

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



Algebra

→ Algebraic Identity
→ Equation
→ max and min

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ALGEBRA (बीजगणित) (CLASS-01) [Algebraic Identity]

Basic Formula

$$1. (a + b)^2 = (a^2 + b^2 + 2ab) \Rightarrow a^2 + b^2 = (a + b)^2 - 2ab$$

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

$$3. (a^2 - b^2) = \underline{(a + b)} \underline{(a - b)} \Rightarrow (a + b) = \frac{a^2 - b^2}{(a - b)}$$

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

Some adding and subtracting Function

$$a^2 + b^2 + \underline{2ab} - ab$$

↑↑

$$a^2 + b^2 - \overbrace{2ab} + \underline{3ab}$$

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

2. $a^2 + 3ab + b^2 = \underline{(a + b)^2} + \textcircled{ab} = (a - b)^2 + \textcircled{5ab}$

3. $a^2 - 3ab + b^2 = \underline{(a + b)^2} - 5ab = \underline{(a - b)^2} - 2ab$

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

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

जब किसी संख्या को उसके व्युत्क्रम के साथ जोड़ा या घटाया जाए।

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

$$\text{If } \boxed{a = x} \boxed{b = \frac{1}{x}} \text{ then } \underline{ab} = \textcircled{1}$$

$$\text{If } x + \frac{1}{x} = \textcircled{k} \text{ then (यदि } x + \frac{1}{x} = k \text{ हो तो)}$$

$$\text{(i) } x^2 + \frac{1}{x^2} = (k^2 - 2) \quad \downarrow \text{square}$$

$$\text{(ii) } x^4 + \frac{1}{x^4} = [k^2 - 2]^2 - 2$$

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

If $x - \frac{1}{x} = p$ then (यदि $x - \frac{1}{x} = p$ हो तो)

✓

(i) $x^2 + \frac{1}{x^2} = R^2 + 2$

✓

(ii) $x^4 + \frac{1}{x^4} = [R^2 + 2]^2 - 2$

$$\begin{aligned}
 a^2 + b^2 &= (a+b)^2 - 2ab \\
 &= 14^2 - 2 \times 24 \\
 &= 196 - 48 = 148
 \end{aligned}$$

1. If $a + b = 14$, $ab = 24$ then $(a^2 + b^2)$ is equal to [अगर $a + b = 14$, $ab = 24$ हो तो $(a^2 + b^2)$ बराबर है -]

(a) 124

✓ (b) 148 ✓

(c) 140

(d) 100

2. If $p + q = 11$ and $pq = 6$ then the numerical value of $\frac{p}{q} + \frac{q}{p}$ will be? [अगर $p + q = 11$ और $pq = 6$, तो $\frac{p}{q} + \frac{q}{p}$ का मान?]

- ☒ (a) $18\frac{1}{6}$
☐ (b) 13
☐ (c) 12.5
☐ (d) $17\frac{1}{9}$

$$\begin{aligned}
 \frac{p}{q} + \frac{q}{p} &= \frac{p^2 + q^2}{pq} = \frac{(p+q)^2 - 2pq}{pq} \\
 &= \frac{11^2 - 2 \times 6}{6} = \frac{121 - 12}{6} \\
 &= \frac{109}{6} \\
 &= 18\frac{1}{6}
 \end{aligned}$$

3. If $x + y = 10$ and $xy = 4$, then what is the value of $x^4 + y^4$? [यदि $x + y = 10$ और $xy = 4$ हो तो $x^4 + y^4$ का मान क्या है?]

- (a) 8432
- (b) 7478
- (c) 6218
- (d) 8464

$$x^2 + y^2 = 10^2 - 2 \times 4 = 100 - 8 = 92$$

$$\begin{aligned} x^4 + y^4 &= (92)^2 - 2 \times (xy)^2 \\ &= 8464 - 2 \times 16 \\ &= 8464 - 32 \\ &= 8432 \end{aligned}$$

$$a + b = \frac{\sqrt{5}+1}{\sqrt{5}-1} + \frac{\sqrt{5}-1}{\sqrt{5}+1}$$

$$= \frac{(\sqrt{5}+1)^2 + (\sqrt{5}-1)^2}{(\sqrt{5}-1)(\sqrt{5}+1)}$$

$$= \frac{2(5+1)}{(5-1)} = 3$$

$$a \times b = 1$$

4.

