Page No.
Date

12. Factorisation

Exercise - 12.1

1. Find the common factors of the given terms in each.

i] $8x, 24$

Soln:- Given, $8x, 24$.

$\therefore 8x = 2 \times 2 \times 2 \times x$

$\therefore 24 = 2 \times 2 \times 2 \times 3$

$\therefore$ Common factors are $2 \times 2 \times 2 = 8$.

ii] $3a, 21ab$

Soln:-

Given, $3a, 21ab$

$\therefore 3a = 3 \times a$

$\therefore 21ab = 7 \times 3 \times a \times b$

$\therefore$ Common factors $= 3 \times a = 3a$.

iii) $7xy, 35x^2y^3$

Soln:-

$\therefore 7xy = 7 \times x \times y$

$\therefore 35x^2y^3 = 7 \times 5 \times x \times x \times y \times y \times y$

∴ Common factors = $7 \times x \times y = 7xy$

iv) $4m^2, 6m^2, 8m^3$

Soln: ∴ $4m^2 = 2 \times 2 \times m \times m$

∴ $6m^2 = 2 \times 3 \times m \times m$

∴ $8m^2 = 2 \times 2 \times 2 \times m \times m$

∴ Common factors = $2, m, m$

v) $15p, 20q\varepsilon, 25\varepsilon p$

Soln ∴ $15p = 3 \times 5 \times p$

∴ $20q\varepsilon = 4 \times 5 \times q \times \varepsilon$

∴ $25p\varepsilon = 5 \times 5 \times \varepsilon \times p$

∴ Common factors = 5

vi) $4x^2, 6xy, 8y^2x$

Soln: ∴ $4x^2 = 2 \times 2 \times x \times x$

$6xy = 2 \times 3 \times x \times y$

$8y^2x = 2 \times 2 \times 2 \times y \times y \times x$

∴ Common factors = $2, x$.

vii) $12x^2y, 18xy^2$

Soln: $12x^2y = 2 \times 2 \times 3 \times x \times x \times y$

$18xy^2 = 3 \times 3 \times 2 \times x \times y \times y$

$\therefore$ Common factors $= 2, 3, x, y$.

2. Factorise the following expressions.

i] $5x^2 - 25xy$

Soln: In the given expression,

Check the common factors for all terms

$[5 \times x \times x - 5 \times 5 \times x \times y]$

$\therefore 5 \times x[x - 5 \times y]$

$\therefore 5x[x - 5y]$

$\therefore 5x^2 - 25xy = 5x[x - 5y]$

ii) $9a^2 - 6ax$

Soln:

$9a^2 - 6ax = 3 \times 3 \times a \times a - 3 \times 2 \times a \times x$

$= 3a[3a - 2x]$

iii) $7p^2 + 49pq$

Soln:

$7p^2 + 49pq = 7 \times p \times p + 7 \times 7 \times p \times q$

$= 7p[p + 7q]$

iv) $36a^2b - 60a^2bc$

Soln: $36a^2b - 60a^2bc = 2 \times 2 \times 3 \times 3 \times a \times a \times b - 2 \times 2 \times 3 \times 5 \times a \times a \times b \times c$

$= 2 \times 2 \times 3 \times a \times a \times b [3 - 5c]$

$= 12a^2b[3 - 5c]$

v] $3a^2bc + 6ab^2c + 9abc^2$

Soln: $3a^2bc + 6ab^2c + 9abc^2 = 3 \times a \times a \times b \times c + 3 \times 2 \times a \times b \times b \times c + 3 \times 3 \times a \times b \times c \times c$

$= 3abc[a + 2b + 3c]$

vi) $4p^2 + 5pq - 6pq^2$

Soln: $4p^2 + 5pq - 6pq^2 = 2 \times 2 \times p \times p + 5 \times p \times q - 2 \times 3 \times p \times q \times q$

$= p[4p + 5q - 6q^2]$

$\therefore 4p^2 + 5pq - 6pq^2 = p[4p + 5q - 6q^2]$

vii] $ut + at^2$

Soln: $ut + at^2 = u \times t + a \times t \times t$

$= t[u + at]$

3. Factorise the following terms:

i] $3ax - 6xy + 8by - 4ab$

Soln: $3ax - 6xy + 8by - 4ab$

$= (3ax - 6xy) - (4ab - 8by)$

$= (3 \times a \times x - 2 \times 3 \times x \times y) - (4 \times a \times b - 4 \times 2 \times b \times y)$

$= 3x(a - 2y) - 4b(a - 2y)$

$= (a - 2y)(3x - 4b)$

ii) $x^3+2x^2+5x+10$

soln: $x^3+2x^2+5x+10 =$

$= (x^3+2x^2)+(5x+10)$

$= (x^2 \times x + 2 \times x^2) + (5 \times x + 5 \times 2)$

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

$= (x+2)(x^2+5)$.

