11. (B) $\frac{y^3 - x^3 - z^3}{2xyz}$

$x + z = y$

put $\Rightarrow 1 + 1 = 2$

$\frac{8 - 1 - 1}{2 \times 2 \times 1 \times 1} \Rightarrow \frac{6}{4} \Rightarrow \frac{3}{2}$

Method - II

$x - y + z = 0$

So, $x^3 - y^3 + z^3 = -3xyz$

$\frac{-(x^3 - y^3 + z^3)}{2xyz} = \frac{-(-3xyz)}{2xyz} = \frac{3}{2}$

12. (A) $5 - x - 5 + x - \left(\frac{20 - x}{200}\right) = 0.08$

$\Rightarrow \frac{x - 20}{200} = 0.08 \Rightarrow x - 20 = 16 \Rightarrow x = 36$

13. (C) $a^3 + b^3 + c^3 - 3abc$

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

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ac)$

So,

$(18)^2 = x^2 + y^2 + z^2 + 2(90) \Rightarrow x^2 + y^2 + z^2 = 324 - 180 \Rightarrow 144$

$x^3 + y^3 + z^3 - 3(81) = 18(144 - 90)$

$\Rightarrow x^3 + y^3 + z^3 = 18(54) + 3(81)$

$\Rightarrow x^3 + y^3 + z^3 = 9(108) + 9(27) \Rightarrow x^3 + y^3 + z^3 = 9(135)$

$\Rightarrow x^3 + y^3 + z^3 + xyz = 9(135) + 81$

$\Rightarrow 9(135) + 9(9) \Rightarrow 9(144) \Rightarrow 144(10 - 1)$

$= 1440 - 144 \Rightarrow 1296$

14. (A) $x^3 + y^3 + z^3 - 3xyz$

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

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ac)$

$(18)^2 = x^2 + y^2 + z^2 + 2(90) \Rightarrow x^2 + y^2 + z^2 = 144$

$x^3 + y^3 + z^3 - 243 = 18(144 - 90) \Rightarrow x^3 + y^3 + z^3 = 18 \times 54 + 243$

$\Rightarrow x^3 + y^3 + z^3 = 9 \times 108 + 9 \times 27 \Rightarrow x^3 + y^3 + z^3 = 9 \times 135 \Rightarrow 1215$

$\sqrt[4]{x^3 + y^3 + z^3 + xyz} \Rightarrow \sqrt[4]{1215 + 81} \Rightarrow$

$\sqrt[4]{1296} \Rightarrow \sqrt[4]{6 \times 6 \times 6 \times 6} \Rightarrow 6$

15. (D) $x^3 - y^3 = (x - y)(x^2 + y^2 + xy)$

$\left(\sqrt{2}x\right)^3 - \left(\sqrt{3}y\right)^3 = \left(\sqrt{2}x - \sqrt{3}y\right)\left(2x^2 + 3y^2 + \sqrt{6}xy\right)$

$2x^2 + 3y^2 + \sqrt{6}xy = Ax^2 + Cy^2 - Bxy \Rightarrow A = 2,$

$B = -\sqrt{6}, C = 3$

$A^2 + B^2 + C^2 = (2)^2 + \left(-\sqrt{6}\right)^2 + (3)^2 \Rightarrow 4 + 6 + 9 = 19$

16. (B) $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - (xy + yz + xz))$

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

$(x+y+z)^2 = x^2 + y^2 + z^2 + 2(-11) \Rightarrow x^2 + y^2 + z^2 = 26$

$x^3 + y^3 + z^3 - 3(-12) = 2(26 - (-11)) \Rightarrow x^3 + y^3 + z^3 = 74 - 36$

$\Rightarrow x^3 + y^3 + z^3 = 38$

17. (D) $x^2 + \frac{1}{x^2} = 23$

$x + \frac{1}{x} = \sqrt{23 + 2} = 5$

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

$125 - 15 = 110$

18. (C) $(a+b-c)^2 \Rightarrow a^2+b^2+c^2+2ab-2bc-2ca = 25$

$a^2+b^2+c^2 \Rightarrow 25 - 20 \Rightarrow 5$

19. (A) $(a+1)^2 + (b-1) + (7c + 4)^2 = 0$

$a = -1, b = 1, 7c = -4$

$-1-1+4 = 2$

20. (C) $2\sqrt{2}x^3 - 3\sqrt{3}y^3$

$= \left(\sqrt{2}x - \sqrt{3}y\right)(Ax^2 - Bxy + cy^2)$

$A = 2, B = 3, C = \sqrt{6}$

$\sqrt{a^2 + B^2 + c^2}$

$\sqrt{4 + 9 + 6} \Rightarrow \sqrt{19}$

21. (B) $\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{3}$

$x + \frac{1}{x} = \left(\sqrt{3}\right)^2 + 2 \Rightarrow 5$

$x^2 + \frac{1}{x^2} = 23$

$x^4 + \frac{1}{x^4} \Rightarrow 529 - 2 \Rightarrow 527$

22. (D) $(x+y+z)[(x+y+z)^2 - 3(xy+yz+zx)]$

$(7)(49 - 3(18)) = 7 \times 25 = 175$

23. (D) $(a+b)^3 \Rightarrow a^3 + b^3 + 3ab(a+b)$

$8 = 218 + 3ab(2)$

$-210 = 6ab$

$-35 = ab$

$\sqrt{1 - ab} \qquad \sqrt{1 + 35} \Rightarrow 6$

24. (D) $a^2 + b^2 + 49c^2 + 18 = 2b + 56c - 2a$

$\Rightarrow a^2 + 2a + b^2 - 2b + 49c^2 - 56c + 18 = 0$

$a^2 + 2a + 1 + b^2 - 2ab + 1 + 49c^2 - 56c + 16 = 0$

$\Rightarrow (a-1)^2+(b-1)^2+7(-4)^2 = 0$

So,

$a+1= 0,\ b-1= 0,\ 7c-4= 0,\ a= 1,\ 3= 1,\ c= \frac{4}{7}$

$2(-1)-(1)+7\left(\frac{4}{7}\right) \Rightarrow -2-1+4 \Rightarrow -3+4 = 1$

25. (D) $x-\frac{1}{x}=5$

So,

$x^3-\frac{1}{x^3} = (5)^3+3(5) \Rightarrow 140$

$x^3-\frac{1}{x^3}+\frac{1}{x}-x \Rightarrow x^3-\frac{1}{x^3}-\left(x-\frac{1}{x}\right)$

