CHAPTER-12

Algebraic Expressions

Ex 12.1:-

Question 1

Get the algebraic expressions in the following cases using variables, constants and arithmetic operations:
(i) Subtraction of z from y.
(ii) One half of the sum of numbers x and y.
(iii) The number z multiplied by itself.
(iv) One-fourth of the product of numbers p and q.
(v) Numbers x and y both squared and added.
(vi) Number 5 added to three times the product of number m and n.
(vii) Product of numbers y and 2 subtracted from 10.
(viii) Sum of numbers a and b subtracted from their product.

Solution:

(i) Subtraction of z from y
Expression: $y - z$

(ii) One half of the sum of numbers x and y
Expression: $12(x+y)$ or $x+y2$
(iii) The number 2 multiplied by itself.
Expression: $z \times z = z^2$

(iv) One-fourth of the product of numbers p and q
Expression: $14pq$ or $pq4$
(v) Numbers x and y both squared and added
Expression: $x^2 + y^2$

(vi) Number 5 added to three times the product of number m and n
Expression: $3mn + 5$

(vii) Product of numbers y and z subtracted from 10
Expression: $10 - yz$

(viii) Sum of numbers a and 6 subtracted from their product
Expression: Sum = a + b, Product = ab
∴ Required expression
= ab − (a + b)
= ab − a- b

Question 2

(i) Identify the terms and their factors in the following expressions show the terms and factors by tree diagrams.

(a) $x - 3$

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

(c) $y - y^3$

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

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

Solution:

(a) Expression $x - 3$

Terms x, -3

(b) Expression $1 + x + x^2$

Terms 1, x, x^2

Factors of x^2: x, x

(c) Expression $y - y^3$

Terms y, $-y^3$

Factors of $-y^3$: $-y$, $-y$, $-y$

(d) Expression $5xy^2 + 7x^2y$

Terms $5xy^2$, $7x^2y$

Factors of $5xy^2$: 5, x, y, y

Factors of $7x^2y$: 7, x, x, y

(e) Expression $-ab + 2b^2 - 3a^2$

Terms $-ab$, $2b^2$, $-3a^2$

Factors of $-ab$: $-a$, b

Factors of $2b^2$: 2, b, b

Factors of $-3a^2$: -3, a, a

(ii) Identify terms and factors in the expression given below:

(a) -4x + 5

(b) -4x + 5y

(c) $5y + 3y^2$
(d) $xy + 2x^2y^2$
(e) $pq + q$
(f) $1.2ab - 2.4b + 3.6a$
(g) $34X+14$
(h) $0.1p^2 + 0.2q^2$
Solution:

Expressions	Terms	Factors
(a) $-4x + 5$	$-4x$	-4 and x
	5	5
(b) $-4x + 5y$	$-4x$	-4 and x
	$5y$	5 and y
(c) $5y + 3y^2$	$5y$	5 and y
	$3y^2$	3, y and y
(d) $xy + 2x^2y^2$	xy	x and y
	$2x^2y^2$	2, x, x, y and y
(e) $pq + q$	pq	p and q
	q	q
(f) $1.2ab - 2.4b + 3.6a$		
	$1.2ab$	1.2, a and b
	$2.4b$	2.4 and b
	$3.6a$	3.6 and a
(g) $\frac{3}{4}x + \frac{1}{4}$	$\frac{3}{4}x$	$\frac{3}{4}$ and x
	$\frac{1}{4}$	$\frac{1}{4}$
(h) $0.1p^2 + 0.2q^2$	$0.1p^2$	0.1, p and p
	$0.2q^2$	0.2, q and q

Question 3

Identify the numerical coefficients of terms (other than constants) in the following:

(i) $5 - 3t^2$

(ii) $1 + t + t^2 + t^3$

(iv) $100m + 1000n$

(v) $-p^2q^2 + 7pq$

(vi) $1.2\,a + 0.86$

(vii) $3.14r^2$

(viii) $2(l + b)$

(ix) $0.1y + 0.01y^2$

Solution:

Expressions	Terms	Coefficients
$(i)\ 5 - 3t^2$	$-3t^2$	-3
$(ii)\ 1 + t + t^2 + t^3$	t	1
	t^2	1
	t^3	1
$(iii)\ x + 2xy + 3y$	x	1
	$2xy$	2
	$3y$	3
$(iv)\ 100m + 1000n$	$100m$	100
	$1000n$	1000
$(v)\ -p^2q^2 + 7pq$	$-p^2q^2$	-1
	$7pq$	7
$(vi)\ 1.2a + 0.8b$	$1.2a$	1.2
	$0.8b$	0.8
$(vii)\ 3.14r^2$	$3.14r^2$	3.14
$(viii)\ 2(l + b)$	$2l$	2
	$2b$	2
$(ix)\ 0.1y + 0.01y^2$	$0.1y$	0.1
	$0.01y^2$	0.01

Question 4

(a) Identify terms which contain x and give the coefficient of x.

(i) $y^2x + y$

(ii) $13y^2 - 8yx$

(iii) $x + y + 2$

(iv) $5 + z + zx$

(v) $1 + x + xy$

(vi) $12xy^2 + 25$

(vii) $7x + xy^2$

Solution:

(a)

Expressions	Terms with x	Coefficient of x
(i) $y^2x + y$	y^2x	y^2
(ii) $13y^2 - 8yx$	$-8yx$	$-8y$
(iii) $x + y + 2$	x	1
(iv) $5 + z + zx$	zx	z
(v) $1 + x + xy$	xy	y
	x	1
(vi) $12xy^2 + 25$	$12xy^2$	$12y^2$
(vii) $7x + xy^2$	$7x$	7
	xy^2	y^2

(b) Identify terms which contain y^2 and give the coefficients of y^2.

(i) $8 - xy^2$

(ii) $5y^2 + 7x$

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

Solution:

Expressions	Terms with y^2	Coefficient of y^2
(i) $8 - xy^2$	$-xy^2$	$-x$
(ii) $5y^2 + 7x$	$5y^2$	5
(iii) $2x^2y - 15xy^2 + 7y^2$		
	$-15xy^2$	$-15x$
	y^2	1
	$7y^2$	7

Question 5

Classify into monomials, binomials and trinomials:

(i) $4y - 7x$

(ii) y^2

(iii) $x + y - xy$

(iv) 100

(v) $ab - a - b$

(vi) $5 - 3t$

(vii) $4p^2q - 4pq^2$

(viii) 7mn

(ix) $z^2 - 3z + 8$

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

(xi) $z^2 + z$

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

Solution:

(i)$4y - 7z$ – Binomial

(ii) y^2 – Monomial

(iii) $x + y - xy$ – Trinomial

(iv) 100 Monomial

(v) $ab - a - b$ – Trinomial

(vi) $5 - 3t$ – Binomial

(vii) $4p^2q - 4pq^2$ – Binomial

(viii) 7mn – Monomial

(ix) $z^2 -3z + 8$ – Trinomial

(x) $a^2 + b^2$ – Binomial

(xi) $z^2 + z$ – Binomial

(xii) $1 + x + x^2$ – Trinomial

Question 6

State whether a given pair of terms is of like or unlike terms.

