NOTES

CLASS -7 TH

SUBJECT – MATHS

CH-12 { ALGEBRAIC EXPRESSION }

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{ EXERCISE -12.1 }

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.

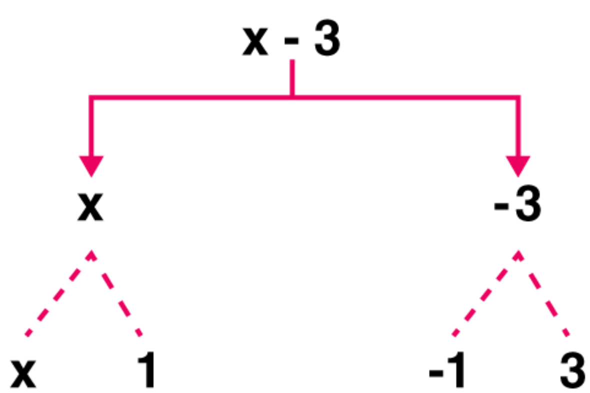
(a) x – 3

Solution:-

Expression: x – 3

Terms: x, -3

Factors: x; -3



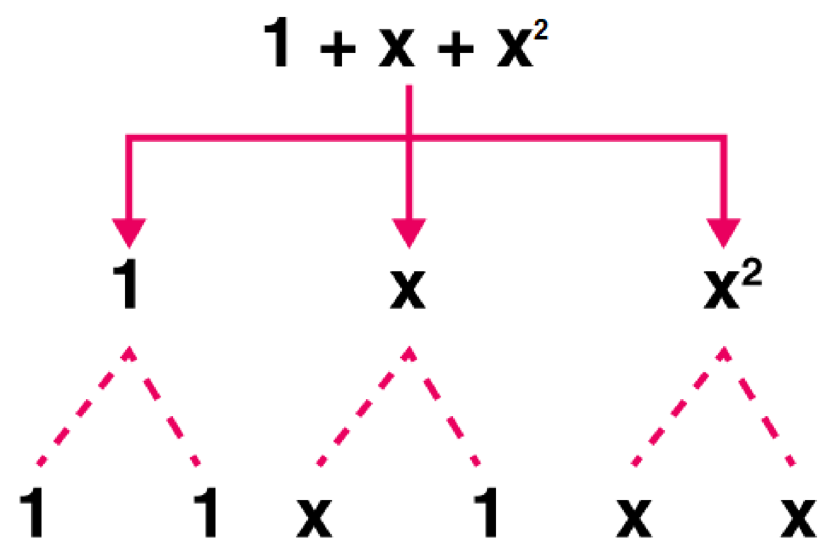
(b) 1 + x + x^2

Solution:-

Expression: 1 + x + x^2

Terms: 1, x, x^2

Factors: 1; x; x,x



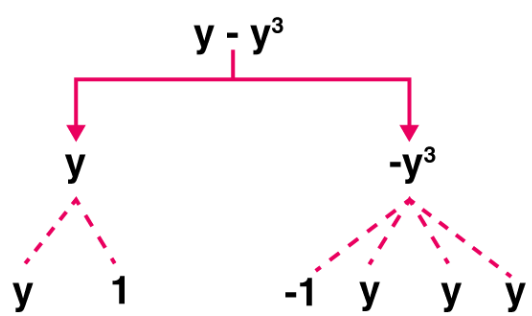
(c) $y - y^3$

Solution:-

Expression: $y - y^3$

Terms: y, $-y^3$

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



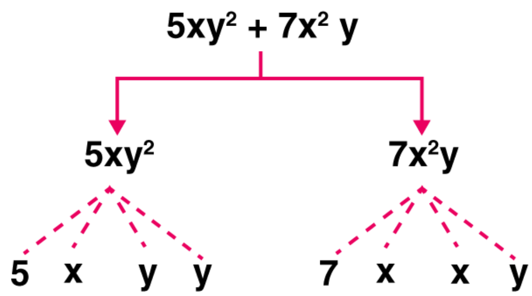
(d) $5xy^2 + 7x^2y$

Solution:-

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

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

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



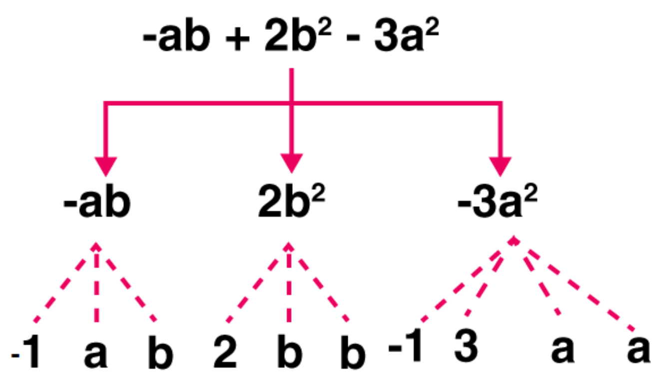
(e) – ab + 2b² – 3a²

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) $5y + 3y^2$ (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)	$\frac{3}{4}x + \frac{1}{4}$	$\frac{3}{4}x$ $\frac{1}{4}$	$\frac{3}{4}, x$ $\frac{1}{4}$
(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 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.