$= 140-5 = 135$

26. (C) put $x = y = 1$

$\Rightarrow 8-3(2-3) = k$

$\Rightarrow k = 11$

27. (B) $a+b+c = 11,\ ab+bc+ca = 28$

$a^3+b^3+c^3-3abc$

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

$= 11(121-3\times28)$

$= 11\times(121-84) = 407$

28. (C) $0.4\ x+\frac{1}{x} = 5$

$\Rightarrow \quad 0.064x^3+\frac{1}{x^3} = 5^3-3\times0.4\times5$

$= 125-6$

$= 119$

29. (C) $x^2+\frac{1}{x^2} = 18$

Now, $x+\frac{1}{x} = \sqrt{20}$

and $x^3+\frac{1}{x^3} = 20\sqrt{20}-3\sqrt{20}$

$= 17\sqrt{20}$

$= 34\sqrt{5}$

30. (D) $\sqrt{x}-\frac{1}{\sqrt{x}} = \sqrt{5}$

$x+\frac{1}{x} = 7$

$\Rightarrow \quad \frac{\frac{1}{x}\left(x^4+\frac{1}{x^2}\right)}{\frac{1}{x}(x^2+1)} = \frac{x^3+\frac{1}{x^3}}{x+\frac{1}{x}}$

$= \quad \frac{343-7\times3}{7} = \frac{322}{7} = 46$

31. (B) $6\sqrt{6}\,p^3+2\sqrt{2}\,q^3 = \left(\sqrt{6}\times P+\sqrt{2}q\right)\left(sp^2+mq^2-Npq\right)$

$\Rightarrow 6p^2+2q^2-2\sqrt{3}\,pq = Sp^2+mq^2-Npq$

by comparision

$S = 6,\ M = 2,\ N = 2\sqrt{3}$

$\therefore\ \sqrt{s^2+m^2+2n^2} = \sqrt{36+4+2(2\sqrt{3})^2}$

$= \sqrt{40+24}$

$= \sqrt{64} = 8$

32. (A) $5x-\frac{1}{4x} = 6 \Rightarrow 25x^2+\frac{1}{16x^2}-2\left(\frac{5}{4}\right) = 36$

$\Rightarrow 25x^2+\frac{1}{16x^2}+\frac{5}{2} = 36+5 \Rightarrow 5x+\frac{1}{4x} = \sqrt{41}$

$= 25x^2-\frac{1}{16x^2} = 6\sqrt{41}$

33. (D) $(a+b)^2 = a^2+b^2+2ab$

$(a+b)^2 = 65+16 \Rightarrow a+b = \pm9$

$\therefore a > b > 0$ so $a = 8,\ b = 1$

$a^2-b^2 = 64-1 = 63$

34. (A) $x^2+\frac{1}{x^2} = 79\ \left(x+\frac{1}{x}\right)^2 = 81$

$\Rightarrow x+\frac{1}{x} = 9$

35. (A) $4x-3y = 12\ ,\ 16x^2+9y^2-24xy = 144$

$\Rightarrow \frac{16x^2+9y^2-24xy}{8} = \frac{144}{8}$

$\Rightarrow \frac{16x^2+9y^2}{8}-3xy = 18$

$\Rightarrow \frac{16x^2+9y^2}{8} = 18+15 \Rightarrow \frac{16x^2+9y^2}{8} = 33$

36. (B) $a+\frac{1}{a}+3 = 4 \Rightarrow a+\frac{1}{a} = +1,\ a+\frac{1}{a} = -7$

$a^2+\frac{1}{a^2} = (+1)^2-2\ ,\ (-7)^2-2$

$\Rightarrow 1-2,\ 49-2 \Rightarrow -1,\ 47$

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ALGEBRA
बीजगणित

(SSC CGL (PRE) - 2020)

(Previous Year Questions)

1. If $8(x+y)^3 - 27(x-y)^3 = (5y-x)(Ax^2 - By^2 + Cxy)$, then what is the value of (A + B – C)?
यदि $8(x+y)^3 - 27(x-y)^3 = (5y-x)(Ax^2 - By^2 + Cxy)$ है, तो (A + B – C) का मान ज्ञात कीजिए?
(A) 16 (B) 36
(C) –26 (D) –16

2. If x + y = 4 and $\frac{1}{x}+\frac{1}{y}=\frac{16}{15}$, then what is the value of $(x^3 + y^3)$?
यदि x + y = 4 और $\frac{1}{x}+\frac{1}{y}=\frac{16}{15}$ है, तो $(x^3 + y^3)$ का मान ज्ञात कीजिए?
(A) 18 (B) 16
(C) 19 (D) 21

3. If $x + \frac{1}{x} = 4$, then the value of $x^5 + \frac{1}{x^5}$ is:
यदि $x + \frac{1}{x} = 4$ है, तो $x^5 + \frac{1}{x^5}$ का मान ज्ञात कीजिए?
(A) 776 (B) 684
(C) 724 (D) 736

4. If $x - y = \frac{1}{x}-\frac{1}{y}=\frac{11}{24}$, then What is the value of $x^3 - y^3 + x^2y^2$?
यदि $x - y = \frac{1}{x}-\frac{1}{y}=\frac{11}{24}$ है, तो $x^3 - y^3 + x^2y^2$ का मान ज्ञात कीजिए?
(A) 1331 (B) 1105
(C) 1307 (D) 1115

5. If $16x^2 + y^2 = 48$ and xy = 2, x, y > 0, then the value of $64x^3 + y^3$ is:
यदि $16x^2 + y^2 = 48$ और xy = 2, x, y > 0 है, तो $64x^3 + y^3$ का मान ज्ञात कीजिए?
(A) 320 (B) 300
(C) 240 (D) 340

6. If $x - \frac{1}{x} = 5$, $x \neq 0$, then what is the value is of $\frac{x^6 - 5x^3 - 1}{x^6 + 7x^3 - 1}$?
यदि $x - \frac{1}{x} = 5$, $x \neq 0$ है, तो $\frac{x^6 - 5x^3 - 1}{x^6 + 7x^3 - 1}$ का मान ज्ञात कीजिए?
(A) $\frac{45}{49}$ (B) $\frac{45}{41}$
(C) $\frac{41}{45}$ (D) $\frac{49}{45}$

