EXERCISE 12.1 PAGE: 234

1. Get the algebraic expressions in the following cases using variables, constants and arithmetic operations.

(i) Subtraction of z from y.

Solution:-

= Y – z

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

Solution:-

= ½ (x + y)

= (x + y)/2

(iii) The number z multiplied by itself.

Solution:-

= z × z

= z^2

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

Solution:-

= ¼ (p × q)

= pq/4

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

Solution:-

= $x^2 + y^2$

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

Solution:-

= 3mn + 5

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

Solution:-

= 10 – (y × z)

= 10 – yz

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

Solution:-

= (a × b) – (a + b)

= ab – (a + b)

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

Show the terms and factors by tree diagrams.

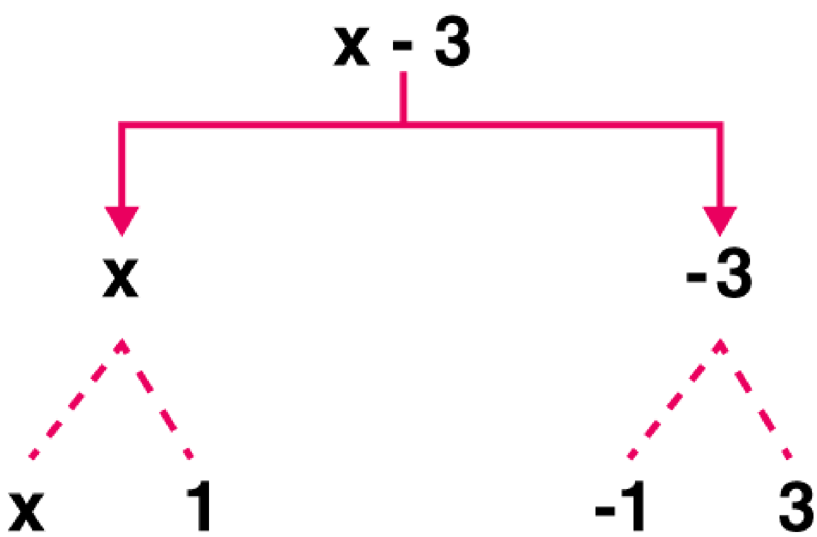
(a) x – 3

Solution:-

Expression: x – 3

Terms: x, -3

Factors: x; -3