iii) $m^2-mn+4m-4n$

soln: $m^2-mn+4m-4n =$

$= (m^2-mn) + (4m-4n)$

$= (m \times m - m \times n) + (4 \times m - 4 \times n)$

$= m(m-n) + 4(m-n)$

$= (m-n)(m+4)$

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

soln: $a^3-a^2b^2-ab+b^3 = (a^3-a^2b^2)-(ab-b^3)$

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

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

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

v) $p^2q - pz^2 - pq + z^2$

Soln: $p^2q - pz^2 - pq + z^2 = (p^2q - pz^2) - (pq - z^2)$

$= (p \times p \times q - p \times z \times z) - (pq - z^2)$

$= p(pq - z^2) - (pq - z^2) \times 1$

$= (pq - z^2)(p - 1)$

Page No.
Date

Exercise - 12.2

1. Factorise the following expression.

i) $a^2+10a+25$

Soln:

$a^2+10a+25 = (a)^2+2\times a\times 5+(5)^2$

It is in the form of $a^2+2ab+b^2$

$\therefore a^2+2ab+b^2 = (a+b)^2$

$\therefore a^2+10a+25 = (a+5)^2$

$\therefore (a+5)^2 = (a+5)(a+5)$

$\therefore$ factors are $(a+5)$ & $(a+5)$

ii) $l^2-16l+64$

Soln: $l^2-16l+64 = (l)^2-2\times l\times 8+(8)^2$

It is in the form of $a^2-2ab+b^2$

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

$\therefore l^2-16l+64 = (l-8)^2 = (l-8)(l-8)$

$\therefore$ factors are $(l-8)$ & $(l-8)$.

=

iii) $36x^2 + 96xy + 64y^2$

soln: $36x^2 + 96xy + 64y^2 = (6x)^2 + 2 \times 6x \times 8y + (8y)^2$

It is in the form of $a^2 + 2ab + b^2$

$\therefore a^2 + 2ab + b^2 = (a+b)^2$

$\therefore 36x^2 + 96xy + 64y^2 = (6x+8y)^2$

$\therefore (6x+8y)^2 = (6x+8y)(6x+8y)$

$\therefore$ factors are $(6x+8y)$ & $(6x+8y)$.

iv) $25x^2 + 9y^2 - 30xy$

soln: $25x^2 + 9y^2 - 30xy = (5x)^2 + (3y)^2 - 2 \times 5x \times 3y$

It is in the form of $a^2 + b^2 - 2ab$

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

$\therefore 25x^2 + 9y^2 - 30xy = (5x-3y)^2$

$(5x-3y)^2 = (5x-3y)(5x-3y)$

$\therefore$ factors are $(5x-3y)$ & $(5x+3y)$.

v) $25m^2 - 40mn + 16n^2$

soln: $25m^2 - 40mn + 16n^2 = (5m)^2 - 2 \times 5m \times 4n + (4n)^2$

It is in the form of $a^2 - 2ab + b^2$

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

$\therefore 25m^2 - 40mn + 16n^2 = (5m - 4n)^2$

$\therefore (5m-4n)^2 = (5m-4n)(5m-4n)$.

$\therefore$ factors are $(5m-4n), (5m-4n)$.

vi) $81x^2 - 198xy + 121y^2$

soln: $81x^2 - 198xy + 121y^2 = (9x)^2 - 2 \times 9x \times 11y + (11y)^2$

It is in form of $a^2 - 2ab + b^2$

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

$\therefore 81x^2 - 198xy + 121y^2 = (9x - 11y)^2$

$\therefore (9x-11y)^2 = (9x-11y)(9x-11y)$

factors are $(9x-11y)$ & $(9x-11y)$.

vii) $(x+y)^2 - 4xy$ [Hint: First expand $(x+y)^2$]

Soln: $(x+y)^2 - 4xy = x^2+y^2+2xy-4xy$

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

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

∴ factors are $(x-y)$ & $(x-y)$.

viii) $l^4 + 4l^2m^2 + 4m^4$

Soln: $l^4 + 4l^2m^2 + 4m^4 = (l^2)^2 + 2 \times l^2 \times 2m^2 + (2m^2)^2$

It is in the form of $a^2+2ab+b^2$.

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

$\therefore l^4 + 4l^2m^2 + 4m^2 = (l^2+2m^2)^2$

$(l^2+2m^2)^2 = (l^2+2m^2)(l^2+2m^2)$

∴ factors are (l^2+2m^2) & (l^2+2m^2).

2. Factorise the following :

i] $x^2 - 36$

Soln: $x^2 - 36 = (x)^2 - (6)^2$

It is in the form of $a^2 - b^2$.

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

$\therefore x^2 - 36 = (x+6)(x-6)$

$\therefore$ Factors of $x^2 - 36$ are $(x+6)$ & $(x-6)$.

ii] $49x^2 - 25y^2$

Soln: $49x^2 - 25y^2 = (7x)^2 - (5y)^2$

It is in the form of $a^2 - b^2$.

