

CBSE NCERT Solutions for Class 7 Mathematics Chapter 10

Back of Chapter Questions

EXERCISE 12.1

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

- (i) Subtraction of z from y .
- (ii) One-half of the sum of numbers x and y .
- (iii) The number z multiplied by itself.
- (iv) One-fourth of the product of numbers p and q .
- (v) Numbers x and y both squared and added.
- (vi) Number 5 added to three times the product of numbers m and n .
- (vii) Product of numbers y and z subtracted from 10.
- (viii) Sum of numbers a and b subtracted from their product.

Solution:

- (i) The algebraic expression obtained by subtracting z from y is $(y - z)$

- (ii) Sum of numbers x and y is equal to $x + y$

One-half of the sum of numbers x and y is $\frac{x+y}{2}$

- (iii) The algebraic expression obtained by multiplying number z by itself
 $= z \times z = z^2$

- (iv) Product of numbers p and q is equal to $p \times q$

One-fourth of product of numbers p and q is equal to $\frac{p \times q}{4}$

- (v) Squared number of x is x^2

Squared number of y is y^2

Sum of squared numbers of x and y is equal to $x^2 + y^2$

- (vi) Product of numbers m and n is equal to mn

Three times the product of numbers m and n is equal to $3mn$

The resulting expression after adding 5 to three times the product of numbers m and n is equal to $5 + 3mn$

- (vii) Product of numbers y and z is equal to yz

The resulting expression after subtracting product of numbers y and z from 10 is $10 - yz$

(viii) Sum of numbers a and b is equal to $a + b$

Product of numbers a and b is equal to ab

The resulting expression is $ab - (a + b)$

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

Show the terms and factors by tree diagrams.

(a) $x - 3$

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

(c) $y - y^3$

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

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

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

(a) $-4x + 5$

(b) $-4x + 5y$

(c) $5y + 3y^2$

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

(e) $pq + q$

(f) $1.2ab - 2.4b + 3.6a$

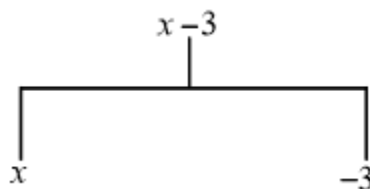
(g) $\frac{3}{4}x + \frac{1}{4}$

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

Solution:

(i) (a) Terms of given expression are $x, -3$

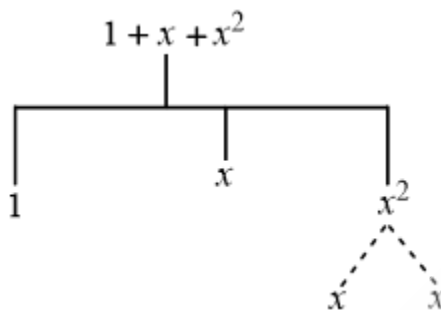
Tree diagram:



(b) Terms of given expression are $1, x, x^2$

Factors of x^2 are x, x .

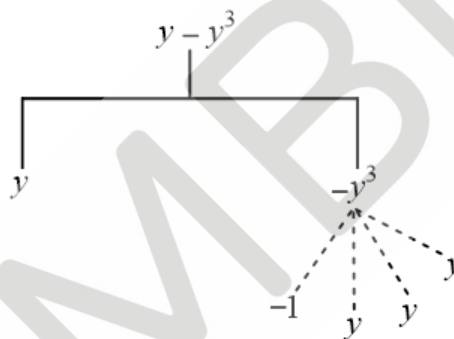
Tree diagram:



(c) Terms of given expression are $y, -y^3$

Factors of $-y^3$ are $-1, y, y, y$.

Tree diagram:

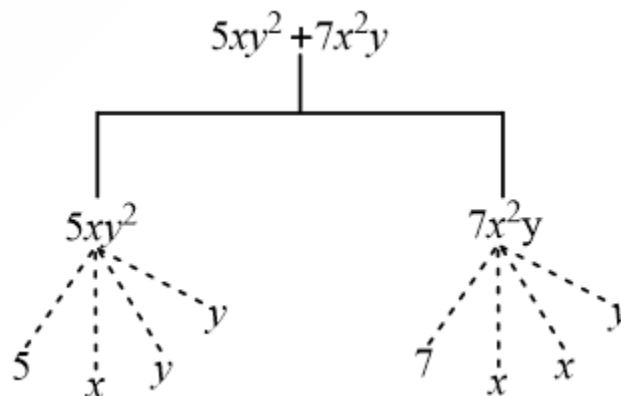


(d) Terms in given expression are $5xy^2, 7x^2y$

Factors of $5xy^2$ are $5, x, y, y$.