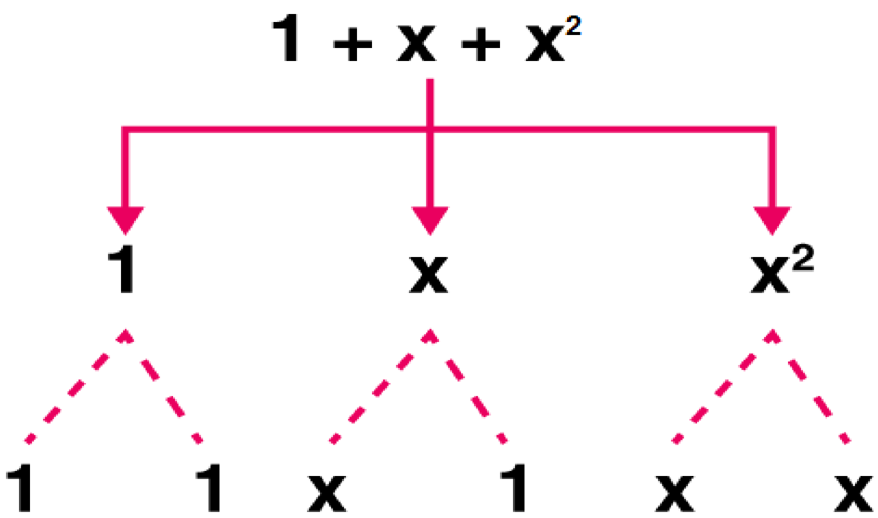
(b) $1 + x + x^2$

Solution:-

Expression: $1 + x + x^2$

Terms: $1, x, x^2$

Factors: 1; x; x,x



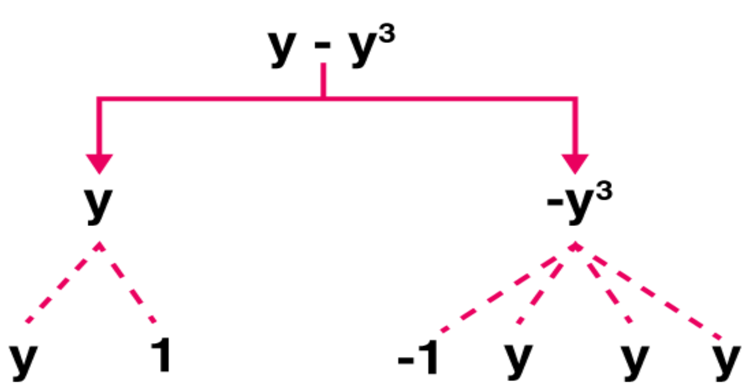
(c) $y – y^3$

Solution:-

Expression: $y – y^3$

Terms: $y, -y^3$

Factors: y; -y, -y, -y



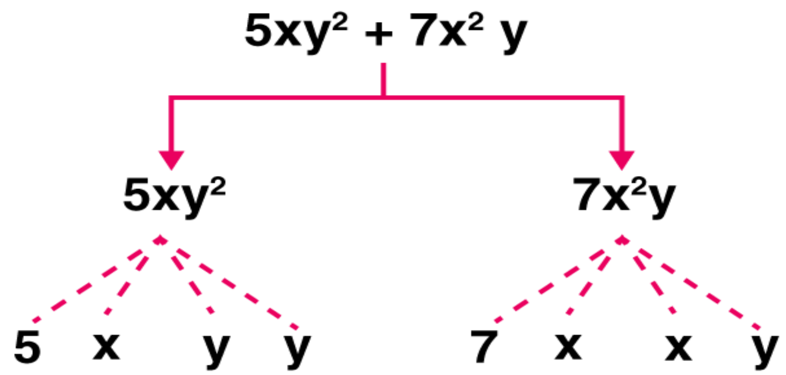
(d) $5xy^2 + 7x^2y$

Solution:-

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

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

Factors: 5, x, y, y; 7, x, x, y



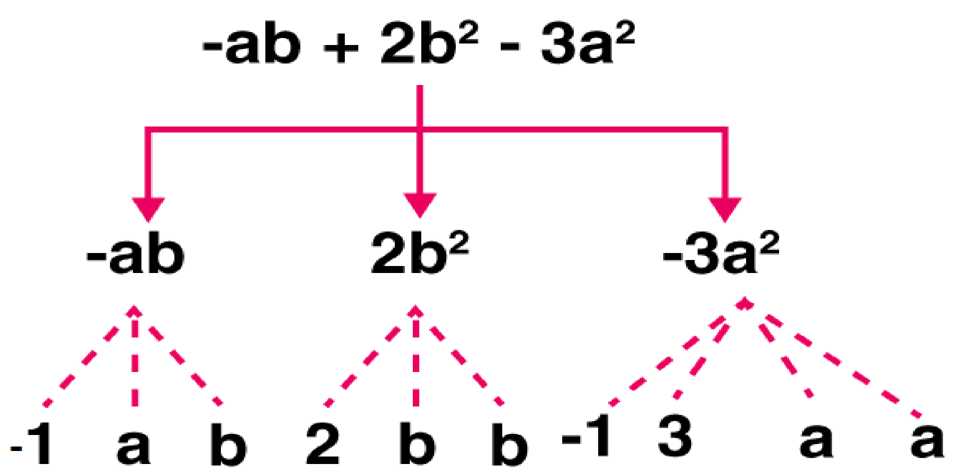
(e) – ab + 2b² – 3a²

Solution:-

Expression: $-ab + 2b^2 – 3a^2$

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

Factors: -a, b; 2, b, b; -3, a, a



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

(a) – 4x + 5 (b) – 4x + 5y (c) 5y + 3y² (d) xy + 2x²y²

(e) pq + q (f) 1.2 ab – 2.4 b + 3.6 a (g) ¾ x + ¼

(h) 0.1 p² + 0.2 q²

Solution:-

Expressions are defined as numbers, symbols and operators (such as +. – , × and ÷) grouped together that show the value of something.