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

$\therefore 49x^2 - 25y^2 = (7x+5y)(7x-5y)$

$\therefore$ Factors are $(7x+5y)$ & $(7x-5y)$.

iii) $m^2 - 121$

Soln: $m^2 - 121 = (m)^2 - (11)^2$

It is in the form of $a^2 - b^2$

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

$\therefore m^2 - 121 = (m-11)(m+11)$

$\therefore$ factors are $(m+11)$ & $(m-11)$.

iv) $81 - 64x^2$

Soln: $81 - 64x^2 = (9)^2 - (8x)^2$

It is in the form of $a^2 - b^2$.

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

$\therefore 81 - 64x^2 = (9-8x)(9+8x)$

$\therefore$ factors are $(9-8x)$ & $(9+8x)$.

v) $x^2y^2 - 64$

Soln: $x^2y^2 - 64 = (xy)^2 - (8)^2$

It is in the form of $a^2 - b^2$.

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

$\therefore x^2y^2 - 64 = (xy+8)(xy-8)$

$\therefore$ factors are $(xy+8)$ & $(xy-8)$.

vi) $6x^2 - 54$

Soln: $6x^2 - 54 = 6x^2 - 6 \times 9$

$= 6(x^2 - 9)$

$= 6[(x)^2 - (3)^2]$

$\therefore 6x^2 - 54 = 6(x+3)(x-3)$

vii) $x^2 - 81$

Soln: $x^2 - 81 = (x)^2 - (9)^2$

This is in the form of $a^2 - b^2$.

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

$\therefore x^2 - 81 = (x+9)(x-9)$

$\therefore$ factors are $(x+9)$ & $(x-9)$.

viii) $2x - 32x^5$

Soln:- $2x - 35x^5 = 2x - 2x \times 16x^4$

$= 2x(1 - 16x^4)$

$= 2x[(1)^2 - (4x^2)^2]$

$= 2x(1+4x^2)(1-4x^2)$

$= 2x(1+4x^2)[(1)^2 - (2x)^2]$

$\therefore 2x - 35x^5 = 2x(1+4x^2)(1+2x)(1-2x)$

ix] $81x^4 - 121x^2$

Soln:- $81x^4 - 121x^2 = x^2(81x^2 - 121)$

$= x^2[(9x)^2 - (11)^2]$

$= x^2(9x+11)(9x-11)$

$\therefore 81x^4 - 121x^2 = x^2(9x+11)(9x-11)$

x) $(p^2 - 2pq + q^2) - \xi^2$

Soln:- $(p^2 - 2pq + q^2) - \xi = (p-q)^2 - (\xi)^2$

$[\because p^2 - 2pq + q^2 = (p-q)^2]$

$= (p-q+\varepsilon)(p-q-\varepsilon)$

$\therefore$ factors are $(p-q+\varepsilon)(p-q-\varepsilon)$.

xi) $(x+y)^2 - (x-y)^2$

soln:- $(x+y)^2 - (x-y)^2$ it is in the form of a^2-b^2.

$\therefore a = x+y, \; b = x-y$

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

$\therefore (x+y)^2 - (x-y)^2 = (x+y+x-y)[x+y-(x-y)]$

$= 2x[x+y-x+y]$

$\therefore (x+y)^2 - (x-y)^2 = 2x \times 2y = 4xy$

3. Factorise the expressions-

i] $lx^2 + mx$

soln:- $lx^2 + mx = l \times x \times x + m \times x$

$= x(lx+m)$.

ii] $7y^2 + 35z^2$

soln:- $7y^2 + 35z^2 = 7 \times y^2 + 7 \times 5 \times z^2$

$= 7(y^2 + 5z^2)$

iii) $3x^4 + 6x^3y + 9x^2z$

soln:- $3x^4 + 6x^3y + 9x^2z = 3 \times x^2 \times x^2 + 3 \times 2 \times x \times x^2 \times y + 3 \times 3 \times x^2 \times z$

$= 3x^2(x^2 + 2xy + 3z)$

iv] $x^2 - ax - bx + ab$

soln:- $x^2 - ax - bx + ab = (x^2 - ax) - (bx - ab)$

$= x(x-a) - b(x-a)$

$= (x-a)(x-b)$

v] $3ax - 6ay - 8by + 4bx$

soln:- $3ax - 6ay - 8by + 4bx =$

$= (3ax - 6ay) + (4bx - 8by)$

$= 3a(x-2y) + 4b(x-2y)$

$= (x-2y)(3a+4b)$.

vi] $mn+m+n+1$

Soln: $mn+m+n+1 = (mn+m)+(n+1)$

$= m(n+1)+(n+1)\times 1$

$= (n+1)(m+1)$

vii] $6ab-b^2+12ac-2bc$

Soln:- $6ab-b^2+12ac-2bc =$

$= (6ab-b^2)+(12ac-2bc)$

$= (6\times a\times b - b\times b)+(6\times 2\times a\times c - 2\times b\times c)$

$= b[6a-b]+2c[6a-b]$

$= (6a-b)(b+2c)$

viii] $p^2q-pe^2-pq+e^2$

Soln:- $p^2q-pe^2-pq+e^2 = (p^2q-pe^2)-(pq-e^2)$

$= (p \times p \times q - p \times \varepsilon \times \varepsilon) - (pq - \varepsilon^2)$

$= p(pq - \varepsilon^2) - (pq - \varepsilon^2) \times 1$

$= (pq - \varepsilon^2)(p - 1)$

ix] $x(y+2) - 5(y+2)$

soln:- $x(y+2) - 5(y+2) = x(y+2) - 5(y+2)$

$= (y+2)(x-5)$

4. factorise the following.

i] $x^4 - y^4$

soln:- $x^4 - y^4 = (x^2)^2 - (y^2)^2$ is in the form of $a^2 - b^2$.

