CHAPTER – 12
ALGEBRAIC EXPRESSIONS

EXERCISE 12.1

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

(i) Subtraction of z from y.

→ $y - z$

(ii) one-half of the sum of numbers x and y

→ $\frac{1}{2}(x+y)$

(iii) The number z multiplied by itself.

→ z^2

(iv) one-fourth of the product of number p and q.

→ $\frac{1}{4}(pq)$

(v) Numbers x and y both squared and added.
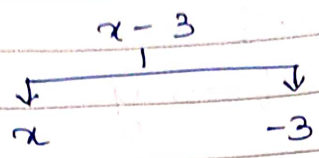
→ $x^2 + y^2$

(vi) Number 5 added to three times the product of numbers m and n.

→ $5 + 3(m \cdot n)$

(vii) Product of numbers y and z subtracted from 10.

→ $10 - yz$

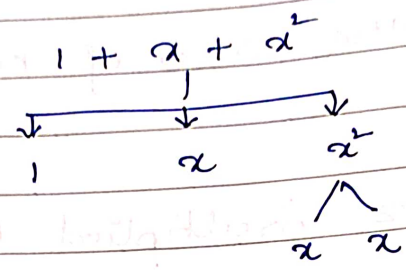(viii) Sum of numbers a and b subtracted from their product.

→ $ab - (a+b)$

Q2. (i) Identify the terms & their factors in the following expressions. Show the terms & factors by Tree diagram.
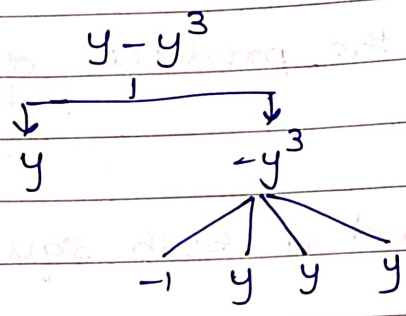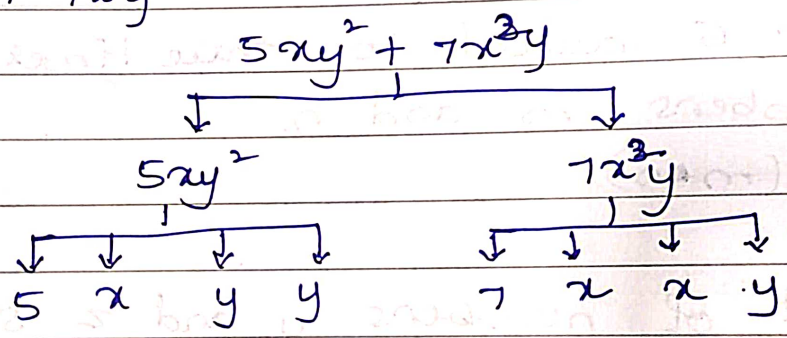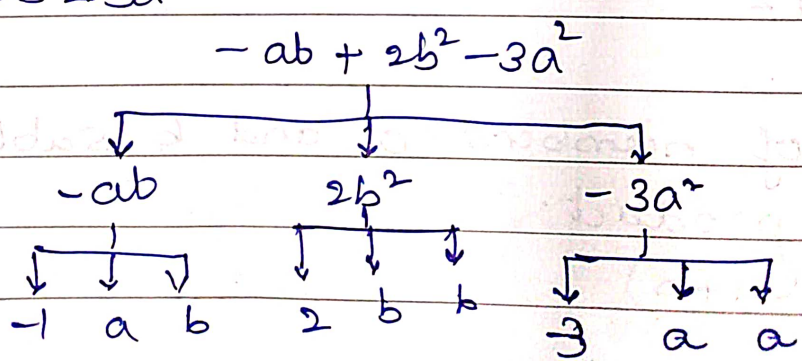
(a) $x - 3$

$$x - 3$$
$$\swarrow \qquad \searrow$$
$$x \qquad\qquad -3$$

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

$$1 + x + x^2$$
$$\swarrow \quad \downarrow \quad \searrow$$
$$1 \qquad x \qquad x^2$$
$$\wedge$$
$$x \quad x$$

(c) $y - y^3$

$$y - y^3$$
$$\swarrow \qquad \searrow$$
$$y \qquad\qquad -y^3$$
$$\diagup | \diagdown \diagdown$$
$$-1 \quad y \quad y \quad y$$

(d) $5xy^2 + 7x^3y$

$$5xy^2 + 7x^3y$$
$$\swarrow \qquad\qquad\qquad \searrow$$
$$5xy^2 \qquad\qquad\qquad 7x^3y$$
$$\swarrow \downarrow \downarrow \searrow \qquad\qquad \downarrow \downarrow \downarrow \searrow$$
$$5 \ x \ y \ y \qquad\qquad 7 \ x \ x \cdot y$$

