

6. बैजिक राशींचे अवयव

सरावसंच 6.1

1. अवयव पाडा.

(1) $x^2 + 9x + 18$.

उकल : $x^2 + 9x + 18$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना

$x^2 + (a + b)x + ab$ या त्रिपदीशी करुन,

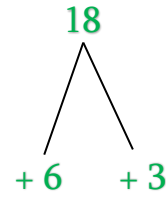
$a + b = 6 + 3 = 9$ आणि $ab = 6 \times 3 = 18$

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

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

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

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



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

(2) $x^2 - 10x + 9$.

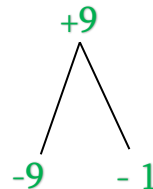
उकल :

$x^2 - 10x + 9$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना

$x^2 + (a + b)x + ab$ या त्रिपदीशी करुन,

$a + b = -9 + (-1) = -10$ आणि

$ab = (-9) + (-1) = 9$



$$\begin{aligned}
 \therefore x^2 - 10x + 9 &= x^2 + (-9 - 1)x + 9 \\
 &= \underline{x^2 - 9x} - \underline{x + 9} \\
 &= x(x - 9) - 1(x - 9) \\
 &= (x - 9)(x - 1)
 \end{aligned}$$

$$\therefore x^2 - 10x + 9 = (x - 9)(x - 1).$$

$$(3) y^2 + 24y + 144.$$

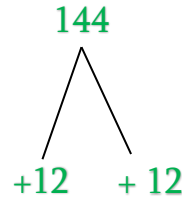
उकल :

$y^2 + 24y + 144$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना

$x^2 + (a + b)x + ab$ या त्रिपदीशी करुन,

$$a + b = 12 + 12 = 24 \text{ आणि}$$

$$ab = 12 \times 12 = 144$$



$$\therefore y^2 + 24y + 144 = y^2 + (12 + 12)y + 144$$

$$= \underline{y^2 + 12y} + \underline{12y + 144}$$

$$= y(y + 12) + 12(y + 12)$$

$$= (y + 12)(y + 12)$$

$$\therefore y^2 + 24y + 144 = (y + 12)(y + 12).$$

(4) $5y^2 + 5y - 10$.

उकल : $5y^2 + 5y - 10$

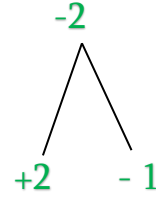
$5(y^2 + y - 2)$... सर्व पदांमधून 5 हा सामाईक अवयव काढून

$5(y^2 + y - 2)$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना

$x^2 + (a + b)x + ab$ या त्रिपदीशी करून,

$a + b = 2 - 1 = 1$ आणि

$ab = 2 \times (-1) = -2$



$\therefore 5(y^2 + y - 2) = 5[y^2 + (2 - 1)y - 2]$

$= 5(\underline{y^2 + 2y} - \underline{y} - 2)$

$= 5[y(\underline{y + 2}) - 1(\underline{y + 2})]$

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

$\therefore 5y^2 + 5y - 10 = 5(y + 2)(y - 1)$.

(5) $p^2 - 2p - 35$.

उकल : $p^2 - 2p - 35$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना

$x^2 + (a + b)x + ab$ या त्रिपदीशी करून,

$a + b = -7 + 5 = -2$ आणि

$ab = (-7) \times 5 = -35$



$$\therefore p^2 - 2p - 35 = p^2 + (-7 + 5)p - 35$$

$$= \underline{p^2 - 7p} + \underline{5p - 35}$$

$$= \underline{p(p - 7)} + \underline{5(p - 7)}$$

$$= (p - 7)(p + 5)$$

$$\therefore p^2 - 2p - 35 = (p - 7)(p + 5)$$

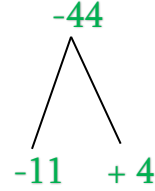
$$(6) \ p^2 - 7p - 44.$$

उकल : $p^2 - 7p - 44$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना

$x^2 + (a + b)x + ab$ या त्रिपदीशी करून,

$$a + b = -11 + 4 = -7 \text{ आणि}$$

$$ab = (-11) \times 4 = -44$$



$$\therefore p^2 - 7p - 44 = p^2 + (-11 + 4)p - 44$$

$$= \underline{p^2 - 11p} + \underline{4p - 44}$$

$$= \underline{p(p - 11)} + \underline{4(p - 11)}$$

$$= (p - 11)(p + 4)$$

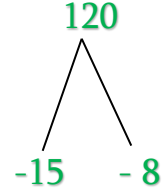
$$\therefore p^2 - 7p - 44 = (p - 11)(p + 4)$$

(7) $m^2 - 23m + 120$.

