

Chapter 4 Factorisation

4. FACTORISATION

EXERCISE - 4.1

Solution - (1) :

(i) $8xy^3 + 12x^2y^2$

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

\therefore H.C.F of $8xy^3$ and $12x^2y^2$ is $4xy^2$

(ii) $15ax^3 - 9ax^2$

\therefore H.C.F of $15ax^3$ and $9ax^2$ is $3ax^2$

$$\Rightarrow 3ax^2(5x - 3)$$

(iii) Solution - 2 :-

(i) $21py^2 - 56py$

\therefore H.C.F of $21py^2$ and $56py$ is $7py$

$$\Rightarrow 7py(3y - 8)$$

(ii) $4x^3 - 6x^2$

\therefore H.C.F of $4x^3$ and $6x^2$ is $2x^2$

$$\Rightarrow 2x^2(2x - 3)$$

Solution-3 :

(i) $2\pi r^2 - 4\pi r$

HCF of $2\pi r^2$ and $4\pi r$ is $2\pi r$.

$\therefore 2\pi r(r-2)$

(ii) $18m + 16n$

HCF of $18m$ and $16n$ is 2

$\therefore \Rightarrow 2(9m + 8n)$

Solution-4 :

(i) $25abc^2 - 15a^2b^2c$

\therefore HCF of $25abc^2$ and $15a^2b^2c$ is $5abc$

$\therefore \rightarrow 5abc(5c - 3ab)$

(ii) $28p^2q^2r - 42pq^2r^2$

\therefore HCF of $28p^2q^2r$ and $42pq^2r^2$ is $14pq^2r$

$\therefore \Rightarrow 14pq^2r(2p - 3r)$

Solution-5 :

(i) $8x^3 - 6x^2 + 10x$

\therefore H.C.F. of $8x^3, 6x^2, 10x$ is $2x$

$\therefore \Rightarrow 2x(4x^2 - 3x + 5)$

$$(ii) 14mn + 22m - 62p$$

HCF of $14mn$, $22m$ and $62p$ are 2

$$\therefore \Rightarrow 2(7mn + 11m - 31p)$$

Solution - 6 :

$$(i) 18p^2q^2 - 24pq^2 + 30p^2q$$

HCF of $18p^2q^2$, $24pq^2$ and $30p^2q$ is $6pq$

$$\Rightarrow 6pq(3pq - 4q + 5p)$$

$$(ii) 27a^3b^3 - 18a^2b^3 + 75a^3b^2$$

HCF of $27a^3b^3$, $18a^2b^3$ and $75a^3b^2$ is $3a^2b^2$

$$\Rightarrow 3a^2b^2(9a - 6b + 25a)$$

Solution - 7 :

$$(i) 15a(2p-3q) - 10b(2p-3q)$$

HCF of $15a(2p-3q)$ and $10b(2p-3q)$ is $5(2p-3q)$

$$\Rightarrow 5(2p-3q)[3a-2b]$$

$$(ii) 3a(x^2+y^2) + 6b(x^2+y^2)$$

HCF of $3a(x^2+y^2)$ and $6b(x^2+y^2)$ is $3(x^2+y^2)$

$$\Rightarrow 3(x^2+y^2)(a+2b)$$

Solution-8:

(A)

(i) $6(x+2y)^3 + 8(x+2y)^2$

HCF of $6(x+2y)^3$ and $8(x+2y)^2$ is $2(x+2y)^2$

$\Rightarrow 2(x+2y)^2 [3(x+2y) + 4]$

(ii) $14(a-3b)^3 - 21p(a-3b)$

HCF of $14(a-3b)^3$ and $21p(a-3b)$ is $7(a-3b)$

$\therefore \Rightarrow 7(a-3b) [2(a-3b)^2 - 3p]$

Solution-9:

(i) $10a(2p+q)^3 - 15b(2p+q)^2 + 35(2p+q)$

HCF is $5(2p+q)$

$\Rightarrow 5(2p+q) [2a(2p+q)^2 - 3b(2p+q) + 7]$

(ii) $x(x^2+y^2-z^2) + y(-x^2-y^2+z^2) - z(x^2+y^2-z^2)$

HCF is $x^2+y^2-z^2$

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

EXERCISE - 4.2

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Solution - 1 :

$$(i) \quad x^2 + xy - x - y.$$

$$\Rightarrow x^2 + xy - (x + y)$$

$$\Rightarrow x(x + y) - 1(x + y)$$

$$\Rightarrow (x + y)(x - 1)$$

$$(ii) \quad y^2 - yz - 5y + 5z$$

$$\rightarrow y(y - z) - 5(y - z)$$

$$\Rightarrow (y - z)(y - 5)$$

Solution - 2 :

$$(i) \quad 5xy + 7y - 5y^2 - 7x$$

$$5xy - 7x + 7y - 5y^2$$

$$x(5y - 7) + y(7 - 5y)$$

$$x(5y - 7) - y(5y - 7)$$

$$(5y - 7)(x - y)$$

$$(ii) \quad 5p^2 - 8pq - 10p + 16q$$

$$p(5p - 8q) - 2(5p - 8q)$$

$$(5p - 8q)(p - 2)$$

Solution-3

$$(i) \quad a^2b - ab^2 + 3a - 3b$$

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

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

$$(ii) \quad x^3 - 3x^2 + x - 3$$

$$\rightarrow x^2(x-3) + 1(x-3)$$

$$\rightarrow (x-3)(x^2+1)$$

Solution-4 :

$$(i) \quad 6xy^2 - 3xy - 10y + 5$$

$$\rightarrow 3xy(2y-1) - 5(2y-1)$$

$$\rightarrow (2y-1)(3xy-5)$$

$$(ii) \quad 3ax - 6ay - 8by + 4bx$$

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

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

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

Solution - 5:

(i) $1 - a - b + ab$

$\Rightarrow (1-a) - b(1-a)$

$\Rightarrow (1-a)(1-b)$

(ii) $a(a-2b-c) + 2bc$

$\Rightarrow a^2 - 2ab - ac + 2bc$

$\Rightarrow a(a-2b) - c(a-2b)$

$\Rightarrow (a-2b)(a-c)$

Solution - 6:

(i) $x^2 + xy(1+y) + y^3$

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

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

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

(ii) $y^2 - xy(1-x) - x^3$

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

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

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

Solution - 7

$$(i) \quad ab^2 + (a-1)b - 1$$

$$\rightarrow ab^2 + ab - b - 1$$

$$\Rightarrow ab(b+1) - 1(b+1)$$

$$\Rightarrow (b+1)(ab-1)$$

$$(ii) \quad 2a - 4b - xa + 2bx$$

$$\Rightarrow 2(a-2b) - x(a-2b)$$

$$\Rightarrow (a-2b)(2-x)$$

Solution - 8 :

$$(i) \quad 5ph - 10qk + 2rph - 4qrk$$

$$\rightarrow 5ph + 2rph - 10qk - 4qrk$$

$$\rightarrow ph(5+2r) - 2qk(5+2r)$$

$$\Rightarrow (5+2r)(ph-2qk)$$

$$(ii) \quad x^2 - x(a+2b) + 2ab$$

$$\rightarrow x^2 - ax - 2xb + 2ab$$

$$\rightarrow x(x-a) - 2b(x-a)$$

$$\rightarrow (x-a)(x-2b)$$

Solution - 9 :

(i) $ab(x^2+y^2) - xy(a^2+b^2)$

$\Rightarrow abx^2 + aby^2 - a^2xy - b^2xy$

$\Rightarrow abx^2 - b^2xy + aby^2 - a^2xy$

$\Rightarrow bx(ax - by) + ay(ax - by)$

$\Rightarrow (ax - by)(bx + ay)$

(ii) $(ax+by)^2 + (bx-ay)^2$

$\Rightarrow (ax)^2 + (by)^2 + 2 \cdot ax \cdot by + (bx)^2 + (ay)^2 - 2 \cdot bx \cdot ay$

$\Rightarrow a^2x^2 + b^2y^2 + b^2x^2 + a^2y^2$

$\Rightarrow a^2x^2 + a^2y^2 + b^2y^2 + b^2x^2$

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

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

Solution - 10 :

(i) $a^3 + ab(1-2a) - 2b^2$

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

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

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

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

$$(ii) \quad 3x^2y - 3xy + 12x - 12$$

$$3xy(x-1) + 12(x-1)$$

$$(x-1)(3xy+12)$$

=

Solution-11:

$$a^2b + ab^2 - abc - b^2c + axy + bxy$$

$$\Rightarrow a^2b - abc + axy + ab^2 - b^2c + bxy$$

$$\Rightarrow a(ab - bc + xy) + b(ab - bc + xy)$$

$$\Rightarrow (a+b)(ab - bc + xy)$$

Solution-12:

$$ax^2 - bx^2 + ay^2 - by^2 + az^2 - bz^2$$

$$ax^2 + ay^2 + az^2 - bx^2 - by^2 - bz^2$$

$$a(x^2 + y^2 + z^2) - b(x^2 + y^2 + z^2)$$

$$(x^2 + y^2 + z^2)(a-b)$$

=

Solution - 13:

$$x-1 - (x-1)^2 + ax-a$$

$$\Rightarrow x-1 - (x^2+1-2x) + ax-a$$

$$\Rightarrow x-1 - x^2-1+2x+ax-a$$

$$\Rightarrow 2x - x^2 + ax - 2 + x - a$$

$$\Rightarrow x(2-x+a) - 1(2-x+a)$$

$$\Rightarrow (2-x+a)(x-1)$$

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EXERCISE - 4.3

Solution - 1 :

$$\begin{aligned} \text{(i)} \quad & 4x^2 - 25y^2 \\ & \Rightarrow (2x)^2 - (5y)^2 \\ & \Rightarrow (2x + 5y)(2x - 5y) \end{aligned}$$

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

$$\begin{aligned} \text{(ii)} \quad & 9x^2 - 1 \\ & \Rightarrow (3x)^2 - 1^2 \\ & \Rightarrow (3x + 1)(3x - 1) \end{aligned}$$

Solution - 2 :

$$\begin{aligned} \text{(i)} \quad & 150 - 6a^2 \\ & \Rightarrow 6(25 - a^2) \\ & \Rightarrow 6(5^2 - a^2) \\ & \Rightarrow 6(5 + a)(5 - a) \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad & 32x^2 - 18y^2 \\ & \Rightarrow 2(16x^2 - 9y^2) \\ & \Rightarrow 2((4x)^2 - (3y)^2) \\ & \Rightarrow 2(4x + 3y)(4x - 3y) \end{aligned}$$

Solution - 3

(i) $(x-y)^2 - 9$

$\Rightarrow (x-y)^2 - 3^2$

$\Rightarrow (x-y+3)(x-y-3)$

(ii) $9(x+y)^2 - x^2$

$\rightarrow 9[(x+y)^2 - x^2]$

$\rightarrow 9[(x+y+x)(x+y-x)]$

$\Rightarrow 9(2x+y)y$

$\rightarrow 9y(2x+y)$

Solution - 4 :

(i) $20x^2 - 45y^2$

$\Rightarrow 5(4x^2 - 9y^2)$

$\Rightarrow 5((2x)^2 - (3y)^2)$

$\Rightarrow 5(2x+3y)(2x-3y)$

(ii) $9x^2 - 4(y+2x)^2$

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

$\Rightarrow (3x+2y+4x)(3x-2y-4x)$

$\Rightarrow (7x+2y)(-x-2y)$

$\Rightarrow -(7x-2y)(x+y)$

Solution - 5 :

$$\begin{aligned} \text{(i)} \quad & 2(x-2y)^2 - 50y^2 \\ & 2[(x-2y)^2 - 25y^2] \\ & 2[(x-2y)^2 - (5y)^2] \\ & 2[(x-2y+5y)(x-2y-5y)] \\ & 2(x+3y)(x-7y) \\ \rightarrow & 2(x+3y)(x-7y) \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad & 32 - 2(x-4)^2 \\ \Rightarrow & 2[16 - (x-4)^2] \\ \Rightarrow & 2[4^2 - (x-4)^2] \\ \Rightarrow & 2[(4+x-4)(4-x+4)] \\ \rightarrow & 2 \cdot x \cdot (8-x) \\ \rightarrow & 2x(8-x) \end{aligned}$$