7. If $x - \frac{1}{x} = 1$, then what is the value of $x^8 + \frac{1}{x^8}$?
यदि $x - \frac{1}{x} = 1$ है, तो $x^8 + \frac{1}{x^8}$ का मान ज्ञात कीजिए?
(A) 119 (B) –1
(C) 3 (D) 47

8. If $x^4 + \frac{1}{x^4} = 727$, x > 1, then what is the value of $x - \frac{1}{x}$?
यदि $x^4 + \frac{1}{x^4} = 727$, x > 1 है, तो $x - \frac{1}{x}$ का मान ज्ञात कीजिए?
(A) 6 (B) 5
(C) –5 (D) –6

9. If $2x^2 - 8x - 1 = 0$, then what is the value of $8x^3 - \frac{1}{x^3}$?
यदि $2x^2 - 8x - 1 = 0$ है, तो $8x^3 - \frac{1}{x^3}$ का मान ज्ञात कीजिए?
(A) 560 (B) 524
(C) 464 (D) 540

10. x + y + z = 2 and xy + yz + zx = –11, then the value of $x^3 + y^3 + z^3 - 3xyz$ is:
x + y + z = 2 और xy + yz + zx = –11 है, तो $x^3 + y^3 + z^3 - 3xyz$ का मान ज्ञात कीजिए?
(A) 78 (B) 71
(C) 74 (D) 69

11. If $a^3 + b^3 = 405$ and $a + b = 9$, then the value of ab is
यदि $a^3 + b^3 = 405$ और $a + b = 9$ है, तो ab का मान ज्ञात कीजिए ?
(A) 10 (B) 15
(C) 8 (D) 12

12. If $2x - \frac{3}{x} = 2$, then what is the value of $16x^4 + \frac{81}{x^4}$?
यदि $2x - \frac{3}{x} = 2$ है, तो $16x^4 + \frac{81}{x^4}$ का मान ज्ञात कीजिए ?
(A) 328 (B) 180
(C) 184 (D) 220

13. If $4x^4 - 37x^2 + 9 = 0$, $x > \sqrt{\frac{3}{2}}$ then what is the value of $8x^3 - \frac{27}{x^3}$?
यदि $4x^4 - 37x^2 + 9 = 0$, $x > \sqrt{\frac{3}{2}}$ है, तो $8x^3 - \frac{27}{x^3}$ का मान ज्ञात कीजिए ?
(A) 35 (B) 215
(C) –215 (D) –35

14. If $a - \frac{12}{a} = 1$, where $a > 0$, then the value of $a^2 + \frac{16}{a^2}$ is:
यदि $a - \frac{12}{a} = 1$ जहाँ $a > 0$, है, तो का मान $a^2 + \frac{16}{a^2}$ है:
(A) 15 (B) 17
(C) 19 (D) 11

15. If $\left(16\sqrt{2}x^3 + 81\sqrt{3}y^3\right) \div \left(2\sqrt{2}x + 3\sqrt{3}y\right) = Ax^2 + By^2 + Cxy$, then find the value of $2A - 3B - 2\sqrt{6}C$.
यदि $\left(16\sqrt{2}x^3 + 81\sqrt{3}y^3\right) \div \left(2\sqrt{2}x + 3\sqrt{3}y\right) = Ax^2 + By^2 + Cxy$ है, तो $2A - 3B - 2\sqrt{6}C$ का मान ज्ञात कीजिए ?
(A) 25 (B) 7
(C) 137 (D) 79

16. If $x + y = 2$ and $\frac{1}{x} + \frac{1}{y} = \frac{18}{5}$, then the value of $(x^3 + y^3)$ is?
यदि $x + y = 2$ और $\frac{1}{x} + \frac{1}{y} = \frac{18}{5}$ है, तो $(x^3 + y^3)$ का मान ज्ञात कीजिए ?
(A) $4\frac{2}{3}$ (B) $4\frac{2}{5}$ (C) $3\frac{1}{5}$ (D) $3\frac{1}{3}$

17. If $p - 2q = 3$ and $pq = 5$, then what is the value of $p^3 - 8q^3$?
यदि $p - 2q = 3$ और $pq = 5$ है, तो $p^3 - 8q^3$ का मान ज्ञात कीजिए ?
(A) –63 (B) 72
(C) 117 (D) 27

18. If $x^2 + 4y^2 = x - 2y = 5$, then what is the value of $x^3 - 8y^3$?
यदि $x^2 + 4y^2 = x - 2y = 5$ है, तो $x^3 - 8y^3$ का मान ज्ञात कीजिए ?
(A) 155 (B) 335
(C) –85 (D) 85

19. If $x + y + z = 7$ $x^2 + y^2 + z^2 = 85$ and $x^3 + y^3 + z^3 = 913$, then the value of $\sqrt[3]{xyz}$ is:
यदि $x + y + z = x^2 + y^2 + z^2 = 85$ और $x^3 + y^3 + z^3 = 913$ है, तो $\sqrt[3]{xyz}$ का मान ज्ञात कीजिए ?
(A) 1 (B) 2
(C) 4 (D) 8

20. If $a^2 + c^2 + 17 = 2(a - 8b - 2b^2)$, then what is the value of $(a^3 + b^3 + c^3)$?
यदि $a^2 + c^2 + 17 = 2(a - 8b - 2b^2)$ है, तो $(a^3 + b^3 + c^3)$ का मान ज्ञात कीजिए ?
(A) –7 (B) 9
(C) 10 (D) –4

21. If $\left(54\sqrt{2}x^3 + 24\sqrt{3}y^3\right) \div \left(\sqrt{18}x + \sqrt{12}y\right) = Ax^2 + By^2 + Cxy$, then find the value of $A^2 - (B^2 + C^2)$?
यदि $\left(54\sqrt{2}x^3 + 24\sqrt{3}y^3\right) \div \left(\sqrt{18}x + \sqrt{12}y\right) = Ax^2 + By^2 + Cxy$ है, तो $A^2 - (B^2 + C^2)$ का मान ज्ञात कीजिए ?
(A) 12 (B) –36
(C) –24 (D) 24

22. If $x^2 - \sqrt{11} + 1 = 0$, then $x^3 + x^{-3} = ?$
यदि $x^2 - \sqrt{11} + 1 = 0$ है, तो $x^3 + x^{-3} = ?$
(A) $8\sqrt{11}$ (B) $10\sqrt{11}$
(C) $4\sqrt{11}$ (D) $7\sqrt{11}$

23. If $(x + y)^3 + 27(x - y)^3 = (Ax - 2y)(Bx^2 + Cxy + 13y^2)$, then the value of A – B – C is:
यदि $(x + y)^3 + 27(x - y)^3 = (Ax - 2y)(Bx^2 + Cxy + 13y^2)$ है, तो A – B – C का मान ज्ञात कीजिए ?
(A) 27 (B) 13
(C) 15 (D) 20

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24. If $x^8 - 433x^4 + 16 = 0$, $x > 0$, then what is the value of $x + \frac{2}{x}$?