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

$$-ab + 2b^2 - 3a^2$$
$$\swarrow \qquad \downarrow \qquad \searrow$$
$$-ab \qquad\quad 2b^2 \qquad\quad -3a^2$$
$$\swarrow \downarrow \searrow \quad \downarrow \downarrow \downarrow \qquad \swarrow \downarrow \searrow$$
$$-1 \ a \ b \quad 2 \ b \ b \qquad 3 \ a \ a$$

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

(a) $-4x +5$	$-4x,\ 5$	$-4, x,\ \ 5$
(b) $-4x + 5y$	$-4x,\ 5y$	$-4, x,\ \ 5, y$
(c) $5y + 3y^2$	$5y,\ 3y^2$	$5, y\quad 3, y, y$
(d) $xy + 2x^2y^2$	$xy,\ 2x^2y^2$	$x, y,\quad 2, x, x, y, y$
(e) $Pq + q$	$Pq,\ \ q$	$P, q,\quad q$
(f) $1.2ab - 2.4b + 3.6a$	$1.2ab,\ -2.4b,\ \overset{+3.6}{a}$	$1.2, a, b,\ \overset{2.4, b}{}\ \ 3.6.a$
(g) $\tfrac{3}{4}x + \tfrac{1}{4}$	$\tfrac{3}{4}x,\ \ \tfrac{1}{4}$	$\tfrac{3}{4}, x\qquad \tfrac{1}{4}$
(h) $0.1p^2 + 0.2q^2$	$0.1p^2,\ \ 0.2q^2$	$0.1, P. P\quad 0.2, q, q$

Q3. Identify the numerical coefficients of terms (other than constants) in the following expressions:

expressions:	Terms.	coefficients
(i) $5 - 3t^2$	$-3t^2$	-3
(ii) $1 + t + t^2 + t^3$	t	1
	t^2	1
	t^3	1
(iii) $x + 2xy + 3y$	x	1
	$2xy$	2
	$3y$	3
(iv) $100m + 1000n$	$1000m$	100
	$1000n$	1000
(v) $-p^2q^2 + 7pq$	$-p^2q^2$	-1
	$+7pq$	$+7$
(vi) $1.2a + 0.8b$	$1.2a$	1.2
	$0.8b$	0.8
(vii) $3.14\,r^2$	$3.14\,r^2$	3.14
(viii) $2(l+b)$	$2l$	2
	$2b$	2
(ix) $0.1y + 0.01y^2$	$0.1y$	0.1
	$0.01y^2$	0.01

Q4 (a) Identify terms which contains x & give the coefficient of x.

Expression	Terms containing x	coefficient
(i) $y^2x + y$	y^2x	y^2
(ii) $13y^2 - 8yx$	$-8yx$	$-8y$
(iii) $x + y + 2$	x	1
(iv) $5 + z + zx$	zx	z
(v) $1 + x + xy$	x xy	1 y
(vi) $12xy^2 + 25$	$12xy^2$	$12y^2$
(vii) $7x + xy^2$	$7x$ xy^2	7 y^2

(b) Identify terms which contains y and give the coefficient of y^2.

Expression	Term containing y^2	coefficient
(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

Q5. classify into mononials, binonial & trinomials.

(i) $4y - 7x \rightarrow$ binomial

(ii) $y^2 \rightarrow$ mononial

(iii) $x + y - xy \rightarrow$ Trinomial

(iv) $100 \rightarrow$ mononial.

(v) $ab - a - b \rightarrow$ Trinomial

(vi) $5 - 3t \rightarrow$ Binomial

(vii) $4p^2q - 4pq^2 \rightarrow$ Binomial

(viii) $7m \rightarrow$ Mononial

(ix) $z^2 - 3z + 8 \rightarrow$ Trinomial

(x) $a^2 + b^2 \Rightarrow$ Binomial

(xi) $z^2 + z \rightarrow$ Binomial

(xii) $1 + x + x^2 \rightarrow$ Trinomial.

Q6. state whether a given pair of terms is of like or unlike terms:

(i) $1, 100 \rightarrow$ unlike Terms

(ii) $-7x, 5/2 x \rightarrow$ Like Terms

(iii) $-29x, -29y \rightarrow$ unlike terms

(iv) $14xy, 42yx \rightarrow$ Like terms

(v) $4m^2p ; 4mp^2 \rightarrow$ unlike Terms

(vi) $12xz, 12x^2z^2 \rightarrow$ Unlike Terms.