उकल : $m^2 - 23m + 120$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना $x^2 + (a + b)x + ab$ या त्रिपदीशी करुन,

$$a + b = -15 - 8 = -23 \text{ आणि}$$

$$ab = -15 \times (-8) = 120$$



$$\begin{aligned} \therefore m^2 - 23m + 120 &= m^2 + (-15 - 8)m + 120 \\ &= \underline{m^2 - 15m} - \underline{8m + 120} \\ &= m(m - 15) - 8(m - 15) \\ &= (m - 15)(m - 8) \end{aligned}$$

$$\therefore m^2 - 23m + 120 = (m - 15)(m - 8).$$

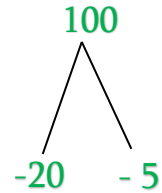
(8) $m^2 - 25m + 100$.

उकल : $m^2 - 25m + 100$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना

$x^2 + (a + b)x + ab$ या त्रिपदीशी करुन,

$$a + b = -20 - 5 = -25 \text{ आणि}$$

$$ab = (-20) \times (-5) = 100$$



$$\begin{aligned} \therefore m^2 - 25m + 100 &= m^2 + (-20 - 5)m + 100 \\ &= \underline{m^2 - 20m} - \underline{5m + 100} \end{aligned}$$

$$= m(m - 20) - 5(m - 20)$$

$$= (m - 20)(m - 5)$$

$$\therefore m^2 - 25m + 100 = (m - 20)(m - 5).$$

$$(9) \ 3x^2 + 14x + 15$$

उकल : $3x^2 + 14x + 15$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना

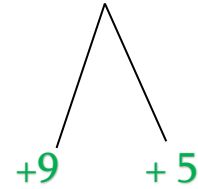
$x^2 + (a + b)x + ab$ या त्रिपदीशी करुन,