(i) 1, 100

(ii) -7x, $52x$

(iii) -29x, -29y

(iv) 14xy, 42yx

(v) $4m^2p$, $4mp^2$

(vi) 12xz, 12 x^2y^2

Solution:

(i) 1, 100 – Like

(ii) -7x, $52x$ – Like

(iii) -29x, -29y – Unlike

(iv) 14xy, 42yx – Like

(v) $4m^2p$, $4mp^2$ – Unlike

(vi) $12xz$, $12x^2z^2$ – Unlike

Question 7

Identify like terms in the following:

(a)$-xy^2$, $-4yx^2$, $8x^2$, $2xy^2$, $7y^2$, $-11x^2$, -100x, -11yx, $20x^2y$, $-6x^2$, y, 2xy, 3x

(b) 10pq, 7p, 8q, $-p^2q^2$, -7qp, -100q, -23, $12q^2p^2$, $-5p^2$, 41, 2405p, 78qp, $13p^2q$, qp^2, $701p^2$

Solution:

(a) Like terms are:

(i) $-xy^2$, $2xy^2$

(ii) $-4yx^2$, $20x^2y$

(iii)$8x^2$, $-11x^2$, $-6x^2$

(iv) 7y, y

(v) -100x, 3x

(vi) -11yx, 2xy

(b) Like terms are:

(i) 10pq, – 7qp, 78qp

(ii) 7p, 2405p

(iii) 8q, -100q

(iv) $-p^2q^2$, 12 q^2p^2

(v) -23, 41

(vi) $-5p^2$, $701p^2$

(vii) $13p^2q$, qp^2

Question 1:

Get the algebraicexpressions in the following cases using variables, constants and arithmetic operations.

(i) Subtraction of z from y.

(ii) One-half of the sum of numbers x and y.

(iii) The number z multiplied by itself.

(iv) One-fourth of the product of numbers p and q.

(v) Numbers x and y both squared and added.

(vi) Number 5 added to three times the product of number m and n.

(vii) Product of numbers y and z subtracted from 10.

(viii)Sum of numbers a and b subtracted from their product.

Answer:

(i) $y - z$

(ii) $\frac{1}{2}(x+y)$

(iii) z^2

(iv) $\frac{1}{4}(pq)$

(v) $x^2 + y^2$

(vi) $5 + 3\,(mn)$

(vii) $10 - yz$

(viii) $ab - (a + b)$

Question 2:

(i) Identify the terms and their factors in the following expressions

Show the terms and factors by tree diagrams.

(a) $x - 3$ (b) $1 + x + x^2$ (c) $y - y^3$

(d) $5xy^2 + 7x^2y$ (e) $-ab + 2b^2 - 3a^2$

(ii) Identify terms and factors in the expressions given below:

(a) $-4x + 5$ (b) $-4x + 5y$ (c) $5y + 3y^2$

(d) $xy + 2x^2y^2$ (e) $pq + q$

(f) $1.2\,ab - 2.4\,b + 3.6\,a$ (g) $\frac{3}{4}x + \frac{1}{4}$

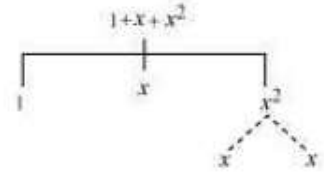
(h) $0.1p^2 + 0.2\,q^2$

Answer:

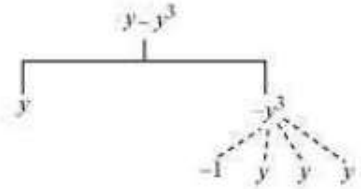
(i)

(a)

(b)



(c)



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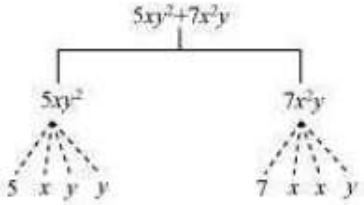
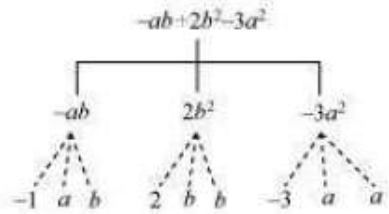


(e)



(ii)

Row	Expression	Terms	Factors
(a)	$-4x + 5$	$-4x$ 5	$-4, x$ 5
(b)	$-4x + 5y$	$-4x$ $5y$	$-4, x$ $5, y$
(c)	$5y + 3y^2$	$5y$ $3y^2$	$5, y$ $3, y, y$
(d)	$xy + 2x^2y^2$	xy $2x^2y^2$	x, y $2, x, x, y, y$
(e)	$pq + q$	pq q	p, q q
(f)	$1.2ab - 2.4b + 3.6a$	$1.2ab$ $-2.4b$ $3.6a$	$1.2, a, b$ $-2.4, b$ $3.6, a$
(g)	$\frac{3}{4}x+\frac{1}{4}$	$\frac{3}{4}x$ $\frac{1}{4}$	$\frac{3}{4}, x$ $\frac{1}{4}$
(h)	$0.1p^2 + 0.2q^2$	$0.1p^2$ $0.2q^2$	$0.1, p, p$ $0.2, q, q$

Question 3:

Identify the numerical coefficients of terms (other than constants) in the following expressions:

(i) $5 - 3t^2$ (ii) $1 + t + t^2 + t^3$ (iii) $x + 2xy + 3y$

(iv) $100m + 1000n$ (v) $-p^2q^2 + 7pq$ (vi) $1.2a + 0.8b$

(vii) $3.14\ r^2$ (viii) $2\ (l + b)$ (ix) $0.1y + 0.01\ y^2$

Answer:

Row	Expression	Terms	Coefficients
(i)	$5 - 3t^2$	$-3t^2$	-3
(ii)	$1 + t + t^2 + t^3$	t t^2 t^3	1 1 1
(iii)	$x + 2xy + 3y$	x $2xy$ $3y$	1 2 3
(iv)	$100m + 1000n$	$100m$ $1000n$	100 1000
(v)	$-p^2q^2 + 7pq$	$-p^2q^2$ $7pq$	-1 7
(vi)	$1.2a + 0.8b$	$1.2a$ $0.8b$	1.2 0.8
(vii)	$3.14\ r^2$	$3.14\ r^2$	3.14
(viii)	$2(l + b)$	$2l$ $2b$	2 2
(ix)	$0.1y + 0.01y^2$	$0.1y$ $0.01y^2$	0.1 0.01

Question 4:

(a) Identify terms which contain x and give the coefficient of x.

