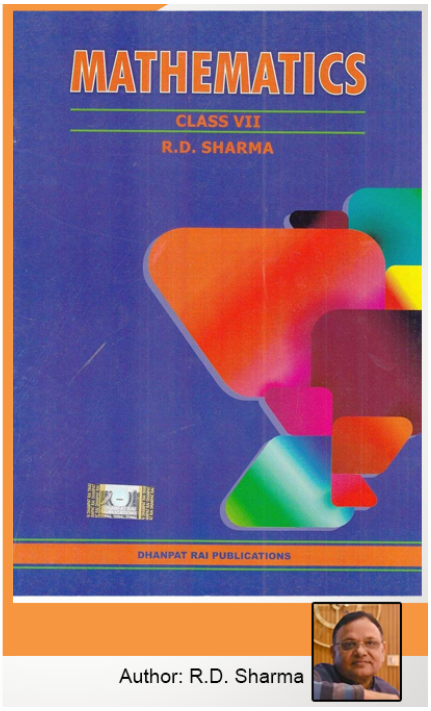
Class 7 - Chapter 7 Algebraic Expressions



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Exercise 7.1 Page No: 7.7

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) a b c + 1

(vii) 3x – 2 + 5

(viii) 2x – 3y + 4

(ix) x y + y z + z x

(x) $ax^3 + bx^2 + cx + d$

Solution:

(i) Given a^2

a^2 is a monomial expression because it contains only one term

(ii) Given $a^2 - b^2$

$a^2 - b^2$ is a binomial expression because it contains two terms

(iii) Given $x^3 + y^3 + z^3$

$x^3 + y^3 + z^3$ is a trinomial because it contains three terms

(iv) Given $x^3 + y^3 + z^3 + 3xyz$

$x^3 + y^3 + z^3 + 3xyz$ is a quadrinomial expression because it contains four terms

(v) Given 7 + 5

7 + 5 is a monomial expression because it contains only one term

(vi) Given a b c + 1

a b c + 1 is a binomial expression because it contains two terms

(vii) Given 3x – 2 + 5

3x – 2 + 5 is a binomial expression because it contains two terms

(viii) Given 2x – 3y + 4

2x – 3y + 4 is a trinomial because it contains three terms

(ix) Given x y + y z + z x

x y + y z + z x is a trinomial because it contains three terms

(x) Given $ax^3 + bx^2 + cx + d$

$ax^3 + bx^2 + cx + d$ is a quadrinomial expression because it contains four terms

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:

(i) Given 3x

3x is the only term of the given algebraic expression.

(ii) Given 2x – 3

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

(iii) Given $2x^2 - 7$

$2x^2$ and −7 are the terms of the given algebraic expression.

(iv) Given $2x^2 + y^2 - 3xy + 4$

$2x^2$, y^2, −3xy and 4 are the terms of the given algebraic expression.

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

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

(ii) $7a^2bc, -3ca^2b, -(5/2)\ abc^2, 3/2abc^2, (-4/3)cba^2$

Solution:

(i) Like terms 4xy, -3yx and Numerical coefficients 4, -3

(ii) Like terms ($7a^2bc$, $-3ca^2b$) and ($-4/3cba^2$) and their Numerical coefficients 7, -3,

(-4/3)

Like terms are ($-5/2abc^2$) and ($3/2\ abc^2$) and numerical coefficients are (−5/2) and (3/2)

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) $abc + ab^2c + 2acb^2 + 3c^2ab + b^2ac - 2a^2bc + 3cab^2$

Solution:

(i) Given $a^2 + b^2 - 2a^2 + c^2 + 4a$

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

(ii) Given $3x + 4xy - 2yz + 52zy$

The like terms in the given algebraic expressions are -2yz and 52zy.

(iii) Given $abc + ab^2c + 2acb^2 + 3c^2ab + b^2ac - 2a^2bc + 3cab^2$

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

5. Write the coefficient of x in the following:

(i) –12x

(ii) –7xy

(iii) xyz

(iv) –7ax

Solution:

(i) Given -12x

The numerical coefficient of x is -12.

(ii) Given -7xy

The numerical coefficient of x is -7y.

(iii) Given xyz

The numerical coefficient of x is yz.

(iv) Given -7ax

The numerical coefficient of x is -7a.