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

$\therefore x^4 - y^4 = (x^2 + y^2)(x^2 - y^2)$

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

ii] $a^4 - (b+c)^4$

Soln:- $a^4 - (b+c)^4 = (a^2)^2 - [(b+c)^2]^2$

$= [a^2 + (b+c)^2][a^2 - (b+c)^2]$

$= [a^2 + (b+c)^2](a+b+c)[a-(b+c)]$

$= [a^2 + (b+c)^2](a+b+c)(a-b-c)$

iii] $l^2 - (m-n)^2$

Soln:- $l^2 - (m-n)^2 = (l)^2 - (m-n)^2$

$= [l + m - n][l - (m-n)]$

$= [l+m-n][l-m+n]$

iv] $49x^2 - \frac{16}{25}$

Soln:- $49x^2 - \frac{16}{25} = (7x)^2 - \left(\frac{4}{5}\right)^2$

$= \left[7x + \left(\frac{4}{5}\right)\right]\left[7x - \left(\frac{4}{5}\right)\right]$

v] $x^4 - 2x^2y^2 + y^4$

Soln:- $x^4 - 2x^2y^2 + y^4 = (x^2)^2 - 2x^2y^2 + (y^2)^2$

It is in the ~~form~~ form of $a^2 - 2ab + b^2 = (a-b)^2$

$\therefore x^4 - 2x^2y^2 + y^4 = (x^2 - y^2)^2$

$= [(x)^2 - (y)^2]^2$

$= [(x+y)(x-y)]^2$

$= (x+y)^2 \; (x-y)^2$

$[\because (ab)^m = a^m \cdot b^m]$

vi] $4(a+b)^2 - 9(a-b)^2$

Soln:- $4(a+b)^2 - 9(a-b)^2 = [2(a+b)]^2 - [3(a-b)]^2$

$= [2(a+b) + 3(a-b)]$
$[2(a+b) - 3(a-b]$

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

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

5. Factorise the following expressions:

i] $a^2 + 10a + 24$

Soln:- Given expression looks as $x^2 + (a+b)x + ab$.

where $a+b = 10$; & $ab = 24$.

factors of 24 & their sum

1×24 ; $1 + 24 = 25$

12×2 ; $2 + 12 = 14$

6×4 ; $6 + 4 = 10$

∴ The factors having sum 10 are 6 & 4.

$\therefore a^2 + 10a + 24 = a^2 + (6+4)a + 24$

$= a^2 + 6a + 4a + 24$

$= a(a+6) + 4(a+6)$

$= (a+6)(a+4)$

∴ Hence, the factors are $(a+6)$ & $(a+4)$.

ii] $x^2+9x+18$

Soln:- $x^2+9x+18$ = this expression looks like $x^2+(a+b)x+ab$

where, $a+b=9$, $ab=18$.

Factors of 18 & their sum is

1×18; $1+18=19$

9×2; $9+2=11$

6×3; $6+3=9$

∴ The factors having sum 9 are 6 & 3.

$\therefore x^2+9x+18 = x^2+(6+3)x+18$

$= x^2+6x+3x+18$

$= x(x+6)+3(x+6)$

$= (x+6)(x+3)$

Hence, the factors are $(x+6)$ & $(x+3)$.

iii) $p^2 - 10p + 21$

Soln:- Given expressions looks as $x^2 + (a+b)x + ab$

where $a+b = -10$, & $ab = 21$

factors of 21 & their sum

-1×-21 ; $-1 - 18 = -19$

-7×-3 ; $-7 - 3 = -10$

∴ the factors having sum -10 are -7 & -3.

$p^2 + 9p + 18 = p^2 + (-7-3)p + 21$

$= p^2 - 7p - 3p + 21$

$= p(p-7) - 3(p-7)$

$= (p-7)(p-3)$

Hence the factors are $(p-7)$ & $(p-3)$.

iv) $x^2 - 4x - 32$

Soln:- Given expression looks as $x^2 + (a+b)x + ab$

where $a+b = -4$ & $ab = -32$

Factors of -32 & their sum is

1×-32 ; $1 - 32 = -31$

-16×2 ; $2 - 16 = -14$

-8×4 ; $4 - 8 = -4$

$\therefore$ Factors having sum -4 ~~$4x$~~ -8 & 4

$\therefore x^2 - 4x - 32 = x^2 + (4 - 8)x - 32$

$= x^2 + 4x - 8x - 32$

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

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

Hence, factors are $(x+4)$ & $(x-8)$.