In algebra, a term is either a single number or variable or numbers and variables multiplied together. Terms are separated by + or – signs or sometimes by division.

Factors are defined as numbers we can multiply together to get another number.

Sl.No.	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)	$1.2\ ab - 2.4\ b + 3.6\ a$	$1.2ab$ $-2.4b$ $3.6a$	1.2, a, b -2.4, b 3.6, a
(g)	¾ x + ¼	¾ x ¼	¾, x ¼
(h)	$0.1\ p^2 + 0.2\ q^2$	$0.1p^2$	0.1, p, p

		$0.2q^2$	0.2, q, q

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) $1.2\ a + 0.8\ b$ (vii) $3.14\ r^2$ (viii) $2\ (l + b)$

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

Solution:-

Expressions are defined as numbers, symbols and operators (such as +. – , × and ÷) grouped together that show the value of something.

In algebra, a term is either a single number or variable or numbers and variables multiplied together. Terms are separated by + or – signs or sometimes by division.

A coefficient is a number used to multiply a variable (2x means 2 times x, so 2 is a coefficient). Variables on their own (without a number next to them) actually have a coefficient of 1 (x is really 1x).

Sl.No.	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)	1.2 a + 0.8 b	1.2a 0.8b	1.2 0.8
(vii)	$3.14\ r^2$	3.14^2	3.14

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

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:-

Sl.No.	**Expression**	**Terms**	**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	x zx	1 z
(v)	1 + x + xy	xy	y
(vi)	$12xy^2 + 25$	$12xy^2$	$12y^2$
(vii)	$7x + xy^2$	7x xy^2	7 y^2

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

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

Solution:-

Sl.No.	**Expression**	**Terms**	**Coefficient of y^2**

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

5. Classify into monomials, binomials and trinomials.

(i) $4y - 7z$

Solution:-

Binomial.

An expression which contains two unlike terms is called a binomial.

(ii) y^2

Solution:-

Monomial.

An expression with only one term is called a monomial.

(iii) $x + y - xy$

Solution:-

Trinomial.

An expression which contains three terms is called a trinomial.

(iv) 100

Solution:-

Monomial.

An expression with only one term is called a monomial.

(v) $ab - a - b$

Solution:-

Trinomial.

An expression which contains three terms is called a trinomial.

(vi) $5 - 3t$

Solution:-

Binomial.

An expression which contains two unlike terms is called a binomial.

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

Solution:-

Binomial.

An expression which contains two unlike terms is called a binomial.

(viii) $7mn$

Solution:-

Monomial.

An expression with only one term is called a monomial.

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

Solution:-

Trinomial.

An expression which contains three terms is called a trinomial.

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

Solution:-

Binomial.

An expression which contains two unlike terms is called a binomial.

(xi) $z^2 + z$

Solution:-

Binomial.

An expression which contains two unlike terms is called a binomial.

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

Solution:-

Trinomial.

An expression which contains three terms is called a trinomial.

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

(i) 1, 100

Solution:-

Like term.

When terms have the same algebraic factors, they are like terms.

(ii) $-7x$, $(5/2)x$

Solution:-

Like term.

When terms have the same algebraic factors, they are like terms.

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

Solution:-

Unlike terms.

The terms have different algebraic factors, they are unlike terms.

(iv) 14xy, 42yx

Solution:-

Like term.

When terms have the same algebraic factors, they are like terms.