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

Tree diagram:



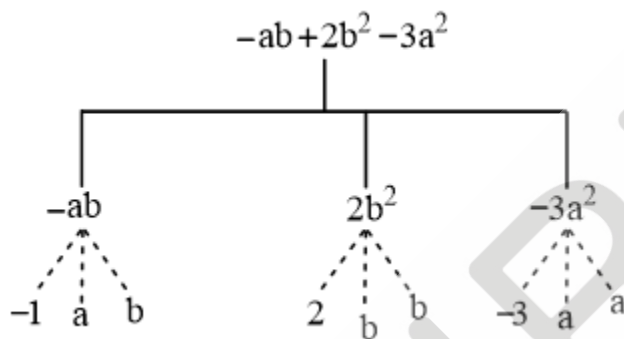
(e) Terms in given expression are $-ab, 2b^2, -3a^2$

Factors of $-ab$ are $-1, a, b$.

Factors of $2b^2$ are $2, b, b$.

Factors of $-3a^2$ are $-3, a, a$.

Tree diagram:



- (ii) (a) Terms in given algebraic expression are $-4x, 5$
Factors of $-4x$ are $-4, x$
- (b) Terms in algebraic expression $-4x + 5y$ are $-4x, 5y$
Factors of $-4x$ are $-4, x$
Factors of $5y$ are $5, y$
- (c) Terms in given algebraic expression are $5y, 3y^2$
Factors of $5y$ are $5, y$
Factors of $3y^2$ are $3, y, y$
- (d) Terms in given algebraic expression are $xy, 2x^2y^2$
Factors of xy are x, y
Factors of $2x^2y^2$ are $2, x, x, y, y$
- (e) Terms in given algebraic expression are pq, q
Factors of pq are p, q
- (f) Terms in given algebraic expression are $1.2ab, -2.4b, 3.6a$
Factors of $1.2ab$ are $1.2, a, b$
Factors of $-2.4b$ are $-2.4, b$
Factors of $3.6a$ are $3.6, a$.
- (g) Terms in given algebraic expression are $\frac{3}{4}x, \frac{1}{4}$

Factors of $\frac{3}{4}x$ are $\frac{3}{4}, x$

(h) Terms in given algebraic expression are $0.1p^2, 0.2q^2$

Factors of $0.1p^2$ are $0.1, p, p$

Factors of $0.2q^2$ are $0.2, q, q$

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) $1.2a + 0.8b$

(vii) $3.14r^2$

(viii) $2(l + b)$

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

Solution:

(i) The term other than constant is $-3t^2$

Numerical coefficient of term $-3t^2 = -3$

(ii) The terms other than constant are t, t^2 and t^3

Numerical coefficient of t is equal to 1

Numerical coefficient of t^2 is equal to 1

Numerical coefficient of t^3 is equal to 1

(iii) The terms other than constant are $x, 2xy, 3y$

Numerical coefficient of x is equal to 1

Numerical coefficient of $2xy$ is equal to 2

Numerical coefficient of $3y$ is equal to 3

(iv) The terms other than constant are $100m$ and $1000n$

Numerical coefficient of $100m$ is equal to 100

Numerical coefficient of $1000n$ is equal to 1000.

- (v) The terms other than constant are $-p^2q^2, 7pq$
Numerical coefficient of $-p^2q^2$ is equal to -1
Numerical coefficient of $7pq$ is equal to 7
- (vi) The terms other than constant are $1.2a, 0.8b$
Numerical coefficient of $1.2a$ is equal to 1.2 .
Numerical coefficient of $0.8b$ is equal to 0.8
- (vii) The term other than constant is $3.14r^2$
Numerical coefficient of $3.14r^2$ is equal to 3.14 .
- (viii) The terms other than constant are $2l, 2b$
Numerical coefficient of $2l$ is equal to 2
Numerical coefficient of $2b$ is equal to 2 .
- (ix) The term other than constant are $0.1y, 0.01y^2$
Numerical coefficient of $0.1y$ is equal to 0.01 .
Numerical coefficient of $0.01y^2$ is equal to 0.001 .
4. (a) Identify terms which contain x and give the coefficient of x .
- (i) $y^2x + y$
- (ii) $13y^2 - 8yx$
- (iii) $x + y + 2$
- (iv) $5 + z + zx$
- (v) $1 + x + xy$
- (vi) $12xy^2 + 25$
- (vii) $7x + xy^2$
- (b) Identify terms which contain y^2 and give the coefficient of y^2
- (i) $8 - xy^2$
- (ii) $5y^2 + 7x$
- (iii) $2x^2y - 15xy^2 + 7y^2$