Exercise - 12.3

1. Carry out following divisions :

i] $48a^3$ by $6a$

Soln:- In the given item,

Dividend $= 48a^3 = 2 \times 2 \times 2 \times 2 \times 3 \times a \times a \times a$

Divisor $= 6a = 2 \times 3 \times a$

$$\therefore \frac{48a^3}{6a} = \frac{2 \times 2 \times 2 \times 2 \times 3 \times a \times a \times a}{2 \times 3 \times a}$$

$$\therefore \frac{48a^3}{6a} = 2 \times 2 \times 2 \times a \times a$$

$$\therefore \frac{48a^3}{6a} = 8a^2$$

$\therefore$ Hence dividing $48a^3$ by $6a$ given $8a^2$.

ii] $14x^3$ by $42x^2$

Soln:- In the given item,

Dividend $= 14x^3 = 2 \times 7 \times x \times x \times x$

Divisor $= 42x^2 = 2 \times 3 \times 7 \times x \times x$

$\therefore \frac{14x^3}{42x^2} = \frac{2 \times 7 \times x \times x \times x}{2 \times 3 \times 7 \times x \times x}$

$\therefore \frac{14x^3}{42x^2} = \frac{(x)}{3}$

Hence, dividing $14x^3$ by $42x^2$ given $\frac{x}{3}$.

iii) $72a^3b^4c^5$ by $8ab^2c^3$

Soln: In the given term,

Dividend $= 72a^3b^4c^5 = 2 \times 2 \times 2 \times 3 \times 3 \times a \times a \times a \times b \times b \times b \times b \times c \times c \times c \times c \times c$

Divisor $= 8ab^2c^3 = 2 \times 2 \times 2 \times a \times b \times b \times c \times c \times c$

$\therefore \frac{72a^3b^4c^5}{8ab^2c^3} = \frac{2 \times 2 \times 2 \times 3 \times 3 \times a \times a \times a \times b \times b \times b \times b \times c \times c \times c \times c \times c}{2 \times 2 \times 2 \times a \times b \times b \times c \times c \times c}$

$\therefore \frac{72a^3b^4c^5}{8ab^2c^3} = 3\times3\times a\times a\times b\times b\times c\times c$

$\therefore \frac{72a^3b^4c^5}{8ab^2c^3} = 9a^2b^2c^2$

$=$

iv) $11x^2y^2z^3$ by $55xyz$

Soln:- $11xy^2z^3 \div 55xyz$

$= \frac{11xy^2z^3}{55xyz}$

$= \frac{11\times x\times y\times y\times z\times z^2}{11\times5\times x\times y\times z}$

$\therefore \frac{11xy^2z^3}{55xyz} = \frac{yz^2}{5}$

$=$

v) $-54l^4m^3n^2$ by $9l^2m^2n^2$

Soln:- $-54l^4m^3n^2 \div 9l^2m^2n^2$

$= \frac{-54l^4m^3n^2}{9l^2m^2n^2}$

$= \frac{-9\times6\times l^2\times l^2\times m^2\times m\times n^2}{9\times l^2\times m^2\times n^2}$

$\frac{-54l^2m^3n^2}{9l^2m^2n^2} = -6l^2m$

$=$

2. Divide the given polynomial by the given monomial.

i] $(3x^2 - 2x) \div x$

Soln:- $(3x^2-2x) \div x = \frac{(3x^2-2x)}{x}$

$= \frac{(3 \times x \times x - 2 \times x)}{x}$

$= \frac{x(3x-2)}{x}$

$\therefore (3x^2-2x) \div x = 3x-2.$

ii] $(5a^3b - 7ab^3) \div ab$

Soln:- $(5a^3b-7ab^3) \div ab = \frac{(5a^3b-7ab^3)}{ab}$

$= \frac{5 \times a^2 \times ab - 7 \times ab \times b^2}{ab}$

$= \frac{ab[5a^2-7b^2]}{ab}$

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

iii] $(25x^5 - 15x^4) \div 5x^3$

Soln:- $(25x^5 - 15x^4) \div 5x^3 = \frac{(25x^5 - 15x^4)}{5x^3}$

$= \frac{5 \times 5 \times x^2 \times x^3 - 5 \times 3 \times x^3 \times x}{5x^3}$

$= \frac{5x^3 [5x^2 - 3x]}{5x^3}$

$= (5x^2 - 3x)$ or $x(5x - 3)$

iv) $(4l^5 - 6l^4 + 8l^3) \div 2l^2$

Soln:- $(4l^5 - 6l^4 + 8l^3) \div 2l^2 = \frac{(4l^5 - 6l^4 + 8l^3)}{2l^2}$

$= \frac{(2 \times 2 \times l^2 \times l^3 - 2 \times 3 \times l^2 \times l^2 + 2 \times 4 \times l \times l^2)}{2l^2}$