$$a + b = 9 + 5 = 14 \text{ आणि}$$

$$(3 \times 15) = 45$$

$$ab = 9 \times 5 = 45$$

$$\therefore 3x^2 + 14x + 15 = 3x^2 + (9 + 5)x + 15$$



$$= \underline{3x^2 + 9x} + \underline{5x + 15}$$

$$= 3x(\underline{x + 3}) + 5(\underline{x + 3})$$

$$= (x + 3)(3x + 5)$$

$$\therefore 3x^2 + 14x + 15 = (x + 3)(3x + 5).$$

$$(10) \ 2x^2 + x - 45.$$

उकल : $2x^2 + x - 45$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना

$x^2 + (a + b)x + ab$ या त्रिपदीशी करुन,

$$a + b = 10 - 9 = 1 \text{ आणि}$$

$$(2 \times -45) = -90$$

$$ab = 10 \times (-9) = -90$$



$$\therefore 2x^2 + x - 45 = 2x^2 + (10 - 9)x - 45$$

$$= \underline{2x^2 + 10x} - \underline{9x - 45}$$

$$= 2x(\underline{x + 5}) - 9(\underline{x + 5})$$

$$= (x + 5)(2x - 9)$$

$$\therefore 2x^2 + x - 45 = (x + 5)(2x - 9).$$

$$(11) \ 20x^2 - 26x + 8.$$

उकल : $20x^2 - 26x + 8$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना

$x^2 + (a + b)x + ab$ या त्रिपदीशी करून, $10 \times 4 = 40$

$$a + b = -8 - 5 = -13 \text{ आणि}$$

$$ab = (-8) \times (-5) = 40$$



$$20x^2 - 26x + 8$$

$$= 2(10x^2 - 13x + 4) \quad \dots \text{सर्व पदांमधून 2 हा सामाईक अवयव काढून}$$

$$\therefore 2(10x^2 - 13x + 4) = 2[10x^2 + (-8 - 5)x + 4]$$

$$= 2(10x^2 - 8x - 5x + 4)$$

$$= 2[2x(5x - 4) - 1(5x - 4)]$$

$$= 2(5x - 4)(2x - 1)$$

$$\therefore 20x^2 - 26x + 8 = 2(5x - 4)(2x - 1).$$

$$(12) 44x^2 - x - 3.$$

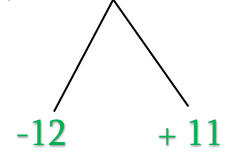
उकल : $44x^2 - x - 3$ या वर्ग त्रिपदीचे अवयव काढण्यासाठी तिची तुलना

$x^2 + (a + b)x + ab$ या त्रिपदीशी करुन,

$$a + b = -12 + 11 = -1 \text{ आणि}$$

$$44 \times (-3) = -132$$

$$ab = -12 \times 11 = -132$$



$$\therefore 44x^2 - x - 3 = 44x^2 + (-12 + 11)x - 3$$

$$= \underline{44x^2 - 12x} + \underline{11x - 3}$$

$$= 4x(\underline{11x - 3}) + 1(\underline{11x - 3})$$

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

$$\therefore 44x^2 - x - 3 = (11x - 3)(4x + 1).$$

सरावसंच 6.2

1. अवयव पाडा.

$$(1) x^3 + 64y^3$$

उकल :

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2) \quad \dots \text{सूत्र}$$

$$\begin{aligned} x^3 + 64y^3 &= (x)^3 + (4y)^3 \\ &= (x + 4y)[x^2 - x(4y) + (4y)^2] \\ &= (x + 4y)(x^2 - 4xy + 16y^2) \\ \therefore x^3 + 64y^3 &= (x + 4y)(x^2 - 4xy + 16y^2) \end{aligned}$$

$$(2) 125p^3 + q^3$$

उकल :

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2) \quad \dots \text{सूत्र}$$

$$\begin{aligned} 125p^3 + q^3 &= (5p)^3 + (q)^3 \\ &= (5p + q)[(5p)^2 - (5p)q + q^2] \\ &= (5p + q)(25p^2 - 5pq + q^2) \\ \therefore 125p^3 + q^3 &= (5p + q)(25p^2 - 5pq + q^2) \end{aligned}$$

$$(3) \ 125k^3 + 27m^3$$

उकल :

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2) \quad \dots \text{ सूत्र}$$

$$\begin{aligned} 125k^3 + 27m^3 &= (5k)^3 + (3m)^3 \\ &= (5k + 3m) [(5k)^2 - (5k)(3m) + (3m)^2] \\ &= (5k + 3m)(25k^2 - 15km + 9m^2) \\ \therefore 125k^3 + 27m^3 &= (5k + 3m)(25k^2 - 15km + 9m^2) \end{aligned}$$

$$(4) \ 2l^3 + 432m^3$$

उकल :

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2) \quad \dots \text{ सूत्र}$$

$$\begin{aligned} 2l^3 + 432m^3 &= 2[(l)^3 + 216m^3] \\ &= 2[(l)^3 + (6m)^3] \\ &= 2[(l + 6m)(l^2 - l(6m) + 6m^2)] \\ &= 2(l + 6m)(l^2 - 6lm + 36m^2) \\ \therefore 2l^3 + 432m^3 &= 2(l + 6m)(l^2 - 6lm + 36m^2). \end{aligned}$$

$$(5) \ 24a^3 + 81b^3$$

उकल :

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2) \quad \dots \text{ सूत्र}$$

$$\begin{aligned} 24a^3 + 81b^3 &= 3(8a^3 + 27b^3) \\ &= 3[(2a)^3 + (3b)^3] \\ &= 3(2a + 3b) [(2a)^2 - (2a \times 3b) + (3b)^2] \\ &= 3(2a + 3b)(4a^2 - 6ab + 9b^2) \\ \therefore 24a^3 + 81b^3 &= 3(2a + 3b)(4a^2 - 6ab + 9b^2). \end{aligned}$$

$$(6) \ y^3 + \frac{1}{8y^3}$$

उकल :