Solution:

- (a) (i) The term that contain x is y^2x
The coefficient of x in y^2x is equal to y^2

- (ii) The term that contain x in $13y^2 - 8yx$ is $-8yx$
The coefficient of x in $-8yx$ is equal to $-8y$
- (iii) The term that contain x is x
The coefficient of x in x is equal to 1
- (iv) The term that contains x is zx
The coefficient of x in zx is equal to z
- (v) The terms that contain x are x, xy
The coefficient of x in term x is equal to 1
The coefficient of x in term xy is equal to y
- (vi) The term that contain x is $12xy^2$
The coefficient of x in term $12xy^2$ is equal to $12y^2$
- (vii) The terms that contain x are $7x$ and xy^2
The coefficient of x in term $7x$ is equal to 7
The coefficient of x in xy^2 is equal to y^2
- (b) (i) The term that contain y^2 is $-xy^2$
The coefficient of y^2 in term $-xy^2$ is equal to $-x$
- (ii) The term that contain y^2 is $5y^2$
The coefficient of y^2 in term $5y^2$ is equal to 5
- (iii) The term that contain y^2 are $-15xy^2$ and $7y^2$
The coefficient of y^2 in term $-15xy^2$ is $-15x$
The coefficient of y^2 in term $7y^2$ is equal to 7

5. Classify into monomials, binomials and trinomials.

- (i) $4y - 7z$
- (ii) y^2
- (iii) $x + y - xy$
- (iv) 100
- (v) $ab - a - b$
- (vi) $5 - 3t$
- (vii) $4p^2q - 4pq^2$

(viii) $7mn$

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

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

(xi) $z^2 + z$

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

Solution:

- (i) It contains two terms

Hence $4y - 7z$ is a binomial.

- (ii) Given expression contains only one term.

Hence y^2 is a monomial.

- (iii) Given expression contains three terms

Hence $x + y - xy$ is a trinomial

- (iv) Given expression contains only one term.

Hence 100 is a monomial.

- (v) Given expression contains three terms

Hence $ab - a - b$ is a trinomial.

- (vi) Given expression contains two terms.

Hence $5 - 3t$ is a binomial.

- (vii) Given expression contains two terms

Hence $4p^2q - 4pq^2$ is a binomial.

- (viii) Given expression contains only one term.

Hence $7mn$ is a monomial.

- (ix) Given expression contains three terms

Hence $z^2 - 3z + 8$ is a trinomial

- (x) It contains two terms.

Hence $a^2 + b^2$ is a binomial.

- (xi) It contains two terms

Hence $z^2 + z$ is a binomial

- (xii) Given expression contains three terms

Hence $1 + x + x^2$ is a trinomial.

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

(i) $1, 100$

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

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

(iv) $14xy, 42yx$

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

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

Solution:

(i) Since, algebraic factors in 1 and 100 both are same

Hence 1,100 are pair of like terms.

(ii) Algebraic factor of $-7x$ is x

Algebraic factor of $\frac{5}{2}x$ is x

Since, algebraic factors are same.

Hence $-7x, \frac{5}{2}x$ are pair of like terms.

(iii) Algebraic factor of $-29x$ is x

Algebraic factor of $-29y$ is y

Since, algebraic factors are different.

Hence $-29x, -29y$ are pair of unlike terms

(iv) Algebraic factor of $14xy$ is x, y

Algebraic factor of $42yx$ is y, x

Since, algebraic factors are same

Hence $14xy, 42yx$ are pair of like terms

(v) Algebraic factor of $4m^2p$ are m, m, p

Algebraic factor of $4mp^2$ are m, p, p

Since, algebraic factors are different

Hence $4m^2p, 4mp^2$ are pair of unlike terms.

(vi) Algebraic factors of $12xz$ are x and z

Algebraic factors of $12x^2y^2$ are x, x, y and y .

Since, algebraic factors are different.

Hence $12xz, 12x^2y^2$ are pair of unlike terms.