यदि $x^8 - 433x^4 + 16 = 0$, $x > 0$ है, तो $x + \frac{2}{x}$ का मान ज्ञात कीजिए ?

(A) 7 (B) 4
(C) 5 (D) 9

25. If $4x^4 = 5x^2 - 1$, $x > \frac{1}{\sqrt{2}}$, then what is the value of $(2x^2 - x - 1)$?

यदि $4x^4 = 5x^2 - 1$, $x > \frac{1}{\sqrt{2}}$ है, तो $(2x^2 - x - 1)$ का मान ज्ञात कीजिए ?

(A) 1 (B) –2
(C) 0 (D) 2

26. If $x^2 + 9y^2 + 4z^2 = 12(x - 2y + 2z) - 88$, then the value of $(x - 3y + z)$ is:

यदि $x^2 + 9y^2 + 4z^2 = 12(x - 2y + 2z) - 88$ है, तो $(x - 3y + z)$ का मान ज्ञात कीजिए ?

(A) 11 (B) 13
(C) 10 (D) 5

27. If $x^4 + y^4 + x^2y^2 = 21$ and $x^2 + y^2 - xy = 7$, then what is the value of $\frac{x}{y} + \frac{y}{x}$?

यदि $x^4 + y4 + x^2y^2 = 21$ और $x^2 + y^2 - xy = 7$ है, तो $\frac{x}{y} + \frac{y}{x}$ का मान ज्ञात कीजिए ?

(A) $\frac{5}{4}$ (B) $\frac{3}{4}$ (C) $\frac{-3}{2}$ (D) $\frac{-5}{2}$

28. If $x + y = 3$ and $\frac{1}{x} + \frac{1}{y} = \frac{3}{10}$, then the value of $x^2 + y^2$ is:

यदि $x + y = 3$ और $\frac{1}{x} + \frac{1}{y} = \frac{3}{10}$ है, तो $x^2 + y^2$ का मान ज्ञात कीजिए ?

(A) 29 (B) 28
(C) 26 (D) 34

29. If $x + y + z = 1$ and $xy + yz + zx = xyz = -4$, then what is the value of $x^3 + y^3 + z^3$?

यदि $x + y + z = 1$ और $xy + yz + zx = xyz = -4$ है, तो $x^3 + y^3 + z^3$ का मान ज्ञात कीजिए ?

(A) 8 (B) –8
(C) 1 (D) –1

30. What is the constant term in the expansion of $\left(5x^2 - \frac{1}{x}\right)^3$?

$\left(5x^2 - \frac{1}{x}\right)^3$ के विस्तार में अचर पद क्या है ?

(A) 15 (B) 5
(C) 75 (D) –15

31. If $x^2 - 5\sqrt{2}x + 1 = 0$, then what is the value of $\frac{x^3 + \frac{1}{x}}{x^2 + 1}$?

यदि $x^2 - 5\sqrt{2}x + 1 = 0$ है, तो $\frac{x^3 + \frac{1}{x}}{x^2 + 1}$ का मान ज्ञात कीजिए ?

(A) $\frac{24\sqrt{2}}{5}$ (B) $\frac{12\sqrt{2}}{5}$
(C) $\frac{18\sqrt{2}}{5}$ (D) $\frac{26\sqrt{2}}{5}$

32. If $a + b + c = 0$, then what is the value of $\frac{(a+b)^2}{ab} + \frac{(b+c)^2}{bc} + \frac{(c+a)^2}{ca}$?

यदि $a + b + c = 0$ है, तो $\frac{(a+b)^2}{ab} + \frac{(b+c)^2}{bc} + \frac{(c+a)^2}{ca}$ का मान ज्ञात कीजिए ?

(A) 1 (B) –3
(C) –1 (D) 3

33. If $x - \frac{1}{x} = \sqrt{77}$, then one of the values of $x^3 + \frac{1}{x^3}$ is:

यदि $x - \frac{1}{x} = \sqrt{77}$ है, तो $x^3 + \frac{1}{x^3}$ का मान ज्ञात कीजिए ?

(A) $80\sqrt{77}$ (B) –702
(C) $77\sqrt{77}$ (D) $3\sqrt{77}$

34. If $a^3 - b^3 = 2349$ and $a - b = 9$, then $(a + b)^2 - ab$ is equal to:

यदि $a^3 - b^3 = 2349$ और $a - b = 9$ है, तो $(a + b)^2 - ab$ का मान ज्ञात कीजिए ?

(A) 280 (B) 244
(C) 261 (D) 229

35. If $2a + \frac{3}{a} - 1 = 11$, then what is the value of $4a^2 + \frac{9}{a^2}$?

यदि $2a+\frac{3}{a}-1=11$ है, तो $4a^2+\frac{9}{a^2}$ का मान ज्ञात कीजिए?
(A) 121 (B) 148
(C) 132 (D) 110

36. If $a^2+b^2+c^2+216=12(a+b-2c)$, then $\sqrt{ab-bc-ca}$ is:
यदि $a^2+b^2+c^2+216=12(a+b-2c)$, तो $\sqrt{ab-bc-ca}$ है
(A) $3\sqrt{5}$ (B) $8\sqrt{5}$
(C) $6\sqrt{5}$ (D) $4\sqrt{5}$

37. Simplify $(x-y+z)^2-(x-y-z)^2$.
सरल कीजिए $(x-y+z)^2-(x-y-z)^2$
(A) $4xz-4yz$ (B) $2xz+2yz$
(C) $4yz-4xz$ (D) $4xz+4yz$

38. If $\frac{x}{y}+\frac{y}{x}=2$, $(x, y\neq 0)$, then the value of $(x-y)$ is:
यदि $\frac{x}{y}+\frac{y}{x}=2$, $(x, y\neq 0)$ है, तो $(x-y)$ का मान ज्ञात कीजिए?
(A) 1 (B) 0
(C) 2 (D) –2