(i) $y^2x + y$ (ii) $13y^2 - 8yx$ (iii) $x + y + 2$

(iv) $5 + z + zx$ (v) $1 + x + xy$ (vi) $12xy^2 + 25$

(vii) $7x + xy^2$

(b) Identify terms which contain y^2 and give the coefficient of y^2.

(i) $8 - xy^2$ (ii) $5y^2 + 7x$ (iii) $2x^2y - 15xy^2 + 7y^2$

Answer:

(a)

Row	Expression	Terms with x	Coefficient of x
(i)	$y^2x + y$	y^2x	y^2
(ii)	$13y^2 - 8yx$	$-8yx$	$-8y$
(iii)	$x + y + 2$	x	1
(iv)	$5 + z + zx$	zx	z
(v)	$1 + x + xy$	x xy	1 y
(vi)	$12xy^2 + 25$	$12xy^2$	$12y^2$
(vii)	$7 + xy^2$	xy^2	y^2

(b)

Row	Expression	Terms with y^2	Coefficient of y^2
(i)	$8 - xy^2$	$-xy^2$	$-x$
(ii)	$5y^2 + 7x$	$5y^2$	5
(iii)	$2x^2y + 7y^2$ $-15xy^2$	$7y^2$ $-15xy^2$	7 $-15x$

Question 5:

Classify into monomials, binomials and trinomials.

(i) $4y - 7z$ (ii) y^2 (iii) $x + y - xy$

(iv) 100 (v) $ab - a - b$ (vi) $5 - 3t$

(vii) $4p^2q - 4pq^2$ (viii) $7mn$ (ix) $z^2 - 3z + 8$

(x) $a^2 + b^2$ (xi) $z^2 + z$ (xii) $1 + x + x^2$

Answer:

The monomials, binomials, and trinomials have 1, 2, and 3 unlike terms in it respectively.

(i) $4y - 7z$

Binomial

(ii) y^2

Monomial

(iii) $x + y - xy$

Trinomial

(iv) 100

Monomial

(v) $ab - a - b$

Trinomial

(vi) $5 - 3t$

Binomial

(vii) $4p^2q - 4pq^2$

Binomial

(viii) $7mn$

Monomial

(ix) $z^2 - 3z + 8$

Trinomial

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

Binomial

(xi) $z^2 + z$

Binomial

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

Trinomial

Question 6:

State whether a given pair of terms is of like or unlike terms.

(i) 1, 100 (ii) $-7x, \frac{5}{2}x$ (iii) $- 29x, - 29y$

(iv) $14xy, 42yx$ (v) $4m^2p, 4mp^2$ (vi) $12xz, 12\ x^2z^2$

Answer:

The terms which have the same algebraic factors are called like terms. However, when the terms have different algebraic factors, these are called unlike terms.

(i) 1, 100

Like

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

Like

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

Unlike

(iv) $14xy$, $42yx$

Like

(v) $4m^2p$, $4mp^2$

Unlike

(vi) $12xz$, $12x^2z^2$

Unlike

Question 7:

Identify like terms in the following:

(a) $-xy^2$, $-4yx^2$, $8x^2$, $2xy^2$, $7y$, $-11x^2$, $-100x$, $-11yx$, $20x^2y$, $-6x^2$, y, $2xy$, $3x$

(b) $10pq$, $7p$, $8q$, $-p^2q^2$, $-7qp$, $-100q$, -23, $12q^2p^2$, $-5p^2$, 41, $2405p$, $78qp$, $13p^2q$, qp^2, $701p^2$

Answer:

(a) $-xy^2$, $2xy^2$

$-4yx^2$, $20x^2y$

$8x^2$, $-11x^2$, $-6x^2$

$7y$, y

$-100x$, $3x$

$-11xy$, $2xy$

(b) $10pq$, $-7qp$, $78qp$

$7p$, $2405p$

$8q$, $-100q$

$-p^2q^2$, $12p^2q^2$

-23, 41

$-5p^2$, $701p^2$

$13p^2q$, qp^2

Ex 12.2:-

Question 1

Simplify combining like terms:

(i) $21b - 32 + 7b - 206$

(ii) $-z^2 + 13z2 - 5z + 7z^3 - 15^2$

(iii) $p - (p - q) - q - (q - p)$

(iv) $3a - 2b - ab - (a - b + ab) + 3ab + 6 - a$

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

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

Solution:

(i) $21b - 32 + 7b - 206$

Re-arranging the like terms, we get

$216 + 7b - 206 - 32$

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

$= 8b - 32$ which is required.

(ii) $-z^2 + 13z^2 - 5z - 15z$

Re-arranging the like terms, we get

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

$= 7z^3 + (-1 + 13)z^2 + (-5 - 15)z$

$= 7z^3 + 12z^2 - 20z$ which is required.

(iii) $p - (p - q) - q - (q - p)$

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

Re-arranging the like terms, we get

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

$= p - q$ which is required.

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

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

Re-arranging the like terms, we get

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

$= 3a - 2a - 2b + 2b - 2ab + 3ab = a + 0 + ab$

$= a + ab$ which is required.

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

Re-arranging the like terms, we get

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

$= 8x^2y + 8xy^2 - 4x^2 - 7y^2$ which is required.

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

$= 3y^2 + 5y - 4 - 8y + y^2 + 4$ (Solving the brackets)

Re-arranging the like terms, we get

= $3y^2 + y^2 + 5y - 8y - 4 + 4$
= $4y^2 - 3y$ which is required.

Question 2

Add:

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

(ii) t − 8tz, 3tz, -z, z − t

(iii) -7mn + 5, 12mn + 2, 9mn − 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) $4x^2y, -3xy^2, -5xy^2, 5x^2y$

(viii) $3p^2q^2 - 4pq + 5, -10p^2q^2, 15 + 9pq + 7p^2q^2$

(ix) ab − 4a, 4b − ab, 4a − 4b

(x) $x^2 - y^2 - 1, y^2 - 1 - x^2, 1 - x^2 - y^2$

Solution:

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

= (3 mn) + (-5 mn) + (8 mn) + (- 4 mn)

= (3 − 5 + 8 − 4)mn

= 2mn which is required.