7. Identify like terms in the following:

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

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

Solution:

(a) Algebraic factors of $-xy^2$ are x, y, y

Algebraic factors of $-4yx^2$ are y, x, x

Algebraic factors of $8x^2$ are x, x

Algebraic factors of $2xy^2$ are x, y, y

Algebraic factor of $7y$ is y

Algebraic factors of $-11x^2$ are x, x

Algebraic factors of $-100x$ are x

Algebraic factors of $-11yx$ are y, x

Algebraic factors of $20x^2y$ are x, x, y

Algebraic factors of $-6x^2$ are x, x

Algebraic factor of y is y

Algebraic factor of $2xy$ are x, y

Algebraic factor of $3x$ is x

$-xy^2, 2xy^2$ are like terms.

$-4yx^2, 20x^2y$ are like terms.

$8x^2, -11x^2, -6x^2$ are like terms.

$7y, y$ are like terms.

$-100x, 3x$ are like terms.

$-11yx, 2xy$ are like terms.

(b) Algebraic factors of $10pq$ are p, q

Algebraic factors of $7p$ is p

Algebraic factors of $8q$ is q

Algebraic factors of $-p^2q^2$ are p, p, q, q

Algebraic factors of $-7qp$ are p, q

Algebraic factors of $-100q$ are q

-23 is a constant term.

Algebraic factors of $12q^2p^2$ are q, q, p, p

Algebraic factors of $-5p^2$ are p, p

41 is a constant term.

Algebraic factors of $2405p$ are p

Algebraic factors of $78qp$ are q, p

Algebraic factors of $13p^2q$ are p, p, q

Algebraic factors of qp^2 are q, p, p

Algebraic factors of $701p^2$ are p, p

$10pq, -7qp, 78qp$ are like terms.

$7p, 2405p$ are like terms.

$8q, -100q$ are like terms.

$12p^2q^2, -p^2q^2$ are like terms.

$-23, 41$ are like terms.

$-5p^2, 701p^2$ are like terms

$13p^2q, qp^2$ are like terms.

EXERCISE 12.2

1. Simplify combining like terms:

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

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

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

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

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

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

Solution:

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

Rearranging the terms,

$$21b + 7b - 20b - 32$$

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

$$= 8b - 32$$

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

Rearranging the terms,

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

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

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

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

Rearranging the terms,

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

$$= (1 - 1 + 1)p + (1 - 1 - 1)q$$

$$= p - q$$

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

Rearranging the terms,

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

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

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

$$= a + ab$$

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

Rearranging the terms,

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

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

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

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

Rearranging the terms,

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

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

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

2. Add:

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

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

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

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

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

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

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

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

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

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

Solution:

(i) The resulting expression after adding given terms is

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

$$= 3mn - 5mn + 8mn - 4mn$$

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

$$= 2mn$$

(ii) The resulting expression after adding given terms is

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

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

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

$$= -5tz$$

(iii) The resulting expression after adding given terms is

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

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

$$= (-7 + 12 + 9 - 2)mn - 4$$

$$= 12mn - 4$$

- (iv) The resulting expression after adding given terms is

$$\begin{aligned} & a + b - 3 + b - a + 3 + a - b + 3 \\ &= a - a + a + b + b - b - 3 + 3 + 3 \\ &= (1 - 1 + 1)a + (1 + 1 - 1)b + 3 \\ &= a + b + 3 \end{aligned}$$

- (v) The resulting expression after adding given terms is

$$\begin{aligned} &= 14x + 10y - 12xy - 13 + 18 - 7x - 10y + 8xy + 4xy \\ &= 14x - 7x + 10y - 10y - 12xy + 8xy + 4xy - 13 + 18 \\ &= (14 - 7)x + (10 - 10)y + (-12 + 8 + 4)xy + 5 \\ &= 7x + 5 \end{aligned}$$

- (vi) The resulting expression after adding given terms is

$$\begin{aligned} & 5m - 7n + 3n - 4m + 2 + 2m - 3mn - 5 \\ &= 5m - 4m + 2m - 7n + 3n - 3mn + 2 - 5 \\ &= (5 - 4 + 2)m + (-7 + 3)n - 3mn - 3 \\ &= 3m - 4n - 3mn - 3 \end{aligned}$$

- (vii) The resulting expression after adding given terms is

$$\begin{aligned} & 4x^2y + (-3xy^2) + (-5xy^2) + 5x^2y \\ &= 4x^2y - 3xy^2 - 5xy^2 + 5x^2y \\ &= (4 + 5)x^2y + (-3 - 5)xy^2 \\ &= 9x^2y - 8xy^2 \end{aligned}$$

