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.

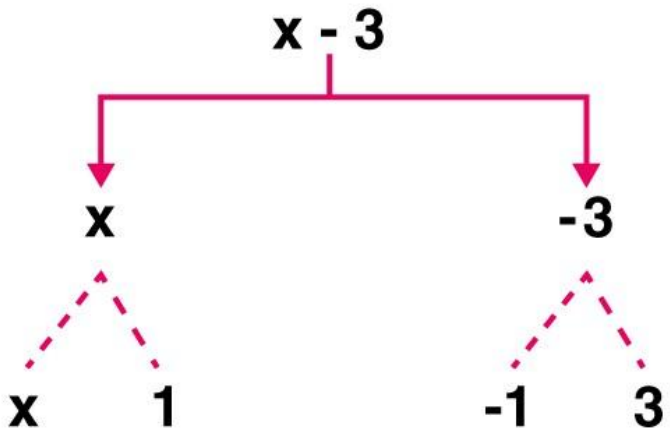
(a) x – 3

Solution:- Expression:

x – 3

Terms: x, -3

Factors: x; -3



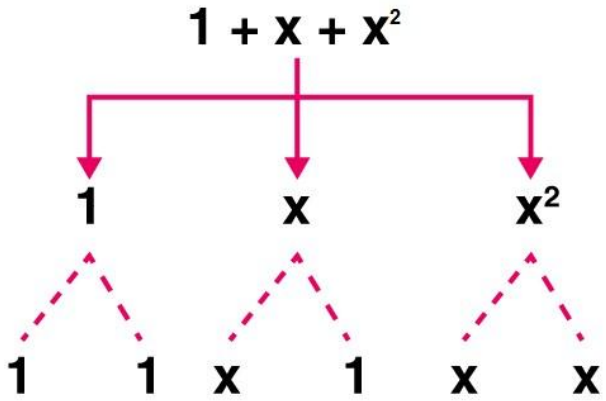
(b) $1 + x + x^2$

Solution:-

Expression: $1 + x + x^2$

Terms: 1, x, x^2

Factors: 1; x; x,x



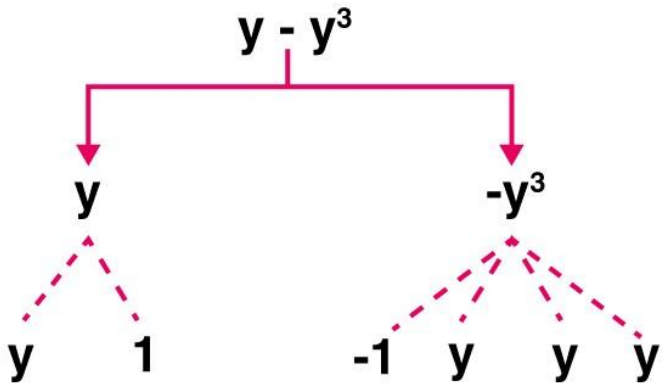
(c) $y - y^3$

Solution:- Expression:

$y - y^3$

Terms: $y, -y^3$

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



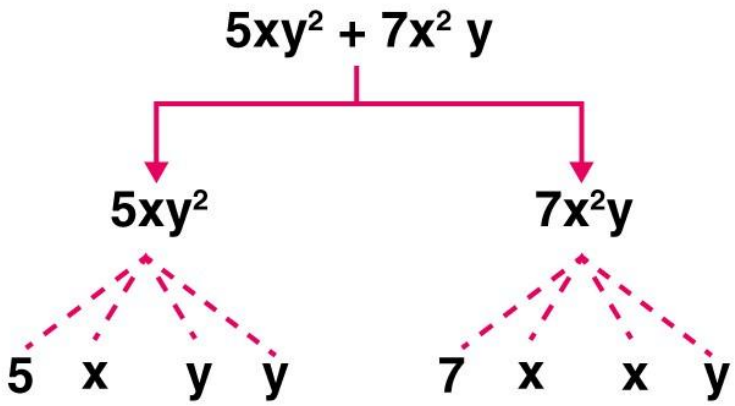
(d) $5xy^2 + 7x^2y$

Solution:-

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

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

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



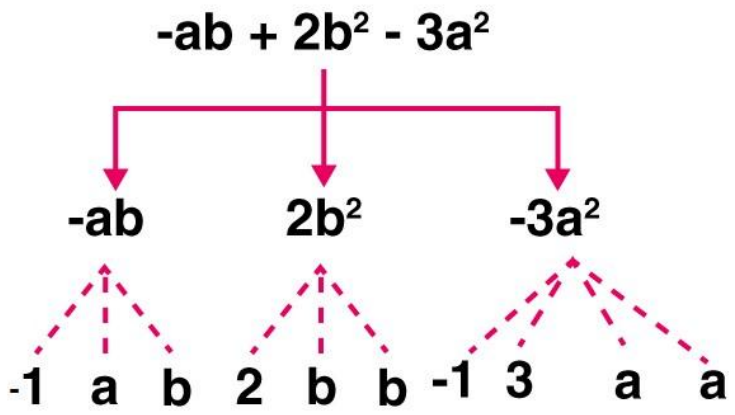
(e) – ab + 2b² – 3a²

Solution:-

Expression: -ab + 2b² – 3a²

Terms: -ab, 2b², -3a²

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

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,

$10pq, -7qp, 78qp$

$7p, 2405p$

$8q, -100q$

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

$-23, 41$

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

$13p^2q, qp^2$

EXERCISE 12.2 PAGE: 239

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,

$= 3a - 2b - ab - a + b - ab + 3ab + b - a$
$= 3a - a - a - 2b + b + b - ab - ab + 3ab$
$= a\,(1 - 1 - 1) + b\,(-2 + 1 + 1) + ab\,(-1 - 1 + 3)$
$= a\,(1 - 2) + b\,(-2 + 2) + ab\,(-2 + 3)$
$= a\,(1) + b\,(0) + ab\,(1)$
$= a + ab$

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

Solution:-

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

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

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

= -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

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

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

$= 2 + 1 - 2$

$= 3 - 2$

$= 1$

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

$= (8 \times 2) - 1$

$= 16 - 1$

$= 15$

(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

$= (11 \times 2) - 10$

$= 22 - 10$

$= 12$

(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

$= (11 \times 2) + 7$

$= 22 + 7$

$= 29$

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

$= (2 \times 3) + 4$

$= 6 + 4$

$= 10$

(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

$= 6 - (4 \times 3)$

$= 6 - 12$

$= -6$

(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

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

$= -(-5) + 6$

$= 5 + 6$

$= 11$

(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

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

$= 6 - (-16)$

$= 6 + 16$

$= 22$

(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

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

$= -3 - (-4) - 9$

$= -3 + 4 - 9$

$= -12 + 4$

$= -8$

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

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

$= 1000 - 30 + 30$

$= 1000$

(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

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

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

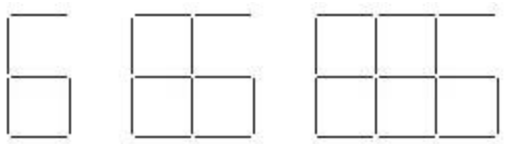
$= 50 - 15 + 3$

$= 53 - 15$

$= 38$

EXERCISE 12.4 PAGE: 246

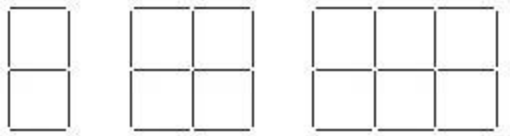
1. Observe the patterns of digits made from line segments of equal length. You will find such segmented digits on the display of electronic watches or calculators.

(a) 

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

(b) 

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

(c) 

7 12 17 22 ... (5n + 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

$= (2 \times 100) - 1$

$= 200 - 1$

$= 199$

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

5^{th} term =?

Where n = 5

$= (3 \times 5) + 2$

$= 15 + 2$

$= 17$

Then, 10^{th} term =?

Where n = 10

$= (3 \times 10) + 2$

$= 30 + 2$

$= 32$

Then, 100^{th} term =?

Where n = 100

$= (3 \times 100) + 2$

$= 300 + 2$

$= 302$

(iii) From the table (4n + 1) 5^{th} term =?

Where n = 5

$= (4 \times 5) + 1$

$= 20 + 1$

= 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	-