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

Solution:-

Unlike terms.

The terms have different algebraic factors, they are unlike terms.

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

Solution:-

Unlike terms.

The terms have different algebraic factors, they are unlike terms.

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, $2xy$, $3x$

Solution:-

When terms have the same algebraic factors, they are like terms.

They are,

$-xy^2$, $2xy^2$

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

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

$7y$, y

$-100x$, $3x$

$-11yx$, $2xy$

(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:-

When terms have the same algebraic factors, they are like terms.

They are,

$10pq$, $-7qp$, $78qp$

$7p$, $2405p$

$8q$, $-100q$

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

$-23, 41$

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

$13p^2q, qp^2$

EXERCISE 12.2 PAGE: 239

1. Simplify combining like terms.

(i) 21b – 32 + 7b – 20b

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

= (21b + 7b – 20b) – 32

= b (21 + 7 – 20) – 32

= b (28 – 20) – 32

= b (8) – 32

= 8b – 32

(ii) – z^2 + 13z^2 – 5z + 7z^3 – 15z

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

= 7z^3 + (-z^2 + 13z^2) + (-5z – 15z)

= 7z^3 + z^2 (-1 + 13) + z (-5 – 15)

= 7z^3 + z^2 (12) + z (-20)

= 7z^3 + 12z^2 – 20z

(iii) p – (p – q) – q – (q – p)

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

= p – p + q – q – q + p

= p – q

(iv) 3a – 2b – ab – (a – b + ab) + 3ab + b – a

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

= 3a – 2b – ab – a + b – ab + 3ab + b – a

= 3a – a – a – 2b + b + b – ab – ab + 3ab

= a (1 – 1- 1) + b (-2 + 1 + 1) + ab (-1 -1 + 3)

= a (1 – 2) + b (-2 + 2) + ab (-2 + 3)

= a (1) + b (0) + ab (1)

= a + ab

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

= $5x^2y + 3yx^2 – 5x^2 + x^2 – 3y^2 – y^2 – 3y^2$

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

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

= $8x^2y – 4x^2 – 7y^2 + 8xy^2$

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then,

= $3y^2 + 5y – 4 – 8y + y^2 + 4$

= $3y^2 + y^2 + 5y – 8y – 4 + 4$

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

= y^2 (4) + y (-3) + (0)

= $4y^2$ – 3y

2. Add:

(i) 3mn, – 5mn, 8mn, – 4mn

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

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

= 3mn – 5mn + 8mn – 4mn

= mn (3 – 5 + 8 – 4)

= mn (11 – 9)

= mn (2)

= 2mn

(ii) t – 8tz, 3tz – z, z – t

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

= 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)

= t (0) + tz (- 5) + z (0)

= – 5tz

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

= – 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)

= mn (- 9 + 21) + (7 – 11)

= mn (12) – 4

= 12mn – 4

(iv) a + b – 3, b – a + 3, a – b + 3

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

= 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 + 3 + 3)

= a (2 -1) + b (2 -1) + (-3 + 6)

= a (1) + b (1) + (3)

= a + b + 3

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

= 14x + 10y – 12xy – 13 + (18 – 7x – 10y + 8xy) + 4xy

= 14x + 10y – 12xy – 13 + 18 – 7x – 10y + 8xy + 4xy

= 14x – 7x + 10y– 10y – 12xy + 8xy + 4xy – 13 + 18

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

$= x(7) + y(0) + xy(0) + (5)$

$= 7x + 5$

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$= 5m – 7n + (3n – 4m + 2) + (2m – 3mn – 5)$

