

Foundation Batch



MATHS

Algebra

(बीजगणित)

Part -3

LIVE

18-12-2024

07:00PM





36. If $a^2 + b^2 + c^2 + 84 = 4(a - 2b + 4c)$, then $\sqrt{ab - bc + ca}$ is equal to:

यदि $a^2 + b^2 + c^2 + 84 = 4(a - 2b + 4c)$ है, तो $\sqrt{ab - bc + ca}$ किसके बराबर होगा।

~~(a) $2\sqrt{10}$~~

(b) $4\sqrt{10}$

(c) $5\sqrt{10}$

(d) $\sqrt{10}$

$2(2a - 4b + 8c)$

$a = 2$

$b = -4$

$c = 8$

$\sqrt{-8 - (-32) + 16}$

$\sqrt{-8 + 32 + 16} = \sqrt{40} = 2\sqrt{10}$



Foundation Batch

MATHS



TYPE-IV

$$\hookrightarrow a^3 + b^3 + c^3 - 3abc = (a+b+c) [a^2 + b^2 + c^2 - ab - bc - ca]$$

$$= \frac{1}{2} (a+b+c) [(a-b)^2 + (b-c)^2 + (c-a)^2]$$

$$\hookrightarrow a^2 + b^2 + c^2 - ab - bc - ca = \frac{1}{2} [(a-b)^2 + (b-c)^2 + (c-a)^2]$$

$$\hookrightarrow a^3 + b^3 + c^3 - 3abc = (a+b+c) [(a+b+c)^2 - 3(ab+bc+ca)]$$

$$a^2 + b^2 + c^2 + 2(ab+bc+ca) - 3(ab+bc+ca)$$

$$a^2 + b^2 + c^2 - (ab+bc+ca)$$



$$a^3 + b^3 + c^3 - 3abc = \frac{1}{2}(a + b + c)[3(a^2 + b^2 + c^2) - (a + b + c)^2]$$

OR

$$\cancel{a^3} + b^3 + c^3 - \cancel{3abc} = \frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$$

OR

$$\cancel{a^3 + b^3 + c^3} - 3abc = (a + b + c)[(a + b + c)^2 - 3(ab + bc + ca)]$$

OR

$$\cancel{a^3 + b^3 + c^3} - 3abc = (\cancel{a + b + c})[a^2 + b^2 + c^2 - (ab + bc + ca)]$$


$$\hookrightarrow a^3 + b^3 + c^3 - 3abc = (a+b+c) \left[a^2 + b^2 + c^2 - ab - bc - ca \right]$$

Case-1 if, $\boxed{a+b+c=0}$

then $a^3 + b^3 + c^3 - 3abc = 0$

✓ $\boxed{a^3 + b^3 + c^3 = 3abc}$

Case 2

$$\hookrightarrow a^2 + b^2 + c^2 - ab - bc - ca = \frac{1}{2} \left[\underbrace{(a-b)^2}_{=0} + \underbrace{(b-c)^2}_{=0} + \underbrace{(c-a)^2}_{=0} \right]$$

if $\boxed{a = b = c}$

then $a^2 + b^2 + c^2 - ab - bc - ca = 0$

$$\boxed{a^2 + b^2 + c^2 = ab + bc + ca}$$

37. 1. If $(a + b + c) = 0$, then what is the value of $a^3 + b^3 + c^3$?

यदि $(a + b + c) = 0$ है, तो $a^3 + b^3 + c^3$ का मान क्या होगा?

(a) $a^2 + b^2 + c^2 - 3abc$

(b) 0

(c) $a^2 + b^2 + c^2 - ab - bc - ca$

 **(d) $3abc$**

SSC CGL 14/07/2023 (2nd shift)

38. If $x + y + z = 2$, $x^3 + y^3 + z^3 - 3xyz = 74$. Then find the value of $(x^2 + y^2 + z^2)$.

यदि $x + y + z = 2$, $x^3 + y^3 + z^3 - 3xyz = 74$ है, तो $(x^2 + y^2 + z^2)$ का मान ज्ञात कीजिए।