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2) \quad \dots \text{ सूत्र}$$

$$\begin{aligned} y^3 + \frac{1}{8y^3} &= (y)^3 + \left(\frac{1}{2y}\right)^3 \\ &= \left(y + \frac{1}{2y}\right) \left[y^2 - \left(y \times \frac{1}{2y}\right) + \left(\frac{1}{2y}\right)^2\right] \\ &= \left(y + \frac{1}{2y}\right) \left(y^2 - \frac{1}{2} + \frac{1}{4y^2}\right) \\ \therefore y^3 + \frac{1}{8y^3} &= \left(y + \frac{1}{2y}\right) \left(y^2 - \frac{1}{2} + \frac{1}{4y^2}\right) \end{aligned}$$

$$(7) a^3 + \frac{8}{a^3}$$

उकल :

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2) \quad \dots \text{ सूत्र}$$

$$a^3 + \frac{8}{a^3} = (a)^3 + \left(\frac{2}{a}\right)^3$$

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

$$= \left(a + \frac{2}{a}\right) \left(a^2 - 2 + \frac{4}{a^2}\right)$$

$$\therefore a^3 + \frac{8}{a^3} = \left(a + \frac{2}{a}\right) \left(a^2 - 2 + \frac{4}{a^2}\right)$$

$$(8) 1 + \frac{q^3}{125}$$

उकल :

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2) \quad \dots \text{ सूत्र}$$

$$1 + \frac{q^3}{125} = (1)^3 + \left(\frac{q}{5}\right)^3$$

$$= \left(1 + \frac{q}{5}\right) \left[1^2 - \left(1 \times \frac{q}{5}\right) + \left(\frac{q}{5}\right)^2\right]$$

$$= \left(1 + \frac{q}{5}\right) \left(1 - \frac{q}{5} + \frac{q^2}{25}\right)$$

$$\therefore 1 + \frac{q^3}{125} = \left(1 + \frac{q}{5}\right) \left(1 - \frac{q}{5} + \frac{q^2}{25}\right)$$

सरावसंच 6.3

1. अवयव पाडा.

$$(1) y^3 - 27$$

उकल :

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2) \quad \dots \text{ सूत्र}$$

$$\begin{aligned} y^3 - 27 &= (y)^3 - (3)^3 \\ &= (y - 3)[y^2 + 3y + (3)^2] \\ &= (y - 3)(y^2 + 3y + 9) \end{aligned}$$

$$\therefore y^3 - 27 = (y - 3)(y^2 + 3y + 9).$$

$$(2) x^3 - 64y^3.$$

उकल :

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2) \quad \dots \text{ सूत्र}$$

$$\begin{aligned} x^3 - 64y^3 &= (x)^3 - (4y)^3 \\ &= (x - 4y)[x^2 + x(4y) + (4y)^2] \\ &= (x - 4y)(x^2 + 4xy + 16y^2) \end{aligned}$$

$$\therefore x^3 - 64y^3 = (x - 4y)(x^2 + 4xy + 16y^2).$$

$$(3) \ 27m^3 - 216n^3.$$

उकल :

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2) \quad \dots \text{ सूत्र}$$

$$\begin{aligned} 27m^3 - 216n^3 &= (3m)^3 - (6n)^3 \\ &= (3m - 6n)[(3m)^2 + (3m)(6n) + (6n)^2] \\ &= (3m - 6n)(9m^2 + 18mn + 36n^2) \\ &= [3(m - 2n) \times 9(m^2 + 2mn + 4n^2)] \\ &= 3 \times 9(m - 2n)(m^2 + 2mn + 4n^2) \\ &= 27(m - 2n)(m^2 + 2mn + 4n^2) \\ \therefore 27m^3 - 216n^3 &= 27(m - 2n)(m^2 + 2mn + 4n^2). \end{aligned}$$

$$(4) \ 125y^3 - 1$$

उकल :

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2) \quad \dots \text{ सूत्र}$$

$$\begin{aligned} 125y^3 - 1 &= (5y)^3 - (1)^3 \\ &= (5y - 1)[(5y)^2 + 1(5y) + (1)^2] \\ &= (5y - 1)(25y^2 + 5y + 1) \\ \therefore 125y^3 - 1 &= (5y - 1)(25y^2 + 5y + 1). \end{aligned}$$

$$(5) \ 8p^3 - \frac{27}{p^3}$$

उकल :

