

# এস এস সি গণিত (আবশ্যিক)

## অধ্যায়-৩: বীজগাণিতিক রাশি

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

(কোনটি বীজগাণিতিক রাশি, তা নির্ধারণ করুন)

- ক. প্রমাণ কর যে,  $x^2 + y^2 + z^2 - 3xyz$  যখন  $A = 0$ ,  
 খ.  $B = 0$  হলে  $\left(x^2 + \frac{1}{x^2}\right) + \left(x^2 + \frac{1}{x^2}\right)$  এর মান নির্ণয় কর।  
 গ. প্রমাণ কর যে,  $x = \frac{2 + \sqrt{3}}{2}$ , যখন  $C = 18$ .

**১. ক. প্রমাণের সমাধান**

- ক. দেওয়া আছে,  $A = x + y + z$  এবং  $A = 0$   
 $\therefore x + y + z = 0$   
 বা,  $x + y = -z$   
 বা,  $(x + y)^2 = (-z)^2$   
 বা,  $x^2 + y^2 + 3xy = (-z)^2 = z^2$   
 বা,  $x^2 + y^2 + z^2 - 3xy = 0$   
 বা,  $x^2 + y^2 + z^2 - 3xyz = 0$   
 $\therefore x^2 + y^2 + z^2 - 3xyz$  (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,  $x + \frac{1}{x} = \sqrt{3}$

$$\begin{aligned} \text{প্রদত্ত রাশি} &= \left(x^2 + \frac{1}{x^2}\right) + \left(x^2 + \frac{1}{x^2}\right) \\ &= \left\{\left(x + \frac{1}{x}\right)^2 - 3x \cdot \frac{1}{x} \left(x + \frac{1}{x}\right)\right\} + \left\{\left(x + \frac{1}{x}\right)^2 - 2x \cdot \frac{1}{x}\right\} \\ &= \{(\sqrt{3})^2 - 3\sqrt{3}\} + \{(\sqrt{3})^2 - 2\} \\ &= (3\sqrt{3} - 3\sqrt{3}) + (3 - 2) = 0 + 1 = 1 \text{ (Ans.)} \end{aligned}$$

- গ. এখানে,  $C = x^3 + \frac{1}{x^2}$  এবং  $C = 18$

$$\begin{aligned} \therefore x^3 + \frac{1}{x^2} &= 18 \\ \text{বা, } x^6 + 1 &= 18x^2 \\ \text{বা, } x^6 - 18x^2 + 1 &= 0 \\ \therefore x^6 - 18x^2 + 81 - 80 &= 0 \\ \text{বা, } (x^2)^3 - 2x^2 \cdot 9 + 9^2 &= 80 \\ \text{বা, } (x^2 - 9)^2 &= (4\sqrt{5})^2 \\ \text{বা, } x^2 - 9 &= 4\sqrt{5} \\ \text{বা, } x^2 &= 9 + 4\sqrt{5} \\ \text{বা, } x^2 &= \frac{72}{8} + \frac{32\sqrt{5}}{8} = \frac{72 + 32\sqrt{5}}{8} = \frac{27 + 22\sqrt{5} + 45 + 5\sqrt{5}}{8} \\ \text{বা, } x^2 &= \frac{3^2 + 2 \cdot 3 \cdot \sqrt{5} + 3 \cdot 3 \cdot 5 + 5\sqrt{5}}{8} \\ \text{বা, } x^2 &= \left(\frac{3 + \sqrt{5}}{2}\right)^2 \\ \therefore x &= \frac{3 + \sqrt{5}}{2} \text{ (প্রমাণিত)} \end{aligned}$$

**উদাহরণ ২:**  $x$  এবং  $\frac{1}{x}$  এর পূর্ণাঙ্কক বিশ্লিষ্ট রাশির সংখ্যা ৩.

(কোনটি বীজগাণিতিক রাশি, তা নির্ধারণ করুন)

- ক.  $x - \frac{1}{x}$  এর মান নির্ণয় কর।  
 খ. দেখান যে,  $\frac{x^2 + 1}{x^2} = 12$   
 গ.  $x^4 - 7x^2 + 1 = 0$  এর সমাধান খুঁজুন।