(ii) t − 8tz, 3tz − z, z − t

t − 8tz + 3tz − z + z − t

Re-arranging the like terms, we get

t − t − 8tz + 3tz − z + z

⇒ 0 − 5 tz + 0

⇒ -5tz which is required.

(iii) -7mn + 5, 12mn + 2, 9mn − 8, -2mn − 3

= -7mn + 5 + 12mn + 2 + 9mn − 8 + (-2mn) − 3

Re-arranging the like terms, we get

-7mn + 12 mn + 9mn − 2 mn + 5 + 2 − 8 − 3

$= -\cancel{9mn} + \cancel{9mn} + 12mn + 7 - 11$

= 12 mn − 4 which is required.

(iv) a + b − 3, b − a + 3, a − b + 3

⇒ a + b − 3 + b − a + 3 + a − b + 3

Re-arranging the like terms, we get

a − a + a + b + b − b − 3 + 3 + 3

⇒ a + b + 3 which is required.

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

∴ 14x + 14y − 12xy − 13 + 18 − 7x − 10y + 8xy + 4xy

Re-arranging the like terms, we get

-12xy + 8xy + 4xy + 14x − 7x + 10y − 10y − 13 + 18

$= -\cancel{12xy} + \cancel{12xy} + 7x + 0 + 5$

= 0 + 7x + 0 + 5
= 7x + 5 which is required

(vi) 5m – 7n, 3n – 4m + 2, 2m – 3mn – 5 5m -In + 3n — 4m + 2 + 2m – 3mn – 5
Re-arranging the like terms, we get
5m – 4m + 2m – 7n + 3n- 3mn + 2 – 5
= 3m – 4n – 3mn – 3 which is required.

(vii) $4x^2y$, $-3xy^2$, $-5xy^2$, $5x^2y$
Re-arranging the like terms and adding, we get
$4x^2y – 5xy^2 – 3xy^2 + 5x^2y$
$=9x^2y — 8xy^2$ which is required.

(viii) $3p^2q^2 – 4pq + 5$, $-10p^2q^2$, $15 + 9pq + 7p^2q^2$
$= (3p^2q^2 – 4pq + 5) + (-10p^2q^2) + (15 + 9pq + 7p^2q^2)$
$= 3p^2q^2 – 4pq + 5 – 10p^2q^2 + (15 + 9pq + 7p^2q^2)$
$= 3p^2q^2 + 7p^2q^2 – 10p^2q^2 – 4pq + 9pq + 5 + 15$
$= 10p^2q^2 – 10p^2q^2 + 5pq + 20$
$= 0 + 5pq + 20$
$= 5pq + 20$ which is required.

(ix) ab – 4a, 4b – ab, 4a – 4b
= ab – 4a + 4b – ab + 4a – 4b
$= ab – ab + 4a – 4a + 4b – 4b$
= 0 + 0 + 0 = 0 which is required.

(x) $x^2 – y^2 – 1$, $y^2 – 1 – x^2$, $1 – x^2 – y^2$
$= x^2 – y^2 – 1 + y^2 – 1 – x^2 + 1 – x^2 – y^2$
$= x^2 – x^2 – x^2 – y^2 + y^2 – y^2 – 1 – 1 + 1$
$= -x^2 – y^2 – 1$
$= -(x^2 + y^2 + 1)$ which is required.

Question 3
Subtract:
(i) $-5y^2$ from y^2
(ii) 6xy from -12xy
(iii) (a – b) from (a + b)
(iv) a(b – 5) from b(5 – a)
(v) $-m^2 + 5mn$ from $4m^2 – 3mn + 8$
(vi) $-x^2 + 10x – 5$ from $5x – 10$
(vii) $5a^2 – 7ab + 5b^2$ from $3ab – 2a^2 – 2b^2$
(viii) $4pq – 5q^2 – 3p^2$ from $5p^2 + 3q^2 – pq$
Solution:
(i) $-5y^2$ from $y^2 = y^2 – (-5y^2)$
$= y^2 + 5y^2 = 6y^2$

(ii) 6ry from -12ry = -12xy – 6xy = -18xy which is required.
(iii) (a – b) from (a + b)
= (a + b) – (a – b)
= a + b – a + b = 2b which is required

(iv) a(b – 5) from b(5 – a)
= b(5 – a) – a(b – 5)
= 5b – ab – ab + 5a
= 5a – 2ab + 5b
= 5a + 5b – 2ab which is required.

(v) $-m^2 + 5mn$ from $4m^2 – 3mn + 8$
= $(4m^2 – 3mn + 8) – (-m^2 + 5mn)$
= $4m^2 – 3mn + 8 + m^2 – 5mn$
= $4m^2 + m^2 – 3mn – 5mn + 8$
= $5m^2 – 8mn + 8$ which is required.

(vi) $-x^2 + 10x – 5$ from $5x – 10$
= $(5x – 10) – (-x^2 + 10x – 5)$
= $5x – 10 + x^2 – 10x + 5$
= $x^2 + 5x – 10x – 10 + 5$
= $x^2 – 5x – 5$ which is required.

(vii) $5a^2 – 7ab + 5b^2$ from $3ab – 2a^2 – 2b^2$
= $(3ab – 2a^2 – 2b^2) – (5a^2 – 7ab + 5b^2)$
= $3ab – 2a^2 – 2b^2 – 5a^2 + 7ab – 5b^2$
= $3ab + 7ab – 2a^2 – 5a^2 – 2b^2 – 5b^2$
= $10ab – 7a^2 – 7b^2$
which is required.

(viii) $4pq – 5q^2 – 3p^2$ from $5p^2 + 3q^2 – pq$
= $(5p^2 + 3q^2 – pq) – (4pq – 5q^2 – 3p^2)$
= $5p^2 + 3q^2 – pq – 4pq + 5q^2 + 3p^2$
= $5p^2 + 3p^2 + 3q^2 + 5q^2 – pq – 4pq$
= $8p^2 + 8q^2 – 5pq$
which is required.

Question 4

(a) What should be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$?

(b) What should be subtracted from $2a + 8b + 10$ to get $-3a + 7b + 16$?

Solution:

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

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

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

$= x^2 + 2xy - y^2$ is required expression.

(b) $(2a + 8b + 10) - (-3a + 7b + 16)$

$= 2a + 8b + 10 + 3a - 7b - 16$

$= 2a + 3a + 8b - 7b + 10 - 16$

$= 5a + b - 6$ is required expression.

