এস এস সি গণিত (আবশ্যিক)

অধ্যায়-৩: বীজগাণিতিক রাশি

প্রশ্ন ▶ ১ $A = x + y + z$, $B = x^2 - \sqrt{3} + 1$ এবং $C = x^3 + \frac{1}{x}$

ক. প্রমাণ কর যে, $x^3 + y^3 + z^3 = 3xyz$ যখন $A = 0$।

খ. $B = 0$ হলে $\left(x^3 + \frac{1}{x^3}\right) + \left(x^2 + \frac{1}{x^2}\right)$ এর মান নির্ণয় কর।

গ. প্রমাণ কর যে, $x = \frac{3 + \sqrt{5}}{2}$, যখন $C = 18$।

২ নং প্রশ্নের সমাধান

ক দেওয়া আছে, $A = x + y + z$ এবং $A = 0$

$\therefore x + y + z = 0$

বা, $x + y = -z$

বা, $(x + y)^3 = (-z)^3$

বা, $x^3 + y^3 + 3xy(x + y) = -z^3$

বা, $x^3 + y^3 + z^3 + 3xy(-z) = 0$

বা, $x^3 + y^3 + z^3 - 3xyz = 0$

$\therefore x^3 + y^3 + z^3 = 3xyz$ (প্রমাণিত)

খ এখানে, $B = x^2 - \sqrt{3} + 1$ এবং $B = 0$

$\therefore x^2 - \sqrt{3} + 1 = 0$

বা, $x^2 + 1 = \sqrt{3}x$

বা, $x + \frac{1}{x} = \sqrt{3}$

প্রদত্ত রাশি $= \left(x^3 + \frac{1}{x^3}\right) + \left(x^2 + \frac{1}{x^2}\right)$

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

$= \left\{(\sqrt{3})^3 - 3\sqrt{3}\right\} + \left\{(\sqrt{3})^2 - 2\right\}$

$= (3\sqrt{3} - 3\sqrt{3}) + (3 - 2) = 0 + 1 = 1$ (Ans.)

গ এখানে, $C = x^3 + \frac{1}{x}$ এবং $C = 18$

$\therefore x^3 + \frac{1}{x} = 18$

বা, $x^4 + 1 = 18x$

বা, $x^4 - 18x + 1 = 0$

বা, $x^4 - 18x^2 + 81 - 80 = 0$

বা, $(x^2)^2 - 2 \cdot x^2 \cdot 9 + 9^2 = 80$

বা, $(x^2 - 9)^2 = (4\sqrt{5})^2$

বা, $x^2 - 9 = 4\sqrt{5}$

বা, $x^2 = 9 + 4\sqrt{5}$

বা, $x^2 = \frac{72}{8} + \frac{32\sqrt{5}}{8} = \frac{72 + 32\sqrt{5}}{8} = \frac{27 + 27\sqrt{5} + 45 + 5\sqrt{5}}{8}$

বা, $x^2 = \frac{3^2 + 3 \cdot 3^2\sqrt{5} + 3 \cdot 3\sqrt{5}^2 + 6\sqrt{5}^2}{8}$

বা, $x^2 = \frac{(2 + \sqrt{5})^2}{2}$

বা, $x^2 = \left(\frac{3 + \sqrt{5}}{2}\right)^2$

$\therefore x = \frac{3 + \sqrt{5}}{2}$ (প্রমাণিত)

প্রশ্ন ▶ ২ x এবং x এর গুণাত্মক বিপরীত রাশির সমষ্টি 3।

ক. $x - \frac{1}{x}$ এর মান নির্ণয় কর।

খ. দেখাও যে, $\frac{x^4 + 1}{x^2} = 18$

গ. $x^4 - 7x^2 + 1 = 0$ এর সমাধান যাচাই কর।

২ নং প্রশ্নের সমাধান

ক x এর গুণাত্মক বিপরীত রাশি $\frac{1}{x}$

প্রশ্নানুসারে, $x + \frac{1}{x} = 3$

বা, $\left(x + \frac{1}{x}\right)^2 = 9$ [বর্গ করে]

বা, $\left(x - \frac{1}{x}\right)^2 + 4 \cdot x \cdot \frac{1}{x} = 9$

বা, $\left(x - \frac{1}{x}\right)^2 + 4 = 9$

বা, $\left(x - \frac{1}{x}\right)^2 = 5$

$\therefore x - \frac{1}{x} = \pm\sqrt{5}$ (Ans.)

খ 'ক' হতে পাই, $x + \frac{1}{x} = 3$

বামপক্ষ $= \frac{x^4 + 1}{x^2} = \frac{x^4}{x^2} + \frac{1}{x^2} = x^2 + \frac{1}{x^2}$

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

$= 3^2 - 3 \cdot 1 \cdot 3$ [মান বসিয়ে]

$= 27 - 9$

$= 18 = $ ডানপক্ষ

$\therefore \frac{x^4 + 1}{x^2} = 18$ (দেখানো হলো)

গ $x^4 - 7x^2 + 1 = 0$

বা, $x^4 + 1 = 7x^2$

বা, $\frac{x^4 + 1}{x^2} = 7$

বা, $\frac{x^4}{x^2} + \frac{1}{x^2} = 7$

বা, $x^2 + \frac{1}{x^2} = 7$

বা, $\left(x + \frac{1}{x}\right)^2 - 2 \cdot x \cdot \frac{1}{x} = 7$

বা, $\left(x + \frac{1}{x}\right)^2 = 7 + 2$

বা, $\left(x + \frac{1}{x}\right)^2 = 9$

বা, $x + \frac{1}{x} = 3$

$\therefore x + \frac{1}{x} = 3$ এর জন্য $x^4 - 7x^2 + 1 = 0$ সমীকরণটি সত্য।

প্রশ্ন ▶ ৩ $a^2 + b^2 = 3ab$ যেখানে $a > b$

ক. $\frac{a}{b} + \frac{b}{a} = $ কত?

খ. $\frac{a^2 + b^2}{a^2 b^2}$ এর মান নির্ণয় কর।

গ. প্রমাণ কর যে, $\frac{a^2}{b^2} - \frac{b^2}{a^2} = 2\sqrt{5}$

৩ নং প্রশ্নের সমাধান

ক দেওয়া আছে, $a^2 + b^2 = 3ab$ যেখানে, $a > b$

বা, $\frac{a^2 + b^2}{ab} = \frac{3ab}{ab}$ [উভয়পক্ষকে ab দ্বারা ভাগ করে]

বা, $\frac{a^2}{ab} + \frac{b^2}{ab} = 3$

বা, $\frac{a}{b} + \frac{b}{a} = 3$

$\therefore \frac{a}{b} + \frac{b}{a} = 3$ (Ans.)

খ 'ক' হতে পাই, $\frac{a}{b} + \frac{b}{a} = 3$

$\frac{a^2 + b^2}{a^2 b^2} = \frac{a^2}{a^2 b^2} + \frac{b^2}{a^2 b^2} = \frac{1}{b^2} + \frac{1}{a^2}$

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

$= (3)^2 - 2 = 9 - 2 = 7$ (Ans.)

খ দেওয়া আছে, $2a + \frac{2}{a} = 5$

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

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Xiaolong Qi

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Math Solution Of Class 9 Bd Book Review: Unveiling the Magic of Language

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