39. If $\left(56\sqrt{7}x^3-2\sqrt{2}y^3\right)\div\left(2\sqrt{7}x-\sqrt{2}y\right)=Ax^2+By^2-Cxy$, then find the value of $A+B-\sqrt{14}C$.
यदि $\left(56\sqrt{7}x^3-2\sqrt{2}y^3\right)\div\left(2\sqrt{7}x-\sqrt{2}y\right)=Ax^2+By^2-Cxy$ है, तो $A+B-\sqrt{14}C$ का मान ज्ञात कीजिए?
(A) 38 (B) 10
(C) 19 (D) 58

40. If $\sqrt{x}-\frac{1}{\sqrt{x}}=\sqrt{7}$, then the value of $x^2+\frac{1}{x^2}$ is:
यदि $\sqrt{x}-\frac{1}{\sqrt{x}}=\sqrt{7}$ है, तो $x^2+\frac{1}{x^2}$ का मान ज्ञात कीजिए?
(A) 81 (B) 60
(C) 79 (D) 75

41. If $x-y=4$ and $x^3-y^3=316$, $y>0$ then the value of x^4-y^4 is:
यदि $x-y=4$ और $x^3-y^3=316$, $y>0$ है, तो x^4-y^4 का मान ज्ञात कीजिए?
(A) 2500 (B) 2320
(C) 2401 (D) 2482

42. What is the coefficient of x in the expansion of $(3x-4)^3$?
$(3x-4)^3$ के प्रसार में x का गुणांक क्या है?
(A) 108 (B) –108
(C) 144 (D) –144

43. If $x+y+z=3$, $xy+yz+zx=-12$ and $xyz=-16$, then the value of $\sqrt{x^3+y^3+z^3+13}$ is:
यदि $x+y+z=3$, $xy+yz+zx=-12$ और $xyz=-16$ है, तो $\sqrt{x^3+y^3+z^3+13}$ का मान ज्ञात कीजिए?
(A) 9 (B) 8
(C) 10 (D) 11

44. If $(x+6)^3+(2x+3)^3+(3x+5)^3=(3x+18)(2x+3)(3x+5)$, then what is the value of x?
यदि $(x+6)^3+(2x+3)^3+(3x+5)^3=(3x+18)(2x+3)(3x+5)$ है, तो x का मान ज्ञात कीजिए?
(A) $-\frac{5}{3}$ (B) $\frac{5}{3}$ (C) $-\frac{7}{3}$ (D) $\frac{7}{3}$

45. If $x^4+x^2y^2+y^4=21$ and $x^2+xy+y^2=3$, then what is the value of $(-xy)$?
यदि $x^4+x^2y^2+y^4=21$ और $x^2+xy+y^2=3$ है, तो $(-xy)$ का मान ज्ञात कीजिए?
(A) –1 (B) 2
(C) 1 (D) –2

46. If $x+\frac{1}{x}=2\sqrt{5}$, then what is the value of $\frac{x^4+\frac{1}{x^2}}{x^2+1}$
यदि $x+\frac{1}{x}=2\sqrt{5}$ है, तो $\frac{x^4+\frac{1}{x^2}}{x^2+1}$ का मान ज्ञात कीजिए?
(A) 14 (B) 17
(C) 20 (D) 23

47. If $9(a^2+b^2)+c^2+20=12(a+2b)$, then the value of $\sqrt{6a+9b+2c}$ is:
यदि $9(a^2+b^2)+c^2+20=12(a+2b)$ है, तो $\sqrt{6a+9b+2c}$ का मान ज्ञात कीजिए?
(A) 4 (B) 3
(C) 6 (D) 2

48. If $x+y+z=2$, $x^3+y^3+z^3-3xyz=74$, then $(x^2+y^2+z^2)$ is equal to:
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) 24 (B) 26
(C) 29 (D) 22

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49. If $(2x + y)^3 - (x - 2y)^3 = (x + 3y)(Ax^2 + Cxy + By^2)$, then What is the value of A + 2B + C?
यदि $(2x + y)^3 - (x - 2y)^3 = (x + 3y)(Ax^2 + Cxy + By^2)$ है, तो A + 2B + C का मान ज्ञात कीजिए?
(A) 13 (B) 14
(C) 7 (D) 10

50. If $a^4 + b^4 + a^2b^2 = 273$ and $a^2 + b^2 - ab = 21$, then one of the values of $\frac{1}{a}+\frac{1}{b}$ is:
यदि $a^4 + b^4 + a^2b^2 = 273$ और $a^2 + b^2 - ab = 21$ है, तो $\frac{1}{a}+\frac{1}{b}$ का मान ज्ञात कीजिए?
(A) $\frac{-9}{4}$ (B) $\frac{-3}{4}$ (C) $\frac{9}{8}$ (D) $\frac{3}{2}$

51. If $x+\frac{1}{x} = 7$, then $x^4+\frac{1}{x^2}$ is equal to:
यदि $x+\frac{1}{x} = 7$ है, तो $x^2+\frac{1}{x^2}$ का मान ज्ञात कीजिए?
(A) 47 (B) 49
(C) 61 (D) 51

52. If $2x + 3y + 1 = 0$, then what is the value of $(8x^3 + 8 + 27y^3 - 18xy)$?
यदि $2x + 3y + 1 = 0$ है, तो $(8x^3 + 8 + 27y^3 - 18xy)$ का मान ज्ञात कीजिए?
(A) –7 (B) 7
(C) –9 (D) 9

53. If $x-\frac{2}{x} = 15$, then what is the value of $x^2+\frac{4}{x^2}$?
यदि $x-\frac{2}{x} = 15$ है, तो $x^2+\frac{4}{x^2}$ का मान ज्ञात कीजिए?
(A) 229 (B) 227
(C) 221 (D) 223

54. If $y = 2x + 1$, then what is the value of $(8x^3 - y^3 + 6xy)$?
यदि $y = 2x + 1$ है, तो $(8x^3 - y^3 + 6xy)$ का मान ज्ञात कीजिए?
(A) 1 (B) –1
(C) 15 (D) –15

55. If $x^4 - 62x^2 + 1 = 0$ where $x > 0$, then the value of $x^3 + x^{-3}$ is:
यदि $x^4 - 62x^2 + 1 = 0$, $x > 0$ तो $x^3 + x^{-3}$ का मान ज्ञात कीजिए?
(A) 500 (B) 512
(C) 488 (D) 364