- (viii) The resulting expression after adding given terms is

$$\begin{aligned} & 3p^2q^2 - 4pq + 5 - 10p^2q^2 + 15 + 9pq + 7p^2q^2 \\ &= (3 - 10 + 7)p^2q^2 + (-4 + 9)pq + 5 + 15 \\ &= 5pq + 20 \end{aligned}$$

- (ix) The resulting expression after adding given terms is

$$\begin{aligned} & ab - 4a + 4b - ab + 4a - 4b \\ &= ab - ab + 4a - 4a + 4b - 4b \\ &= (1 - 1)ab + (4 - 4)a + (4 - 4)b \\ &= 0 \end{aligned}$$

(x) The resulting expression after adding given terms is

$$\begin{aligned}
 & x^2 - y^2 - 1 + y^2 - 1 - x^2 + 1 - x^2 - y^2 \\
 &= x^2 - x^2 - x^2 - y^2 + y^2 - y^2 - 1 + 1 - 1 \\
 &= (1 - 1 - 1)x^2 + (-1 + 1 - 1)y^2 - 1 \\
 &= -x^2 - y^2 - 1
 \end{aligned}$$

3. Subtract:

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

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

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

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

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

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

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

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

Solution:

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

$$= y^2 + 5y^2$$

$$= (1 + 5)y^2$$

$$= 6y^2$$

(ii) $-12xy - 6xy$

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

$$= -18xy$$

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

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

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

$$= 2b$$

(iv) $b(5 - a) - a(b - 5)$

$$= 5b - ab - ab + 5a$$

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

$$= 5a + 5b - 2ab$$

$$\begin{aligned} \text{(v)} \quad & 4m^2 - 3mn + 8 - (-m^2 + 5mn) \\ &= 4m^2 - 3mn + 8 + m^2 - 5mn \\ &= (4 + 1)m^2 + (-3 - 5)mn + 8 \\ &= 5m^2 - 8mn + 8 \end{aligned}$$

$$\begin{aligned} \text{(vi)} \quad & 5x - 10 - (-x^2 + 10x - 5) \\ &= 5x - 10 + x^2 - 10x + 5 \\ &= x^2 + (5 - 10)x - 10 + 5 \\ &= x^2 - 5x - 5 \end{aligned}$$

$$\begin{aligned} \text{(vii)} \quad & 3ab - 2a^2 - 2b^2 - (5a^2 - 7ab + 5b^2) \\ &= 3ab - 2a^2 - 2b^2 - 5a^2 + 7ab - 5b^2 \\ &= (-2 - 5)a^2 + (-2 - 5)b^2 + (3 + 7)ab \\ &= -7a^2 - 7b^2 + 10ab \end{aligned}$$

$$\begin{aligned} \text{(viii)} \quad & 5p^2 + 3q^2 - pq - (4pq - 5q^2 - 3p^2) \\ &= 5p^2 + 3q^2 - pq - 4pq + 5q^2 + 3p^2 \\ &= (5 + 3)p^2 + (3 + 5)q^2 + (-1 - 4)pq \\ &= 8p^2 + 8q^2 - 5pq \end{aligned}$$

4. (a) What should be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$?
- (b) What should be subtracted from $2a + 8b + 10$ to get $-3a + 7b + 16$?

Solution:

- (a) The algebraic expression that to be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$ is

$$\begin{aligned} & (2x^2 + 3xy) - (x^2 + xy + y^2) \\ &= 2x^2 - x^2 + 3xy - xy - y^2 \\ &= (2 - 1)x^2 + (3 - 1)xy - y^2 \\ &= x^2 + 2xy - y^2 \end{aligned}$$

- (b) The algebraic expression that to be subtracted from $2a + 8b + 10$ to get $-3a + 7b + 16$ is

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

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

$$= (2 + 3)a + (8 - 7)b - 6$$

$$= 5a + b - 6$$

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

Solution:

The algebraic expression that should be taken away from $3x^2 - 4y^2 + 5xy + 20$ to obtain $-x^2 - y^2 + 6xy + 20$ is

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

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

$$= (3 + 1)x^2 + (-4 + 1)y^2 + (5 - 6)xy + 20 - 20$$

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

6. (a) From the sum of $3x - y + 11$ and $-y - 11$, subtract $3x - y - 11$.
 (b) From the sum of $4 + 3x$ and $5 - 4x + 2x^2$, subtract the sum of $3x^2 - 5x$ and $-x^2 + 2x + 5$.