Question 5

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

Solution:

Let A be taken away.

$\therefore (3x^2 - 4y^2 + 5xy + 20) - A$

$= -x^2 - y^2 + 6xy + 20$

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

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

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

$= 4x^2 - 3y^2 - xy$ is required expression.

Question 6

(a) From the sum of $3x - y + 11$ and $-y - 11$, subtract $3x - y - 11$.

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

Solution:

(a) Sum of $3x - y + 11$ and $-y - 11$

$= (3x - y + 11) + (-y - 11)$

$= 3x - y + 11 - y - 11$

$\therefore 3x - 2y - (3x - 2y) - (3x - y - 11)$

$= 3x - 2y - 3x + y + 11$

$= 3x - 3x - 2y + y + 11$

$= -y + 11$ is required solution.

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

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

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

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

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

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

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

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

$= 2x^2 - 2x^2 + 3x - x + 4$
$= 2x + 4$ is required expression.

Question 1:

Simplify combining like terms:

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

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

(iii) $p - (p - q) - q - (q - p)$

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

(v) $5x^2y - 5x^2 + 3y\,x^2 - 3y^2 + x^2 - y^2 + 8xy^2 - 3y^2$

(vi) $(3\,y^2 + 5y - 4) - (8y - y^2 - 4)$

Answer:

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

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

$= 8b - 32$

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

$= 7z^3 + z^2\,(-1 + 13) + z\,(-5 - 15)$

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

(iii) $p - (p - q) - q - (q - p) = p - p + q - q - q + p$

$= p - q$

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

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

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

$= a\,(3 - 1 - 1) + b\,(-2 + 1 + 1) + ab\,(-1 - 1 + 3)$

$= a + ab$

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

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

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

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

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

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

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

$= y^2\,(3 + 1) + y\,(5 - 8) + 4\,(1 - 1)$

$= 4y^2 - 3y$

Question 2:

Add:

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

(ii) $t - 8tz, 3tz - z, z - t$

(iii) $-7mn + 5, 12mn + 2, 9mn - 8, -2mn - 3$

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

(viii) $3p^2q^2 - 4pq + 5, -10p^2q^2, 15 + 9pq + 7p^2q^2$

(ix) $ab - 4a, 4b - ab, 4a - 4b$

(x) $x^2 - y^2 - 1, y^2 - 1 - x^2, 1 - x^2 - y^2$

Answer:

(i) $3mn + (-5mn) + 8mn + (-4mn) = mn\,(3 - 5 + 8 - 4)$

$= 2mn$

(ii) $(t - 8tz) + (3tz - z) + (z - t) = t - 8tz + 3tz - z + z - t$

$= t - t - 8tz + 3tz - z + z$

$= t\,(1 - 1) + tz\,(-8 + 3) + z\,(-1 + 1)$

$= -5tz$

(iii) $(-7mn + 5) + (12mn + 2) + (9mn - 8) + (-2mn - 3)$

$= -7mn + 5 + 12mn + 2 + 9mn - 8 - 2mn - 3$

$= -7mn + 12mn + 9mn - 2mn + 5 + 2 - 8 - 3$

$= mn\,(-7 + 12 + 9 - 2) + (5 + 2 - 8 - 3)$

$= 12mn - 4$

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

$= a + b - 3 + b - a + 3 + a - b + 3$

$= a - a + a + b + b - b - 3 + 3 + 3$

$= a\,(1 - 1 + 1) + b\,(1 + 1 - 1) + 3\,(-1 + 1 + 1)$

$= a + b + 3$

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

$= 14x + 10y - 12xy - 13 + 18 - 7x - 10y + 8yx + 4xy$

$= 14x - 7x + 10y - 10y - 12xy + 8yx + 4xy - 13 + 18$

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

$= 7x + 5$

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

$= 5m - 7n + 3n - 4m + 2 + 2m - 3mn - 5$

$= 5m - 4m + 2m - 7n + 3n - 3mn + 2 - 5$

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

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

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

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

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

(viii) $(3p^2q^2 - 4pq + 5) + (-10\,p^2q^2) + (15 + 9pq + 7p^2q^2)$

$= 3p^2q^2 - 4pq + 5 - 10\,p^2q^2 + 15 + 9pq + 7p^2q^2$

$= 3p^2q^2 - 10\,p^2q^2 + 7p^2q^2 - 4pq + 9pq + 5 + 15$

$= p^2q^2\,(3 - 10 + 7) + pq\,(-4 + 9) + 5 + 15$

$= 5pq + 20$

(ix) $(ab - 4a) + (4b - ab) + (4a - 4b)$

$= ab - 4a + 4b - ab + 4a - 4b$

$= ab - ab - 4a + 4a + 4b - 4b$

$= ab\,(1 - 1) + a\,(-4 + 4) + b(4 - 4)$

$= 0$

(x) $(x^2 - y^2 - 1) + (y^2 - 1 - x^2) + (1 - x^2 - y^2)$

$= x^2 - y^2 - 1 + y^2 - 1 - x^2 + 1 - x^2 - y^2$

$= x^2 - x^2 - x^2 - y^2 + y^2 - y^2 - 1 - 1 + 1$

$= x^2(1 - 1 - 1) + y^2\,(-1 + 1 - 1) + (-1 - 1 + 1)$

$= -x^2 - y^2 - 1$

Question 3:

Subtract:

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

(ii) $6xy$ from $-12xy$

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

(iv) $a\,(b - 5)$ from $b\,(5 - a)$

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

(vi) $-x^2 + 10x - 5$ from $5x - 10$

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

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

Answer:

(i) $y^2 - (-5y^2) = y^2 + 5y^2 = 6y^2$

(ii) $-12xy - (6xy) = -18xy$

(iii) $(a + b) - (a - b) = a + b - a + b = 2b$

(iv) $b(5 - a) - a(b - 5) = 5b - ab - ab + 5a$

$= 5a + 5b - 2ab$

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

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

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

(vi) $(5x - 10) - (-x^2 + 10x - 5) = 5x - 10 + x^2 - 10x + 5$

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

$= x^2 - 5x - 5$

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

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

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

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

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

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

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

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

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

Question 4:

(a) What should be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$?

(b) What should be subtracted from $2a + 8b + 10$ to get $-3a + 7b + 16$?

Answer:

(a) Let a be the required term.

$a + (x^2 + y^2 + xy) = 2x^2 + 3xy$

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

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

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

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

(b) Let p be the required term.