यदि $a = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ और $b = \frac{\sqrt{5}-1}{\sqrt{5}+1}$ हो तो $\frac{a^2+ab+b^2}{a^2-ab+b^2} = ?$

If $a = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b = \frac{\sqrt{5}-1}{\sqrt{5}+1}$ then find the value of $\frac{a^2+ab+b^2}{a^2-ab+b^2} = ?$

- (a) $\frac{3}{5}$
(b) $\frac{3}{4}$
(c) $\frac{4}{3}$
(d) $\frac{5}{3}$

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

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

= $\frac{8}{3}$

5. If $x = 3 + 2\sqrt{2}$ and $xy = 1$ then the value of $\frac{x^2 + 3xy + y^2}{x^2 - 3xy + y^2}$ is? [अगर $x = 3 + 2\sqrt{2}$ और $xy = 1$ तो $\frac{x^2 + 3xy + y^2}{x^2 - 3xy + y^2} :$]

- (a) $\frac{30}{31}$
 (b) $\frac{70}{31}$
 (c) $\frac{35}{31}$
 ✓ (d) $\frac{37}{31}$

$$\begin{aligned} xy &= 1 & x+y &= 3+2=5 \\ x &= 3+2\sqrt{2} & x-y &= 4\sqrt{2} \\ y &= \frac{1}{x} = 3-2\sqrt{2} \end{aligned}$$

$$\begin{aligned} &\downarrow \\ &\frac{(x+y)^2 + xy}{(x-y)^2 - xy} \\ &= \frac{5^2 + 1}{(4\sqrt{2})^2 - 1} = \frac{26}{31} \end{aligned}$$

$$\frac{a+b}{a-b} + \frac{(a-b)}{a+b}$$

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

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

Q. 6. If $\frac{x + \sqrt{x^2 - 1}}{x - \sqrt{x^2 - 1}} + \frac{x - \sqrt{x^2 - 1}}{x + \sqrt{x^2 - 1}} = 34$ and then the value of x is $(x < 0)$?

- (a) -1
(b) -2
(c) -3
(d) -4

$$x < 0$$

$$\frac{2(x^2 + x^2 - 1)}{x^2 - x^2 + 1} = 34$$

$$2(2x^2 - 1) = 34$$

$$2x^2 - 1 = 17$$

$$2x^2 = 18$$

$$x^2 = 9$$

$$x = \pm 3$$

7. If a and b be positive integers such that $a^2 - b^2 = 19$ then the value of $a^2 - b$ is

(a) 19

☒ (b) 91

(c) 89

(d) 10

$$a^2 - b = 10^2 - 9 = 91$$

$$(a+b)(a-b) = 19$$

$$19 \times 1 = 19$$

$$a + b = 19$$

$$a - b = 1$$

$$a = \frac{20}{2} = 10$$

$$b = \frac{18}{2} = 9$$

$$\begin{aligned}
 & \overset{a}{\uparrow} 1006^2 - \overset{a}{(1006+1)} \overset{a}{(1006-1)} + \overset{a}{(1006+2)} \overset{a}{(1006-2)} \\
 & \quad - \overset{a}{(1006+3)} \overset{a}{(1006-3)}
 \end{aligned}$$

8. What is the value of $1006^2 - 1007 \times 1005 + 1008 \times 1004 - 1009 \times 1003$?

- (a) 6
(b) 3
(c) 12
(d) 24

$$a^2 - (a^2 - 1) + (a^2 - 4) - (a^2 - 9)$$

$$a^2 - \cancel{a^2} + 1 + \cancel{a^2} - 4 - \cancel{a^2} + 9 = 10 - 4 = \underline{6}$$

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

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

$$\text{○ } x(\quad)$$

$$x = b + c - 2a$$

$$y = c + a - 2b$$

$$z = a + b - 2c$$

$$x+y+z = 0$$

$$= 0$$

9. $x = b + c - 2a$, $y = c + a - 2b$, $z = a + b - 2c$ then the value of $x^2 + y^2 - z^2 + 2xy$ is?
 यदि $x = b + c - 2a$, $y = c + a - 2b$, $z = a + b - 2c$ तो $x^2 + y^2 - z^2 + 2xy$ का मान:

- (a) 0
 (b) $a + b + c$
 (c) $a + b - c$
 (d) $a - b + c$

$$(x+y)^2 - z^2 = 8$$

$$(x+y+z)(x+y-z) = 8$$

$$(y+z+x)(y+z-x) = 10$$

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

$$(x+y+z)[x+y-z+y+z-x+x+y-z-y] = 25$$

$$(x+y+z)(x+y+z) = 25$$

$$(x+y+z)^2 = 25$$

$$x+y+z = 5$$

10. Given that x, y, z are positive real numbers, if $(x + y)^2 - z^2 = 8$, $(y + z)^2 - x^2 = 10$ and $(x + z)^2 - y^2 = 7$ then $(x + y + z)$ is equal to:

[x, y, z वास्तविक धनात्मक संख्याएँ हैं, अगर $(x + y)^2 - z^2 = 8$, $(y + z)^2 - x^2 = 10$ और $(x + z)^2 - y^2 = 7$ हो तो $(x + y + z)$ के बराबर है?]

(a) 5

(b) 8

(c) 7

(d) 9

$$x^4 + y^4 + x^2y^2 + x^2y^2 = 481 + x^2y^2$$

$$x^4 + y^4 + 2x^2y^2 = 481 + (12)^2$$

$$(x^2 + y^2)^2 = 625$$

$$x^2 + y^2 = 25$$

$$x^2 + y^2 - xy = 25 - 12 = \underline{13}$$

11. x and y are positive integers. If $x^4 + y^4 + x^2y^2 = 481$ and $xy = 12$, then what is the value of $x^2 - xy + y^2$?

481
144

[x तथा y एक धनात्मक पूर्णांक हैं। यदि $x^4 + y^4 + x^2y^2 = 481$ तथा $xy = 12$ हैं, तो $x^2 - xy + y^2 = ?$]

(a) 16

(b) 13

(c) 113

(d) 15

$$2^{32} - (2+1)(2^2+1)(2^4+1)(2^8+1)(2^{16}+1)$$

(2^2-1)

$2^{32} - 1$

$$2^{32} - [(2^2-1)(2^2+1)(2^4+1)(2^8+1)(2^{16}+1)]$$

(2^4-1)

(2^8-1)

$(2^{16}-1)$

$(2^{32}-1)$

$$= \cancel{2^{32}} - \cancel{2^{32}} + 1 = 1$$

12. $2^{32} - (2+1)(2^2+1)(2^4+1)(2^8+1)(2^{16}+1)$

किसके समान है?

$[2^{32} - (2+1)(2^2+1)(2^4+1)(2^8+1)(2^{16}+1)]$ is equal to]

- (a) 2^{16}
- (b) 2
- (c) 0
- (d) 1

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

Trick:-

$$\cancel{2^{32}} - \cancel{2^{32}} + 1 = 1$$

13. If $P = \sqrt{5} - 2$ then $P^4 + 16P^2 + 8P^3 + 4 = ?$

[यदि $P = \sqrt{5} - 2$ हो तो $P^4 + 16P^2 + 8P^3 + 4$ का मान है?]

- (a) 5
- (b) 3
- (c) 0
- (d) 1

$$P = \sqrt{5} - 2$$

$$(P+2)^2 = (\sqrt{5})^2$$

$$P^2 + 4P + 4 = 5$$

$$(P^2 + 4P)^2 = (1)^2$$

$$P^4 + 16P^2 + 2 \times 4P \times P^2 = 1$$

$$P^4 + 16P^2 + 8P^3 = 1$$

$$1 + 4 = 5$$

14. $(x^{128} + 1)(x^{32} + 1)(x^{64} + 1)(x^{16} + 1)(x^8 + 1)(x^4 + 1)(x^2 + 1)(x + 1) = ?$

(a) $x^{256} - 1$

(b) $\frac{x^{128} - 1}{x - 1}$

✓ (c) $\frac{x^{256} - 1}{x - 1}$

(d) $\frac{x^{64} - 1}{x - 1}$

$$\begin{array}{r} (x-1) \\ \times (x-1) \\ \hline (x^{256} - 1) \\ \hline (x-1) \end{array}$$

15. If $\sqrt{13x^3 - 14x + 29} + \sqrt{13x^3 - 14x - 21} = 10$ then $\sqrt{13x^3 - 14x + 29} - \sqrt{13x^3 - 14x - 21} = ?$

