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:-

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

$= ab - (a + b)$

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

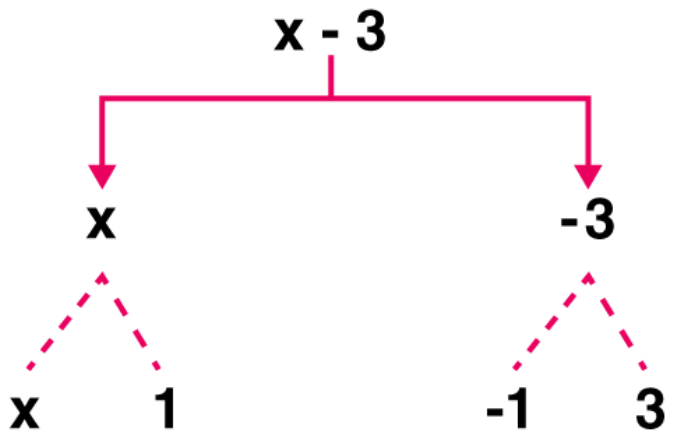
(a) x – 3

Solution:-

Expression: x – 3

Terms: x, -3

Factors: x; -3



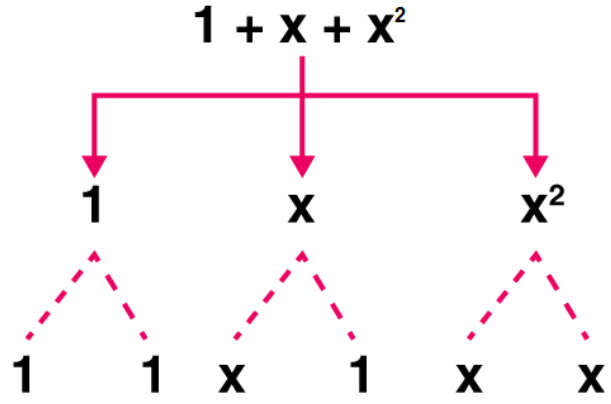
(b) $1 + x + x^2$

Solution:-

Expression: $1 + x + x^2$

Terms: 1, x, x^2

Factors: 1; x; x,x



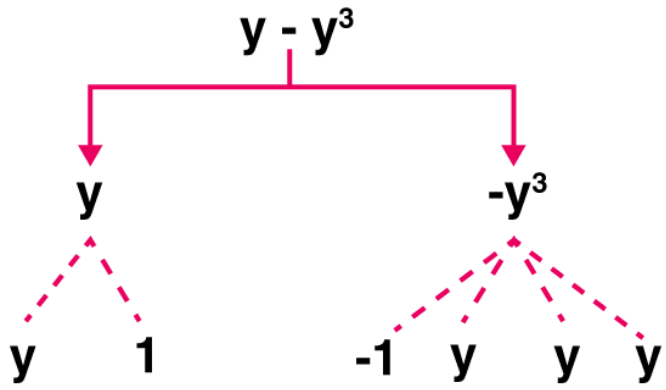
(c) $y - y^3$

Solution:-

Expression: $y - y^3$

Terms: $y, -y^3$

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



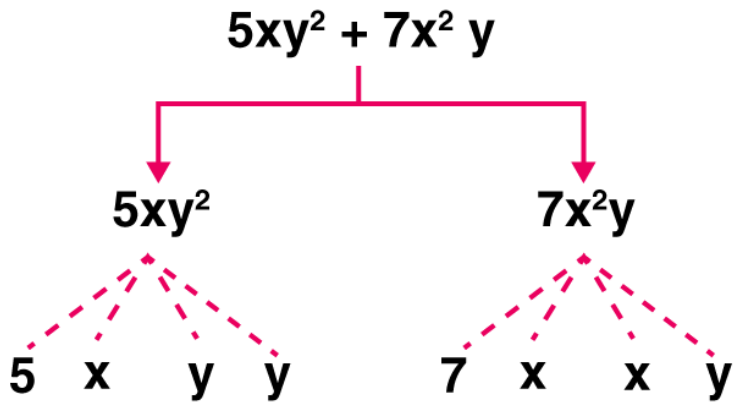
(d) $5xy^2 + 7x^2y$

Solution:-

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

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

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



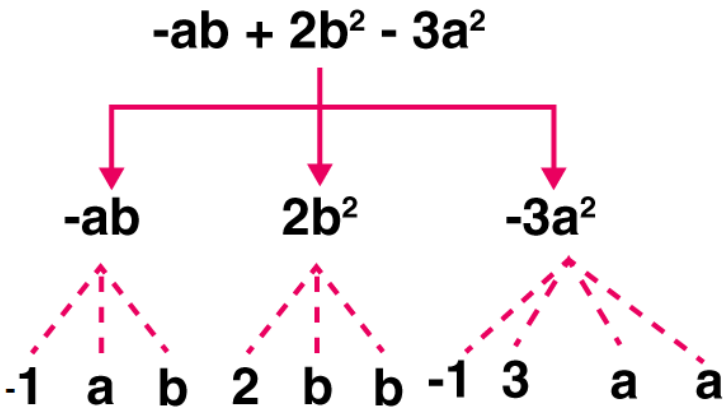
(e) $-ab + 2b^2 - 3a^2$

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) $5y + 3y^2$** **(d) $xy + 2x^2y^2$**

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

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

Solution:-

Expressions is 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 is 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 0.2q^2	0.1, p, p 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 is 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 x
(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 term have the same algebraic factors, they are like terms.

(ii) –7x, (5/2)x
Solution:-
Like term.
When term 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 term 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 term 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 term 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

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1. Simplify combining like terms:

(i) 21b – 32 + 7b – 20b

Solution:-

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

Then,

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

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

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

= $7z^3 + 12z^2 – 20z + 7z^3$

(iii) p – (p – q) – q – (q – p)

Solution:-

When term 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 term 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 (3 – 1- 1) + b (-2 + 1 + 1) + ab (-1 -1 + 3)

= a (3 - 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 term 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 term 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 term 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 term 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 term 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 term 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 term 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 term 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 