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) $1.2\,ab - 2.4\,b + 3.6\,a$

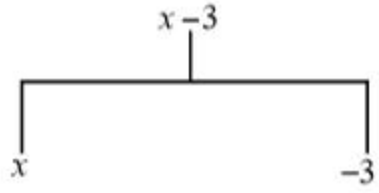
(g) $\frac{3}{4}x + \frac{1}{4}$

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

Solution:

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

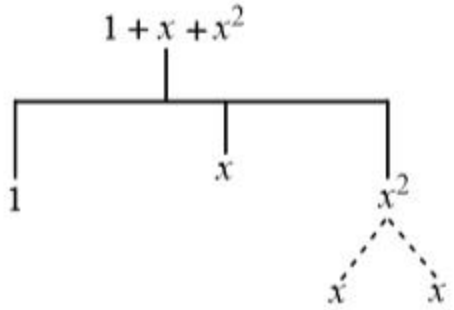
Tree diagram:



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

Factors of x^2 are x, x.

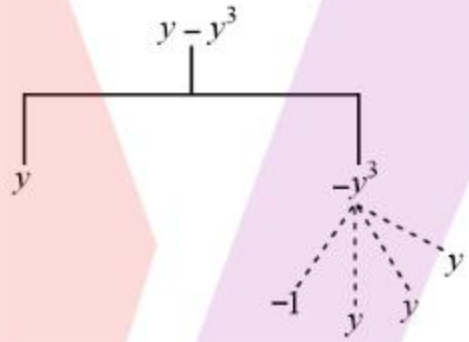
Tree diagram:



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

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

Tree diagram:

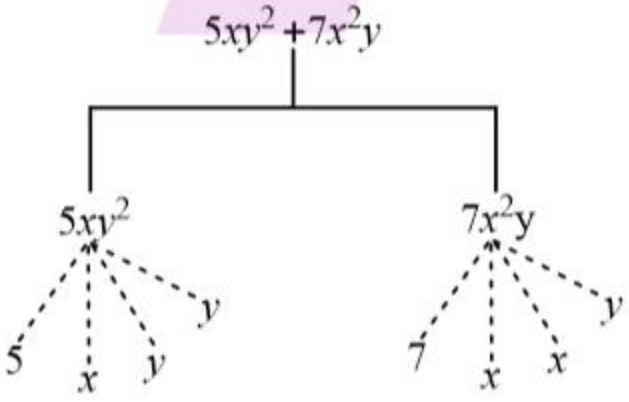


(d) Terms in given expression are $5xy^2, 7x^2y$

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

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

Tree diagram:



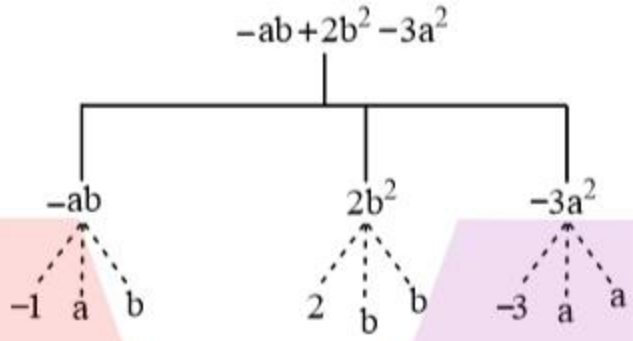
(e) Terms in given expression are $-ab, 2b^2, -3a^2$

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) $1.2\,a + 0.8\,b$

(vii) $3.14\,r^2$

(viii) $2\,(l + b)$

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

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 $1.2\ a, 0.8\ b$

Numerical coefficient of $1.2\ a$ is equal to 1.2.

Numerical coefficient of $0.8\ b$ 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

$a + b - 3 + b - a + 3 + a - b + 3$

$= a - a + a + b + b - b - 3 + 3 + 3$

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

$= a + b + 3$

(v) The resulting expression after adding given terms is

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

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

$= (14 - 7)x + (10 - 10)y + (-12 + 8 + 4)xy + 5$

$= 7x + 5$

(vi) The resulting expression after adding given terms is

$5m - 7n + 3n - 4m + 2 + 2m - 3mn - 5$

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

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

$= 3m - 4n - 3mn - 3$

(vii) The resulting expression after adding given terms is

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

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

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

$= 9x^2y - 8xy^2$

(viii) The resulting expression after adding given terms is

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

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

$= 5pq + 20$

(ix) The resulting expression after adding given terms is

$ab - 4a + 4b - ab + 4a - 4b$

$= ab - ab + 4a - 4a + 4b - 4b$

$= (1 - 1)ab + (4 - 4)a + (4 - 4)b$

$= 0$

(x) The resulting expression after adding given terms is

$x^2 - y^2 - 1 + y^2 - 1 - x^2 + 1 - x^2 - y^2$

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

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

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

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

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

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

$= 5a + 5b - 2ab$

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

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

$= (4 + 1)m^2 + (-3 - 5)mn + 8$

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

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

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

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

$= x^2 - 5x - 5$

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

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

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

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

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

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

$= (5 + 3)p^2 + (3 + 5)q^2 + (-1 - 4)pq$

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

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

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

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

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

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

(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

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

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

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

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

Final expression is

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

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

$= (2 - 2)x^2 + (-1 + 3)x + 9 - 5$

$= 2x + 4$

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 $p = -2$,

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

$= 16 - 12 - 8 + 7 = 3$

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

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

Solution:

(i) Given $a = 0, b = -1$

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

(ii) Given $a = 0, b = -1$

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

$= 0 + 1 + 1 = 2$

(iii) 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) 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) $x + 7 + 4\,(x - 5)$

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

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

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

Solution:

(i) 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,

$3(x+2)+5x-7$

$=3x+6+5x-7$

$=(3+5)x+6-7$

$=8x-1$

Substituting $x=2$,

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

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

On simplifying,

$6x+5(x-2)$

$=6x+5x-10$

$=(6+5)x-10$

$=11x-10$

Substituting $x=2$,

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

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

On simplifying,

$4(2x-1)+3x+11$

$=8x-4+3x+11$

$=(8+3)x-4+11$

$=11x+7$

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

$2a - 2b - 4 - 5 + a$

$= (2 + 1)a - 2b - 4 - 5$

$= 3a - 2b - 9$

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

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 $a = 5, b = -3$

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)

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:

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	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	-	-	-	-	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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