6. Write the coefficient of x^2 in the following:

(i) $-3x^2$

(ii) $5x^2yz$

(iii) $5/7x^2z$

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

Solution:

(i) Given $-3x^2$

The numerical coefficient of x^2 is -3.

(ii) Given $5x^2yz$

The numerical coefficient of x^2 is 5yz.

(iii) Given $5/7x^2z$

The numerical coefficient of x^2 is 5/7z.

(iv) Given $(-3/2)\ ax^2 + yx$

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

7. Write the coefficient of:

(i) y in –3y

(ii) a in 2ab

(iii) z in –7xyz

(iv) p in –3pqr

(v) y^2 in $9xy^2z$

(vi) x^3 in $x^3 + 1$

(vii) x^2 in $- x^2$

Solution:

(i) Given –3y

The coefficient of y is -3.

(ii) Given 2ab

The coefficient of a is 2b.

(iii) Given -7xyz

The coefficient of z is -7xy.

(iv) Given -3pqr

The coefficient of p is -3qr.

(v) Given $9xy^2z$

The coefficient of y^2 is 9xz.

(vi) Given $x^3 + 1$

The coefficient of x^3 is 1.

(vii) Given $- x^2$

The coefficient of x^2 is -1.

8. Write the numerical coefficient of each in the following:

(i) xy

(ii) -6yz

(iii) 7abc

(iv) $-2x^3y^2z$

Solution:

(i) Given xy

The numerical coefficient in the term xy is 1.

(ii) Given -6yz

The numerical coefficient in the term – 6yz is – 6.

(iii) Given 7abc

The numerical coefficient in the term 7abc is 7.

(iv) Given $-2x^3y^2z$

The numerical coefficient in the term $-2x^3y^2z$ is -2.

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

(i) $4x^2y – (3/2)xy + 5/2\ xy^2$

(ii) $(–5/3)x^2y + (7/4)xyz + 3$

Solution:

(i) Given $4x^2y – (3/2)\ xy + 5/2\ xy^2$

Numerical coefficient of following algebraic expressions are given below

Term	Coefficient
$4x^2y$	4
$– (3/2)\ xy$	-(3/2)
$5/2\ xy^2$	(5/2)

(ii) Given $(–5/3)x^2y + (7/4)xyz + 3$

Numerical coefficient of following algebraic expressions are given below

Term	Coefficient
$(–5/3)x^2y$	(-5/3)
(7/4)xyz	(7/4)
3	3

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

(i) $x^2y − xy^2 + 7xy − 3$

(ii) $a^3 − 3a^2 + 7a + 5$

Solution:

(i) Given $x^2y − xy^2 + 7xy − 3$

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The constant term in the given algebraic expressions is -3.

(ii) Given $a^3 - 3a^2 + 7a + 5$

The constant term in the given algebraic expressions is 5.

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

(i) (x/y) + (y/z) + (z/x)

(ii) $x^2 + y^2 + z^2 – xy – yz – zx$

Solution:

(i) Given x = -2, y = -1, z = 3

Consider (x/y) + (y/z) + (z/x)

On substituting the given values we get,

= (-2/-1) + (-1/3) + (3/-2)

The LCM of 3 and 2 is 6

= (12 – 2 – 9)/6

= (1/6)

(ii) Given x = -2, y = -1, z = 3

Consider $x^2 + y^2 + z^2 – xy – yz – zx$

On substituting the given values we get,

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

= 4 + 1 + 9 – 2 + 3 + 6

= 23 – 2

= 21

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:

(i) Given x = 1, y = -1, z = 2, a = -2, b = 1, c = -2

Consider ax + by + cz

On substituting the given values

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

= –2 – 1 – 4

= –7

(ii) Given x = 1, y = -1, z = 2, a = -2, b = 1, c = -2

Consider $ax^2 + by^2 – cz$

On substituting the given values

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

= -2 + 1 – (-4)

= -1 + 4

= 3

(iii) Given x = 1, y = -1, z = 2, a = -2, b = 1, c = -2

Consider axy + byz + cxy

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

= 2 + (-2) + 2

= 4 – 2

= 2

Exercise 7.2 Page No: 7.13

1. Add the following:

(i) 3x and 7x

(ii) -5xy and 9xy

Solution:

(i) Given 3x and 7x

3x + 7x = (3 + 7) x

= 10x

(ii) Given -5xy and 9xy

-5xy + 9xy = (-5 + 9) xy

= 4xy

2. Simplify each of the following:

(i) $7x^3y + 9yx^3$

(ii) $12a^2b + 3ba^2$

Solution:

(i) Given $7x^3y + 9yx^3$

$7x^3y + 9yx^3 = (7 + 9)\ x^3y$

$= 16x^3y$

(ii) Given

$12a^2b + 3ba^2 = (12 + 3)\ a^2b$

= $15a^2b$

3. Add the following:

(i) 7abc, -5abc, 9abc, -8abc

(ii) $2x^2y$, – $4x^2y$, $6x^2y$, $-5x^2y$

Solution:

(i) Given 7abc, -5abc, 9abc, -8abc

Consider 7abc + (-5abc) + (9abc) + (-8abc)

= 7abc – 5abc + 9abc – 8abc

= (7 – 5 + 9 – 8) abc [by taking abc common]

= (16 – 13) abc

= 3abc

(ii) Given $2x^2y$, – $4x^2y$, $6x^2y$, $-5x^2y$

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

= $2x^2y$ – $4x^2y$ + $6x^2y$ – $5x^2y$

= (2- 4 + 6 – 5) x^2y [by taking x^2 y common]

= (8 – 9) x^2y

= $-x^2y$

4. Add the following expressions:

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

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

Solution:

(i) Given x^3 $-2x^2y$ + $3xy^2$– y^3, $2x^3$– $5xy^2$ + $3x^2y$ – $4y^3$

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Collecting positive and negative like terms together, we get

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

= $3x^3 + x^2y – 2xy^2 – 5y^3$

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

= $a^4 – 2a^3b + 3ab^3 + 4a^2b^2 + 3b^4 – 2a^4 – 5ab^3 + 7a^3b – 6a^2b^2 + b^4$

Collecting positive and negative like terms together, we get

= $a^4 – 2a^4 – 2a^3b + 7a^3b + 3ab^3 – 5ab^3 + 4a^2b^2 – 6a^2b^2 + 3b^4 + b^4$

= $– a^4 + 5a^3b – 2ab^3 – 2a^2b^2 + 4b^4$

5. Add the following expressions:

(i) 8a – 6ab + 5b, –6a – ab – 8b and –4a + 2ab + 3b

(ii) $5x^3 + 7 + 6x – 5x^2$, $2x^2 – 8 – 9x$, $4x – 2x^2 + 3x^3$, $3x^3 – 9x – x^2$ and $x – x^2 – x^3 – 4$

Solution:

(i) Given 8a – 6ab + 5b, –6a – ab – 8b and –4a + 2ab + 3b

= (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) Given $5x^3 + 7 + 6x – 5x^2$, $2x^2 – 8 – 9x$, $4x – 2x^2 + 3x^3$, $3x^3 – 9x – x^2$ and $x – x^2 – x^3 – 4$

= $(5x^3 + 7 + 6x – 5x^2) + (2x^2 – 8 – 9x) + (4x – 2x^2 + 3x^3) + (3x^3 – 9x – x^2) + (x – x^2 – x^3 – 4)$

Collecting positive and negative like terms together, we get

$5x^3 + 3x^3 + 3x^3 – x^3 – 5x^2 + 2x^2 – 2x^2 – x^2 – x^2 + 6x – 9x + 4x – 9x + x + 7 – 8 – 4$

= $10x^3 – 7x^2 – 7x – 5$

6. Add the following:

(i) x – 3y – 2z

5x + 7y – 8z

3x – 2y + 5z

(ii) 4ab – 5bc + 7ca

–3ab + 2bc – 3ca

5ab – 3bc + 4ca

Solution:

(i) Given x – 3y – 2z, 5x + 7y – 8z and 3x – 2y + 5z

= (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) Given 4ab – 5bc + 7ca, –3ab + 2bc – 3ca and 5ab – 3bc + 4ca

= (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

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

Solution:

Given $2x^2 – 3x + 1$, $3x^2 – 2x$ and $3x + 7$

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 = $2x^2 – 3x + 1+ (3x^2 + x + 7)$

$= 2x^2 + 3x^2 – 3x + x + 1 + 7$

$= 5x^2 – 2x + 8$

8. Add $x^2 + 2xy + y^2$ to the sum of $x^2 – 3y^2$and $2x^2 – y^2 + 9$.

Solution:

Given $x^2 + 2xy + y^2$, $x^2 – 3y^2$and $2x^2 – y^2 + 9$.