(a) 22

(b) 29

(c) 26

(d) 24

$$a^3 + b^3 + c^3 - 3abc = \frac{1}{2}(a+b+c) \left[3(a^2 + b^2 + c^2) - (a+b+c)^2 \right]$$

$$74 = \frac{1}{2}(2) \left[3(x^2 + y^2 + z^2) - 2^2 \right]$$

(SSC CGL Pre 23/8/2021)

$$74 + 4 = 3(x^2 + y^2 + z^2)$$

$$78 \text{ (26)}$$

39. If $(a^3 + b^3 + c^3 - 3abc) = 405$ and $(a + b + c) = 15$, find the value of $(a - b)^2 + (b - c)^2 + (c - a)^2$.

यदि $(a^3 + b^3 + c^3 - 3abc) = 405$ और $(a + b + c) = 15$ है, तो $(a - b)^2 + (b - c)^2 + (c - a)^2$ का मान ज्ञात कीजिए।

(a) 27

(b) 18

(c) 45

(d) 54

$$a^3 + b^3 + c^3 - 3abc = \frac{1}{2}(a+b+c) \left[(a-b)^2 + (b-c)^2 + (c-a)^2 \right]$$

$$405 = \frac{1}{2} \times 15 [P]$$

$$P = 54$$

(SSC CGL Pre 20/07/2023)



40. If $a + b + c = 15$ and $ab + bc + ca = 35$, then find the value of $a^3 + b^3 + c^3 - 3abc$.

यदि $a + b + c = 15$ और $ab + bc + ca = 35$ है, तो $a^3 + b^3 + c^3 - 3abc$ का मान ज्ञात करें।

(a) 1800

(b) 1500

(c) 1200

(d) 2100

(SSC CPO 29/06/2024)

$$a^3 + b^3 + c^3 - 3abc = (a+b+c) \left[(a+b+c)^2 - 3(ab+bc+ca) \right]$$

$$15 \left[15^2 - 3 \times 35 \right]$$

$$15 \times [225 - 105]$$

$$15 \times 120$$

$$\underline{1800}$$

41. If $(a + b + c) = 5$ and $ab + bc + ca = 7$, then the value of $(a^3 + b^3 + c^3 - 3abc)$ is?

यदि $(a + b + c) = 5$ और $ab + bc + ca = 7$ है, तो $a^3 + b^3 + c^3 - 3abc$ का मान कितना है?

(a) 20

(b) 25

(c) 30

(d) 15

(SSC CPO Pre 05/10/2023)

$$a^3 + b^3 + c^3 - 3abc = (a+b+c) \left[(a+b+c)^2 - 3(ab+bc+ca) \right]$$

$$5 [5^2 - 3 \times 7]$$

$$5 [25 - 21]$$

$$5 \times 4 = 20$$

42. If $a + b + c = 13$ and $ab + bc + ca = 22$, then $a^3 + b^3 + c^3 - 3abc$ is equal to.

यदि $a + b + c = 13$ और $ab + bc + ca = 22$, तब $a^3 + b^3 + c^3 - 3abc$ बराबर है।

(a) 1912

(b) 1225

(c) 1625

(d) 1339

$$= 13[13^2 - 3 \times 22]$$

$$13[169 - 66]$$

$$13[103]$$

$$1339$$

(SSC CPO Pre 29/06/2024)



43. If $x + y + z = 2$ and $xy + yz + zx = -11$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is.

यदि $x + y + z = 2$ और $xy + yz + zx = -11$, तब $x^3 + y^3 + z^3 - 3xyz$ का मान है।

(a) 74

(b) 69

(c) 78

(d) 71

$$2 [2^3 - 3 \times (-11)]$$

$$2 [4 + 33]$$

$$2 \times 37$$

(SSC CGL Pre 16/07/2020)

$$= 74$$

44. If $(a + b + c) = 14$ and $(a^3 + b^3 + c^3 - 3abc) = 98$, find the value of $(ab + bc + ca)$.

यदि $(a + b + c) = \underline{14}$ और $(a^3 + b^3 + c^3 - 3abc) = 98$ है, तो $(ab + bc + ca)$ का मान ज्ञात कीजिए।

