

SSC FOUNDATION



सम्यान बैच

समय से तैयारी, समय से सफलता

MATHEMATICS

ALGEBRA (बीजगणित)

सबसे सटीक, सबसे बेहतर



LIVE STREAM : 11:00 AM

BY - SHASHI SIR

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ALGEBRA (बीजगणित) (CLASS-02) [Algebraic Identity]

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

$$= 10^2 - 3 \times 1$$

$$= 97$$

1. If $a = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$ and $b = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$ then find the value of $a^2 + b^2 - ab$ $ab = ?$

[यदि $a = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$ तथा $b = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$ है, तो $a^2 + b^2 - ab$ का मान क्या है?]

$$(a+b)^2 - 3ab = 10^2 - 3 \times 1 = 97$$

- (a) 97
(b) 98
(c) $2\sqrt{3} + 2$
(d) $4\sqrt{6} + 1$

$$a = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}} \times \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} + \sqrt{2}} = (\sqrt{3} + \sqrt{2})^2$$

$$b = (\sqrt{3} - \sqrt{2})^2$$

$$a + b = (\sqrt{3} + \sqrt{2})^2 + (\sqrt{3} - \sqrt{2})^2$$

$$= 2(3 + 2) = 10$$

2. If $a^2 + b^2 = 2$ and $c^2 + d^2 = 1$ then find $(ad - bc)^2 + (ac + bd)^2 = ?$
 [यदि $a^2 + b^2 = 2$ और $c^2 + d^2 = 1$ है तो $(ad - bc)^2 + (ac + bd)^2$ ज्ञात करो।]

(a) $\frac{4}{9}$

(b) 1

(c) $\frac{1}{2}$

✓ (d) 2

$$(ad - bc)^2 + (ac + bd)^2 = \underline{a^2d^2} - \cancel{2abcd} + \underline{b^2c^2} + \underline{a^2c^2} + \underline{b^2d^2} + \cancel{2abcd}$$

$$= a^2(d^2 + c^2) + b^2(c^2 + d^2)$$

$$= (d^2 + c^2)(a^2 + b^2)$$

$$= 1 \times 2 = 2$$

3. If $x = \frac{1}{2+\sqrt{3}}$, $y = \frac{1}{2-\sqrt{3}}$ then $8xy(x^2 + y^2) = ?$

[यदि $x = \frac{1}{2+\sqrt{3}}$, $y = \frac{1}{2-\sqrt{3}}$ है तो $8xy(x^2 + y^2) = ?$]

(a) 97

☒ (b) 112

(c) 194

(d) 196

$$\begin{array}{l|l}
 xy = ①, & 8xy(x^2 + y^2) \\
 x = 2 - \sqrt{3} & 8 \times 1 [(x+y)^2 - 2xy] \\
 y = 2 + \sqrt{3} & \\
 \hline
 x+y = 4 & = 8 \times (4^2 - 2) \\
 & = 8 \times 14 = \underline{112}
 \end{array}$$

4. If $x^2 - y^2 = 80$ and $x - y = 8$ then find the Average of x and y ?
 [यदि $x^2 - y^2 = 80$ और $x - y = 8$ है तो x और y का औसत क्या है?]

(a) 2

(b) 3

✓ (c) 5

(d) 4

$$(x+y)(x-y) = 80$$

$$10 \times 8 = 80$$

$$x+y = \underline{10}$$

$$\frac{x+y}{2} = \text{Avg} = \frac{10}{2} = \underline{5}$$

5. If $1.5x = 0.04y$ then the value of $\frac{y^2 - x^2}{y^2 + 2xy + x^2}$ is

[यदि $1.5x = 0.04y$ हो तो $\frac{y^2 - x^2}{y^2 + 2xy + x^2}$ का मान है?]

(a) $\frac{735}{77}$

(b) $\frac{73}{770}$

(c) $\frac{73}{77}$

(d) $\frac{75}{77}$

$$\frac{x}{y} = \frac{0.04}{1.5} = \frac{2}{75}$$

$$\frac{(y+x)(y-x)}{(y+x)^2}$$

$$= \frac{y-x}{y+x} = \frac{73}{77}$$

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

$$\Downarrow$$

$$(\sqrt{x})^2 + 2 \times \sqrt{x} \times \frac{1}{10} + \left(\frac{1}{10}\right)^2$$

$$a = \frac{1}{10}$$

6. If $x + \frac{1}{5}\sqrt{x} + a^2$ is a perfect square then "a" is?
a के किस मान के लिए $x + \frac{1}{5}\sqrt{x} + a^2$ एक पूर्ण वर्ग होगा?