First we have to find the 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 = $(x^2 + 2xy + y^2) + (3x^2 – 4y^2 + 9)$

$= x^2 + 3x^2 + 2xy + y^2 – 4y^2 + 9$

$= 4x^2 + 2xy – 3y^2+ 9$

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:

Given $a^3+ b^3 – 3$, $2a^3 – 3b^3 – 3ab + 7$ and $-a^3 + b^3 + 3ab – 9$.

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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 $= (a^3 + b^3 – 3) + (a^3 – 2b^3 – 2)$.

$= a^3+ a^3+ b^3– 2b^3 – 3 – 2$

$= 2a^3 – b^3 – 5$

10. Subtract:

(i) $7a^2b$ from $3a^2b$

(ii) 4xy from -3xy

Solution:

(i) Given $7a^2b$ from $3a^2b$

$= 3a^2b -7a^2b$

$= (3 -7) a^2b$

$= – 4a^2b$

(ii) Given 4xy from -3xy

$= –3xy – 4xy$

$= –7xy$

11. Subtract:

(i) – 4x from 3y

(ii) – 2x from – 5y

Solution:

(i) Given – 4x from 3y

= (3y) – (–4x)

= 3y + 4x

(ii) Given – 2x from – 5y

= (-5y) – (–2x)

= –5y + 2x

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) $x^3 + 2x^2y + 6xy^2 - y^3$ from $y^3 - 3xy^2 - 4x^2y$

Solution:

(i) Given $6x^3 - 7x^2 + 5x - 3$ and $4 - 5x + 6x^2 - 8x^3$

= $(4 - 5x + 6x^2 - 8x^3) - (6x^3 - 7x^2 + 5x - 3)$

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

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

= $- 14x^3 + 13x^2 - 10x + 7$

(ii) Given $- x^2 - 3z$ and $5x^2 - y + z + 7$

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

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

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

= $6x^2 - y + 4z + 7$

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(iii) Given $x^3 + 2x^2y + 6xy^2 - y^3$ and $y^3-3xy^2-4x^2y$

$= (y^3 – 3xy^2 – 4x^2y) – (x^3 + 2x^2y + 6xy^2 – y^3)$

$= y^3 – 3xy^2 – 4x^2y – x^3 – 2x^2y – 6xy^2 + y^3$

$= y^3 + y^3– 3xy^2– 6xy^2– 4x^2y – 2x^2y – x^3$

$= 2y^3– 9xy^2 – 6x^2y – x^3$

13. From

(i) $p^3 – 4 + 3p^2$, 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) Given $p^3 – 4 + 3p^2$, take away $5p^2 - 3p^3 + p - 6$

$= (p^3 – 4 + 3p^2) – (5p^2 – 3p^3 + p – 6)$

$= p^3 – 4 + 3p^2 – 5p^2 + 3p^3 – p + 6$

$= p^3 + 3p^3 + 3p^2 – 5p^2– p – 4+ 6$

$= 4p^3 – 2p^2 – p + 2$

(ii) Given $7 + x - x^2$, take away $9 + x + 3x^2 + 7x^3$

$= (7 + x – x^2) – (9 + x + 3x^2 + 7x^3)$

$= 7 + x – x^2 – 9 – x – 3x^2 – 7x^3$

$= – 7x^3– x^2 – 3x^2 + 7 – 9$

$= – 7x^3 – 4x^2 – 2$

(iii) Given $1- 5y^2$, take away $y^3 + 7y^2 + y + 1$

= $(1 – 5y^2) – (y^3 + 7y^2 + y + 1)$

= $1 – 5y^2 – y^3 – 7y^2 – y – 1$

= $– y^3 – 5y^2 – 7y^2 – y$

= $– y^3 – 12y^2 – y$

(iv) Given $x^3 − 5x^2 + 3x + 1$, take away $6x^2 − 4x^3 + 5 + 3x$

= $(x^3 – 5x^2 + 3x + 1) – (6x^2 – 4x^3 + 5 + 3x)$

= $x^3 – 5x^2 + 3x + 1 – 6x^2 + 4x^3 – 5 – 3x$

= $x^3 + 4x^3 – 5x^2 – 6x^2 + 1 – 5$

= $5x^3 – 11x^2 – 4$

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

Solution:

First we have to add $3x^2 − 5x + 2$ and $− 5x^2 − 8x + 9$ then from the result we have to subtract $4x^2 − 7x + 9$.