(a) 3

(b) 4

(c) 5

(d) 6

$$\frac{29+21}{10} = \frac{50}{10} = 5$$

(5)

$$\sqrt{13x^3 - 14x + 29} + \sqrt{13x^3 - 14x - 21} = 10$$

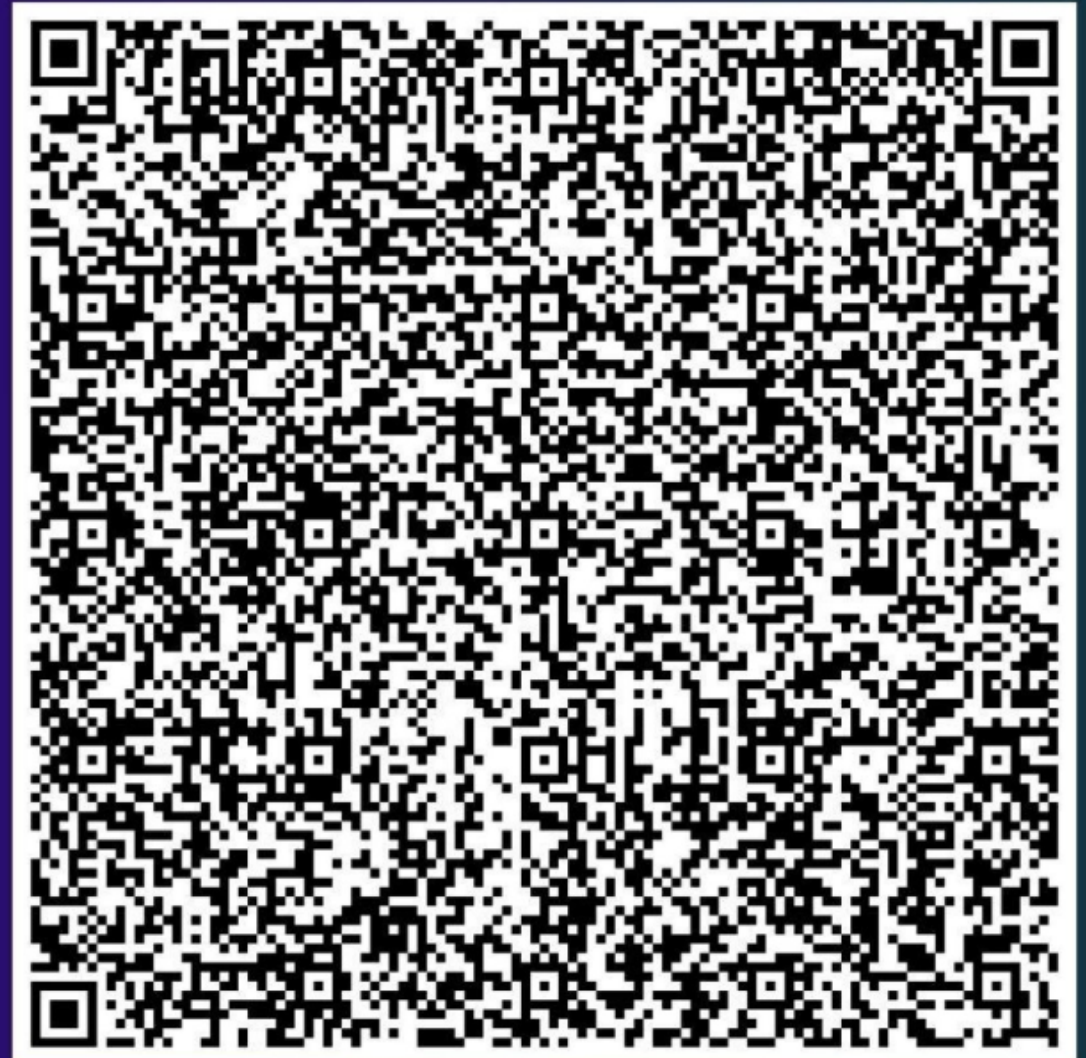
$$\sqrt{13x^3 - 14x + 29} - \sqrt{13x^3 - 14x - 21} = k$$

$$(13x^3 - 14x + 29) - (13x^3 - 14x - 21) = 10k$$

$$50 = 10k$$

$$k = 5$$

MATHS BY SHASHI SINGH RATHORE



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