$= \frac{2l^2 [2l^3 - 3l^2 + 4l]}{2l^2}$

$= 2l^3 - 3l^2 + 4l$

$= l[2l^2 - 3l + 4)$

v] $15(a^3b^2c^2 - a^2b^3c^2 + a^2b^2c^3) \div 3abc$

Soln:- $$\frac{15(a^3b^2c^2 - a^2b^3c^2 + a^2b^2c^3)}{3abc}$$

$$= \frac{3\times5(abc \times a^2bc - abc \times ab^2c + abc \times abc^2)}{3abc}$$

$$= \frac{3\times5[abc(a^2bc - ab^2c + abc^2)]}{3abc}$$

$$= 5[a \times abc - b \times abc + c \times abc]$$

$$= 5abc[a - b + c]$$

vi] $(3p^3 - 9p^2q - 6pq^2) \div (-3p)$

Soln:- $$\frac{3p^3 - 9p^2q - 6pq^2}{-3p} = \frac{[3p \times p^2 - 3 \times 3p \times pq -}{}$$

$$= \frac{[3p \times p^2 - 3 \times 3p \times pq - 2 \times 3p \times q^2]}{-3p}$$

$$= \frac{-3p[p^2 - 3pq - 2q^2]}{-3p}$$

$$= -[p^2 - 3pq - 2q^2]$$

$$= 2^2 + 3pq - p^2$$

$$= =$$

(iii) $\left(\frac{2}{3}a^2b^2c^2 + \frac{4}{3}ab^2c^2\right) \div \frac{1}{2}abc$

Soln:-

$$\frac{\frac{2}{3}a^2b^2c^2 + \frac{4}{3}ab^2c^2}{\frac{1}{2}abc}$$

$$= \frac{\frac{2}{3}(abc)(abc) + \frac{4}{3}(abc)(bc)}{\frac{1}{2}abc}$$

$$= (abc)(bc)\frac{\left[\frac{2}{3}a + \frac{4}{3}\right]}{\frac{1}{2}(abc)}$$

$$= 2bc\left[\frac{2a}{3} + \frac{4}{3}\right]$$

$$= \frac{4abc + 8bc}{3}$$

$$= =$$

3. Workout the following divisions:

i] $(49x - 63) \div 7$

Soln:- $(49x-63) \div 7 = \frac{49x-63}{7}$

$= \frac{7 \times 7 \times x - 7 \times 9}{7}$

$= \frac{7(7x-9)}{7}$

$= 7x - 9$

ii] $12x(8x-20) \div 4(2x-5)$

Soln:- $\frac{12x(8x-20)}{4(2x-5)} = \frac{12x \times (4 \times 2x - 4 \times 5)}{4(2x-5)}$

$= \frac{12x \times 4(2x-5)}{4(2x-5)}$

$= 12x$

iii] $11a^3b^3(7c-35) \div 3a^2b^2(c-5)$

Soln: $\frac{11a^3b^3(7c-35)}{3a^2b^2(c-5)} = \frac{11 \times ab \times a^2b^2(7 \times c - 7 \times 5)}{3 \times a^2b^2 \times (c-5)}$

$= \frac{11 \times ab \times a^2b^2 \times 7(c-5)}{3a^2b^2(c-5)}$

$= \frac{77ab}{3}$

iv) $54lmn(l+m)(m+n)(n+l) \div 81mn(l+m)(n+l)$

Soln: $\frac{54lmn(l+m)(m+n)(n+l)}{81mn(l+m)(n+l)} = \frac{54l(m+n)}{81}$

$= \frac{27 \times 2 \times l \times (m+n)}{27 \times 3}$

$= \frac{2l}{3}(m+n)$

v] $36(x+4)(x^2+7x+10) \div 9(x+4)$

Soln: $\frac{36(x+4)(x^2+7x+10)}{9(x+4)} = 4(x^2+7x+10)$

$= 4(x^2 + 5x + 2x + 10)$

$= 4[x(x+5) + 2(x+5)]$

$= 4(x+5)(x+2)$

vi) $a(a+1)(a+2)(a+3) \div a(a+3)$

Soln:- $\frac{a(a+1)(a+2)(a+3)}{a(a+3)} = (a+1)(a+2)$.

$= (a+1)(a+2)$.

4. factorise the expression and divide them as directed :

i] $(x^2+7x+12) \div (x+3)$

Soln:- $x^2+7x+12 = x^2 + 3x + 4x + 12$

$= x(x+3) + 4(x+3)$

$= (x+3)(x+4)$

$\therefore \frac{(x^2+7x+12)}{(x+3)} = \frac{(x+3)(x+4)}{(x+3)} = x+4$

$= x+4$

ii] $(x^2 - 8x + 12) \div (x-6)$

Soln: $x^2 - 8x + 12 = x^2 - 6x - 2x + 12$

$= x(x-6) - 2(x-6)$

$= (x-6)(x-2)$

$\therefore \frac{(x^2 - 8x + 12)}{(x-6)} = \frac{(x-6)(x-2)}{(x-6)}$

$= x - 2$

iii) $(p^2 + 5p + 4) \div (p+1)$

Soln: $p^2 + 5p + 4 = p^2 + p + 4p + 4$

$= p(p+1) + 4(p+1)$

$= (p+1)(p+4)$

$\therefore \frac{p^2 + 5p + 4}{p+1} = \frac{(p+1)(p+4)}{(p+1)} = p + 4$

$= p + 4$

iv) $15ab(a^2-7a+10) \div 3b(a-2)$

Soln:- $15ab(a^2-7a+10) = 15ab(a^2-5a-2a+10)$

$= 15ab[(a^2-2a)-(5a-10)]$

$= 15ab[a(a-2)-5(a-2)]$

$= 15ab(a-2)(a-5)$

$\therefore \frac{15ab(a^2-7a+10)}{3b(a-2)} = \frac{15ab(a-2)(a-5)}{3b(a-2)}$

$= 5a(a-5)$.