$(2a + 8b + 10) - p = -3a + 7b + 16$

$p = 2a + 8b + 10 - (-3a + 7b + 16)$

$= 2a + 8b + 10 + 3a - 7b - 16$

$= 2a + 3a + 8b - 7b + 10 - 16$

$= 5a + b - 6$

Question 5:

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

Answer:

Let p be the required term.

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

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

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

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

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

Question 6:

(a) From the sum of $3x - y + 11$ and $-y - 11$, subtract $3x - y - 11$.

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

Answer:

(a) $(3x - y + 11) + (-y - 11)$

$= 3x - y + 11 - y - 11$

$= 3x - y - y + 11 - 11$

$= 3x - 2y$

$(3x - 2y) - (3x - y - 11)$

$= 3x - 2y - 3x + y + 11$

$= 3x - 3x - 2y + y + 11$

$= -y + 11$

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

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

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

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

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

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

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

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

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

$= 2x + 4$

Ex 12.3:-

Question 1

If m = 2, find the value of:

(i) m − 2

(ii) 3m − 5

(iii) 9 − 5m

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

(v) $5m2-4$

Solution:

(i) m − 2

Putting m = 2, we get

2 − 2 = 0

(ii) 3m − 5

Putting m = 2, we get

3 × 2 − 5 = 6 − 5 = 1

(iii) 9 − 5m

Putting m = 2, we get

9 − 5 × 2 = 9 − 10 = -1

(iv) $3m^2 - 2m - 7$ Putting m = 2, we get

$3(2)^2 - 2(2) - 7 = 3 \times 4 - 4 - 7$

=12 − 4 − 7 = 12 − 11 = 1

(v) $5m2-4$

Putting m = 2, we get

$5\times22-4=5-4=1$

Question 2
If p = -2, find the value of:
(i) $4p + 7$
(ii) $-3p^2 + 4p + 7$
(iii) $-2p^3 - 3p^2 + 4p + 7$
Solution:
(i) $4p + 7$
Putting p = -2, we get $4(-2) + 7 = -8 + 7 = -1$

(ii) $-3p^2 + 4p + l$
Putting p = -2, we get
$-3(-2)^2 + 4(-2) + 7$
$= -3 \times 4 - 8 + 7 = -12 - 8+ 7 = -13$

(iii) $-2p^3 - 3p^2 + 4p + 7$
Putting p = -2, we get
$- 2(-2)^3 - 3(-2)^2 + 4(-2) + 7$
$= -2 \times (-8) - 3 \times 4 - 8 + 7$
$= 16 - 12 - 8 + 7 = 3$

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:
(i) $a^2 + b^2$
Putting a = 2 and b = -2, we get
$(2)^2 + (-2)^2 = 4 + 4 = 8$

(ii) $a^2 + ab + b^2$
Putting a = 2 and b = -2, we get
$(2)^2 + 2(-2) + (-2)^2 = 4 - 4 + 4 = 4$

(iii) $a^2 - b^2$
Putting a = 2 and b = -2, we get
$(2)^2 - (-2)^2 = 4 - 4 = 0$

Question 4

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

(i) $2a + 2b$

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

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

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

Solution:

(i) $2a + 2b = 2(0) + 2(-1)$

$= 0 - 2 = -2$ which is required.

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

$= 2(0)^2 + (-1)^2 + 1 = 0 + 1 + 1 = 2$ which is required.

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

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

$= 0 + 0 + 0 = 0$ which is required.

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

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

$= 0 + 0 + 2 = 0$ which is required.

Question 5

Simplify the expressions and find the value if x is equal to 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:

(i) $x + 7 + 4(x - 5) = x + 7 + 4x - 20 = 5x - 13$

Putting x = 2, we get

$= 5 \times 2 - 13 = 10 - 13 = -3$

which is required.

(ii) $3(x + 2) + 5x - 7 = 3x + 6 + 5x - 7 = 8x - 1$

Putting x = 2, we get

$= 8 \times 2 - 1 = 16 - 1 = 15$

which is required.

(iii) $6x + 5(x - 2) = 6x + 5x - 10$

$= 11 \times - 10$

Putting x = 2, we get

$= 11 \times 2 - 10 = 22 - 10 = 12$

which is required.

(iv) 4(2x − 1) + 3x + 11 = 8x − 4 + 3x + 11
= 11x + 7
Putting x = 2, we get
= 11 × 2 + 7 = 22+ 7 = 29

Question 6
Simplify these expressions and find their values if x = 3, a = -1, b = -2.
(i) 3x − 5 − x + 9
(ii) 2 − 8x + 4x + 4
(iii) 3a + 5 − 8a + 1
(iv) 10 − 3b − 4 − 55
(v) 2a − 2b − 4 − 5 + a
Solution:
(i) 3x − 5 − x + 9 = 2x + 4
Putting x = 3, we get
2 × 3 + 4 = 6 + 4 = 10
which is required.

(ii) 2 − 8x + 4x + 4 = -8x + 4x + 2 + 4 = -4x + 6
Putting x = 2, we have
= -4 × 2 + 6 = -8 + 6 =-2
which is required.

(iii) 3a + 5 − 8a +1 = 3a − 8a + 5 + 1 = -5a + 6
Putting a = -1, we get
= -5(-1) + 6 = 5 + 6 = 11
which is required.

(iv) 10 − 3b − 4 − 5b = -3b − 5b + 10 − 4
= -8b + 6
Putting b = -2, we get
= -8(-2) + 6 = 16 + 6 = 22
which is required.

(v) 2a − 2b − 4 − 5 + a = 2a + a − 2b − 4 − 5
= 3a − 26 − 9
Putting a = -1 and b = -2, we get
= 3(-1) − 2(-2) − 9
= -3 + 4 − 9 = 1 − 9 = -8
which is required.

Question 7

(i) If z = 10, find the value of $z^2 - 3(z - 10)$.

(ii) If p = -10, find the value of p^2 -2p – 100.

Solution:

(i) $z^2 - 3(z - 10)$

$= z^2 - 3z + 30$

Putting z = 10, we get

$= (10)^2 - 3(10) + 30$

= 1000 – 30 + 30 = 1000 which is required.

(ii) $p^2 - 2p - 100$

Putting p = -10, we get

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

= 100 + 20 – 100 = 20 which is required.

Question 8

What should be the value of a if the value of $2x^2 + x - a$ equals to 5, when x = 0?

Solution:

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

Putting x = 0, we get

$2(0)^2 + (0) - a = 5$

0 + 0 – a = 5

-a = 5

⇒ a = -5 which is required value.