Solution - 6 :

$$\begin{aligned} \text{(i)} \quad & 108a^2 - 3(b-c)^2 \\ \Rightarrow & 3[36a^2 - (b-c)^2] \\ \Rightarrow & 3[(6a)^2 - (b-c)^2] \\ \Rightarrow & 3(6a+b-c)(6a-b+c) \end{aligned}$$

$$(ii) \pi a^5 - \pi^3 ab^2$$

$$\pi a [a^4 - \pi^2 b^2]$$

$$\pi a [(a^2)^2 - (\pi b)^2]$$

$$\pi a (a^2 + \pi b) (a^2 - \pi b)$$

Solution - 7 :

$$(i) 50x^2 - 2(x-2)^2$$

$$2 [25x^2 - (x-2)^2]$$

$$2 [(5x)^2 - (x-2)^2]$$

$$2 \cdot (5x+x-2) (5x-x+2)$$

$$2 \cdot (6x-2) (4x+2)$$

$$\rightarrow 2 (6x-2) (4x+2)$$

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

$$\rightarrow (x^2 - 2^2) + 3$$

$$\rightarrow x^2 - 4 + 3$$

$$\rightarrow x^2 - 1$$

$$\rightarrow x^2 - 1^2$$

$$\rightarrow (x+1) (x-1)$$

Solution - 8 :-

16

$$(i) \quad x - 2y - x^2 + 4y^2$$

$$x - 2y - (x^2 - 4y^2)$$

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

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

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

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

$$(ii) \quad 4a^2 - b^2 + 2a + b$$

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

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

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

Solution - 9 :

$$(i) \quad a(a - 2) - b(b - 2)$$

$$a^2 - 2a - b^2 + 2b$$

$$a^2 - b^2 - 2a + 2b$$

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

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

$$(ii) a(a-1) - b(b-1)$$

$$\Rightarrow a^2 - a - b^2 + b$$

$$\Rightarrow a^2 - b^2 - a + b$$

$$\Rightarrow (a+b)(a-b) - 1(a-b)$$

$$\Rightarrow (a-b)(a+b-1)$$

Solution-10:

$$(i) 9 - x^2 + 2xy - y^2$$

$$\Rightarrow 9 - x^2 + xy + xy - y^2$$

$$\Rightarrow 9 - x^2 + xy + 3x - 3x + 3y - 3y + xy - y^2$$

$$\Rightarrow 9 - 3x + 3y + 3x - x^2 + xy + xy - 3y - y^2$$

$$\Rightarrow 3(3-x+y) + x(3-x+y) + y(-3-y+x)$$

$$\Rightarrow 3(3-x+y) + x(3-x+y) - y(3-x+y)$$

$$\Rightarrow \underline{(3+x-y)(3-x+y)}$$

$$(ii) 9x^4 - (x^2 + 2x + 1)$$

$$9x^4 - x^2 - 2x + 1$$

$$9x^4 - 3x^3 + 3x^3 - 3x^2 + 3x^2 - x^2 - x - x + 1$$

$$9x^4 - 3x^3 - 3x^2 + 3x^3 - x^2 - x + 3x^2 - x - 1$$

$$\Rightarrow 3x^2(3x^2 - x - 1) + x(3x^2 - x - 1) + 1(3x^2 - x - 1)$$

$$\Rightarrow (3x^2 - x - 1) (3x^2 + x + 1)$$

Solution - 11 :

$$(i) \quad 9x^4 - x^2 - 12x - 36$$

$$\rightarrow 9x^4 - 3x^3 + 3x^3 - 18x^2 + 18x^2 - x^2 - 12x - 36$$

$$\rightarrow 9x^4 - 3x^3 - 18x^2 + 3x^3 - x^2 - 6x + 18x^2 - 6x - 36$$

$$\rightarrow 3x^2(3x^2 - x - 6) + x(3x^2 - x - 6) + 6(3x^2 - x - 6)$$

$$\Rightarrow (3x^2 - x - 6) (3x^2 + x + 6)$$

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

$$\rightarrow x^3 - x - 5x^2 + 5$$

$$\rightarrow x(x^2 - 1) - 5(x^2 - 1)$$

$$\rightarrow (x^2 - 1)(x - 5)$$

$$\rightarrow (x^2 - 1^2)(x - 5)$$

$$\rightarrow (x+1)(x-1)(x-5)$$

Solution - 12 :

$$(i) \quad a^4 - b^4 + 2b^2 - 1$$

$$\Rightarrow a^4 - b^4 - a^2b^2 + a^2b^2 + a^2 - a^2 + b^2 + b^2 - 1$$

$$\Rightarrow a^4 - a^2b^2 + a^2 + a^2b^2 - b^4 + b^2 - a^2 + b^2 - 1$$

$$\rightarrow a^2 (a^2 - b^2 + 1) + b^2 (a^2 - b^2 + 1) - 1 (a^2 - b^2 + 1)$$

$$\rightarrow (a^2 - b^2 + 1) (a^2 + b^2 - 1)$$

$$(ii) x^3 - 25x$$

$$\rightarrow x (x^2 - 25)$$

$$\rightarrow x (x^2 - 5^2)$$

$$\rightarrow x (x + 5) (x - 5)$$

Solution - 13 :

$$(i) 2x^4 - 32$$

$$\rightarrow 2 (x^4 - 16)$$

$$\rightarrow 2 (x^4 - 2^4)$$

$$\rightarrow 2 ((x^2)^2 - (2^2)^2)$$

$$\rightarrow 2 (x^2 + 4) (x^2 - 4)$$

$$(ii) a^2(b+c) - (b+c)^3$$

$$\rightarrow (b+c) (a^2 - (b+c)^2)$$

$$\rightarrow (b+c) (a + (b+c)) (a - (b+c))$$

$$\rightarrow (b+c) (a+b+c) (a-b-c)$$

Solution - 14 :

(i) $(a+b)^3 - a - b$

$\rightarrow (a+b)^3 - (a+b)$

$\rightarrow (a+b) [(a+b)^2 - 1^2]$

$\rightarrow (a+b) (a+b+1) (a+b-1)$

(ii) $x^2 - 2xy + y^2 - a^2 - 2ab - b^2$

$\rightarrow (x-y)^2 - (a^2 + 2ab + b^2)$

$\rightarrow (x-y)^2 - (a+b)^2$

$\rightarrow (x-y+a+b) (x-y-a-b)$

Solution - 15 :