(a) 65

(b) 64

(c) 63

(d) 60

$$\cancel{98} = 14 \left[14^2 - 3 \underbrace{(ab + bc + ca)}_p \right]$$

$$7 = [196 - 3p]$$

(SSC CGL 26/07/2023)

$$\cancel{3p} = \cancel{189}$$

$$p = \underline{63}$$

45. If $a^3 + b^3 + c^3 - 3abc = 250$, and $a + b + c = 10$ then find the value of $\frac{1}{5}(ab + bc + ca)$.

यदि $a^3 + b^3 + c^3 - 3abc = 250$ और $a + b + c = 10$ है, तो

$\frac{1}{5}(ab + bc + ca)$ का मान ज्ञात करें।

(a) 10

(b) 15

(c) 5

(d) 25

$$250 = 10 [10^2 - 3P]$$

$$25 = 100 - 3P$$

$$3P = 75 \quad 25$$

(SSC CHSL Pre 18/04/2021)

$$P = 25$$

$$\frac{1}{5}P = \frac{1}{5} \times 25$$

(5)

46. If $a + b + c = 7$, $ab + bc + ca = 11$ and $abc = -1$ then $a^3 + b^3 + c^3$ is equal to.

यदि $a + b + c = 7$, $ab + bc + ca = 11$ और $abc = -1$ तो $a^3 + b^3 + c^3$ किसके बराबर है।

(a) 109

(b) 101

(c) 111

(d) 107

(SSC CGL Pre 20/07/2023)

$$\underbrace{a^3 + b^3 + c^3}_P - 3abc = (a+b+c) \left[(a+b+c)^2 - 3(ab+bc+ca) \right]$$

$$P - 3(-1) = 7 \left[7^2 - 3(11) \right]$$

$$P + 3 = 7 \left[49 - 33 \right]$$

$$P + 3 = 7 \times 16 \quad | \quad P = 112 - 3$$
$$112 \quad | \quad 109$$



47. If $x^2 + y^2 + z^2 = 133$, $xy + yz + zx = 114$ and $z = 216$, then find the value of $x^3 + y^3 + z^3$.

यदि $x^2 + y^2 + z^2 = 133$, $xy + yz + zx = 114$ है और $xyz = 216$ है, तो $x^3 + y^3 + z^3$ का मान है।

(a) 999

(b) 942

(c) 1009

(d) 100

(SSC CGL Pre 06/07/2019)

$$\underline{x^3 + y^3 + z^3} - 3xyz = (x+y+z)(x^2 + y^2 + z^2 - (xy + yz + zx))$$

$$P - 3 \times 216 = 19 [133 - 114]$$

$$19 \times 19$$

$$361$$

$$P = 361 + 648 = 1009$$

$$x^2 + y^2 + z^2 = 133 + 2 \times 114$$

$$133 + 228$$

$$361$$

$$x+y+z = \sqrt{361}$$

$$= 19$$

48. If $x + y + z = 1$, $xy + yz + zx = -1$ and $xyz = -1$, then find the value of $(x^3 + y^3 + z^3)$.

यदि $x + y + z = 1$, $xy + yz + zx = -1$ और $xyz = -1$ हो, तो $(x^3 + y^3 + z^3)$ का मान ज्ञात कीजिए।

(a) 2

(b) 1

(c) 3

(d) 0

$$P - 3(-1) = 1[1^3 - 3(-1)]$$

$$P + 3 = 1[1 + 3]$$

(SSC CPO 27/06/2024)

$$P + 3 = 4$$

$$P = 1$$

49. If $x + y + z = 2$, $xy + yz + zx = -11$ and $xyz = -12$ then what is the value of $\sqrt{x^3 + y^3 + z^3 - 2}$.

यदि $x + y + z = 2$, $xy + yz + zx = -11$ और $xyz = -12$ हैं, तो $\sqrt{x^3 + y^3 + z^3 - 2}$ का मान है।

(a) 9

(b) 6

(c) 12

(d) 8

$$\underbrace{x^3 + y^3 + z^3}_P - 3xyz = (x+y+z) \left[(x+y+z)^2 - 3(xy+yz+zx) \right]$$

$$P - 3(-12) = 2 \left[2^2 - 3(-11) \right]$$

(SSC CGL Pre 12/09/2019)

$$P + 36 = 2[4 + 33]$$

$$P + 36 = 74$$

$$P = 74 - 36 = 38$$

$$\sqrt{38 - 2} = \sqrt{36} = 6$$

50. x, y and z are real numbers. If $x^3 + y^3 + z^3 = 13, x + y + z = 1$ and $xyz = 1$, then what is the value of $xy + yz + zx$?

x, y तथा z वास्तविक संख्याएँ हैं। यदि $x^3 + y^3 + z^3 = 13, x + y + z = 1$ तथा $xyz = 1$ है, तो $xy + yz + zx$ का मान क्या है?