v] $15lm(2p^2-2q^2) \div 3l(p+q)$

Soln:- $15lm(2p^2-2q^2) = 15lm \times 2(p^2-q^2)$

$= 30lm(p+q)(p-q)$

$\therefore \frac{15lm(2p^2-2q^2)}{3l(p+q)} = \frac{30lm(p+q)(p-q)}{3l(p+q)}$

$= 10m(p-q)$

vii] $26z^3(32z^2-18) \div 13z^2(4z-3)$

soln: $26z^3(32z^2-18) = 26z^3(2\times16z^2-2\times9)$

$= 26z^3 \times 2[16z^3-9]$

$= 52z^3[(4z)^3-(3)^3]$

$= 52z^3(4z+3)(4z-3)$

$\therefore \dfrac{26z^3(32z^2-18)}{13z^2(4z-3)} = \dfrac{52z^3(4z+3)(4z-3)}{13z^2(4z-3)}$

$= 4z(4z+3)$

Exercise - 12.4

Find the errors & correct the following mathematical sentences :

i] $3(x-9) = 3x-9$

Soln :

Given sentence is $3(x-9) = 3x-9$

$\therefore 3x - 3 \times 9 = 3x-9$

$\therefore 3x - 27 = 3x-9$

$\therefore -27 \neq -9$

$\therefore$ The given sentence is wrong.

Correct sentence is $3(x-9) = 3x-27$.

ii] $x(3x+2) = 3x^2+2$

Soln : Given sentense $= x(3x+2) = 3x^2+2$

$\therefore x \times 3x + x \times 2 = 3x^2+2$

$\therefore 3x^2+2x \neq 3x^2+2$

$\therefore$ The given sentence is wrong

Correct sentence is $x(3x+2) = 3x^2+2x$.

iii] $2x + 3x = 5x^2$

soln:- Given sentence, $2x + 3x = 5x^2$

$\therefore \quad 5x = 5x^2$

$\therefore \quad x \neq x^2$

$\therefore$ The given sentence is wrong.

Correct ~~ans~~ sentence is $2x + 3x = 5x$

iv] $2x + x + 3x = 5x$

soln:- Given sentence, $2x + x + 3x = 5x$

$\therefore \quad 6x = 5x$

$\therefore \quad 6 \neq 5$

$\therefore$ The given sentence is wrong.

Correct sentence is $2x + 3x = 5x$

v] $4p + 3p + 2p + p - 9p = 0$

soln:- Given sentence, $4p + 3p + 2p + p - 9p = 0$

$\therefore 10 - 9p = 0$

$\therefore p = 0$

It is not possible.

$\therefore$ The given sentence is wrong.
Correct sentence is $4p + 3p + 2p + p - 9p = p = 0$.

vi] $3x + 2y = 6xy$

Soln:- Given sentence, $3x + 2y = 6xy$

$\therefore a + b \neq ab$

$\therefore$ The given sentence is wrong.
Correct sentence is $3x \times 2y = 6xy$.

vii] $(3x)^2 + 4x + 7 = 3x^2 + 4x + 7$

Soln:- Given sentence, $(3x)^2 + 4x + 7 = 3x^2 + 4x + 7$

$\therefore (3x)^2 = 3x^2$

$\therefore 9x^2 = 3x^2$

$\therefore 9 = 3$

It is not possible.

∴ The given sentence is wrong.
Correct sentence is
$(3x)^2 + 4x + 7 = 9x^2 + 4x + 7$.

viii] $(2x)^2 + 5x = 4x + 5x = 9x$

soln:- Given, $(2x)^2 + 5x = 4x + 5x = 9x$

$\therefore 4x^2 + 5x = 4x + 5x$

$\therefore 4x^2 = 4x$

$\therefore x^2 = x$

$\therefore x \neq \sqrt{x}$

∴ The given sentence is wrong.
correct sentence is $(2x)^2 + 5x = 4x^2 + 5x$

ix] $(2a+3)^2 = 2a^2 + 6a + 9$

soln:- Given $(2a+3)^2 = 2a^2 + 6a + 9$

$\therefore (2a)^2 + 2 \times 2a \times 3 + 3^2 = 2a^2 + 6a + 9$

$\therefore 4a^2 + 12a + 9 = 2a^2 + 6a + 9$

$\therefore 4a^2 - 2a^2 = 6a - 12$

$\therefore 2a^2 = -6a$

$\therefore 2a \neq 6$.