Solution:

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

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

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

$$= 3x + (-1 - 1)y + 11 - 11$$

$$= 3x - 2y$$

On subtracting $3x - y - 11$, we get

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

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

$$= (3 - 3)x + (-2 + 1)y + 11$$

$$= -y + 11$$

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

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

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

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

Sum of $3x^2 - 5x$, $-x^2 + 2x + 5$ is

$$\begin{aligned} & 3x^2 - 5x + (-x^2 + 2x + 5) \\ &= 3x^2 - 5x - x^2 + 2x + 5 \\ &= (3 - 1)x^2 + (-5 + 2)x + 5 \\ &= 2x^2 - 3x + 5 \end{aligned}$$

Final expression is

$$\begin{aligned} & (2x^2 - x + 9) - (2x^2 - 3x + 5) \\ &= 2x^2 - x + 9 - 2x^2 + 3x - 5 \\ &= (2 - 2)x^2 + (-1 + 3)x + 9 - 5 \\ &= 2x + 4 \end{aligned}$$

EXERCISE 12.3

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

- (i) $m - 2$
- (ii) $3m - 5$
- (iii) $9 - 5m$
- (iv) $3m^2 - 2m - 7$
- (v) $\frac{5m}{2} - 4$

Solution:

- (i) Given expression is $m - 2$

Substituting $m = 2$,

$$m - 2 = 2 - 2 = 0$$

- (ii) Given expression is $3m - 5$

Substituting $m = 2$,

$$3m - 5 = 3(2) - 5 = 6 - 5 = 1$$

- (iii) Given expression is $9 - 5m$

Substituting $m = 2$,

$$9 - 5m = 9 - (5)2 = 9 - 10 = -1$$

- (iv) Given expression is $3m^2 - 2m - 7$

Substituting $m = 2$,

$$3m^2 - 2m - 7 = 3(2)^2 - 2(2) - 7 = 12 - 4 - 7 = 1$$

(v) Given expression is $\frac{5m}{2} - 4$

Substituting $m = 2$,

$$\frac{5m}{2} - 4 = \frac{5(2)}{2} - 4 = 5 - 4 = 1$$

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

(i) $4p + 7$

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

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

Solution:

(i) Given expression is $4p + 7$

Substituting $p = -2$,

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

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

Substituting $p = -2$,

$$-3p^2 + 4p + 7 = -3(-2)^2 + 4(-2) + 7 = -12 - 8 + 7 = -13$$

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

Substituting $p = -2$,

$$\begin{aligned} -2p^3 - 3p^2 + 4p + 7 &= -2(-2)^3 - 3(-2)^2 + 4(-2) + 7 \\ &= 16 - 12 - 8 + 7 = 3 \end{aligned}$$

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

(i) $2x - 7$

(ii) $-x + 2$

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

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

Solution:

(i) Given expression is $2x - 7$

Substituting $x = -1$,

$$2x - 7 = 2(-1) - 7 = -2 - 7 = -9$$

- (ii) Given expression is $-x + 2$

Substituting $x = -1$,

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

- (iii) Given expression is $x^2 + 2x + 1$

Substituting $x = -1$,

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

- (iv) Given expression is $2x^2 - x - 2$

Substituting $x = -1$,

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

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

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

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

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

Solution:

- (i) Given $a = 2, b = -2$

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

$$= 4 + 4$$

$$= 8$$

- (ii) Given $a = 2, b = -2$

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

$$= 4 - 4 + 4$$

$$= 4$$

- (iii) Given $a = 2, b = -2$

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

$$= 4 - 4$$

$$= 0$$

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

(i) $2a + 2b$

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

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

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

Solution:

$$(i) \quad \text{Given } a = 0, b = -1$$

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

$$(ii) \quad \text{Given } a = 0, b = -1$$

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

$$= 0 + 1 + 1 = 2$$

$$(iii) \quad \text{Given } a = 0, b = -1$$

$$2a^2b + 2ab^2 + ab = 2(0)^2(-1) + 2(0)(-1)^2 + (0)(-1)$$

$$= 0 + 0 + 0$$

$$= 0$$

$$(iv) \quad \text{Given } a = 0, b = -1$$

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

$$= 0 + 0 + 2$$

$$= 2$$

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

$$(i) \quad x + 7 + 4(x - 5)$$

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

$$(iii) \quad 6x + 5(x - 2)$$

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

Solution:

$$(i) \quad \text{Given expression is } x + 7 + 4(x - 5)$$

On simplifying,

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

$$= (1 + 4)x + 7 - 20$$

$$= 5x - 13$$

Substituting $x = 2$,

$$5x - 13 = 5(2) - 13 = 10 - 13 = -3$$

- (ii) Given expression is $3(x + 2) + 5x - 7$

On simplifying,

$$\begin{aligned} & 3(x + 2) + 5x - 7 \\ &= 3x + 6 + 5x - 7 \\ &= (3 + 5)x + 6 - 7 \\ &= 8x - 1 \end{aligned}$$

Substituting $x = 2$,

$$8x - 1 = 8(2) - 1 = 16 - 1 = 15$$

- (iii) Given expression is $6x + 5(x - 2)$

On simplifying,

$$\begin{aligned} & 6x + 5(x - 2) \\ &= 6x + 5x - 10 \\ &= (6 + 5)x - 10 \\ &= 11x - 10 \end{aligned}$$

Substituting $x = 2$,

$$11x - 10 = 11(2) - 10 = 22 - 10 = 12$$

- (iv) Given expression is $4(2x - 1) + 3x + 11$

On simplifying,

$$\begin{aligned} & 4(2x - 1) + 3x + 11 \\ &= 8x - 4 + 3x + 11 \\ &= (8 + 3)x - 4 + 11 \\ &= 11x + 7 \end{aligned}$$

Substituting $x = 2$,

$$11x + 7 = 11(2) + 7 = 22 + 7 = 29$$

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

- (i) $3x - 5 - x + 9$
- (ii) $2 - 8x + 4x + 4$
- (iii) $3a + 5 - 8a + 1$
- (iv) $10 - 3b - 4 - 5b$

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

Solution:

(i) Given expression is $3x - 5 - x + 9$

On simplifying, we get

$$3x - 5 - x + 9$$

$$= (3 - 1)x - 5 + 9$$

$$= 2x + 4$$

Substituting $x = 3$,

$$2x + 4 = 2(3) + 4 = 6 + 4 = 10$$

(ii) Given expression is $2 - 8x + 4x + 4$

On simplifying, we get

$$2 - 8x + 4x + 4$$

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

$$= -4x + 6$$

Substituting $x = 3$,

$$-4x + 6 = -4(3) + 6 = -12 + 6 = -6$$

(iii) Given expression is $3a + 5 - 8a + 1$

On simplifying, we get

$$3a + 5 - 8a + 1$$

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

$$= -5a + 6$$

Substituting $a = -1$,

$$-5a + 6 = -5(-1) + 6 = 5 + 6 = 11$$

(iv) Given expression is $10 - 3b - 4 - 5b$

On simplifying, we get

$$10 - 3b - 4 - 5b$$

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

$$= 6 - 8b$$

Substituting $b = -2$,

$$6 - 8b = 6 - 8(-2) = 6 + 16 = 22$$

- (v) Given expression is $2a - 2b - 4 - 5 + a$

On simplifying, we get

$$\begin{aligned} & 2a - 2b - 4 - 5 + a \\ &= (2 + 1)a - 2b - 4 - 5 \\ &= 3a - 2b - 9 \end{aligned}$$

Substituting $b = -2$ and $a = -1$,

$$3a - 2b - 9 = 3(-1) - 2(-2) - 9 = -3 + 4 - 9 = -8$$

8. (i) If $z = 10$, find the value of $z^3 - 3(z - 10)$
(ii) If $p = -10$, find the value of $p^2 - 2p - 100$

Solution:

(i) Given $z = 10$,
Hence, $z^3 - 3(z - 10)$
 $= z^3 - 3z + 30$
 $= 10^3 - 3(10) + 30$
 $= 1000 - 30 + 30 = 1000$

(ii) Given $p = -10$
Hence, $p^2 - 2p - 100$
 $= (-10)^2 - 2(-10) - 100$
 $= 100 + 20 - 100$
 $= 20$

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

Solution:

Given expression is $2x^2 + x - a$ and $x = 0$,

Value of the given expression at $x = 0$ is equal to 5

$$\text{Hence, } 2(0) + 0 - a = 5$$

$$\Rightarrow -a = 5$$

$$\Rightarrow a = -5$$

Hence, the value of a is -5 .