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

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

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

$= m(3) + n(-4) – 3mn + (-3)$

$= 3m – 4n – 3mn – 3$

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

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

$= 4x^2y + 5x^2y – 3xy^2 – 5xy^2$

$= x^2y(4 + 5) + xy^2(-3 – 5)$

$= x^2y(9) + xy^2(- 8)$

$= 9x^2y – 8xy^2$

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

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

$= 3p^2q^2 – 10p^2q^2 + 7p^2q^2 – 4pq + 9pq + 5 + 15$

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

$= p^2q^2 (0) + pq (5) + 20$

$= 5pq + 20$

(ix) ab – 4a, 4b – ab, 4a – 4b

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$= ab – 4a + (4b – ab) + (4a – 4b)$

$= ab – 4a + 4b – ab + 4a – 4b$

$= ab – ab – 4a + 4a + 4b – 4b$

$= ab (1 -1) + a (4 – 4) + b (4 – 4)$

$= ab (0) + a (0) + b (0)$

$= 0$

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to add the like terms.

$= x^2 – y^2 – 1 + (y^2 – 1 – x^2) + (1 – x^2 – y^2)$

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

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

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

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

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

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

3. Subtract:

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

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

$= y^2 + 5y^2$

$= 6y^2$

(ii) 6xy from –12xy

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

$= -12xy - 6xy$

$= -18xy$

(iii) (a – b) from (a + b)

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

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

$= a + b - a + b$

$= a - a + b + b$

$= a(1 - 1) + b(1 + 1)$

$= a(0) + b(2)$

$= 2b$

(iv) a (b – 5) from b (5 – a)

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

= b (5 -a) – a (b – 5)

= 5b – ab – ab + 5a

= 5b + ab (-1 -1) + 5a

= 5a + 5b – 2ab

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

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

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

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

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

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

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

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

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

= $x^2 - 5x - 5$

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

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

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

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

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

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

Solution:-

When terms have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms.

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

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

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

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

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

Solution:-

Let us assume p be the required term.

Then,

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

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

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

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

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

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

Solution:-

Let us assume x be the required term.

Then,

$2a + 8b + 10 – x = -3a + 7b + 16$

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

$x = 2a + 8b + 10 + 3a – 7b – 16$

$x = 2a + 3a + 8b – 7b + 10 – 16$

$x = 5a + b – 6$

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

Solution:-

Let us assume a be the required term.

Then,

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

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

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

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

$a = 4x^2 – 3y^2 – xy$

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

Solution:-

First, we have to find out the sum of $3x – y + 11$ and $– y – 11$.

$= 3x – y + 11 + (-y – 11)$

$= 3x – y + 11 – y – 11$

$= 3x – y – y + 11 – 11$

$= 3x – 2y$

Now, subtract $3x – y – 11$ from $3x – 2y$.

$= 3x – 2y – (3x – y – 11)$

$= 3x – 2y – 3x + y + 11$

$= 3x – 3x – 2y + y + 11$

$= -y + 11$

(b) From the sum of 4 + 3x and 5 – 4x + 2x², subtract the sum of 3x² – 5x and –x² + 2x + 5.

Solution:-

First, we have to find out the sum of $4 + 3x$ and $5 - 4x + 2x^2$

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

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

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

$= 9 - x + 2x^2$

$= 2x^2 - x + 9$ … [equation 1]

Then, we have to find out the sum of $3x^2 - 5x$ and $-x^2 + 2x + 5$

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

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

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

$= 2x^2 - 3x + 5$ … [equation 2]

Now, we have to subtract equation (2) from equation (1)

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

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

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

$= 2x + 4$

EXERCISE 12.3 PAGE: 242

1. If m = 2, find the value of:

(i) m – 2

Solution:-

From the question, it is given that m = 2

Then, substitute the value of m in the question.

= 2 -2

= 0

(ii) 3m – 5

Solution:-

From the question, it is given that m = 2

Then, substitute the value of m in the question.

= (3 × 2) – 5

= 6 – 5

= 1

(iii) 9 – 5m

Solution:-

From the question, it is given that m = 2

Then, substitute the value of m in the question.

= 9 – (5 × 2)

= 9 – 10

= – 1

(iv) $3m^2$ – 2m – 7

Solution:-

From the question, it is given that m = 2

Then, substitute the value of m in the question.