= $\{(3x^2 – 5x + 2) + (- 5x^2 – 8x + 9)\} – (4x^2 – 7x + 9)$

= $\{3x^2 – 5x + 2 – 5x^2 – 8x + 9\} – (4x^2 – 7x + 9)$

= $\{3x^2 – 5x^2 – 5x – 8x + 2 + 9\} – (4x^2 – 7x + 9)$

= $\{- 2x^2 – 13x + 11\} – (4x^2 – 7x + 9)$

= $– 2x^2 – 13x + 11 – 4x^2 + 7x – 9$

= $– 2x^2 – 4x^2 – 13x + 7x + 11 – 9$

= $– 6x^2 – 6x + 2$

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

Solution:

First we have to find the sum of 13x – 4y + 7z and – 6z + 6x + 3y

Therefore, 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)

Now we have to find the 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)

= (8x – 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

16. 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:

First we have to find the sum of $(x^2 + 3y^2 – 6xy)$, $(2x^2 – y^2 + 8xy)$, $(y^2 + 8)$ and $(x^2 – 3xy)$

$=\{(x^2 + 3y^2 – 6xy) + (2x^2 – y^2 + 8xy) + (y^2 + 8) + (x^2 – 3xy)\}$

$=\{x^2 + 3y^2 – 6xy + 2x^2 – y^2 + 8xy + y^2 + 8 + x^2 – 3xy\}$

$= \{x^2+ 2x^2+ x^2 + 3y^2– y^2 + y^2– 6xy + 8xy – 3xy + 8\}$

$= 4x^2 + 3y^2 – xy + 8$

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Now, from the result subtract the $-3x^2 + 4y^2 - xy + x - y + 3$.

Therefore, required expression = $(4x^2 + 3y^2 - xy + 8) - (-3x^2 + 4y^2 - xy + x - y + 3)$

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

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

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

17. What should be added to xy – 3yz + 4zx to get 4xy – 3zx + 4yz + 7?

Solution:

By subtracting xy – 3yz + 4zx from 4xy – 3zx + 4yz + 7, we get the required expression.

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

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

Solution:

Let ‘E’ be the required expression. Then, we have

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

Therefore, $E = (x^2 - xy + y^2 - x + y + 3) - (-x^2 + 3y^2 - 4xy + 1)$

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

Collecting positive and negative like terms together, we get

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

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

19. How much is x – 2y + 3z greater than 3x + 5y – 7?

Solution:

By subtracting x – 2y + 3z from 3x + 5y – 7 we can get the required expression,

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

= 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

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

Solution:

By subtracting the $x^2 - 2xy + 3y^2$ from $2x^2 - 3y^2 + xy$ we can get the required expression,

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

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

= $x^2 – 6y^2 + 3xy$

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

Solution:

By subtracting $2a^2 - 7ab + 9b^2$ from $a^2 - 3ab + 2b^2$ we get the required expression

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

= $a^2 – 2a^2 – 3ab + 7ab + 2b^2 – 9b^2$

$= -a^2 + 4ab - 7b^2$

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

Solution:

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

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

Therefore, $E = (x^3 + 2x^2 - 3x + 2) - (12x^3 - 4x^2 + 3x - 7)$

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

Collecting positive and negative like terms together, we get

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

$= -11x^3 + 6x^2 - 6x + 9$

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:

Given $P = 7x^2 + 5xy - 9y^2$, $Q = 4y^2 - 3x^2 - 6xy$ and $R = -4x^2 + xy + 5y^2$

Now we have to prove $P + Q + R = 0$,

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

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

Collecting positive and negative like terms together, we get

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

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

$= 0$

24. 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 $P + Q + R + S - T$.