(i) $(a^2 - b^2) (c^2 - d^2) - 4abcd$

$\rightarrow a^2(c^2 - d^2) - b^2(c^2 - d^2) - 4abcd$

$\rightarrow a^2c^2 - a^2d^2 - b^2c^2 + b^2d^2 - 4abcd$

$\rightarrow a^2c^2 + b^2d^2 - a^2d^2 - b^2c^2 - 2abcd - 2abcd$

$\rightarrow a^2c^2 + b^2d^2 - 2abcd - a^2d^2 - b^2c^2 - 2abcd$

$\rightarrow (ac - bd)^2 - (ad - bc)^2$

$\rightarrow (ac - bd + ad - bc) (ac - bd - ad + bc)$

$$(ii) \quad 4x^2 - y^2 - 3xy + 2x - 2y$$

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

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

$$\rightarrow (x+y)(x-y) + 3x(x-y) + 2(x-y)$$

$$\rightarrow (x-y)(x+y+3x+2)$$

$$\rightarrow (x-y)(4x+y+2)$$

Solution-16 :

$$(i) \quad x^2 + \frac{1}{x^2} - 11$$

$$\rightarrow x^2 + \frac{1}{x^2} - 2 - 9$$

$$\rightarrow (x^2 + \frac{1}{x^2} - 2) - 3^2$$

$$\rightarrow (x + \frac{1}{x})^2 - 3^2$$

$$\rightarrow (x + \frac{1}{x} + 3)(x + \frac{1}{x} - 3)$$

$$(ii) \quad x^4 + 5x^2 + 9$$

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

$$\rightarrow (x^2)^2 + 6x^2 + 3^2 - x^2$$

$$\rightarrow (x^2 + 3)^2 - x^2$$

$$\rightarrow (x^2 + 3 + x)(x^2 + 3 - x)$$

Solution-17:

(i) $a^4 + b^4 - 7a^2b^2$

$a^4 + b^4 + 2a^2b^2 - 2a^2b^2 - 7a^2b^2$

$\Rightarrow (a^2)^2 + (b^2)^2 + 2 \cdot a^2 \cdot b^2 - 9a^2b^2$

$\Rightarrow (a^2 + b^2)^2 - (3ab)^2$

$\Rightarrow (a^2 + b^2 + 3ab)(a^2 + b^2 - 3ab)$

Solution-18:

(i) $(x^2 - 5x + 7)(x^2 + 5x + 7)$

$\Rightarrow ((x^2 + 7) - 5x)((x^2 + 7) + 5x)$

$\Rightarrow (x^2 + 7)^2 - (5x)^2$

$\Rightarrow (x^2 + 7)^2 - 25x^2$

(ii) $(x^2 - 5x + 7)(x^2 - 5x - 7)$

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

$(x^2 - 5x)^2 - 7^2$

$(x^2 - 5x)^2 - 49$

$$\begin{aligned}
 & \text{(iii)} \quad (x^2 + 5x - 7)(x^2 - 5x + 7) \\
 & \quad (x^2 + (5x - 7))(x^2 - (5x - 7)) \\
 & \rightarrow x^2 - (5x - 7)^2 \\
 & \rightarrow x^2 - (25x^2 + 49 - 70x) \\
 & \rightarrow x^2 - 25x^2 - 49 + 70x \\
 & \rightarrow -24x^2 + 70x - 49
 \end{aligned}$$

Solution-19:

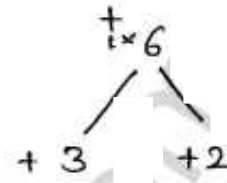
$$\begin{aligned}
 & \text{(i)} \quad (979)^2 - (21)^2 \\
 & \rightarrow (979 + 21)(979 - 21) \\
 & \rightarrow (1000)(958) \\
 & \rightarrow 958000
 \end{aligned}$$

$$\begin{aligned}
 & \text{(ii)} \quad (99.9)^2 - (0.1)^2 \\
 & \rightarrow (99.9 + 0.1)(99.9 - 0.1) \\
 & \rightarrow (100)(99.8) \\
 & \rightarrow 9980/
 \end{aligned}$$

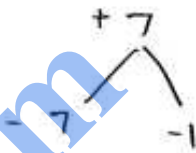
EXERCISE-4.4

Solution-1 :

(i) $x^2 + 5x + 6$
 $x^2 + 3x + 2x + 6$
 $x(x+3) + 2(x+3)$
 $(x+3)(x+2)$

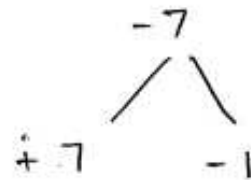


(ii) $x^2 - 8x + 7$
 $x^2 - 7x - x + 7$
 $x(x-7) - 1(x-7)$
 $(x-7)(x-1)$

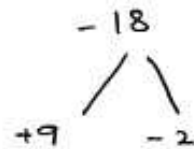


Solution-2 :

(i) $x^2 + 6x - 7$
 $x^2 + 7x - x - 7$
 $x(x+7) - 1(x+7)$
 $(x+7)(x-1)$



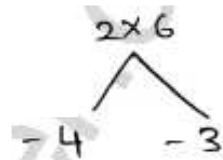
(ii) $y^2 + 7y - 18$
 $y^2 + 9y - 2y - 18$
 $y(y+9) - 2(y+9)$
 $(y+9)(y-2)$



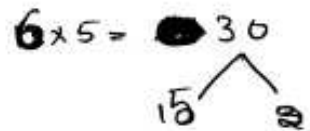
$$\begin{aligned}
 \text{(i)} \quad & a^2 - 3a - 54 \\
 & a^2 - 9a + 6a - 54 \\
 & a(a-9) + 6(a-9) \\
 & (a-9)(a+6) =
 \end{aligned}$$

Solution - 4 :

$$\begin{aligned}
 \text{(i)} \quad & 2x^2 - 7x + 6 \\
 & 2x^2 - 4x - 3x + 6 \\
 & 2x(x-2) - 3(x-2) \\
 & (x-2)(2x-3) =
 \end{aligned}$$

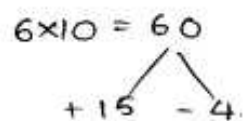


$$\begin{aligned}
 \text{(ii)} \quad & 6x^2 + 13x - 5 \\
 & 6x^2 + 15x - 2x - 5 \\
 & 3x(2x+5) - 1(2x+5) \\
 & (2x+5)(3x-1) =
 \end{aligned}$$



Solution - 5 :

$$\begin{aligned}
 \text{(i)} \quad & 6x^2 + 11x - 10 \\
 & 6x^2 + 15x - 4x - 10 \\
 & 3x(2x+5) - 2(2x+5) \\
 & (2x+5)(3x-2) =
 \end{aligned}$$



$$\begin{aligned}
 \text{(ii)} \quad & 6x^2 - 7x - 3 \\
 & 6x^2 - 9x + 2x - 3 \\
 & 3x(2x - 3) + 1(2x - 3) \\
 & (2x - 3)(3x + 1)
 \end{aligned}$$

$$\begin{array}{c}
 6 \times 3 = 18 \\
 \swarrow \quad \searrow \\
 9 \quad \quad 2
 \end{array}$$