(a) $\frac{1}{100}$

☒ (b) $\frac{1}{10}$

(c) $\frac{1}{10}$

(d) $-\frac{1}{10}$

If $N = (12345)^2 + 12345 + 12346$ then the value of $\sqrt{N}$?

- ☒ (a) 12346
☐ (b) 12345
☐ (c) 12347
☐ (d) 12344

$$(12345)^2 + \boxed{12345 + 12345} + 1$$
$$\Downarrow \qquad \qquad \qquad \Downarrow$$
$$a^2 + 2a \times b + b^2$$
$$\sqrt{(a+b)^2} = a+b$$
$$\qquad \qquad \qquad \Downarrow$$
$$12345 + 1 = 12346$$

8. If the expression $\frac{x^2}{y^2} + tx + \frac{y^2}{4}$ is a perfect square then the values of t is:

यदि व्यंजक $\frac{x^2}{y^2} + tx + \frac{y^2}{4}$ एक पूर्ण वर्ग है, तो t का मान क्या होगा?

[SSC CGL PRE 2018]

(a) ± 1

(b) ± 2

(c) 0

(d) ± 3

$$\left[\frac{x}{y}\right]^2 + 2 \times \frac{x}{y} \times \frac{1}{2} + \left[\frac{y}{2}\right]^2$$

$$tx = x$$

$$t = \pm 1$$

$$(a+b)^2$$

$$(a-b)^2$$

$$(1) \quad (a + b)^3 = \underline{a^3 + b^3 + 3ab(a + b)} = \boxed{a^3 + 3a^2b + 3ab^2 + b^3}$$

$$(a - b)^3 = \underline{a^3 - b^3 - 3ab(a - b)} = \underline{a^3 - 3a^2b + 3ab^2 - b^3}$$

$$\boxed{a^3 + b^3} = \underline{(a + b)^3} - 3ab(a + b) = \boxed{(a + b)(a^2 - ab + b^2)}$$

$$\underline{a^3 - b^3} = \underline{(a - b)^3} + 3ab(a - b) = \boxed{(a - b)(a^2 + ab + b^2)}$$

CASE-01

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

→ If $a^2 + ab + b^2 = 0$

Divide by ab on both sides:

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

$$\frac{a}{b} + 1 + \frac{b}{a} = 0$$

$$\left(\frac{a}{b} + \frac{b}{a}\right) = -1 \text{ then } a^3 = b^3 \Rightarrow a = b$$

$$\frac{a^3}{b^3} = \frac{b^3}{b^3} \Rightarrow \frac{a^3}{b^3} = 1, \left(\frac{a}{b}\right)^3 = 1$$

यदि $x + \frac{1}{x} = 1$ then $x^3 = -1$

✓ यदि $x + \frac{1}{x} = 1$ then $x^3 = -1$

$$\frac{a^3 - b^3}{a - b} = (a^2 + ab + b^2)$$

If $x + \frac{1}{x} = k$ then $x^3 + \frac{1}{x^3} = k^3 - 3k$

$$\frac{a^3 + b^3}{a + b} = (a^2 - ab + b^2)$$

If $x - \frac{1}{x} = p$ then $x^3 - \frac{1}{x^3} = p^3 + 3p$

9. If $P - 2q = 4$, then the value of $p^3 - 8q^3 - 24pq - 64$ is?
 अगर $P - 2q = 4$ हो तो $p^3 - 8q^3 - 24pq - 64$ का मान:

(a) 2

☒ (b) 0

(c) 3

(d) -1

$$[p - 2q]^3 = 4^3$$

$$p^3 - 8q^3 - 3 \times p \times 2q (p - 2q) = 64$$

$$p^3 - 8q^3 - 6pq \times 4 = 64$$

$$p^3 - 8q^3 - 24pq - 64 = 0$$

10. If $m - 5n = 2$ then the value of $(m^3 - 125n^3 - 30mn)$ is
यदि $m - 5n = 2$, तो $(m^3 - 125n^3 - 30mn)$ का मान

(a) 6

(b) 7

☒ (c) 8

(d) 9

$$3 \times m \times 5n \times 2$$

11. If $P = 999$ then the value of $\sqrt[3]{P(P^2 + 3P + 3)} + 1$ is

यदि $P = 999$ तो $\sqrt[3]{P(P^2 + 3P + 3)} + 1$ का मान

☒ (a) 1000

(b) 999

(c) 998

(d) 1002

$$P^3 + 3P^2 + 3P \times 1 + 1^3 = (P+1)^3 \Rightarrow \sqrt[3]{(P+1)^3} = P+1$$

$$999 + 1 = 1000$$

12. If $P = 99$ then value of $P(P^2 + 3P + 3)$ is

यदि $P = 99$ तो $P(P^2 + 3P + 3)$ का मान:

(a) 999

(b) 9999

(c) 99999

(d) 999999

$$\begin{aligned}
 &P^3 + 3P^2 + 3P + 1 - 1 \\
 &(P+1)^3 - 1 = (100)^3 - 1 \\
 &= \underline{999999}
 \end{aligned}$$

13. यदि $x + y + z = 2S$ है, तो $(S - x)^3 + (S - y)^3 + 3(S - x)(S - y)z$ का मान ज्ञात करो।

If $x + y + z = 2S$ find $(S - x)^3 + (S - y)^3 + 3(S - x)(S - y)z = ?$

(a) z^3

(b) $-z^3$

(c) 0

(d) $2z^3$

$$x + y + z = S + S$$

$$z^3 = [(S - x) + (S - y)]^3$$

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

$$[(S - x) + (S - y)]^3$$

$$2$$

$$(S - x)^3 + (S - y)^3 + 3(S - x)(S - y)z = z^3$$

14. If $24\sqrt{3}x^3 + 5\sqrt{5}y^3 = (2\sqrt{3}x + \sqrt{5}y) \times (Ax^2 + Bxy + Cy^2)$ then what is the value of $(A^2 - B^2 + C^2)$?

यदि $24\sqrt{3}x^3 + 5\sqrt{5}y^3 = (2\sqrt{3}x + \sqrt{5}y) \times (Ax^2 + Bxy + Cy^2)$ है, तो $(A^2 - B^2 + C^2)$ का मान क्या होगा?

(a) 108

(b) 128

✓ (c) 109

(d) 139

$$[2\sqrt{3}x]^3 + [\sqrt{5}y]^3 = (2\sqrt{3}x + \sqrt{5}y) ((2\sqrt{3})^2 x^2 - 2\sqrt{3}x \times \sqrt{5}y + (\sqrt{5})^2 y^2)$$

$$A = 12$$

$$B = -2\sqrt{15}$$

$$C = 5$$

$$\begin{array}{l} A^2 - B^2 + C^2 \\ 144 - 60 + 25 \\ = 109 \\ \underline{\underline{=}} \end{array}$$

15. $\left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2} - 1\right)\left(x^2 + \frac{1}{x^2} + 1\right) = ?$

(a) $x^6 + \frac{1}{x^6}$

(b) $x^8 + \frac{1}{x^8}$

(c) $x^8 - \frac{1}{x^8}$

☒ (d) $x^6 - \frac{1}{x^6}$

$$\begin{aligned} \left(x + \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2} - 1\right) &= x^3 + \frac{1}{x^3} \\ \left(x - \frac{1}{x}\right)\left(x^2 + \frac{1}{x^2} + 1\right) &= x^3 - \frac{1}{x^3} \end{aligned}$$

$$= x^6 - \frac{1}{x^6}$$

16. If $x^3 + \frac{3}{x} = 4(a^3 + b^3)$ and $3x + \frac{1}{x^3} = 4(a^3 - b^3)$ then $4(a^2 - b^2)$ is equal to?

यदि $x^3 + \frac{3}{x} = 4(a^3 + b^3)$ और $3x + \frac{1}{x^3} = 4(a^3 - b^3)$ हो तो $4(a^2 - b^2)$ बराबर है?

- (a) 0
- (b) 1
- (c) 2
- (d) 4

$$\begin{aligned}
 x^3 + \frac{3}{x} &= 4a^3 + 4b^3 \\
 3x + \frac{1}{x^3} &= 4a^3 - 4b^3 \\
 \hline
 x^3 + \frac{1}{x^3} + 3x + \frac{3}{x} &= 8a^3 \\
 \left(x + \frac{1}{x}\right)^3 &= (2a)^3 \\
 \boxed{x + \frac{1}{x} = 2a} \\
 a &= \frac{x + \frac{1}{x}}{2} \quad \bigg| \quad b = \frac{x - \frac{1}{x}}{2}
 \end{aligned}$$

$$\begin{aligned}
 &4 \left[\frac{\left(x + \frac{1}{x}\right)^2}{4} - \frac{\left(x - \frac{1}{x}\right)^2}{4} \right] \\
 &= 4 \times x \times \frac{1}{x} = \boxed{4}
 \end{aligned}$$

$$\begin{aligned}
 &(a+b)^2 - (a-b)^2 \\
 &= 4ab
 \end{aligned}$$

17. If $a + b = 1$ and $a^3 + b^3 + 3ab = k$ then value of K is?

यदि $a + b = 1$ और $a^3 + b^3 + 3ab = K$ तो K का मान क्या है?