(ii) y^2

Solution:-Monomial.

(iii) $x + y - xy$

Solution:-Trinomial.

(iv) 100

Solution:-Monomial.

(v) $ab - a - b$

Solution:-Trinomial.

(vi) $5 - 3t$

Solution:-Binomial.

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

Solution:-Binomial.

(viii) 7mn

Solution:-

Monomial

(ix) $z^2 – 3z + 8$

Solution:-Trinomial.

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

Solution:-

Binomial.

(xi) $z^2 + z$

Solution:-

Binomial.

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

Solution:-

Trinomial.

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

(i) 1, 100

Solution:-

Like term.

(ii) –7x, (5/2)x

Solution:-

Like term

(iii) – 29x, – 29y

Solution:-

Unlike terms.

(iv) 14xy, 42yx

Solution:-

Like term.

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

Solution:-

Unlike terms.

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

Solution:-

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}

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,

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

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

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

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

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

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

$= 4m^2 – 3mn + 8 – (- m^2 + 5mn)$

$= 4m^2 – 3mn + 8 + m^2 – 5mn$

$= 4m^2 + m^2 – 3mn – 5mn + 8$

$= 5m^2 – 8mn + 8$

(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 + 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 }

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 × 2^2) – (2 × 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 × 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

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

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

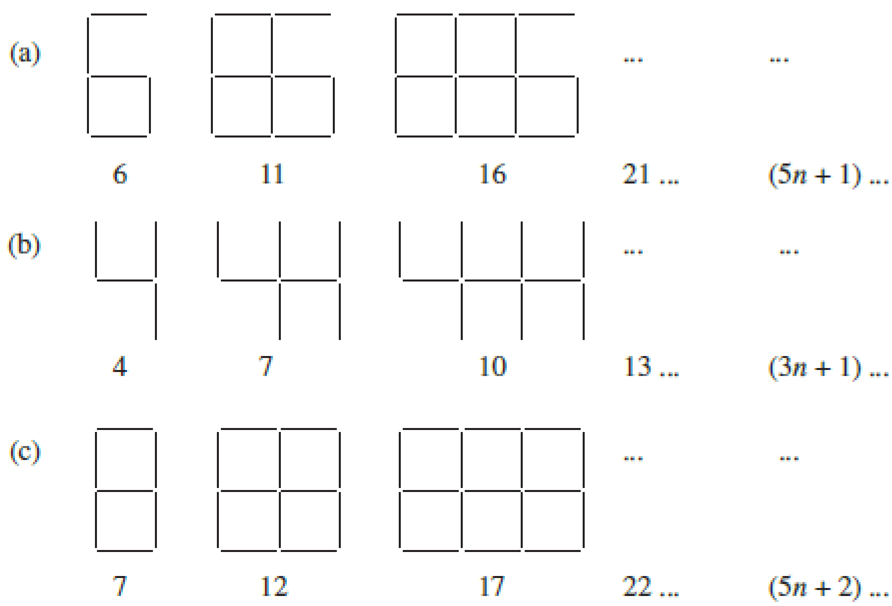
$= 50 – 15 + 3$

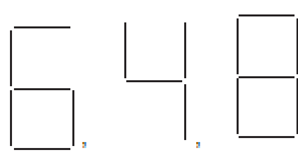
$= 53 – 15$

= 38

{ **Exercise -12.4** }

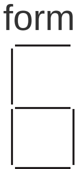
1. Observe the patterns of digits made from line segments of equal length. You will find such segmented digits on the display of electronic watches or calculators.



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 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)

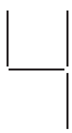
= 51

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)

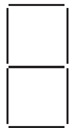
= 31

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									
		1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}	…	10^{th}	…	100^{th}	…
(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 $n = 10$

$= (4 \times 10) + 1$

$= 40 + 1$

$= 41$

Then, 100^{th} term =?

Where $n = 100$

$= (4 \times 100) + 1$

$= 400 + 1$

$= 401$

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

5^{th} term =?

Where $n = 5$

$= (7 \times 5) + 20$

$= 35 + 20$

$= 55$

Then, 10^{th} term =?

Where $n = 10$

$= (7 \times 10) + 20$

$= 70 + 20$

$= 90$

Then, 100^{th} term =?

Where $n = 100$

$= (7 \times 100) + 20$

$= 700 + 20$

$= 720$

(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