Solution-6 :-

$$\begin{aligned}
 \text{(i)} \quad & 2x^2 - x - 6 \\
 & 2x^2 - 4x + 3x - 6 \\
 & 2x(x - 2) + 3(x - 2) \\
 & (x - 2)(2x + 3)
 \end{aligned}$$

$$\begin{array}{c}
 6 \times 2 = 12 \\
 \swarrow \quad \searrow \\
 -4 \quad \quad +3
 \end{array}$$

$$\begin{aligned}
 \text{(ii)} \quad & 1 - 18y - 63y^2 \\
 & 1 - 21y + 3y - 63y^2 \\
 & 1(1 - 21y) + 3y(1 - 21y) \\
 & (1 - 21y)(1 + 3y)
 \end{aligned}$$

$$\begin{array}{c}
 1 \times 63 = 63 \\
 \swarrow \quad \searrow \\
 \quad \quad 3
 \end{array}$$

Solution-7 :-

$$\begin{aligned}
 \text{(i)} \quad & 2y^2 + y - 45 \\
 & 2y^2 + 10y - 9y - 45 \\
 & 2y(y + 5) - 9(y + 5) \\
 & (y + 5)(2y - 9)
 \end{aligned}$$

$$\begin{array}{c}
 2 \times 45 = 90 \\
 \swarrow \quad \searrow \\
 +10 \quad \quad -9
 \end{array}$$

$$\begin{aligned}
 \text{(ii)} \quad & 5 - 4x - 12x^2 \\
 & 5 - 10x + 6x - 12x^2 \\
 & 5(1 - 2x) + 6x(1 - 2x) \\
 & (1 - 2x)(5 + 6x)
 \end{aligned}$$

$$\begin{array}{c}
 5 \times 12 = 60 \\
 \swarrow \quad \searrow \\
 10 \quad \quad 6
 \end{array}$$

Solution - 8 :-

$$\begin{aligned}
 \text{(i)} \quad & x(12x + 7) - 10 \\
 & 12x^2 + 7x - 10 \\
 & 12x^2 + 15x - 8x - 10 \\
 & 3x(4x + 5) - 2(4x + 5) \\
 & (4x + 5)(3x - 2)
 \end{aligned}$$

$$\begin{array}{c}
 12 \times 10 = 120 \\
 \swarrow \quad \searrow \\
 15 \quad \quad 8
 \end{array}$$

$$\begin{aligned}
 \text{(ii)} \quad & (4 - x)^2 - 2x \\
 & 16 + x^2 - 8x - 2x \\
 & 16 + x^2 - 10x \\
 & x^2 - 10x + 16 \\
 & x^2 - 8x - 2x + 16 \\
 & x(x - 8) - 2(x - 8) \\
 & (x - 8)(x - 2)
 \end{aligned}$$

$$\begin{array}{c}
 1 \times 16 = 16 \\
 \swarrow \quad \searrow \\
 12 \quad \quad 8
 \end{array}$$

Solution - 9 :

(i) $60x^2 - 70x - 30$

$\Rightarrow 10(6x^2 - 7x - 3)$

$\Rightarrow 10(6x^2 - 9x + 2x - 3)$

$\Rightarrow 10(3x(2x-3) + 1(2x-3))$

$\Rightarrow 10(2x-3)(3x+1)$

$60 \times 30 = 1800$
90 20

(ii) $x^2 - 6xy - 7y^2$

$x^2 - 7xy + xy - 7y^2$

$x(x-7y) + y(x-7y)$

$(x-7y)(x+y)$

$1 \times 7 = 7$
1 7

Solution - 10 :

(i) $2x^2 + 13xy - 24y^2$

$2x^2 + 16xy - 3xy - 24y^2$

$2x(x+8y) - 3y(x+8y)$

$(x+8y)(2x-3y)$

$2 \times 24 = 48$
16 3

$$\begin{aligned}
 \text{(ii)} \quad & 6x^2 - 5xy - 6y^2 \\
 & 6x^2 - 9xy + 4xy - 6y^2 \\
 & 3x(2x - 3y) + 2y(2x - 3y) \\
 & (2x - 3y)(3x + 2y)
 \end{aligned}$$

$$\begin{array}{c}
 6 \times 6 = 36 \\
 \swarrow \quad \searrow \\
 9 \quad \quad 4
 \end{array}$$

Solution - 11 :

$$\begin{aligned}
 \text{(i)} \quad & 5x^2 + 17xy - 12y^2 \\
 & 5x^2 + 20xy - 3xy - 12y^2 \\
 & 5x(x + 4y) - 3y(x + 4y) \\
 & (x + 4y)(5x - 3y)
 \end{aligned}$$

$$\begin{array}{c}
 5 \times 12 = 60 \\
 \swarrow \quad \searrow \\
 20 \quad \quad 3
 \end{array}$$

$$\begin{aligned}
 \text{(ii)} \quad & x^2y^2 - 8xy - 48 \\
 & x^2y^2 - 12xy + 4xy - 48 \\
 & xy(xy - 12) + 4(xy - 12) \\
 & (xy - 12)(xy + 4)
 \end{aligned}$$

$$\begin{array}{c}
 1 \times 48 = 48 \\
 \swarrow \quad \searrow \\
 12 \quad \quad 4
 \end{array}$$

Solution - 12 :

$$\begin{aligned}
 \text{(i)} \quad & 2a^2b^2 - 7ab - 30 \\
 & 2a^2b^2 - 12ab + 5ab - 30 \\
 & 2ab(ab - 6) + 5(ab - 6) \\
 & (ab - 6)(2ab + 5)
 \end{aligned}$$

$$\begin{array}{c}
 2 \times 30 = 60 \\
 \swarrow \quad \searrow \\
 12 \quad \quad 5
 \end{array}$$

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

$$2a^2 - ab - b^2$$

$$2a^2 - 2ab + ab - b^2$$

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

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

$$1 \times 2 = 2$$

Solution-13:

$$(i) (x-y)^2 - 6(x-y) + 5$$

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

$$(x-y)(x-y-5) - 1(x-y-5)$$

$$(x-y-5)(x-y-1)$$

$$5 \times 1 = 5$$

(ii)

$$(2x-y)^2 - 11(2x-y) + 28$$

$$(2x-y)^2 - 7(2x-y) - 4(2x-y) + 28$$

$$(2x-y)(2x-y-7) - 4(2x-y-7)$$

$$(2x-y-7)(2x-y-4)$$

$$1 \times 28 = 28$$

$$7 \quad 4$$

Solution - 14

01

$$(i) \quad 4(a-1)^2 - 4(a-1) - 3$$

$$4(a-1)^2 - 6(a-1) + 2(a-1) - 3$$

$$2(a-1)(2(a-1)-3) + 1(2(a-1)-3)$$

$$(2(a-1)-3)(2(a-1)+1)$$

$$(2a-2-3)(2a-2+1)$$

$$(2a-5)(2a-1)$$

$$4 \times 3 = 12$$

$$\begin{array}{r} \wedge \\ 6 \quad 2 \end{array}$$

$$(ii) \quad 1 - 2a - 2b - 3(a+b)^2$$

$$1 - 2(a+b) - 3(a+b)^2$$

$$1 - (a+b) - 3(a+b) - 3(a+b)^2$$

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

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

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

$$1 \times 3 = 3$$

Solution - 15:

$$(i) \quad 3 - 5a - 5b - 12(a+b)^2$$

$$3 - 5(a+b) - 12(a+b)^2$$

$$3 - 9(a+b) + 4(a+b) - 12(a+b)^2$$

$$3(1 - 3(a+b)) + 4(a+b)(1 - 3(a+b))$$

$$(1 - 3(a+b))(3 + 4(a+b))$$

$$(1 - 3a - 3b)(3 + 4a + 4b)$$

$$3 \times 12 = 36$$

$$\begin{array}{r} \wedge \\ 9 \quad 4 \end{array}$$

$$(11) \quad a^4 - 11a^2 + 10$$

$$a^4 - 10a^2 - a^2 + 10$$

$$a^2(a^2 - 10) - 1(a^2 - 10)$$

$$(a^2 - 10)(a^2 - 1)$$

$$1 \times 10 = 10$$
$$\begin{array}{c} \wedge \\ 10 \end{array}$$

Solution-16 :

$$(i) \quad (x+4)^2 - 5xy - 20y - 6y^2$$

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

$$(x+4)^2 - 6y(x+4) + y(x+4) - 6y^2$$

$$(x+4)(x+4-6y) + y(x+4-6y)$$

$$(x+4-6y)(x+4+y)$$

$$(x-6y+4)(x+y+4)$$

$$1 \times 6 = 6$$
$$\begin{array}{c} \wedge \\ 6 \quad 1 \end{array}$$

$$(ii) \quad (x^2 - 2x)^2 - 23(x^2 - 2x) + 120$$

$$(x^2 - 2x)^2 - 5(x^2 - 2x) - 8(x^2 - 2x) + 120$$

$$(x^2 - 2x)(x^2 - 2x - 15) - 8(x^2 - 2x - 15)$$

$$(x^2 - 2x - 15)(x^2 - 2x - 8)$$

$$1 \times 120 = 120$$
$$\begin{array}{c} \wedge \\ -15 \quad +8 \end{array}$$

Solution-17:

$$4(2a-3)^2 - 3(2a-3)(a-1) - 7(a-1)^2$$

Let $2a-3 = x$

and $a-1 = y$

$$\therefore \Rightarrow 4x^2 - 3xy - 7y^2$$

$$4 \times 7 = 28$$

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

$$x(4x-7y) + y(4x-7y)$$

$$(4x-7y)(x+y)$$

\therefore put the values of $2a-3 = x$ and $a-1 = y$.

$$\therefore (4(2a-3) - 7(a-1))(2a-3 + a-1)$$

$$(8a-12-7a+7)(3a-4)$$

$$(a-5)(3a-4)$$

Solution-18:

$$(2x^2+5x)(2x^2+5x-19) + 84$$

let $2x^2+5x = y$

then $y(y-19) + 84$

$$\Rightarrow y^2 - 19y + 84$$

$$y^2 - 12y - 7y + 84$$

$$y(y-12) - 7(y-12)$$

$$1 \times 84 = 84$$

$$\begin{array}{c} 84 \\ / \quad \backslash \\ 12 \quad 7 \end{array}$$

$$\rightarrow (y-12)(y-7)$$

put the value of $y = 2x^2 + 5x$

$$\therefore (2x^2 + 5x - 12)(2x^2 + 5x - 7)$$

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EXERCISE - 4.5

Solution - 1 :

(i) $8x^3 + y^3$

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

\therefore It is in the form of $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

\therefore Here $a = 2x$; $b = y$

$$\therefore \Rightarrow (2x)^3 + y^3 = (2x + y)(2x)^2 - 2x \cdot y + y^2$$

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

(ii) $64x^3 - 125y^3$

$$(4x)^3 - (5y)^3$$

It is in the form of $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

here $a = 4x$; $b = 5y$

$$\therefore \Rightarrow (4x - 5y)(4x)^2 + 4x \cdot 5y + (5y)^2$$

$$= (4x - 5y)(16x^2 + 20xy + 25y^2)$$

Solution - 2 :

(i) $64x^3 + 1$

$$(4x)^3 + 1^3$$

It is in the form of $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

Here $a = 4x$; $b = 1$

$$\therefore \Rightarrow (4x+1) (4x)^2 - 4x \cdot 1 + 1^2$$

$$\Rightarrow (4x+1) (16x^2 - 4x + 1)$$

(ii) $7a^3 + 56b^3$

$$\rightarrow 7 (a^3 + 8b^3)$$

$$\rightarrow 7 (a^3 + (2b)^3)$$

It is in the form of $a^3 + b^3 = (a+b) (a^2 - ab + b^2)$

\therefore Here $a = a$; $b = 2b$

$$\therefore \Rightarrow 7 (a+2b) (a^2 - a \cdot 2b + (2b)^2)$$

$$\rightarrow 7 (a+2b) (a^2 - 2ab + 4b^2)$$

Solution - 3 :

(i) $\frac{x^6}{343} + \frac{343}{x^6}$

$$(\because 7^3 = 343)$$

$$\frac{x^6}{7^3} + \frac{7^3}{x^6}$$

\Rightarrow It is in the form of $a^3 + b^3 = (a+b) (a^2 - ab + b^2)$

$$\therefore \text{Here } a = \frac{x^2}{7} ; b = \frac{7}{x^2}$$

$$\Rightarrow \frac{(x^2)^3}{7^3} + \frac{7^3}{(x^2)^3}$$

$$\Rightarrow \left(\frac{x^2}{7} + \frac{7}{x^2} \right) \left(\left(\frac{x^2}{7} \right)^2 - \frac{x^2}{7} \cdot \frac{7}{x^2} + \left(\frac{7}{x^2} \right)^2 \right)$$

$$\Rightarrow \left(\frac{x^2}{7} + \frac{7}{x^2} \right) \left(\frac{x^4}{49} - 1 + \frac{49}{x^4} \right)$$