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Solution:

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

Now we have to find P + Q + R + S – T

Substituting all values we get

Consider P + Q + R + S – T = {($a^2 - b^2 + 2ab$) + ($a^2 + 4b^2 - 6ab$) + ($b^2 + b$) + ($a^2 - 4ab$)} – ($-2a^2 + b^2 - ab + a$)

= {$a^2 - b^2 + 2ab + a^2 + 4b^2 - 6ab + b^2 + b + a^2 - 4ab$}- ($- 2a^2 + b^2 - ab + a$)

= {$3a^2 + 4b^2 - 8ab + b$ } – ($-2a^2 + b^2 - ab + a$)

= $3a^2 + 4b^2 - 8ab + b + 2a^2 - b^2 + ab - a$

Collecting positive and negative like terms together, we get

$3a^2 + 2a^2 + 4b^2 - b^2 - 8ab + ab - a + b$

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

Exercise 7.3 Page No: 7.16

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:

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(i) Given x + y – 3z + y

x + y – 3z + y = x + y – (3z – y)

(ii) Given 3x – 2y – 5z – 4

3x – 2y – 5z – 4 = 3x – 2y – (5z + 4)

(iii) Given 3a – 2b + 4c – 5

3a – 2b + 4c – 5 = 3a – 2b – (–4c + 5)

(iv) Given 7a + 3b + 2c + 4

7a + 3b + 2c + 4 = 7a + 3b – (–2c – 4)

(v) Given $2a^2 – b^2 – 3ab + 6$

$2a^2 – b^2 – 3ab + 6 = 2a^2 – b^2 – (3ab – 6)$

(vi) Given $a^2 + b^2 – c^2 + ab – 3ac$

$a^2 + b^2 – c^2 + ab – 3ac = a^2 + b^2 – c^2 – (- ab + 3ac)$

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) Given 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) Given 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) Given 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

$\{(2x^2 + y^2 – 3xy) – (x^2 – y^2 + 4xy)\} + (9x^2 – 3y^2 – xy))$

This is the required expression.

Exercise 7.4 Page No: 7.20

Simplify each of the following algebraic expressions by removing grouping symbols.

1. 2x + (5x – 3y)

Solution:

Given 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

On simplifying, we get

= 7x – 3y

2. 3x – (y – 2x)

Solution:

Given 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

On simplifying, we get

= 5x – y

3. 5a – (3b – 2a + 4c)

Solution:

Given 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

On simplifying, we get

= 7a – 3b – 4c

4. $-2(x^2 – y^2 + xy) – 3(x^2 + y^2 – xy)$

Solution:

Given $– 2(x^2 – y^2 + xy) – 3(x^2 + y^2 – xy)$

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

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

On rearranging,

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

On simplifying, we get

$= -5x^2 – y^2 + xy$

5. 3x + 2y – {x – (2y – 3)}

Solution:

Given 3x + 2y – {x – (2y – 3)}

First, we have to remove the parentheses. Then, we have to remove the braces.

Then we get,

= 3x + 2y – {x – 2y + 3}

= 3x + 2y – x + 2y – 3

On simplifying, we get

= 2x + 4y – 3

6. 5a – {3a – (2 – a) + 4}

Solution:

Given 5a – {3a – (2 – a) + 4}

First, we have to remove the parentheses. Then, we have to remove the braces.

Then we get,

= 5a – {3a – 2 + a + 4}

= 5a – 3a + 2 – a – 4

On simplifying, we get

= 5a – 4a – 2

= a – 2

7. a – [b – {a – (b – 1) + 3a}]

Solution:

Given a – [b – {a – (b – 1) + 3a}]

First we have to remove the parentheses, then the curly brackets, and then the square brackets.

Then we get,

= a – [b – {a – (b – 1) + 3a}]

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= a – [b – {a – b + 1 + 3a}]

= a – [b – {4a – b + 1}]

= a – [b – 4a + b – 1]

= a – [2b – 4a – 1]

On simplifying, we get

= a – 2b + 4a + 1

= 5a – 2b + 1

8. a – [2b – {3a – (2b – 3c)}]

Solution:

Given a – [2b – {3a – (2b – 3c)}]

First we have to remove the parentheses, then the braces, and then the square brackets.

Then we get,

= a – [2b – {3a – (2b – 3c)}]

= a – [2b – {3a – 2b + 3c}]

= a – [2b – 3a + 2b – 3c]

= a – [4b – 3a – 3c]

On simplifying we get,

= a – 4b + 3a + 3c

= 4a – 4b + 3c

9. -x + [5y – {2x – (3y – 5x)}]

Solution:

Given -x + [5y – {2x – (3y – 5x)}]

First we have to remove the parentheses, then remove braces, and then the square brackets.

