ₹ 740, find the distance traveled.

# Solution:

Let the distance travelled by taxi be 'x' km For the first 5 km the charge = ₹ 100For additional kms the charge = ₹ 16(x - 5) $\therefore$  For x kms the charge = 100 + 16(x - 5)Amount paid = ₹ 740  $\therefore 100 + 16 (x - 5) = 740$  100 + 16 (x - 5) - 100 = 740 - 100 16 (x - 5) = 640 16(x - 5) 16 = 64016 x - 5 = 40 x - 5 + 5 = 45 + 5 x = 45 x = 45 km  $\therefore$  Total distance travelled = 45 km

#### **Objective Type Questions**

Question 8. The generalization of the number pattern 3, 6, 9, 12, ..... is (i) n (ii) 2n (iii) 3n (iv) 4n

#### Solution:

(iii) 3n

Question 9. The solution of 3x + 5 = x + 9 is t (i) 2 (ii) 3 (iii) 5 (iv)4

#### Solution:

(i) 2 Hint:  $3x + 5 = x + 9 \Rightarrow 3x - x = 9 - 5 \Rightarrow 2x = 4 \Rightarrow x = 2$ 

#### Question 10.

The equation y + 1 = 0 is true only when y is (i) 0 (ii) -1 (iii) 1 (iv) - 2

### Solution:

(ii) -1

# Ex 3.4

**Miscellaneous Practice Problems** 

Question 1. Subtract – 3ab – 8 from 3ab – 8. Also subtract 3ab + 8 from -3ab – 8.

Solution: Subtracting -3ab - 8 from 3ab + 8= 3ab + 8 - (-3ab - 8) = 3ab + 8 + (3ab + 8)= 3ab + 8 + 3ab + 8 = (3 + 3) ab + (8 + 8)= 6ab + 16Also subtracting 3 ab + 8 from - 3ab - 8= - 3ab - 8 - (3ab + 8) = - 3ab - 8 + (-3ab - 8) = - 3ab - 8 - 3 ab - 8= [(-3) + (-3)] ab + [(-8) + (-8)] = - 6ab + (-16)= -6ab - 16

Question 2. Find the perimeter of a triangle whose sides are x + 3y, 2x + y, x – y.

Solution: Perimeter of a triangle = Sum of three sides = (x + 3y) + (2x + y) + (x - y)= x + 3y + 2x + y + x - y= (1 + 2 + 1)x + (3 + 1 + (-1))y = 4x + 3y $\therefore$  Perimeter of the triangle = 4x + 3y

Question 3.

Thrice a number when increased by 5 gives 44. Find the number.

Solution:

Let the required number be x. Thrice the number = 3x. Thrice the number increased by 4 = 3x + 5Given 3x + 5 = 44 3x + 5 - 5 = 44 - 5 3x = 39 3x3=393 x = 13 $\therefore$  The required number = 13 Question 4. How much smaller is 2ab + 4b - c than 5ab - 3b + 2c.

# Solution:

To find the answer we have to find the difference. Here greater number 5ab - 3ab + 2c.  $\therefore$  Difference = 5ab - 3b + 2c - (2ab + 4b - c) = 5ab - 3b + 2c + (-2ab - 4b + c)= 5ab - 3b + 2c - 2ab - 4b + c= (5 - 2) ab + (-3 - 4) b + (2 + 1) c = 3ab + (-7)b + 3c= 3ab - 7b + 3cIt is 3ab - 7b + 3c smaller.

# Question 5. Six times a number subtracted from 40 gives – 8. Find the number.

Solution: Let the required number be x. Six times the number = 6x. Given 40 - 6x = -8 -6x + 40 - 40 = -8 - 40 -6x = -48 -6x-6=-48-6 x = 8 $\therefore$  The required number is 8.

# **Challenge Problems**

Question 6. From the sum of 5x + 7y - 12 and 3x - 5y + 2, subtract the sum of 2x - 7y - 1 and - 6x + 3y + 9.

Solution: Sum of 5x + 7y - 12 and 3x - 5y + 2. = 5x + 7y - 12 + 3x - 5y + 2 = (5 + 3) x + (7 - 5) y + ((-12) + 2) = 8x + 2y - 10. Again Sum of 2x - 7y - 1 and - 6x + 3y + 9 = 2x - 7y - 1 + (-6x + 3y + 9) = 2x - 7y - 1 - 6x + 3y + 9 = (2 - 6) x + (-7 + 3) y + (-1 + 9) = -4x - 4y + 8Now 8x + 2y - 10 - (-4x - 4y + 8) = 8x + 2y - 10 + (4x + 4y - 8)= 8x + 2y - 10 + 4x + 4y - 8 = (8 + 4) x + (2 + 4) y + ((-10) + (-8))= 12x + 6y - 18

Question 7. Find the expression to be added with 5a - 3b - 2c to get a - 4b - 2c?

## Solution:

To get the required expression we must subtract 5a - 3b + 2c from a - 4b - 2c.  $\therefore a - 4b - 2c - (5a - 3b + 2c) = a - 4b - 2c + (-5a + 3b - 2c)$  = a - 4b - 2c - 5a + 3b - 2c = (1 - 5) a + (-4 + 3) b + (-2 - 2) c = -4a - b - 4c.  $\therefore -4a - b - 4c$  must be added.

Question 8. What should be subtracted from 2m + 8n + 10 to get – 3m + 7n + 16?

Solution:

To get the expression we have to subtract -3m + 7n + 16 from 2m + 8n + 10. (2m + 8n + 10) - (-3m + 7n + 16) = 2m + 8n + 10 + 3m - 7n - 16 = (2 + 3) m + (8 - 7) n + (10 - 16)= 5m + n - 6

Question 9. Give an algebraic equation for the following statement: "The difference between the area and perimeter of a rectangle is 20".

Solution: Let the length of a rectangle = l and breadth = b then Area = lb; Perimeter = 2(1 + b)Area - Perimeter = 20 $\therefore$  lb - 2(l + b)

Question 10. Add : 2a + b + 3c and a + 13b + 25c Solution:

Solution:  

$$2a + b + 3c + \left(a + \frac{1}{3}b + \frac{2}{5}c\right) = 2a + b + 3c + a + \frac{1}{3}b + \frac{2}{5}c$$

$$= (2 + 1)a + \left(1 + \frac{1}{3}\right)b + \left(3 + \frac{2}{5}\right)c$$

$$= 3a + \left(\frac{3}{3} + \frac{1}{3}\right)b + \left(\frac{15}{5} + \frac{2}{5}\right)c$$

$$= 3a + \frac{4}{3}b + \frac{17}{5}c$$