56. Given that $x^8 - 34x^4 + 1 = 0$, $x > 0$. What is the value of $x^3 - x^{-3}$?
दिया है कि $x^8 - 34x^4 + 1 = 0$, $x > 0$. $x^3 - x^{-3}$ का मान ज्ञात कीजिए?
(A) 14 (B) 12
(C) 18 (D) 16

57. What is the coefficient of x^2 in the expansion of $\left(5-\frac{x^2}{3}\right)^3$?
$\left(5-\frac{x^2}{3}\right)^3$ के विस्तार में x^2 का गुणांक क्या है?
(A) –25 (B) $-\frac{25}{3}$ (C) 25 (D) $-\frac{5}{3}$

Solution

1. (B) $[2(x + y)]^3 - [3(x - y)]^3 = (5x - y)[4x^2 + 4y^2 + 8xy + 9x^2 + 9y^2 - 18xy + (2x + 2y)(3x - 3y)]$
$= (5x - y)[19x^2 + 7y^2 - 10xy]$
By comparison
A = 19; B = 7; C = – 10
$\therefore$ A + B – C
= 19 + 7 – (–10)
= 36.

2. (C) $x + y = 4$

$\frac{1}{x}+\frac{1}{y} = \frac{16}{15}$

$xy = \frac{15}{4}$

$x^3 + y^3 = (x + y)[(x + y)^2 - 3xy]$

$= 4\left(16 - 3\times\frac{15}{4}\right) = 4\left(\frac{64-45}{4}\right) = 19$

3. (C) $x + \frac{1}{x} = 4$

$x^2 + \frac{1}{x^2} = 14$

and $x^3 + \frac{1}{x^3} = 64 - 12 = 52$

$x^5 + \frac{1}{x^5} = \left(x^2+\frac{1}{x^2}\right)\left(x^3+\frac{1}{x^3}\right) - \left(x+\frac{1}{x}\right)$

$= 14 \times 52 - 4 = 724$

4. **(D)** $x - y = 11$

$\Rightarrow \frac{1}{x} - \frac{1}{y} = \frac{11}{24}$

$\Rightarrow \frac{x-y}{xy} = \frac{11}{24}$

$\Rightarrow xy = -24$

$\therefore x^3 - y^3 + x^2y^2 = (x-y)[(x-y)^2 + 3xy] + x^2y^2$
$= 11[121 - 72] + 576$
$= 539 + 576$
$= 539 + 576$
$= 1115$

5. **(A)** $16x^2 + y^2 = 48, \quad xy = 2, x, y > 0$
$16x^2 + y^2 + 8xy = 48 + 8xy$
$(4x + y)^2 = 48 + 16$
$4x + y = \sqrt{64} = 8$
$\therefore \quad 64x^3 + y^3 = (4x + y)[(4x + y)^2 - 3(4xy)]$
$8[64 - 3(4 \times 2)]$
$= 8 \times 40 = 320$

6. **(A)** $x - \frac{1}{x} = 5 \quad \Rightarrow x^3 - \frac{1}{x^3} = 125 + 15 = 140$
$x^2 - 1 = 54$

$\Rightarrow \frac{x^6 - 5x^3 - 1}{\frac{x^6 + 7x^3 - 1}{x^3}} = \frac{x^3 - \frac{1}{x^3} - 5}{x^3 - \frac{1}{x^3} + 7} = \frac{135}{147} = \frac{45}{49}$

7. **(D)** $x - \frac{1}{x} = 1 \Rightarrow \quad x^2 + \frac{1}{x^2} = 3$

$x^4 + \frac{1}{x^4} = 7 \Rightarrow x^8 + \frac{1}{x^8} = 47$

8. **(B)** $x^4 + \frac{1}{x^4} = 727 \Rightarrow \quad x^2 + \frac{1}{x^2} = 27$

$x^2 + \frac{1}{x^2} - 2 = 25 \Rightarrow \quad x - \frac{1}{x} = 5 \qquad (x > 1)$

9. **(A)** $2x^2 - 8x - 1 = 0$

$2x - \frac{1}{x} = 8$

$8x^3 - \frac{1}{x^3} = 8^3 + 3\left(24 \times \frac{1}{x}\right) \times 8$
$= 512 + 48 = 560$

10. **(C)** $x + y + z = 2$
$xy + yz + zx = -11$
$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]$
$= 2[4 + 33] = 74$

11. **(D)** $a^3 + b^3 = 405, \qquad a + b = 9$
$a^2 + b^2 + 2ab = 81$
$a^2 + b^2 - ab = 81 - 3ab$

$\Rightarrow \frac{a^3 + b^3}{a + b} = a^2 + b^2 - ab$
$\Rightarrow 45 = 81 - 3ab$
$\Rightarrow ab = 12$

12. **(C)** $2x - \frac{3}{x} = 2$

$4x^2 + \frac{9}{x^2} = 2^2 + 2(6)$

$\Rightarrow 4x^2 + \frac{9}{x^2} = 16$

$\Rightarrow 16x^4 + \frac{81}{x^4} = (16)^2 - 2(4 \times 9)$
$= 256 - 72 = 184$

13. **(B)** $4x^4 - 37x^2 + 9 = 0,$
$4x^2 + \frac{9}{x^2} = 37$
$2x - \frac{3}{x} = \sqrt{37 - 12} = 5 \qquad \left(x > \sqrt{\frac{3}{2}}\right)$
$8x^3 - \frac{27}{x^3} = 125 + 3(6)5$
$= 125 + 90 = 215$

14. **(B)** $a - \frac{12}{a} = 1$
$\Rightarrow a^2 - a - 12 = 0$
$\Rightarrow a^2 - 4a + 3a - 12 = 0$
$\Rightarrow a = 4, -3 \qquad (a > 0)$

$\Rightarrow a^2 + \frac{16}{a^2} = 16 + 1 = 17$

15. **(B)** $\frac{\left(16\sqrt{2}x^3 + 81\sqrt{3}y^3\right)}{2\sqrt{2}x + 3\sqrt{3}y}$

$= (2\sqrt{2}\,x)^2 + (3\sqrt{3}\,y)^2 - (2\sqrt{2}\,x)(3\sqrt{3})y$
$= 8x^2 + 27y^2 - 6\sqrt{6}\,xy$
By comparison A = 8, B = 27, C = $-6\sqrt{6}$
$\Rightarrow 2A - 3B - 2\sqrt{6}\,C = 2 \times 8 - 3 \times 27 - 2\sqrt{6}$
$(-6\sqrt{6})$
$\Rightarrow 16 - 81 + 72 = 7$