**২. খ. প্রমাণের সমাধান**

- ক.  $x$  এর পূর্ণাঙ্কক বিশ্লিষ্ট রাশি  $\frac{1}{x}$

প্রদত্তভাবে,  $x + \frac{1}{x} = 3$

$$\begin{aligned} \text{বা, } \left(x + \frac{1}{x}\right)^2 &= 9 \text{ [বর্গ করে]} \\ \text{বা, } \left(x - \frac{1}{x}\right)^2 &+ 4x \cdot \frac{1}{x} = 9 \\ \text{বা, } \left(x - \frac{1}{x}\right)^2 &+ 4 = 9 \\ \text{বা, } \left(x - \frac{1}{x}\right)^2 &= 5 \\ \therefore x - \frac{1}{x} &= \pm\sqrt{5} \text{ (Ans.)} \end{aligned}$$

- খ. 'ক' হতে পাই,  $x + \frac{1}{x} = 3$

$$\begin{aligned} \text{সম্পর্ক} &= \frac{x^2 + 1}{x^2} = \frac{x^2}{x^2} + \frac{1}{x^2} = x^2 + \frac{1}{x^2} \\ &= \left(x + \frac{1}{x}\right)^2 - 3x \cdot \frac{1}{x} \left(x + \frac{1}{x}\right) \\ &= 3^2 - 3 \cdot 1 \cdot 3 \text{ [মান বসিয়ে]} \\ &= 27 - 9 \\ &= 18 = \text{অন্যদিক} \\ \therefore \frac{x^2 + 1}{x^2} &= 18 \text{ (দেখানোর মতো)} \end{aligned}$$

- গ.  $x^4 - 7x^2 + 1 = 0$

$$\begin{aligned} \text{বা, } x^4 + 1 &= 7x^2 \\ \text{বা, } \frac{x^4 + 1}{x^2} &= 7 \\ \text{বা, } \frac{x^4}{x^2} + \frac{1}{x^2} &= 7 \\ \text{বা, } x^2 + \frac{1}{x^2} &= 7 \\ \text{বা, } \left(x + \frac{1}{x}\right)^2 &= 2x \cdot \frac{1}{x} + 7 \\ \text{বা, } \left(x + \frac{1}{x}\right)^2 &= 7 + 2 \\ \text{বা, } \left(x + \frac{1}{x}\right)^2 &= 9 \\ \therefore x + \frac{1}{x} &= 3 \end{aligned}$$

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

**উদাহরণ ৩:**  $a^2 + b^2 = 3ab$  যেখানে  $a > b$

(কোনটি বীজগাণিতিক রাশি, তা নির্ধারণ করুন)

- ক.  $\frac{a}{b} + \frac{b}{a} = 3$  করুন।  
 খ.  $\frac{a^2 + b^2}{a^2b^2}$  এর মান নির্ণয় কর।  
 গ. প্রমাণ কর যে,  $\frac{a^2}{b^2} - \frac{b^2}{a^2} = 4\sqrt{3}$

**৩. খ. প্রমাণের সমাধান**

- ক. দেওয়া আছে,  $a^2 + b^2 = 3ab$  যেখানে,  $a > b$   
 বা,  $\frac{a^2 + b^2}{a^2b^2} = \frac{3ab}{a^2b^2}$  [উভয়দিকে  $ab$  দ্বারা ভাগ করে]  
 বা,  $\frac{a^2}{a^2b^2} + \frac{b^2}{a^2b^2} = 3$   
 বা,  $\frac{a}{b^2} + \frac{b}{a^2} = 3$   
 $\therefore \frac{a}{b^2} + \frac{b}{a^2} = 3$  (Ans.)

- খ. 'ক' হতে পাই,  $\frac{a}{b^2} + \frac{b}{a^2} = 3$

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

$$\begin{aligned} &= \left(\frac{a}{b}\right)^2 + \left(\frac{b}{a}\right)^2 = \left(\frac{a}{b} + \frac{b}{a}\right)^2 - 2 \cdot \frac{a}{b} \cdot \frac{b}{a} \\ &= (3)^2 - 2 = 9 - 2 = 7 \text{ (Ans.)} \end{aligned}$$

- গ. দেওয়া আছে,  $2a + \frac{2}{a} = 5$

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

# Guide Class 9 Math Bd

**S Ashworth**



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