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

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

= 12 – 4 -7

= 12 – 11

= 1

(v) (5m/2) – 4

Solution:-

From the question, it is given that m = 2

Then, substitute the value of m in the question.

= $((5 \times 2)/2) - 4$

= (10/2) – 4

= 5 – 4

= 1

2. If p = – 2, find the value of:

(i) 4p + 7

Solution:-

From the question, it is given that p = -2

Then, substitute the value of p in the question.

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

= -8 + 7

= -1

(ii) – $3p^2$ + 4p + 7

Solution:-

From the question, it is given that p = -2

Then, substitute the value of p in the question.

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

= $(-3 \times 4) + (-8) + 7$

= $-12 - 8 + 7$

= $-20 + 7$

= -13

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

Solution:-

From the question, it is given that p = -2

Then, substitute the value of p in the question.

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

= $(-2 \times -8) - (3 \times 4) + (-8) + 7$

= $16 - 12 - 8 + 7$

= $23 - 20$

= 3

3. Find the value of the following expressions when x = –1:

(i) 2x – 7

Solution:-

From the question, it is given that x = -1

Then, substitute the value of x in the question.

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

= $-2 - 7$

= -9

(ii) – x + 2

Solution:-

From the question, it is given that x = -1

Then, substitute the value of x in the question.

= – (-1) + 2

= 1 + 2

= 3

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

Solution:-

From the question, it is given that x = -1

Then, substitute the value of x in the question.

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

= 1 – 2 + 1

= 2 – 2

= 0

(iv) $2x^2 – x – 2$

Solution:-

From the question, it is given that x = -1

Then, substitute the value of x in the question.

= $(2 \times (-1)^2) – (-1) – 2$

= (2 × 1) + 1 – 2

= 2 + 1 – 2

= 3 – 2

= 1

4. If a = 2, b = – 2, find the value of:

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

Solution:-

From the question, it is given that a = 2, b = -2

Then, substitute the value of a and b in the question.

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

$= 4 + 4$

$= 8$

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

Solution:-

From the question, it is given that a = 2, b = -2

Then, substitute the value of a and b in the question.

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

$= 4 + (-4) + (4)$

$= 4 – 4 + 4$

$= 4$

(iii) $a^2 – b^2$

Solution:-

From the question, it is given that a = 2, b = -2

Then, substitute the value of a and b in the question.

$= 2^2 – (-2)^2$

$= 4 – (4)$

$= 4 – 4$

$= 0$

5. When a = 0, b = – 1, find the value of the given expressions:

(i) 2a + 2b

Solution:-

From the question, it is given that a = 0, b = -1

Then, substitute the value of a and b in the question.

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

$= 0 – 2$

= -2

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

Solution:-

From the question, it is given that a = 0, b = -1

Then, substitute the value of a and b in the question.

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

$= 0 + 1 + 1$

$= 2$

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

Solution:-

From the question, it is given that a = 0, b = -1

Then, substitute the value of a and b in the question.

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

$= 0 + 0 +0$

$= 0$

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

Solution:-

From the question, it is given that a = 0, b = -1

Then, substitute the value of a and b in the question.

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

$= 0 + 0 + 2$

$= 2$

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

(i) x + 7 + 4 (x – 5)

Solution:-

From the question, it is given that x = 2

We have,

= x + 7 + 4x – 20

= 5x + 7 – 20

Then, substitute the value of x in the equation.

= (5 × 2) + 7 – 20

= 10 + 7 – 20

= 17 – 20

= – 3

(ii) 3 (x + 2) + 5x – 7

Solution:-

From the question, it is given that x = 2

We have,

= 3x + 6 + 5x – 7

= 8x – 1

Then, substitute the value of x in the equation.

= (8 × 2) – 1

= 16 – 1

= 15

(iii) 6x + 5 (x – 2)

Solution:-

From the question, it is given that x = 2

We have,

= 6x + 5x – 10

= 11x – 10

Then, substitute the value of x in the equation.