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

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

Solution:

Given expression is $2(a^2 + ab) + 3 - ab$

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

$$= 2a^2 + (2 - 1)ab + 3$$

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

Given $a = 5, b = -3$

$$\text{Hence, } 2a^2 + ab + 3 = 2(5)^2 + 5(-3) + 3$$

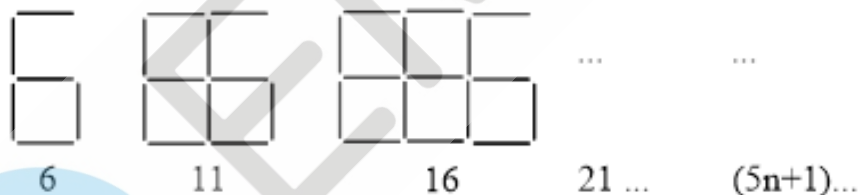
$$= 50 - 15 + 3$$

$$= 38$$

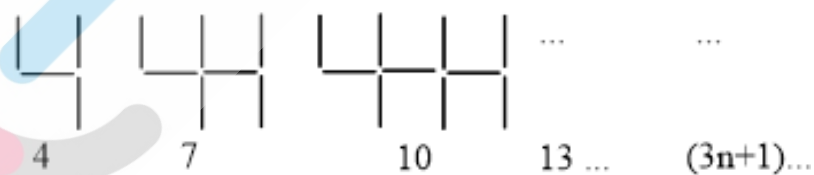
EXERCISE 12.4

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.

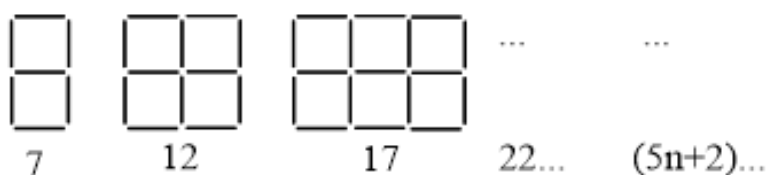
(a)



(b)



(c)




If the number of digits formed is taken to be n , the number of segments required to form n digits is given by the algebraic expression appearing on the right of each pattern.

How many segments are required to form 5, 10, 100 digits of the kind

6, 8, 4,


Solution:

Algebraic expression relating to  is $(5n + 1)$

If $n = 5$, segments required are $5(5) + 1 = 26$

If $n = 10$, segments required are $5(10) + 1 = 51$

If $n = 100$, segments required are $5(100) + 1 = 501$

Algebraic expression relating to  is $(3n + 1)$

If $n = 5$, segments required are $3(5) + 1 = 16$

If $n = 10$, segments required are $3(10) + 1 = 31$

If $n = 100$, segments required are $3(100) + 1 = 301$

Algebraic expression relating to  is $(5n + 2)$

If $n = 5$, segments required are $5(5) + 2 = 27$

If $n = 10$, segments required are $5(10) + 2 = 52$

If $n = 100$, segments required are $5(100) + 2 = 502$

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

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

Solution:

- (i) Given expression is $2n - 1$

If $n = 100$,

$$2n - 1 = 2(100) - 1 = 200 - 1 = 199$$

- (ii) Given expression is $3n + 2$

If $n = 5$,

$$3n + 2 = 3(5) + 2 = 15 + 2 = 17$$

If $n = 10$,

$$3n + 2 = 3(10) + 2 = 30 + 2 = 32$$

If $n = 100$,

$$3n + 2 = 3(100) + 2 = 300 + 2 = 302$$

- (iii) Given expression is $4n + 1$

If $n = 5$,

$$4n + 1 = 4(5) + 1 = 20 + 1 = 21$$

If $n = 10$,

$$4n + 1 = 4(10) + 1 = 40 + 1 = 41$$

If $n = 100$,

$$4n + 1 = 4(100) + 1 = 400 + 1 = 401$$

- (iv) Given expression is $7n + 20$

If $n = 5$,

$$7n + 20 = 7(5) + 20 = 35 + 20 = 55$$

If $n = 10$,

$$7n + 20 = 7(10) + 20 = 70 + 20 = 90$$

If $n = 100$,

$$7n + 20 = 7(100) + 20 = 700 + 20 = 720$$

- (v) Given expression is $n^2 + 1$

If $n = 5$,

$$n^2 + 1 = (5)^2 + 1 = 25 + 1 = 26$$

If $n = 10$,

$$n^2 + 1 = (10)^2 + 1 = 100 + 1 = 101$$

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