Q7. Identify like Terms is the following:

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

$\rightarrow$ Like Terms are:

$-xy^2, 2xy^2; \qquad -4yx^2, 20x^2y;$

$8x^2, -11x^2, -6x^2; \qquad 7y, y;$

$-100x, 3x; \qquad -11yx, 20xy$

(b) $10pq$, $7p$, $8q$, $-p^2q^2$, $-79p$, $-100q$, -23,
$129p^2$, $-5p^2$, 41, $2405p$, $789p$, $13p^2q$,
$9p^2$, $701p^2$

$\rightarrow$ Like Terms are:

$10pq$, $-79p$, $789p$; $7p$, $2405p$;

$8q$, $-100q$; $-p^2q^2$, $129p^2$; $-5p^2$, $701p^2$;

$13p^2q$; $9p^2$; -23, 41;

EXERCISE 12·3

Q1. If $m = 2$, find the value of:

(i) $m - 2$

For $m = 2$; $2 - 2 = 0$

(ii) $3m - 5$

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

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

(iv) $3m^2 - 2m - 7 = 3(2)^2 - 2(2) - 7$

$= 3 \times 4 - 4 - 7$

$= 12 - 4 - 7$

$= 1$

(v) $\dfrac{5m + 4}{2} = \dfrac{5 \times 2}{2} + 4$

$= \dfrac{10}{2} + 4$

$= 5 + 4 = 9$

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

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

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

(iii) $-2p^3 - 3p^2 + 4p + 7$
$= -2(-2)^3 - 3(-2)^2 + 4(-2) + 7$
$= -2 \times (-8) - 3(4) + (-8) + 7$
$= 16 - 12 - 8 + 7$
$= 3$

33. Find the value of the following expressions, when $x = -1$;

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

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

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

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

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

(i) $a^2 + b^2 = (2)^2 + (-2)^2 = 4 + 4 = 8$

(ii) $a^2 + ab + b^2 = (2)^2 + (2)(-2) + (-2)^2$
$= 4 - 4 + 4$
$= 4$

(iii) $\quad a^2 - b^2 = (2)^2 - (-2)^2 = 4 - 4 = 0$

Q5. When $a = 0$, $b = -1$, find the value of the given expressions:

(i) $\quad 2a + 2b = 2(0) + 2(-1) = 0 - 2 = -2$

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

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

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

Q6. Simplify the expressions & find the value if x is equal to 2.

(i) $\quad x + 7 + 4(x - 5)$
$= x + 7 + 4x - 20$
$= 5x - 13$
$= 5(2) - 13$
$= 10 - 13 = -3$

(ii) $\quad 3(x + 2) + 5x - 7$
$= 3x + 6 + 5x - 7$
$= 8x - 1$
$= 8(2) - 1$
$= 16 - 1 = 15$

(iii) $\quad 6x + 5(x - 2)$
$= 6x + 5x - 10$
$= 11x - 10$
$= 11(2) - 10 = 22 - 10 = 12$

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

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

$= 11x + 7$

$= 11(2) + 7$

$= 22 + 7 = 29$

Q7. Simplify the expressions & find their values if $x = 3$, $a = -1$, $b = -2$

(i) $3x - 5 - x + 9$

$= 2x + 4$

$= 2(3) + 4 \quad = 6 + 4 \quad = 10$

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

$= -4x + 6$

$= -4(3) + 6 \quad = \quad -12 + 6 \quad = -6$

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

$= -5a + 6$

$= -5(-1) + 6 \quad = \quad 5 + 6 \quad = 11$

(iv) $10 - 3b - 4 - 5b$

$= 6 - 8b$

$= 6 - 8(-2) \quad = \quad 6 + 16 = 22$

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

$= 3a - 2b - 9$

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

$= -3 + 4 - 9$

$= -8$

Q8. (i) If $z = 10$, find the value of $z^3 - 3(z - 10)$

$z^3 - 3(z - 10)$

$= z^3 - 3z + 30$

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

$= 1000 - 30 + 30$

$= 980 \; 1000$

(ii) If $p = -10$, find the value of $p^2 - 2p - 100$

$p^2 - 2p - 100$

$= (-10)^2 - 2(-10) - 100$

$= 100 + 20 - 100$

$= 20$

Q9. What should be the value of a if the value of $2x^2 + x - a$ equals to 5, when $x = 0$?

Given: $2x^2 + x - a = 5$ when $x = 0$

$2(0) + 0 - a = 5$

$a = -5$

Q10. Simplify the expression & find its value when $a = 5$ and $b = -3$. $2(a^2 + ab) + 3 - ab$

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

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

$= 2a^2 + ab - 3$

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

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

$= 50 - 15 - 3$

$= 38$