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2) \quad \dots \text{ सूत्र}$$

$$\begin{aligned} 8p^3 - \frac{27}{p^3} &= (2p)^3 - \left(\frac{3}{p}\right)^3 \\ &= \left(2p - \frac{3}{p}\right) \left[(2p)^2 + (2p)\left(\frac{3}{p}\right) + \left(\frac{3}{p}\right)^2\right] \\ &= \left(2p - \frac{3}{p}\right) \left(4p^2 + 6 + \frac{9}{p^2}\right) \\ \therefore 8p^3 - \frac{27}{p^3} &= \left(2p - \frac{3}{p}\right) \left(4p^2 + 6 + \frac{9}{p^2}\right). \end{aligned}$$

$$(6) \ 343a^3 - 512b^3$$

उकल :

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2) \quad \dots \text{ सूत्र}$$

$$\begin{aligned} 343a^3 - 512b^3 &= (7a)^3 - (8b)^3 \\ &= (7a - 8b) [(7a)^2 + (7a)(8b) + (8b)^2] \\ &= (7a - 8b)(49a^2 + 56ab + 64b^2) \end{aligned}$$

$$\therefore 343a^3 - 512b^3 = (7a - 8b)(49a^2 + 56ab + 64b^2)$$

$$(7) 64x^3 - 729y^3.$$

उकल :

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2) \quad \dots \text{ सूत्र}$$

$$\begin{aligned} 64x^3 - 729y^3 &= (4x)^3 - (9y)^3 \\ &= (4x - 9y) [(4x)^2 + (4x)(9y) + (9y)^2] \\ &= (4x - 9y)(16x^2 + 36xy + 81y^2) \end{aligned}$$

$$\therefore 64x^3 - 729y^3 = (4x - 9y)(16x^2 + 36xy + 81y^2).$$

$$(8) 16a^3 - \frac{128}{b^3}.$$

उकल :

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2) \quad \dots \text{ सूत्र}$$

$$16a^3 - \frac{128}{b^3} = 16\left(a^3 - \frac{8}{b^3}\right) \quad \dots (16 \text{ हा सामाईक अवयव काढून})$$

$$\begin{aligned} &= 16\left[\left(a\right)^3 - \left(\frac{2}{b}\right)^3\right] \\ &= 16\left[\left(a - \frac{2}{b}\right)\left(a^2 + \left(a \times \frac{2}{b}\right) + \left(\frac{2}{b}\right)^2\right)\right] \\ &= 16\left(a - \frac{2}{b}\right)\left(a^2 + \frac{2a}{b} + \frac{4}{b^2}\right) \end{aligned}$$

$$\therefore 16a^3 - \frac{128}{b^3} = 16\left(a - \frac{2}{b}\right)\left(a^2 + \frac{2a}{b} + \frac{4}{b^2}\right).$$

2. सोपे रूप द्या.

(1) $(x + y)^3 - (x - y)^3$.

उकल : $(x + y)^3 - (x - y)^3$

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

$$\dots[(a + b)^2 = a^2 + 2ab + b^2 \quad (a + b)(a - b) = a^2 - b^2]$$

$$\text{आणि } (a - b)^2 = a^2 - 2ab + b^2]$$

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

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

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

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

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

उकल : $(3a + 5b)^3 - (3a - 5b)^3$

$$= [(3a + 5b) - (3a - 5b)][(3a + 5b)^2 + (3a + 5b)(3a - 5b) + (3a - 5b)^2]$$

$$= (3a + 5b - 3a + 5b)(9a^2 + 30ab + 25b^2 + 9a^2 - 25b^2 + 9a^2 - 30ab + 25b^2)$$

$$= 10b (9a^2 + 9a^2 + 9a^2 + 30ab - 30ab + 25b^2 - 25b^2 + 25b^2)$$

$$= 10b (27a^2 + 25b^2)$$

$$= 270a^2b + 250b^3$$

$$\therefore (3a + 5b)^3 - (3a - 5b)^3 = 270a^2b + 250b^3.$$

$$(3) \quad (a + b)^3 - a^3 - b^3.$$

$$\text{उकल : } (a + b)^3 - a^3 - b^3 = [a^3 + b^3 + 3a^2b + 3ab^2] - a^3 - b^3$$