= (11 × 2) – 10

= 22 – 10

= 12

(iv) 4(2x – 1) + 3x + 11

Solution:-

From the question, it is given that x = 2

We have,

= 8x – 4 + 3x + 11

= 11x + 7

Then, substitute the value of x in the equation.

= (11 × 2) + 7

= 22 + 7

= 29

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

(i) 3x – 5 – x + 9

Solution:-

From the question, it is given that x = 3

We have,

= 3x – x – 5 + 9

= 2x + 4

Then, substitute the value of x in the equation.

= (2 × 3) + 4

= 6 + 4

= 10

(ii) 2 – 8x + 4x + 4

Solution:-

From the question, it is given that x = 3

We have,

= 2 + 4 – 8x + 4x

= 6 – 4x

Then, substitute the value of x in the equation.

= 6 – (4 × 3)

= 6 – 12

= – 6

(iii) 3a + 5 – 8a + 1

Solution:-

From the question, it is given that a = -1

We have,

= 3a – 8a + 5 + 1

= – 5a + 6

Then, substitute the value of a in the equation.

= – (5 × (-1)) + 6

= – (-5) + 6

= 5 + 6

= 11

(iv) 10 – 3b – 4 – 5b

Solution:-

From the question, it is given that b = -2

We have,

= 10 – 4 – 3b – 5b

= 6 – 8b

Then, substitute the value of b in the equation.

= 6 – (8 × (-2))

= 6 – (-16)

= 6 + 16

= 22

(v) 2a – 2b – 4 – 5 + a

Solution:-

From the question, it is given that a = -1, b = -2

We have,

= 2a + a – 2b – 4 – 5

= 3a – 2b – 9

Then, substitute the value of a and b in the equation.

= (3 × (-1)) – (2 × (-2)) – 9

= -3 – (-4) – 9

= – 3 + 4 – 9

= -12 + 4

= -8

8. (i) If z = 10, find the value of z^3 – 3(z – 10).

Solution:-

From the question, it is given that z = 10

We have,

= z^3 – 3z + 30

Then, substitute the value of z in the equation.

= $(10)^3$ – (3 × 10) + 30

= 1000 – 30 + 30

= 1000

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

Solution:-

From the question, it is given that p = -10

We have,

$= p^2 – 2p – 100$

Then, substitute the value of p in the equation.

$= (-10)^2 – (2 \times (-10)) – 100$

= 100 + 20 – 100

= 20

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

Solution:-

From the question, it is given that x = 0

We have,

$2x^2 + x – a = 5$

$a = 2x^2 + x – 5$

Then, substitute the value of x in the equation.

$a = (2 \times 0^2) + 0 – 5$

a = 0 + 0 – 5

a = -5

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

$2(a^2 + ab) + 3 – ab$

Solution:-

From the question, it is given that a = 5 and b = -3

We have,

$= 2a^2 + 2ab + 3 – ab$

$= 2a^2 + ab + 3$

Then, substitute the value of a and b in the equation.