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16.(A) $x + y = 2$

$$\frac{1}{x} + \frac{1}{y} = \frac{18}{5}$$

$$\Rightarrow \frac{x+y}{xy} = \frac{18}{5}$$

$$\Rightarrow xy = \frac{5}{9}$$

$\therefore$ $x^3 + y^3 = (x + y)[(x + y)^2 - 3xy]$

$$= 2\left(4 - 3 \times \frac{5}{9}\right) \Rightarrow 2\left(4 - \frac{5}{3}\right) = 4\frac{2}{3}$$

17.(C) $p - 2q = 3$
$pq = 5$
$p^3 - 8q^3 = (p - 2q)[(p - 2q)^2 + 3p(2q)]$
$= 3(9 + 3 \times 2 \times 5)$
$= 3 \times 39 = 117$

18.(B) $x^2 + 4y^2 = 53$
$x - 2y = 5$
$x^2 + 4y^2 - 4xy = 25$
$xy = 7$

$\therefore$ $x^3 - 8y^3 = (x - 2y)\left[x^2 + 4y^2 + (2xy)\right]$
$= 5[53 + 14] \Rightarrow 5 \times 67 = 335$

19.(C) $x + y + z = 7$
$\Rightarrow (x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$
$\Rightarrow x^2 + y^2 + z^2 = 85$
$\Rightarrow x^3 + y^3 + z^3 = 913$
$\Rightarrow 2(xy + yz + zx) = 49 - 85 = 36$
$\Rightarrow (xy + yz + zx) = -18$
$\Rightarrow x^3 + y^3 + z^3 - 3xyz = [x + y + z)(x^2 + y^2 + z^2 - (xy + yz + zx)]$
$\Rightarrow -3xyz = 7(85 + 18) - 913$
$\Rightarrow xyz = 64$
$\Rightarrow \sqrt[3]{xyz} = 4$

20.(A) $a^2 + c^2 + 17 = 2(a - 8b + 2b^2)$
Put $a = 1, b = -2, c = 0$
$\Rightarrow a^3 + b^3 + c^3 = 1 - 8 + 0 = -7$

21.(B) $$\frac{\left(3\sqrt{2}x\right)^3 + \left(2\sqrt{3}y\right)^3}{3\sqrt{2}x + 2\sqrt{3}y} = 18x^2 + 12y^2 - 6\sqrt{6}\,xy$$

$= (18)^2 - (12^2 + 216)$
$= 324 - 360 = -36$

22.(A) $x^2 - \sqrt{11}\,x + 1 = 0$

$$x + \frac{1}{x} = \sqrt{11}$$

$$x^3 + \frac{1}{x^3} = 11\sqrt{11} - 3\sqrt{11} = 8\sqrt{11}$$

23.(B) $(x + y)^3 + (3x - 3y)^3 = (4x - 2y)[(x + y)^2 + (3x - 3y)^2 - (x + y)(3x - 3y)]$
$= (4x - 2y)[]7x^2 + 13y^2 - 16xy]$
$\Rightarrow A = 4, B = 7, C = -16$
$\therefore$ $A - B - C = 4 - 7 + 16 = 13$

24.(C) $x^8 - 433x^4 + 16 = 0$

$$x^4 + \frac{16}{x^4} = 433$$

$$x^2 + \frac{4}{x^2} = 21$$

$$x + \frac{2}{x} = \sqrt{21 + 4} = 5$$

25.(C) $4x^4 = 5x^2 - 1$
Put $x = 1$
$\therefore$ $2x^2 - x - 1 = 0$

26.(B) $x^2 + 9y^2 + 4z^2 = 12(x - 2y + 2z) - 88$
$= 2(6x - 12y + 12z) - 88$

$$x = 6, y = \frac{-12}{9}, z = \frac{12}{4}$$

$$x - 3y + z = 6 - \left(-\frac{4}{3}\right) + 3$$
$= 13$

27.(D) $x^4 + y^4 + x^2y^2 = 21$
$x^2 + y^2 - xy = 7$

$$x^2 + y^2 + xy = \frac{21}{7} = 3$$

$2(x^2 + y^2) = 10$
$x^2 + y^2 = 5$
and $-2xy = 4$
$xy = -2$

$$\Rightarrow \frac{x}{y} + \frac{y}{x} = \frac{x^2 + y^2}{xy} = \frac{5}{-2} = -\frac{5}{2}$$

28.(A) $x + y = 3, \quad \frac{1}{x} + \frac{1}{y} = \frac{-3}{10}$

$x^2 + y^2 + 2xy = 9$ ..... (i)

and $$\frac{x+y}{xy} = -\frac{3}{10}$$

$xy = -10$ put in (i)
$x^2 + y^2 = 9 + 2(10)$
$= 29$

29.(C) $x + y + z = 1$
and $xy + yz + zx = xyz = -4$
$\Rightarrow x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]$
$x^3 + y^3 + z^3 = 1[1 - 3(-4)] - 12 = 1$

30.(A) $125x^6 - \frac{1}{x^3} - 3(25x^4)\frac{1}{x} + 3(5x^2)\left(\frac{1}{x^2}\right)$

constant value = 15

31.(A) $x + \frac{1}{x} = 5\sqrt{2} \quad \Rightarrow \quad x^2 + 1 = 5\sqrt{2}\,x$

$$\Rightarrow \frac{x\left(x^2+\frac{1}{x^2}\right)}{x^2+1} = \frac{x(50-2)}{5\sqrt{2}x} = \frac{48}{5\sqrt{2}} = \frac{24\sqrt{2}}{5}$$