☒ (a) 1

(b) 3

(c) 5

(d) 7

$$(a+b)^3 = 1^3$$

$$a^3 + b^3 + 3ab(a+b) = 1$$

$$a^3 + b^3 + 3ab \times 1 = 1$$

$$a^3 + b^3 + 3ab = 1 = k$$

18. $xy(x+y) = 1$, तो $\frac{1}{x^3y^3} - x^3 - y^3$ का मान है?

If $xy(x+y) = 1$, then value of $\frac{1}{x^3y^3} - x^3 - y^3$?

- (a) 0
- (b) 1
- ☒ (c) 3
- (d) -2

$$x+y = \frac{1}{xy}$$

$$x^3+y^3+3xy \times (x+y) = \frac{1}{x^3y^3}$$

$$x^3+y^3+3xy \times \frac{1}{xy} = \frac{1}{x^3y^3}$$

$$x^3+y^3+3 = \frac{1}{x^3y^3}$$

$$\frac{1}{x^3y^3} - x^3 - y^3 = 3$$

19. If $x(x - 3) = -1$, then the value of $x^3(x^3 - 18)$ is:
 यदि $x(x - 3) = -1$, तो $x^3(x^3 - 18)$ का मान है:

(a) -1

(b) 2

(c) 1

(d) 0

$$x - 3 = -\frac{1}{x}$$

$$x^3 - 27 - 3 \times x \times 3(x - 3) = -\frac{1}{x^3}$$

$$x^3 - 27 - 9x - \frac{1}{x} = -\frac{1}{x^3}$$

$$x^3 - 27 + 9 = -\frac{1}{x^3}$$

$$(x^3 - 18) = -\frac{1}{x^3} \Rightarrow x^3(x^3 - 18) = -1$$

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

$$\cancel{\left(x^2 + \frac{1}{x^2} \right)} (x^4 - 1 + \frac{1}{x^4}) = K \cancel{\left(x^2 + \frac{1}{x^2} \right)}$$

$$K = x^4 - 1 + \frac{1}{x^4}$$

20. If $x^6 + \frac{1}{x^6} = K \left(x^2 + \frac{1}{x^2} \right)$, then k is equal to

यदि $x^6 + \frac{1}{x^6} = k \left(x^2 + \frac{1}{x^2} \right)$ है, तो k बराबर है:

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

✓ (b) $x^4 - 1 + \frac{1}{x^4}$

(c) $x^4 + 1 + \frac{1}{x^4}$

(d) $x^4 - 1 - \frac{1}{x^4}$

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

21. If $(a^2 + b^2)^3 = (a^3 + b^3)^2$, then the value of $\frac{a}{b} + \frac{b}{a}$ is

यदि $(a^2 + b^2)^3 = (a^3 + b^3)^2$ है, तो $\frac{a}{b} + \frac{b}{a}$ का मान है:

(a) $\frac{1}{3}$

(b) $\frac{2}{3}$

(c) $-\frac{1}{3}$

(d) $-\frac{2}{3}$

$$\cancel{a^3} + \cancel{b^3} + 3\cancel{a^2b} + 3\cancel{ab^2} = \cancel{a^3} + \cancel{b^3} + 2ab^2$$

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

$$\frac{a}{b} + \frac{b}{a} = \frac{2}{3}$$

22. If $x^3 + \frac{3}{x} = 4(a^3 + b^3)$ and $3x + \frac{1}{x^3} = 4(a^3 - b^3)$ then $a^2 - b^2 = ?$

यदि $x^3 + \frac{3}{x} = 4(a^3 + b^3)$ and $3x + \frac{1}{x^3} = 4(a^3 - b^3)$ है तो $a^2 - b^2 = ?$

- (a) 4
- (b) 0
- (c) 1
- (d) 2

17.10

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