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

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

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

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

$$(4) \quad p^3 - (p + 1)^3.$$

$$\text{उकल : } p^3 - (p + 1)^3$$

$$= [p - (p + 1)][p^2 + p(p + 1) + (p + 1)^2]$$

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

$$= -1(3p^2 + 3p + 1)$$

$$= -3p^2 - 3p - 1$$

$$\therefore p^3 - (p + 1)^3 = -3p^2 - 3p - 1.$$

$$(5) \quad (3xy - 2ab)^3 - (3xy + 2ab)^3.$$

$$\text{उकल : } (3xy - 2ab)^3 - (3xy + 2ab)^3$$

$$= [(3xy - 2ab) - (3xy + 2ab)][(3xy - 2ab)^2 + (3xy - 2ab)(3xy + 2ab) + (3xy + 2ab)^2]$$

$$= (3xy - 2ab - 3xy - 2ab)(9x^2y^2 - 12xyab + 4a^2b^2 + 9x^2y^2 - 4a^2b^2$$

$$+ 9x^2y^2 + 12xyab + 4a^2b^2)$$

$$\begin{aligned}
&= -4ab(9x^2y^2 + 9x^2y^2 + 9x^2y^2 - 12xyab + 12xyab + 4a^2b^2 - \\
&\quad 4a^2b^2 \\
&\quad + 4a^2b^2) \\
&= -108x^2y^2ab - 16a^3b^3 \\
\therefore (3xy - 2ab)^3 - (3xy + 2ab)^3 &= -108x^2y^2ab - 16a^3b^3.
\end{aligned}$$

सरावसंच 6.4

1. सोपे रूप द्या :

$$(1) \frac{m^2 - n^2}{(m+n)^2} \times \frac{m^2 + mn + n^2}{m^3 - n^3}$$

$$\text{उकल : } \frac{m^2 - n^2}{(m+n)^2} \times \frac{m^2 + mn + n^2}{m^3 - n^3} \dots(I)$$

प्रथम उदाहरणात दिलेल्या राशींचे अवयव पाडू

$$(i) m^2 - n^2 = (m + n)(m - n)$$

$$(ii) (m + n)^2 = (m + n)(m + n)$$

$$(iii) m^3 - n^3 = (m - n)(m^2 + mn + n^2)$$

समीकरण (i), (ii), (iii) च्या किंमत समीकरण I मध्ये ठेवून

$$= \frac{(m + n)(m - n)}{(m + n)(m + n)} \times \frac{(m^2 + mn + n^2)}{(m - n)(m^2 + mn + n^2)}$$

$$= \frac{1}{m + n} \dots(\text{संक्षिप्त रूप देऊन})$$

$$\therefore \frac{m^2 - n^2}{(m+n)^2} \times \frac{m^2 + mn + n^2}{m^3 - n^3} = \frac{1}{m+n}.$$

$$(2) \frac{a^2 + 10a + 21}{a^2 + 6a - 7} \times \frac{a^2 - 1}{a + 3}.$$

$$\text{उकल : } \frac{a^2 + 10a + 21}{a^2 + 6a - 7} \times \frac{a^2 - 1}{a + 3} \dots\dots(I)$$

प्रथम उदाहरणात दिलेल्या राशींचे अवयव पाडू

$$(i) a^2 + 10a + 21$$

$$= a^2 + 7a + 3a + 21$$

$$= a(a + 7) + 3(a + 7)$$

$$= (a + 7) + 3(a + 7)$$

$$= (a + 7)(a + 3)$$

$$(ii) a^2 + 6a - 7$$

$$= a^2 + 7a - a - 7$$

$$= a(a + 7) - 1(a + 7)$$

$$= (a + 7)(a - 1)$$

समीकरण (i), (ii) च्या किंमत समीकरण I मध्ये ठेवून

$$= \frac{(a + 7)(a + 3)}{(a + 7)(a - 1)} \times \frac{(a + 1)(a - 1)}{(a + 3)}$$