= 1

$$(ii) \quad 8x^3 - \frac{1}{27y^3}$$

$$(2x)^3 - \left(\frac{1}{3y} \right)^3$$

It is in the form of $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

here $a = 2x$; $b = \frac{1}{3y}$

$$\Rightarrow \left(2x - \frac{1}{3y} \right) \left((2x)^2 + 2x \cdot \frac{1}{3y} + \left(\frac{1}{3y} \right)^2 \right)$$

$$\Rightarrow \left(2x - \frac{1}{3y} \right) \left(4x^2 + \frac{2x}{3y} + \frac{1}{9y^2} \right)$$

Solution - 4 :

$$(i) \quad x^2 + x^5$$

$$x^2 (1 + x^3)$$

$$x^2 (1^3 + x^3)$$

It is in the form of $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

Here $a=1$; $b=x$

$$\therefore x^2 (1+x) (1^2 - 1 \cdot x + x^2)$$

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

(ii) $32x^4 - 500x$

$$4x (8x^3 - 125)$$

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

It is in the form of $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

Here $a=2x$; $b=5$

$$\Rightarrow 4x (2x-5) (2x)^2 + 2x \cdot 5 + 5^2$$

$$\Rightarrow 4x (2x-5) (4x^2 + 10x + 25)$$

Solution-5

(i) $27x^3y^3 - 8$

$$(3xy)^3 - 2^3$$

It is in the form of $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

Here $a=3xy$; $b=2$

$$\therefore (3xy-2) (3xy)^2 + 3xy \cdot 2 + 2^2$$

$$(3xy-2) (9x^2y^2 + 6xy + 4)$$

$$(ii) \quad 27(x+y)^3 + 8(2x-y)^3$$

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

$$\Rightarrow (3(x+y))^3 + (2(2x-y))^3$$

It is in the form of $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

$$\therefore \text{Here } a = 3(x+y); b = 2(2x-y)$$

$$\therefore \Rightarrow [3(x+y) + 2(2x-y)] [3^2(x+y)^2 - 3(x+y) \cdot 2(2x-y) + 2^2(2x-y)^2]$$

$$\Rightarrow (3x+3y + 4x-2y) [9(x+y)^2 - 6(x+y)(2x-y) + 4(2x-y)^2]$$

$$\Rightarrow (7x-y) [9(x^2+y^2+2xy) - 6(2x^2-xy+2xy-y^2) + 4(4x^2+y^2-4xy)]$$

$$\Rightarrow (7x-y) [9x^2+9y^2+18xy - 12x^2 - 6xy - 6y^2 + 16x^2 + 4y^2 - 16xy]$$

$$\Rightarrow (7x-y) [13x^2 - 4xy + 17y^2]$$

Solution-6

$$(i) a^3 + b^3 + a + b$$

$$\rightarrow (a^3 + b^3) + (a + b)$$

$$\rightarrow (a + b)(a^2 - ab + b^2) + (a + b)$$

$$\rightarrow (a + b)(a^2 - ab + b^2 + 1)$$

$$(ii) a^3 - b^3 - a + b$$

$$(a^3 - b^3) - (a - b)$$

$$\rightarrow (a - b)(a^2 + ab + b^2) - (a - b)$$

$$\rightarrow (a - b)(a^2 + ab + b^2 - 1)$$

Solution-7

$$(i) x^3 + x + 2$$

$$x^3 + x + 1 + 1$$

$$(x^3 + 1) + (x + 1)$$

$$\rightarrow (x + 1)(x^2 - x + 1) + (x + 1)$$

$$\rightarrow (x + 1)(x^2 - x + 1 + 1)$$

$$\rightarrow (x + 1)(x^2 - x + 2)$$

$$(ii) a^3 - a - 120$$

$$a^3 - a - 125 + 5$$

$$a^3 - 125 - (a - 5)$$

$$(a^3 - 5^3) - (a - 5)$$

$$(a - 5)(a^2 + 5a + 5^2) - (a - 5)$$

$$(a - 5)(a^2 + 5a + 25) - (a - 5)$$

$$(a - 5)(a^2 + 5a + 25 - 1)$$

$$(a - 5)(a^2 + 5a + 24)$$

Solution - 8:

$$(i) x^3 + 6x^2 + 12x + 16$$

$$x^3 + 6x^2 + 12x + 8 + 8$$

$$(x^3 + 3 \cdot 2 \cdot x^2 + 3 \cdot 2^2 \cdot x + 2^3) + 8$$

It is in the form of $a^3 + 3 \cdot a^2 b + 3ab^2 + b^3$ is

$$(a+b)^3$$

\therefore Here $a = x$; $b = 2$.

$$\therefore (x+2)^3 + 8$$

$$\Rightarrow (x+2)^3 + 2^3$$

$$\therefore \rightarrow (x+2+2) \left((x+2)^2 + 2 \cdot (x+2) + 2^2 \right)$$

$$\rightarrow (x+4) (x^2 + 4 + 4x + 2x + 4 + 4)$$

$$\rightarrow (x+4) (x^2 + 6x + 12)$$

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

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

$$\rightarrow (a-b)^3 - b^3$$

It is in the form of $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

Here $a = a-b$; $b = b$

$$\Rightarrow (a-b-b) ((a-b)^2 + (a-b)b + b^2)$$

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

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

Solution - 9 :

$$(i) 2a^3 + 16b^3 - 5a - 10b$$

$$a^3 + a^3 + 8b^3 + 8b^3 - 5a - 10b + 8b^3$$

$$2(a^3 + 8b^3) - 5(a + 2b)$$

\therefore It is in the form of $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

$$2(a+2b)(a^2 - 2ab + (2b)^2) - 5(a+2b)$$

$$\Rightarrow 2[(a+2b)(a^2 - 2ab + 4b^2)] - 5(a+2b)$$

$$\Rightarrow (a+2b)[2(a^2 - 2ab + 4b^2) - 5]$$

$$\Rightarrow (a+2b)[2a^2 - 4ab + 8b^2 - 5]$$

$$(ii) \cdot a^3 - \frac{1}{a^3} - 2a + \frac{2}{a}$$

$$a^3 - 2a + a - a + \frac{2}{a} + \frac{1}{a} - \frac{1}{a} - \frac{1}{a^3}$$

$$a^3 - 3a + a + \frac{3}{a} - \frac{1}{a} - \frac{1}{a^3}$$

$$a^3 - 3 \cdot a^2 \cdot \frac{1}{a} + 3 \cdot a \cdot \frac{1}{a^2} - \frac{1}{a^3} + \left(a - \frac{1}{a}\right)$$

It is in the form of $a^3 - b^3 = a^3 - 3a^2b + 3ab^2 - b^3$.