Question 9

Simplify the expression and find its value when a = 5 and b = -3.

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

Solution:

$2(a^2 + ab) + 3 - ab = 2a2 + 2ab + 3 - ab$

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

= 2ab + ab + 3

Putting, a = 5 and b = -3, we get

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

= 2 × 25 – 15 + 3

= 50 – 15 + 3

= 53 – 15 = 38

Hence, the required value = 38.

Question 1:

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

(i) $m - 2$ (ii) $3m - 5$ (iii) $9 - 5m$

(iv) $3m^2 - 2m - 7$ (v) $\frac{5m}{2} - 4$

Answer:

(i) $m - 2 = 2 - 2 = 0$

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

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

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

$= 12 - 4 - 7 = 1$

(v) $\frac{5m}{2} - 4 = \left(\frac{5 \times 2}{2}\right) - 4 = 1$

Question 2:

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

(i) $4p + 7$

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

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

Answer:

(i) $4p + 7 = 4 \times (-2) + 7 = -8 + 7 = -1$

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

$= -12 - 8 + 7 = -13$

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

$= -2(-2) \times (-2) \times (-2) - 3(-2) \times (-2) + 4 \times (-2) + 7$

$= 16 - 12 - 8 + 7 = 3$

Question 3:

Find the value of the following expressions, when $x = -1$:

(i) $2x - 7$ (ii) $-x + 2$ (iii) $x^2 + 2x + 1$

(iv) $2x^2 - x - 2$

Answer:

(i) $2x - 7$

$= 2 \times (-1) - 7 = -9$

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

(iii) $x^2 + 2x + 1 = (-1) \times (-1) + 2 \times (-1) + 1$

$= 1 - 2 + 1 = 0$

(iv) $2x^2 - x - 2 = 2(-1) \times (-1) - (-1) - 2$

$= 2 + 1 - 2 = 1$

Question 4:

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

(i) $a^2 + b^2$ (ii) $a^2 + ab + b^2$ (iii) $a^2 - b^2$

Answer:

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

$= (2)^2 + (-2)^2 = 4 + 4 = 8$

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

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

$= 4 - 4 + 4 = 4$

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

$= (2)^2 - (-2)^2 = 4 - 4 = 0$

Question 5:

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

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

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

Answer:

(i) $2a + 2b = 2 \times (0) + 2 \times (-1) = 0 - 2 = -2$

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

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

$= 0 + 1 + 1 = 2$

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

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

$= 0 + 0 + 0 = 0$

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

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

$= 0 + 0 + 2 = 2$

Question 6:

Simplify the expressions and find the value if x is equal to 2

(i) $x + 7 + 4\ (x - 5)$ (ii) $3\ (x + 2) + 5x - 7$

(iii) $6x + 5\ (x - 2)$ (iv) $4\ (2x - 1) + 3x + 11$

Answer:

(i) $x + 7 + 4\ (x - 5) = x + 7 + 4x - 20$

$= x + 4x + 7 - 20$

$= 5x - 13$

$= (5 \times 2) - 13$

$= 10 - 13 = -3$

(ii) $3\ (x + 2) + 5x - 7 = 3x + 6 + 5x - 7$

$= 3x + 5x + 6 - 7 = 8x - 1$

$= (8 \times 2) - 1 = 16 - 1 = 15$

(iii) $6x + 5\ (x - 2) = 6x + 5x - 10$

$= 11x - 10$

$= (11 \times 2) - 10 = 22 - 10 = 12$

(iv) $4\ (2x - 1) + 3x + 11 = 8x - 4 + 3x + 11$

$= 11x + 7$

$= (11 \times 2) + 7$

$= 22 + 7 = 29$

Question 7:

Simplify these expressions and find their values if $x = 3$, $a = -1$, $b = -2$.

(i) $3x - 5 - x + 9$ (ii) $2 - 8x + 4x + 4$

(iii) $3a + 5 - 8a + 1$ (iv) $10 - 3b - 4 - 5b$

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

Answer:

(i) $3x - 5 - x + 9 = 3x - x - 5 + 9$

$= 2x + 4 = (2 \times 3) + 4 = 10$

(ii) $2 - 8x + 4x + 4 = 2 + 4 - 8x + 4x$

$= 6 - 4x = 6 - (4 \times 3) = 6 - 12 = -6$

(iii) $3a + 5 - 8a + 1 = 3a - 8a + 5 + 1$

$= -5a + 6 = -5 \times (-1) + 6$

$= 5 + 6 = 11$

(iv) $10 - 3b - 4 - 5b = 10 - 4 - 3b - 5b$

$= 6 - 8b = 6 - 8 \times (-2)$

$= 6 + 16 = 22$

(v) $2a - 2b - 4 - 5 + a = 2a + a - 2b - 4 - 5$

$= 3a - 2b - 9s$

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

$= -3 + 4 - 9 = -8$

Question 8:

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

(ii) If $p = -10$, find the value of $p^2 - 2p - 100$

Answer:

(i) $z^3 - 3(z - 10) = z^3 - 3z + 30$

$= (10 \times 10 \times 10) - (3 \times 10) + 30$

$= 1000 - 30 + 30 = 1000$

(ii) $p^2 - 2p - 100$

$= (-10) \times (-10) - 2(-10) - 100$

$= 100 + 20 - 100 = 20$

Question 9:

What should be the value of a if the value of $2x^2 + x - a$ equals to 5, when $x = 0$?

Answer:

$2x^2 + x - a = 5$, when $x = 0$

$(2 \times 0) + 0 - a = 5$

$0 - a = 5$

$a = -5$

Question 10:

Simplify the expression and find its value when $a = 5$ and $b = -3$.

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

Answer:

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

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

$= 2a^2 + ab + 3$

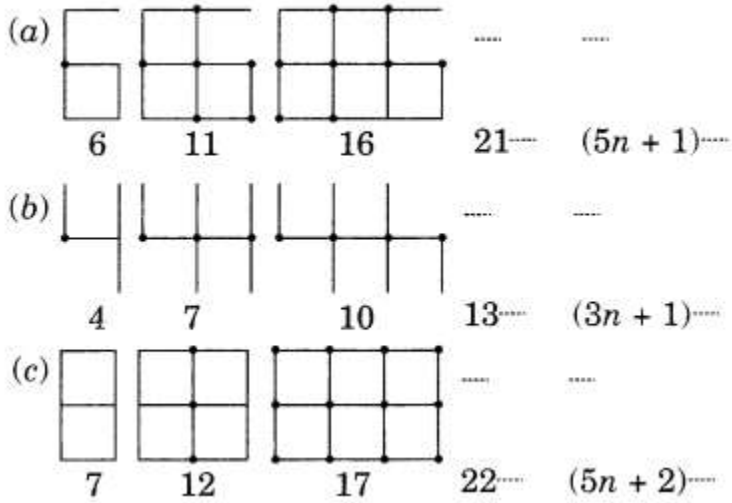
$= 2 \times (5 \times 5) + 5 \times (-3) + 3$

$= 50 - 15 + 3 = 38$

Ex 12.4:-

Question 1

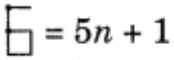
Observe the patterns of digits made from line segments of equal length. You will find such segmented digits on the display of electronic watches or calculators.