$$= a + 1 \quad \dots(\text{संक्षिप्त रूप देऊन})$$

$$\therefore \frac{a^2 + 10a + 21}{a^2 + 6a - 7} \times \frac{a^2 - 1}{a + 3} = a + 1.$$

$$(3) \frac{8x^3 - 27y^3}{4x^2 - 9y^2}.$$

$$\text{उकल : } \frac{8x^3 - 27y^3}{4x^2 - 9y^2} = \frac{(2x)^3 - (3y)^3}{(2x)^2 - (3y)^2} \dots(I)$$

$$= \frac{(2x - 3y)(4x^2 + 6xy + 9y^2)}{(2x + 3y)(2x - 3y)} \dots[a^3 - b^3 = (a - b)(a^2 + ab + b^2)]$$

$$\text{आणि } (a^2 - b^2) = (a + b)(a - b)]$$

$$= \frac{(4x^2 + 6xy + 9y^2)}{2x + 3y} \dots(\text{संक्षिप्त रूप देऊन})$$

$$\therefore \frac{8x^3 - 27y^3}{4x^2 - 9y^2} = \frac{(2x)^3 - (3y)^3}{(2x)^2 - (3y)^2} = \frac{(4x^2 + 6xy + 9y^2)}{2x + 3y}.$$

$$(4) \frac{x^2 - 5x - 24}{(x + 3)(x + 8)} \times \frac{x^2 - 64}{(x - 8)^2}.$$

$$\text{उकल : } \frac{x^2 - 5x - 24}{(x + 3)(x + 8)} \times \frac{x^2 - 64}{(x - 8)^2} \dots(I)$$

प्रथम उदाहरणात दिलेल्या राशींचे अवयव पाडू

$$(i) x^2 - 5x - 24 = x^2 - 8x + 3x - 24$$

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

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

$$(ii) x^2 - 64 = (x)^2 - (8)^2 = (x + 8)(x - 8)$$

$$(iii) (x - 8)^2 = (x - 8)(x - 8)$$

समीकरण (i), (ii), (iii) च्या किंमत समीकरण I मध्ये ठेवून

$$= \frac{(x - 8)(x + 3)}{(x + 3)(x + 8)} \times \frac{(x + 8)(x - 8)}{(x - 8)(x - 8)}$$

$$= 1$$

$$\therefore \frac{x^2 - 5x - 24}{(x + 3)(x + 8)} \times \frac{x^2 - 64}{(x - 8)^2} = 1.$$

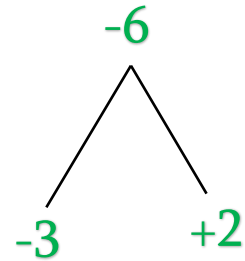
$$(5) \frac{3x^2 - x - 2}{x^2 - 7x + 12} \div \frac{3x^2 - 7x - 6}{x^2 - 4}$$

$$\text{रीत : } \frac{3x^2 - x - 2}{x^2 - 7x + 12} \div \frac{3x^2 - 7x - 6}{x^2 - 4}$$

$$\frac{3x^2 - x - 2}{x^2 - 7x + 12} \times \frac{x^2 - 4}{3x^2 - 7x - 6} \quad \dots(I)$$