$$\therefore \text{Here } a = a ; b = \frac{1}{a}$$

$$\therefore \left(a - \frac{1}{a}\right)^3 + \left(a - \frac{1}{a}\right)$$

$$\Rightarrow \left(a - \frac{1}{a}\right) \left[\left(a - \frac{1}{a}\right)^2 + 1\right]$$

$$\Rightarrow \left(a - \frac{1}{a}\right) \left[a^2 + \frac{1}{a^2} - 2 \cdot a \cdot \frac{1}{a} + 1\right]$$

$$\Rightarrow \left(a - \frac{1}{a}\right) \left(a^2 + \frac{1}{a^2} - 2 + 1\right)$$

$$\rightarrow \left(a - \frac{1}{a}\right) \left(a^2 + \frac{1}{a^2} - 1\right)$$

Solution-10 :

(i) $a^6 - b^6$

$$(a^2)^3 - (b^2)^3$$

It is in the form of $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

Here $a = a^2$; $b = b^2$

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

$$(a^2 - b^2) (a^4 + a^2 b^2 + b^4)$$

(ii) $x^6 - 1$

$$(x^2)^3 - 1^3$$

It is in the form of $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

Here $x^2 = a$; $b = 1$

$$\therefore (x^2 - 1) ((x^2)^2 + x^2 \cdot 1 + 1^2)$$

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

Solution-11

(1) $64x^6 - 729y^6$

$$(2x)^6 - (3y)^6$$

$$\Rightarrow [(2x)^2]^3 - [(3y)^2]^3$$

It is in the form of $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

$$\text{Here } a = (2x)^2 ; b = (3y)^2$$

$$\Rightarrow [(2x)^2 - (3y)^2] [((2x)^2)^2 + (2x)^2 \cdot (3y)^2 + ((3y)^2)^2]$$

$$\Rightarrow (4x^2 - 9y^2) [16x^4 + 4x^2 \cdot 9y^2 + (9y^2)^2]$$

$$(4x^2 - 9y^2) [16x^4 + 36x^2y^2 + 81y^4]$$

$$\Rightarrow [(2x)^2 - (3y)^2] [16x^4 + 36x^2y^2 + 81y^4]$$

$$(2x+3y)(2x-3y)(16x^4 + 36x^2y^2 + 81y^4)$$

(ii) $x^2 - \frac{8}{x}$

$$\left(x^2 - \frac{8}{x}\right) \times \frac{x}{x}$$

$$\Rightarrow x \left(x^2 - \frac{8}{x}\right) \times \frac{1}{x}$$

$$\Rightarrow \left(x^3 - x \cdot \frac{8}{x}\right) \cdot \frac{1}{x}$$

$$\Rightarrow (x^3 - 8) \cdot \frac{1}{x}$$

$$\Rightarrow (x^3 - 2^3) \cdot \frac{1}{x}$$

It is in the form of $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

$$a = x ; b = 2$$

$$\Rightarrow \frac{1}{x} \cdot (x-2)(x^2 + 2x + 4)$$

Solution-12 :

$$(i) \quad 250(a-b)^3 + 2$$

$$(250(a-b)^3 + 2) \cdot \frac{2}{2}$$

$$\Rightarrow 2 \frac{(250(a-b)^3 + 2)}{2}$$

$$\Rightarrow 2 (125(a-b)^3 + 1)$$

$$\Rightarrow 2 (5^3(a-b)^3 + 1)$$

$$\Rightarrow 2 \left((5(a-b))^3 + 1^3 \right)$$

It is in the form of $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

Here $a = 5(a-b)$; $b = 1$

$$\Rightarrow 2 \left[(5(a-b) + 1) \left((5(a-b))^2 - 5(a-b) \cdot 1 + 1^2 \right) \right]$$

$$\Rightarrow 2 \left[(5a - 5b + 1) \left[25(a^2 + b^2 - 2ab) - 5a + 5b + 1 \right] \right]$$

$$\Rightarrow 2 (5a - 5b + 1) (25a^2 + 25b^2 - 50ab - 5a + 5b + 1)$$

$$(ii) \quad 32a^2x^3 - 8b^2x^3 - 4a^2y^3 + b^2y^3$$

$$\rightarrow x^3 (32a^2 - 8b^2) - y^3 (4a^2 - b^2)$$

$$\rightarrow 8x^3 (4a^2 - b^2) - y^3 (4a^2 - b^2)$$

$$\rightarrow (4a^2 - b^2) (8x^3 - y^3)$$

$$\rightarrow (4a^2 - b^2) ((2x)^3 - y^3)$$

$$\rightarrow ((2a)^2 - b^2) ((2x)^3 - y^3)$$

$$\rightarrow (2a+b)(2a-b) [(2x-y) ((2x)^2 + 2x \cdot y + y^2)]$$

$$\rightarrow (2a+b)(2a-b)(2x-y)(4x^2 + 2xy + y^2)$$

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Solution-13

(i) $x^9 + y^9$

$$(x^3)^3 + (y^3)^3$$

It is in the form of $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

Here $a = x^3$; $b = y^3$

$$\therefore (x^3 + y^3) ((x^3)^2 - x^3 \cdot y^3 + (y^3)^2)$$

$$\underline{(x^3 + y^3) (x^6 - x^3 y^3 + y^6)}$$

\Rightarrow It is in the form of $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

\Rightarrow here $a = x$; $b = y$

$$\therefore \Rightarrow (x+y)(x^2 - xy + y^2)(x^6 - x^3 y^3 + y^6)$$

(ii) $x^6 - 7x^3 - 8$

$$(x^2)^3 - 7x^3 - x^3 + x^3 - 8$$

$$(x^2)^3 - 8x^3 + x^3 - 2^3$$

$$\left((x^2)^3 - (2x)^3 \right) + (x^3 - 2^3)$$

$$\Rightarrow (x^2 - 2x) \left((x^2)^2 + x^2 \cdot 2x + (2x)^2 \right) + (x-2) \left(x^2 + 2x + 2^2 \right)$$

$$\Rightarrow (x^2 - 2x) (x^4 + 2x^3 + 4x^2) + (x-2) (x^2 + 2x + 4)$$

$$\Rightarrow x(x-2) \cdot x^2(x^2 + 2x + 4) + (x-2)(x^2 + 2x + 4)$$

Taking common factor as $(x-2)$ and x^2+2x+4

$$\therefore (x-2)(x^2+2x+4)(x \cdot x^2+1)$$

$$(x-2)(x^2+2x+4) \underline{(x^3+1)}$$

It is in the form of $a^3+b^3 = (a+b)(a^2-ab+1)$

$$\therefore (x-2)(x^2+2x+4)(x+1) \underline{(x^2-x+1)}$$

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