Then we get,

= – x + [5y – {2x – (3y – 5x)}]

= – x + [5y – {2x – 3y + 5x)]

= – x + [5y – {7x – 3y}]

= – x + [5y – 7x + 3y]

= – x + [8y – 7x]

On simplifying we get

= – x + 8y – 7x

= – 8x + 8y

10. 2a – [4b – {4a – 3(2a – b)}]

Solution:

Given 2a – [4b – {4a – 3(2a – b)}]

First we have to remove the parentheses, then remove braces, and then the square brackets.

Then we get,

= 2a – [4b – {4a – 3(2a – b)}]

= 2a – [4b – {4a – 6a + 3b}]

= 2a – [4b – {- 2a + 3b}]

= 2a – [4b + 2a – 3b]

= 2a – [b + 2a]

On simplifying, we get

= 2a – b – 2a

= – b

11. -a – [a + {a + b – 2a – (a – 2b)} – b]

Solution:

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

First we have to remove the parentheses, then remove braces, and then the square brackets.

Then we get,

= – 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]

On simplifying, we get

= – a + a – 2b

= – 2b

12. 2x – 3y – [3x – 2y -{x – z – (x – 2y)}]

Solution:

Given 2x – 3y – [3x – 2y -{x – z – (x – 2y)}]

First we have to remove the parentheses, then remove braces, and then the square brackets.

Then we get,

= 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]

On simplifying, we get

= 2x – 3y – 3x + 4y – z

= – x + y – z

13. 5 + [x – {2y – (6x + y – 4) + 2x} – {x – (y – 2)}]

Solution:

Given 5 + [x – {2y – (6x + y – 4) + 2x} – {x – (y – 2)}]

First we have to remove the parentheses, then remove braces, and then the square brackets.

Then we get,

= 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

14. x^2 – [3x + [2x – (x^2 – 1)] + 2]

Solution:

Given x^2 – [3x + [2x – (x^2 – 1)] + 2]

First we have to remove the parentheses, then remove braces, and then the square brackets.

Then we get,

= 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]

On simplifying we get

= x^2 – 5x + x^2 – 3

= $2x^2$ – 5x – 3

15. 20 – [5xy + 3[x^2 – (xy – y) – (x – y)]]

Solution:

Given 20 – [5xy + 3[x^2 – (xy – y) – (x – y)]]

First we have to remove the parentheses, then remove braces, and then the square brackets.

Then we get,

= 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]

On simplifying we get

= 20 – 2xy – $3x^2$ – 6y + 3x

= – $3x^2$ – 2xy – 6y + 3x + 20

16. 85 – [12x – 7(8x – 3) – 2{10x – 5(2 – 4x)}]

Solution:

Given 85 – [12x – 7(8x – 3) – 2{10x – 5(2 – 4x)}]

First we have to remove the parentheses, then remove braces, and then the square brackets.

Then we get,

= 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]

On simplifying, we get

= 85 + 104x – 41

= 44 + 104x

17. xy [yz – zx – {yx – (3y – xz) – (xy – zy)}]

Solution:

Given xy [yz – zx – {yx – (3y – xz) – (xy – zy)}]

First we have to remove the parentheses, then remove braces, and then the square brackets.

Then we get,

= 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]

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On simplifying, we get

= xy – [- 2zx + 3y]

= xy + 2xz – 3y

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- Chapter 2–Fractions
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- Chapter 5–Operations On Rational Numbers
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- Chapter 25–Data Handling - IV (Probability)

About RD Sharma

RD Sharma i*sn't the kind of author you'd bump into at lit fests. But his bestselling books have helped many* CBSE *students lose their dread of* maths. *Sunday Times profiles the tutor turned internet star*

He dreams of algorithms that would give most people nightmares. And, spends every waking hour thinking of ways to explain concepts like 'series solution of linear differential equations'. Meet Dr Ravi Dutt Sharma — mathematics teacher and author of 25 reference books — whose name evokes as much awe as the subject he teaches. And though students have used his thick tomes for the last 31 years to ace the dreaded maths exam, it's only recently that a spoof video turned the tutor into a YouTube star.

R D Sharma had a good laugh but said he shared little with his on-screen persona except for the love for maths. "I like to spend all my time thinking and writing about maths problems. I find it relaxing," he says. When he is not writing books explaining mathematical concepts for classes 6 to 12 and engineering students, Sharma is busy dispensing his duty as vice-principal and head of department of science and humanities at Delhi government's Guru Nanak Dev Institute of Technology.