प्रथम उदाहरणात दिलेल्या राशींचे अवयव पाडू

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

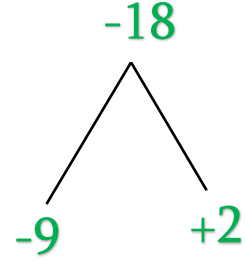


$$(ii) \quad 3x^2 - 7x - 6$$

$$= 3x^2 - 9x + 2x - 6$$

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

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

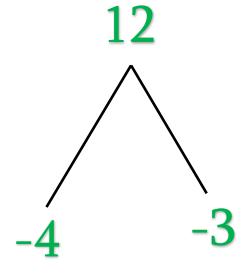


$$(iii) \quad x^2 - 7x + 12$$

$$= x^2 - 4x - 3x + 12$$

$$= x(x - 4) - 3(x - 4)$$

$$= (x - 4)(x - 3)$$



$$(iv) \quad x^2 - 4 = x^2 - 2^2 = (x + 2)(x - 2)$$

समीकरण (i), (ii), (iii), (iv) च्या किंमती समीकरण I मध्ये ठेवून,

$$= \frac{(x-1)(3x+2)}{(x-4)(x-3)} \times \frac{(x+2)(x-2)}{(x-3)(3x+2)}$$

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

$$\therefore \frac{3x^2 - x - 2}{x^2 - 7x + 12} \div \frac{3x^2 - 7x - 6}{x^2 - 4} = \frac{(x-1)(x+2)(x-2)}{(x-3)^2(x-4)}.$$

$$(6) \frac{4x^2 - 11x + 6}{16x^2 - 9}$$

$$\text{उकल : } \frac{4x^2 - 11x + 6}{16x^2 - 9} \dots\dots\dots(I)$$

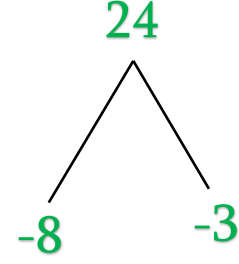
प्रथम उदाहरणात दिलेल्या राशींचे अवयव पाडू

$$(i) \quad 4x^2 - 11x + 6$$

$$= 4x^2 - 8x - 3x + 6$$

$$= 4x(x - 2) - 3(x - 2)$$

$$= (x - 2)(4x - 3)$$



$$(ii) \quad 16x^2 - 9 = (4x)^2 - (3)^2 = (4x + 3)(4x - 3)$$

समीकरण (i), (ii) च्या किंमती समीकरण I मध्ये ठेवून,

$$= \frac{(x-2)(4x-3)}{(4x+3)(4x-3)}$$

$$= \frac{x-2}{4x+3}$$

$$\therefore \frac{4x^2 - 11x + 6}{16x^2 - 9} = \frac{x-2}{4x+3}$$

$$(7) \frac{a^3 - 27}{5a^2 - 16a + 3} \div \frac{a^2 + 3a + 9}{25a^2 - 1}$$

$$\text{उकल : } \frac{a^3 - 27}{5a^2 - 16a + 3} \div \frac{a^2 + 3a + 9}{25a^2 - 1}$$

$$\frac{a^3 - 27}{5a^2 - 16a + 3} \times \frac{25a^2 - 1}{a^2 + 3a + 9} \dots (I)$$

प्रथम उदाहरणात दिलेल्या राशींचे अवयव पाडू

$$(i) \quad a^3 - 27 = a^3 - 3^3 \\ = (a - 3)(a^2 + 3a + 9)$$

$$(ii) \quad 5a^2 - 16a + 3 = 5a^2 - 15a - a + 3 \\ = 5a(a - 3) - 1(a - 3) \\ = (a - 3)(5a - 1)$$

$$(iii) \quad 25a^2 - 1 = (5a)^2 - (1)^2 \\ = (5a + 1)(5a - 1)$$

समीकरण (i), (ii), (iii) च्या किंमती समीकरण I मध्ये ठेवून,

$$= \frac{(a-3)(a^2+3a+9)}{(a-3)(5a-1)} \times \frac{(5a+1)(5a-1)}{(a^2+3a+9)} = 5a + 1$$

$$\therefore \frac{a^3 - 27}{5a^2 - 16a + 3} \div \frac{a^2 + 3a + 9}{25a^2 - 1} = 5a + 1.$$

$$(8) \frac{1 - 2x + x^2}{1 - x^3} \times \frac{1 + x + x^2}{1 + x}.$$

$$\text{उकल : } \frac{1 - 2x + x^2}{1 - x^3} \times \frac{1 + x + x^2}{1 + x}$$

$$= \frac{(1 - x)^2}{(1 - x)(1 + x + x^2)} \times \frac{1 + x + x^2}{1 + x}$$

$$= \frac{(1 - x)(1 - x)}{(1 - x)(1 + x + x^2)} \times \frac{(1 + x + x^2)}{(1 + x)} \quad \dots(\text{अवयव पाड़ून})$$

$$= \frac{1 - x}{1 + x}$$

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