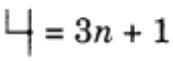
If the number of digits formed is taken to be n, the number of segments required to form n digits is given by the algebraic expression appearing on the right of each pattern. How many segments are required to form 5, 10, 100 digits of the kind 6, 4, 3.

Solution:

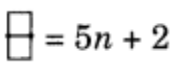
(i) The number of line segments required to form
n digits is given by the expressions.

 = 5n + 1

For 5 figures, the number of line segments = 5 × 5 + 1 = 25 + 1 = 26
For 10 figures, the number of line segments = 5 × 10 + 1
= 50 + 1 = 51
For 100 figures, the number of line segments = 5 × 100 + 1
= 500 + 1 = 501

(ii)  = 3n + 1

For 5 figures, the number of line segments =3 ×5 + 1
= 15 + 1 = 16
For 10 figures, the number of line segments = 3 × 10 + 1
= 30 + 1 = 31
For 100 figures, the number of line segments = 3 × 100 + 1
= 300 + 1 = 301

(iii)  = 5n + 2

For 5 figures, the number of line numbers = 5 × 5 + 2
= 25 + 2 = 27
For 10 figures, the number of line segments = 5 × 10 + 2
= 50 + 2 = 52

For 100 figures, the number of line segments = 5 × 100 + 2
= 500 + 2 = 502

Question 2

Use the given algebraic expression to complete the table of number patterns:

S.No.	Expression	Terms									
		1st	2nd	3rd	4th	5th	...	10th	...	100th	...
(i)	2n – 1	1	3	5	7	9	–	19	–	–	–
(ii)	3n + 2	5	8	11	14	–	–	–	–	–	–
(iii)	4n + 1	5	9	13	17	–	–	–	–	–	–
(iv)	7n + 20	27	34	41	48	–	–	–	–	–	–
(v)	$n^2 + 1$	2	5	10	17	–	–	–	–	10,001	–

Solution:

(i) Given expression is 2n – 1
For n = 100, 2 × 100 – 1
= 200 – 1 = 199

(ii) Given expression is 3n + 2
For n = 5, 3 × 5 + 2 = 15 + 2 = 17

For n = 10, $3 \times 10 + 2 = 30 + 2 = 32$
For n = 100, $3 \times 100 + 2 = 300 + 2 = 302$

(iii) Given expression is $4n + 1$
For n = 5, $4 \times 5 + 1 = 20 + 1 = 21$
For n = 10, $4 \times 10 + 1 = 40 + 1 = 41$
For n = 100, $4 \times 100 + 1 = 400 + 1 = 401$

(iv) Given expression is $7n + 20$
For n = 5, $7 \times 5 + 20 = 35 + 20 = 55$
For n = 10, $7 \times 10 + 20 = 70 + 20 = 90$
For n = 100, $7 \times 100 + 20 = 700 + 20 = 720$

(v) Given expression is $n^2 + 1$
For n = 5, $5^2 + 1 = 25 + 1 = 26$
For n = 10, $10^2 + 1 = 100 + 1 = 101$

Question 1:

Observe the patterns of digits made from line segments of equal length. You will find such segmented digits on the display of electronic watches or calculators.

(a)

6 11 16 21... (5*n* + 1) ...

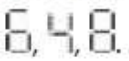
(b)

4 7 10 13... (3*n* + 1) ...

(c)

7 12 17 22... (5*n* + 2) ...

If the number of digits formed is taken to be *n*, the number of segments required to form *n* digits is given by the algebraic expression appearing on the right of each pattern. How many segments are required to form 5, 10, 100 digits of the kind –



Answer:

(a) It is given that the number of segments required to form *n* digits of the kind  is (5*n* + 1).

Number of segments required to form 5 digits = (5 × 5 + 1)

= 25 + 1 = 26

Number of segments required to form 10 digits = (5 × 10 + 1)

= 50 + 1 = 51

Number of segments required to form 100 digits = (5 × 100 + 1)

= 500 + 1 = 501

(b) It is given that the number of segments required to form *n* digits of the kind  is (3*n* + 1).

Number of segments required to form 5 digits = (3 × 5 + 1)

= 15 + 1 = 16

Number of segments required to form 10 digits = (3 × 10 + 1)

= 30 + 1 = 31

Number of segments required to form 100 digits = (3 × 100 + 1)

= 300 + 1 = 301

(c)It is given that the number of segments required to form *n* digits of the kind  is (5

+ 2).

Number of segments required to form 5 digits = (5 × 5 + 2)

= 25 + 2 = 27

Number of segments required to form 10 digits = (5 × 10 + 2)

= 50 + 2 = 52

Number of segments required to form 100 digits = (5 × 100 + 2)

= 500 + 2 = 502

Question 2:

Use the given algebraic expression to complete the table of number patterns.

S. No	Expression	Terms									
		1st	2nd	3rd	4th	5th	...	10th	...	100th	...
(i)	$2n - 1$	1	3	5	7	9	-	19	-	-	-
(ii)	$3n + 2$	2	5	8	11	-	-	-	-	-	-
(iii)	$4n + 1$	5	9	13	17	-	-	-	-	-	-
(iv)	$7n + 20$	27	34	41	48	-	-	-	-	-	-
(v)	$n^2 + 1$	2	5	10	17	-	-	-	-	10, 001	-

Answer:

The given table can be completed as follows.

S.No.	Expression	Terms									
		1st	2nd	3rd	4th	5th	...	10th	...	100th	...
(i)	$2n - 1$	1	3	5	7	9	-	19	-	199	-

(ii)	$3n + 2$	2	5	8	11	17	-	32	-	302	-
(iii)	$4n + 1$	5	9	13	17	21	-	41	-	401	-
(iv)	$7n + 20$	27	34	41	48	55	-	90	-	720	-
(v)	$n^2 + 1$	2	5	10	17	26	-	101	-	10,001-	-