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

$= (2 \times 25) + (-15) + 3$

$= 50 – 15 + 3$

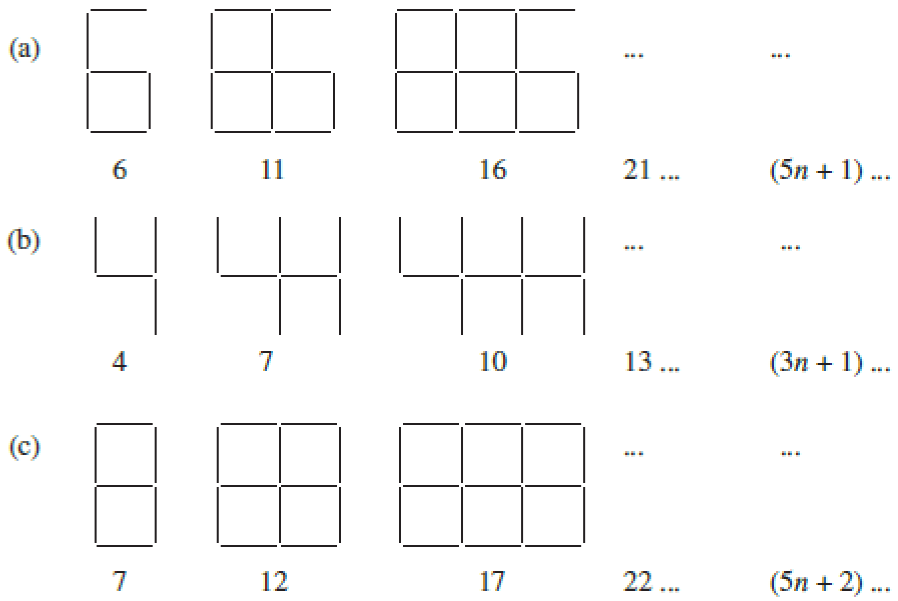
$= 53 – 15$

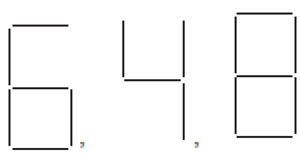
$= 38$

EXERCISE 12.4

PAGE: 246

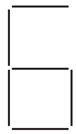
1. Observe the patterns of digits made from line segments of equal length. You will find such segmented digits on the display of electronic watches or calculators.



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 

Solution:-

(a) From the question, it is given that the number of segments required to form n digits of the kind

 is (5n + 1)

Then,

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

= (25 + 1)

= 26

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

= (50 + 1)

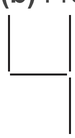
= 51

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

= (500 + 1)

= 501

(b) From the question, it is given that the number of segments required to form n digits of the kind

 is (3n + 1)

Then,

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

= (15 + 1)

= 16

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

= (30 + 1)

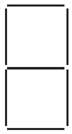
= 31

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

= (300 + 1)

= 301

(c) From the question, it is given that the number of segments required to form n digits of the kind


is (5n + 2)

Then,

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

= (25 + 2)

= 27

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

= (50 + 2)

= 52

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

= (500 + 2)

= 502

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**	**–**	**–**	**–**	**–**	**10001**	**–**

Solution:-

(i) From the table (2n – 1)

Then, 100^{th} term =?

Where n = 100

= (2 × 100) – 1

= 200 – 1

= 199

(ii) From the table (3n + 2)

5^{th} term =?

Where n = 5

= (3 × 5) + 2

= 15 + 2

= 17

Then, 10^{th} term =?

Where n = 10

= (3 × 10) + 2

= 30 + 2

= 32

Then, 100^{th} term =?

Where n = 100

= (3 × 100) + 2

= 300 + 2

= 302

(iii) From the table (4n + 1)

5th term =?

Where n = 5

= (4 × 5) + 1

= 20 + 1

= 21

Then, 10th term =?

Where n = 10

= (4 × 10) + 1

= 40 + 1

= 41

Then, 100th term =?

Where n = 100

= (4 × 100) + 1

= 400 + 1

= 401

(iv) From the table (7n + 20)

5th term =?

Where n = 5

= (7 × 5) + 20

= 35 + 20

= 55

Then, 10th term =?

Where n = 10

= (7 × 10) + 20

= 70 + 20

= 90

Then, 100^{th} term =?

Where n = 100

= (7 × 100) + 20

= 700 + 20

= 720

(v) From the table (n^2 + 1)

5^{th} term =?

Where n = 5

= (5^2) + 1

= 25+ 1

= 26

Then, 10^{th} term =?

Where n = 10

= (10^2) + 1

= 100 + 1

= 101

So, the table is completed below.

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

(ii)	3n + 2	5	8	11	14	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	–	10001	–