(a) -3

(b) 1

(c) 3

(d) -1

$$13 - 3(1) = 1 \left[1^2 - 3p \right]$$

$$10 = [1 - 3p]$$

$$3p = 1 - 10 = -9$$

(SSC CGL Mains 17/02/2018)

$$p = \frac{-9}{3} = (-3)$$

51. If $a + b + c = 6$, $a^2 + b^2 + c^2 = 32$ and $a^3 + b^3 + c^3 = 189$, then find the value of $4abc$.

यदि $a + b + c = 6$, $a^2 + b^2 + c^2 = 32$ और $a^3 + b^3 + c^3 = 189$ है, तो $4abc$ का मान ज्ञात करें।

(a) 12

(b) 16

(c) 9

(d) 8

$$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - (ab + bc + ca))$$

$$189 - 3abc = 6[32 - 2]$$

$$180$$

(SSC CGL Pre 20/04/2022)

$$3abc = 189 - 180 = 9 \Rightarrow abc = 3$$

$$4abc = 4 \times 3 = 12$$

$$abc = 3$$

$$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - (ab + bc + ca))$$

$$189 - 3abc = 6(32 - (ab + bc + ca))$$

$$189 - 3abc = 6(32 - 2)$$

$$189 - 3abc = 180$$

$$3abc = 9$$

$$abc = 3$$

$$4abc = 12$$

52. If $x + y + z = 13$, $x^2 + y^2 + z^2 = 133$ and $x^3 + y^3 + z^3 = 847$, then the value of $\sqrt[3]{xyz}$ is.

यदि $x + y + z = 13$, $x^2 + y^2 + z^2 = 133$ और $x^3 + y^3 + z^3 = 847$ है, तब $\sqrt[3]{xyz}$ है।

(a) -9

(b) 7

(c) -6

(d) 8

(CISF ASI 24/11/2020)

$$x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x+y+z) \left[3(x^2 + y^2 + z^2) - (x+y+z)^2 \right]$$

$$847 - 3xyz = \frac{1}{2} \times 13 \left[3 \times 133 - 13^2 \right]$$

$$-3xyz = 1495 - 847$$

$$648$$

$$xyz = -\frac{648}{3} = -216$$

$$\frac{1}{2} \times 13 \left[399 - 169 \right]$$

$$\frac{1}{2} \times 13 \left[230 \right]$$

$$= 1495$$

$$\sqrt[3]{-216} = -6$$



53. If $(P - Q) = 6$, $(R - Q) = 5$ and $(R - P) = 3$, then find the value of $(p^3 + q^3 + r^3 - 3pqr)/(P + Q + R)$.

यदि $(p - q) = 6$, $(r - q) = 5$ और $(r - p) = 3$, तो

$(p^3 + q^3 + r^3 - 3pqr)/(p + q + r)$ का मान ज्ञात कीजिए।

(a) 35

(b) 45

(c) 30

(d) 40

$$p^3 + q^3 + r^3 - 3pqr = \frac{1}{2}(p+q+r) \left[(p-q)^2 + (q-r)^2 + (r-p)^2 \right]$$

$$\frac{p^3 + q^3 + r^3 - 3pqr}{p+q+r} = \frac{1}{2} [6^2 + 5^2 + 3^2]$$

SSC CHSL 16/03/2023 (2nd Shift)

$$\frac{1}{2} [36 + 25 + 9]$$

$$\frac{1}{2} \times 70 = 35$$



54. Given that $(5x - 3)^3 + (2x + 5)^3 + 27(4 - 3x)^3 = 9(3 - 5x)(2x + 5)(4 - 3x)$, then the value of $(2x + 1)$ is:

यह देखते हुए कि $(5x - 3)^3 + (2x + 5)^3 + 27(4 - 3x)^3 =$

$9(3 - 5x)(2x + 5)(4 - 3x)$ का मान क्या है, तो $(2x + 1)$ का मान क्या है?