term 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 term 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 term 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 term 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 term 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 term 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 term 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 term 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 term have the same algebraic factors, they are like terms.

Then, we have to subtract the like terms

= $4m^2 – 3mn + 8 – (- m^2 + 5mn)$

= $4m^2 – 3mn + 8 + m^2 - 5mn$

= $4m^2 + m^2 – 3mn - 5mn + 8$

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

(vi) $– x^2 + 10x – 5$ from $5x – 10$

Solution:-

When term 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 term 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 term 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 $5 – 4x + 2x^2$, subtract the sum of $3x^2 – 5x$ and $–x^2 + 2x + 5$.
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 × 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 × 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 × (-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 × 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 × -8) - (3 × 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 × -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 × -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 × $(-1)^2$) – (-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
$= (5 \times 2) + 7 – 20$
$= 10 + 7 – 20$
$= 17 – 20$
$= - 3$

(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

= $(-10)^2 – (2 × (-10)) – 100$
= 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

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

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

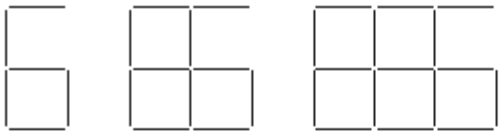
$= 50 - 15 + 3$

$= 53 – 15$

$= 38$

EXERCISE 12.4 PAGE: 246

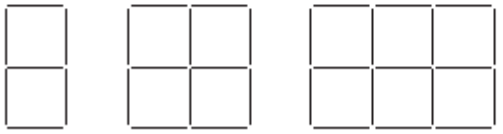
1. Observe the patterns of digits made from line segments of equal length. You will find such segmented digits on the display of electronic watches or calculators.

(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

Solution:-

(a) From the question it is given that the numbers 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 numbers 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 numbers 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)
5^{th} term =?
Where n = 5
= (4 × 5) + 1
= 20 + 1
= 21
Then, 10^{th} term =?
Where n = 10
= (4 × 10) + 1
= 40 + 1
= 41
Then, 100^{th} term =?

Where n = 100

= (4 × 100) + 1

= 400 + 1

= 401

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

5^{th} term =?

Where n = 5

= (7 × 5) + 20

= 35 + 20

= 55

Then, 10^{th} 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	-