∴ The given sentence is wrong.
Correct sentence is
$(2a+3)^2 = 4a^2 + 12a + 9$

x] Substitute $x = -3$ in

a] $x^2 + 7x + 12 = (-3)^2 + 7(-3) + 12 = 9 + 4 + 12$
$= 25$

Soln:- $x^2 + 7x + 12 = (-3)^2 + 7(-3) + 12$

$= 9 - 21 + 12$

$= 21 - 21$

$= 0$ i.e 25 is false.

b] $x^2 - 5x + 6 = (-3)^2 - 5(-3) + 6 = 9 - 15 + 6 = 0$

Soln:- $x^2 - 5x + 6 = (-3)^2 - 5(-3) + 6$

$= 9 + 15 + 6$

$= 30 \neq 0$ (false)

c] $x^2+5x = (-3)^2+5(-3)+6 = -9-15 = -24$

Soln: $x^2+5x = (-3)^2+5(-3)$

$= 9-15$

$= -6 \neq -24$ (False).

xi] $(x-4)^2 = x^2-16$

Soln: Given, $(x-4)^2 = x^2-16$

$\therefore (x-4)^2 = x^2-16 = (x)^2-(4)^2$

$\therefore (a-b)^2 \neq a^2-b^2$

$\therefore (x-4)^2 \neq (x)^2-(4)^2$

$\therefore$ The given sentence is wrong.

Correct sentence is $(x-4)^2 = x^2-8x+16$.

xii] $(x+7)^2 = x^2+49$

Soln: Given, $(x+7)^2 = x^2+49$

$\therefore (x+7)^2 = x^2+49 = (x)^2+(7)^2$

$\therefore (a+b)^2 \neq (a)^2 + (b)^2$

$\therefore (x+7)^2 \neq (x)^2 + (7)^2$

$\therefore$ The given sentence is wrong.

Correct sentence is $(x+7)^2 = x^2 + 14x + 49$.

xiii] $(3a+4b)(a-b) = 3a^2 - 4a^2$

Soln:- Given, $(3a+4b)(a-b) = 3a^2 - 4a^2$

$\therefore 3a(a-b) + 4b(a-b) = 3a^2 - 4^2$

$\therefore 3a^2 - 3ab + 4ab - 4ab^2 = -a^2$

$\therefore 3a^2 - ab - 4b^2 \neq a^2$

$\therefore$ The given sentence is wrong.

Correct is $(3a+4b)(a-b) = 3a^2 + ab - 4b^2$.

xiv] $(x+4)(x+2) = x^2 + 8$

Soln:- Given, $(x+4)(x+2) = x^2 + 8$

$\therefore x^2 + 6x + 8 = x^2 + 8$

$\therefore 6x \neq 0$

Here, '6x' term missing in R.H.S.

∴ The given sentence is wrong.
correct is $(x+4)(x+2) = x^2+6x+8$.

xv] $(x-4)(x-2) = x^2-8$

Soln:- Given, $(x-4)(x-2) = x^2-8$

$\therefore x^2-6x+8 \neq x^2-8$

∴ The given sentence is wrong.
Correct is $(x-4)(x-2) = x^2-6x+8$.

xvi] $5x^3 \div 5x^3 = 0$

Soln:- Given, $5x^3 \div 5x^3 = 0$

$\therefore x^{3-3} = 0$

$\therefore x^0 = 0$

$\therefore 1 \neq 0$ (∵ but $x^0 = 1$).

∴ The given sentence is wrong.
Correct is $5x^3 \div 5x^3 = 1$.

xvii) $2x^3 + 1 \div 2x^3 = 1$

Soln:- Given, $2x^3 + 1 \div 2x^3 = 1$

$\therefore \frac{2x^3+1}{2x^3} = 1$

In the denominator the term 1 is missing.

∴ The given sentence is wrong.

Correct is $2x^3 + 1 \div 2x^3 = 1 + \frac{1}{2x^3}$

xviii] $3x + 2 \div 3x = \frac{2}{3x}$

Soln:- Given,

$3x + 2 \div 3x = \frac{2}{3x}$

$\therefore \frac{3x+2}{3x} = \frac{2}{3x}$

$\therefore 1 + \frac{2}{3x} = \frac{2}{3x}$

$\therefore 1 \neq 0$

∴ Given sentense is wrong.

correct is $3x + 2 \div 3x = 1 + \frac{2}{3x}$.

XIX] $3x+5 \div 3 = 5$

Soln:- Given, $3x+5 \div 3 = 5$

$\therefore \frac{3x+5}{3} = 5$

$\therefore \frac{3x}{3} + \frac{5}{3} = 5$

$\therefore x + \frac{5}{3} \neq 5$

$\therefore$ Given sentense is wrong.

Correct is $3x+5 \div 3 = x + \frac{5}{3}$.

XX] $\frac{4x+3}{3} = x+1$

Soln:- Given, $\frac{4x+3}{3} = x+1$

$\therefore \frac{4x}{3} + \frac{3}{3} = x+1$

$\therefore \frac{4x}{3} + 1 \neq x+1$

$\therefore$ Given sentence is wrong.

Correct is $\frac{4x+3}{3} = \frac{4x}{3} + 1$.