(a) -13

(b) 15

(c) -15

(d) 13

$$(5x-3)^3 + (2x+5)^3 + [3(4-3x)]^3 = 3(5x-3)(2x+5)(3(4-3x))$$

$$a+b+c=0$$

$$5x-3+2x+5+12-9x=0$$

$$-2x+14=0$$

$$-2x=-14$$

$$2x+1$$

$$=2 \times 7+1$$

$$=15$$

SSC CGL TIER II (13 September 2019)

$$x=+7$$

55. If $a^{1/3} + b^{1/3} + c^{1/3} = 0$, then $(a + b + c)^6$ is equal to:

यदि $a^{1/3} + b^{1/3} + c^{1/3} = 0$, तो $(a + b + c)^6$ बराबर है:

(a) $81 abc$

(b) $729a^2b^2c^2$

(c) $729 abc$

(d) $81a^2b^2c^2$

$$(a^{1/3})^3 + (b^{1/3})^3 + (c^{1/3})^3 = 3 a^{1/3} b^{1/3} c^{1/3}$$

$$a + b + c = 3 a^{1/3} b^{1/3} c^{1/3}$$

$$(a + b + c)^6 = [3 a^{1/3} b^{1/3} c^{1/3}]^6$$

SSC CHSL 10 July 2019 (Afternoon)

$$(a^{1/3})^6$$

$$\underline{729 a^2 b^2 c^2}$$



56. If $(4x - 5)^3 + (x - 2)^3 + 27(2x - 5)^3 = 9(4x - 5)(x - 2)(2x - 5)$, then find the value of $\left(x + \frac{3}{2}\right)$.

यदि $(4x - 5)^3 + (x - 2)^3 + 27(2x - 5)^3 = 9(4x - 5)(x - 2)(2x - 5)$ है, तो $\left(x + \frac{3}{2}\right)$ का मान ज्ञात करें।

(a) $\frac{3}{2}$ $(4x-5)^3 + (x-2)^3 + [3(2x-5)]^3 = 3(4x-5)(x-2)[3(2x-5)]$

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

$$4x-5+x-2+6x-15=0$$

(c) $\frac{7}{2}$

$$11x-22=0$$

(d) $\frac{5}{2}$

$$x=2$$

$$x + \frac{3}{2}$$

$$2 + \frac{3}{2} = \frac{7}{2}$$

(SSC CHSL Pre 05/08/2021)

57. If $x = 14$, $y = 15$ and $z = 17$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is.

यदि $x = 14$, $y = 15$ और $z = 17$ है, तो $x^3 + y^3 + z^3 - 3xyz$ का मान है।

(a) 312

(b) 322

(c) 222

(d) 333

$$x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x+y+z) \left[(x-y)^2 + (y-z)^2 + (z-x)^2 \right]$$

$$= \frac{1}{2} \times 46 \left[(-1)^2 + (-2)^2 + 3^2 \right]$$

$$= \frac{1}{2} \times 46 \times [1 + 4 + 9]$$

$$= \frac{1}{2} \times 46 \times 14$$

$$= 322$$



58. If $x = 5.51$, $y = 5.52$ and $z = 5.57$, then the value of $x^3 + y^3 + z^3 - 3xyz$

यदि $x = 5.51$, $y = 5.52$ और $z = 5.57$, तो $x^3 + y^3 + z^3 - 3xyz$ का मान है।

(a) 51.46

(b) 5.146

(c) 0.05146

(d) 0.5146

(SSC CPO 11/12/2019)



59. If $a = 25$, $b = 15$, $c = -10$, then the value of

$$\frac{a^3 + b^3 + c^3 - 3abc}{(a-b)^2 + (b-c)^2 + (c-a)^2} \text{ is.}$$

यदि $a = 25$, $b = 15$, $c = -10$ हो, तो $\frac{a^3 + b^3 + c^3 - 3abc}{(a-b)^2 + (b-c)^2 + (c-a)^2}$ का मान है।

(a) 15

(b) -30

(c) 30

(d) -15

$$\frac{1}{2}(25+15-10)$$

$$\frac{1}{2}(30)$$

15

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

$$\frac{1}{2}(a+b+c)$$



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