32.(D) $a + b + c = 0$

Put 2, –1, –1

$$\Rightarrow \frac{(a+b)^2}{ab} + \frac{(b+c)^2}{bc} + \frac{(a+c)^2}{ca}$$

$$\Rightarrow \frac{c^2}{ab} + \frac{a^2}{bc} + \frac{b^2}{ca} \Rightarrow \frac{a^3+b^3+c^3}{abc} = 3$$

$$\Rightarrow \frac{(z-1)^2}{-2} + \frac{(-1-1)^2}{1} + \frac{(-1+2)^2}{-2}$$

$$\Rightarrow -\frac{1}{2} + 4 - \frac{1}{2} = 3$$

33.(B) $x - \frac{1}{x} = \sqrt{77}$

$$x^2 + \frac{1}{x^2} + 4 = 81$$

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

$$x + \frac{1}{x} = \pm 9$$

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

$$= -702$$

34.(C) $a^3 - b^3 = 2349$

$a - b = 9$

$$a^2 + b^2 + ab = \frac{2349}{9} = 261$$

$\therefore \quad (a + b)^2 - ab = a^2 + b^2 + ab = 261$

35.(C) $2a + \frac{3}{a} = 12$

$$4a^2 + \frac{9}{a^2} = 144 - 2(2)(3)$$

$$= 132$$

36.(C) $a^2 + b^2 + c^2 = 2(6a + 6b - 12c) - 216$

$a = 6, b = 6, c = -12$

$\therefore \quad \sqrt{36 + 72 + 72} = \sqrt{180} = 6\sqrt{5}$

37.(A) $(x - y + z)^2 - (x - y - z)^2$

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

$= 2(x - y)2z$

$= 4xz - 4yz$

38.(B) $\frac{x^2 + y^2}{xy} = 2$

$x^2 + y^2 - 2xy = 0$

$(x - y) = 0$

39.(D) $\frac{\left(2\sqrt{7}x\right)^3 - \left(\sqrt{2}y\right)^3}{2\sqrt{7}x - \sqrt{2}y}$

$= \left(2\sqrt{7}x\right)^2 + \left(\sqrt{2}y\right)^2 + 2\sqrt{15}xy$

$= 28x^2 + 2y^2 + 2\sqrt{14}\,xy$

$A + B - \sqrt{14}\,C = 28 + 2 - \sqrt{14} \times (-2\sqrt{14})$

$= 28 + 2 + 28 = 58$

40.(C) $\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{7}$

$$x + \frac{1}{x} = 9$$

$$x^2 + \frac{1}{x^2} = 81 - 2 = 79$$

41.(B) $x - y = 4$

$x^3 - y^3 = 316$

$$\Rightarrow \frac{x^3 - y^3}{x - y} = x^2 + y^2 + xy = 79$$

and $x^2 + y^2 - 2xy = 16$

$79 - xy - 2xy = 16$

$3xy = 63$

$xy = 21$

$x^2 + y^2 = 16 + 42$

$= 58$

and $(x + y)^2 = \sqrt{42 + 58}$

$= \sqrt{100}$

$\therefore \quad x^4 - y^4 = (x^2 + y^2)(x^2 - y^2)$

$= 58(x - y)(x + y)$

$= 38 \times 4 \times 10 = 2320$

42.(C) $(3x - 4)^3$

$= 27x^3 - 64 - 3(3x^2)4 + 3(3x)16$

cofficient of x = 144

43.(C) $x + y + z = 3$

$xy + yz + zx = -12$

$xyz = -16$

$x^3 + y^3 + z^3 - 3(-16) = 3[(9 - 3(-12)]$

$= 3(45)$

$$\sqrt{x^2 + y^2 + z^2 + 13} = \sqrt{135 - 48 + 13}$$

$$\Rightarrow \quad \sqrt{135 - 35} = 10$$

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44.(C) $(x + 6)^3 + (2x + 3)^3 + (3x + 5)^3 - 3(x + 6)(2x + 3)(3x + 5) = 0$

$\therefore \quad [x + 6 + 2x + 3 + 3x + 5] = 0$

$6x + 14 = 0$

$\Rightarrow \quad x = -\frac{7}{3}$

45.(B) $x^4 + x^2y^2 + y^4$

$x^2 + 2y + y^2 = 3$

$x^2 - xy + y^2 = 7$

$2xy = -4$

$-xy = 2$

46.(B) $x + \frac{1}{x} = 2\sqrt{5} \qquad x^3 + \frac{1}{x^3}$

$x^2 + 1 = 2\sqrt{5}x$

$\frac{x\left(x^3 + \frac{1}{x^3}\right)}{2\sqrt{5}x} = \frac{34\sqrt{5}}{2\sqrt{5}} = 17$

47.(A) $9a^2 + 9b^2 + c^2 = 2(6a + 12b) - 20$

$a = \frac{6}{9}$, $b = \frac{12}{9}$, $c = 0$

$\sqrt{6 \times \frac{2}{3} + 9 \times \frac{12}{9} + 0} = \sqrt{16} = 4$

48.(B) $x + y + z = 2$, $x^3 + y^3 + z^3 - 3xyz = 74$

$x^2 + y^2 + z^2 + z(zy + yz + zx) = 4$

$(xy + yz + zx) = \frac{4 - (x^2 + y^2 + z^2)}{2}$

$74 = 2\left[2^2 - 3\left(\frac{4 - (x^2 + y^2 + x^2)}{2}\right)\right]$

$37 = \left[4 - \frac{3}{2}(4 - (x^2 + y^2 + z^2))\right]$

$33 + 6 = 3(x^2 + y^2 + z^2)$

$13 = x^2 + y^2 + z^2$

49.(D) $\frac{(2x + y)^3 - (x - 2y)^3}{(x + 3y)}$

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

$= 4x^2 + y^2 + 4xy + x^2 + 4y^2 - 4xy + 2x^2 - 4xy - xy - 2y^2$

$= 7x^2 + 3y^2 - 5xy$

50.(B) $a^4 + b^4 + a^2b^2 = 273$

$a^2 + b^2 - ab = 21$

$a^2 + b^2 + ab = 13$

$a^2 + b^2 = 17$

$ab = -4$

$\frac{1}{a} + \frac{1}{b} = \frac{a + b}{ab} = \frac{\sqrt{a^2 + b^2 + 2ab}}{ab} = \frac{\sqrt{17 - 8}}{-4} = -\frac{3}{4}$

51.(A) $x + \frac{1}{x} = 7 \Rightarrow x^2 + \frac{1}{x^2} = 47$

52.(B) $2x + 3y = -1$

$8x^3 + 27y^3 + 18xy(2x + 3y) = -1$

$8x^3 + 27y^2 - 18xy = -1$

$\therefore \quad 8 - 1 = 7$

53.(A) $x - \frac{2}{x} = 15$

$x^2 + \frac{4}{x^2} = 225 + 4$

$= 229$

54.(B) $y = zx + 1$

$\Rightarrow \quad 2x - y = -1$

$8x^3 - y^3 - 3(2xy)(-1) = -1$

$8x^3 - y^3 + 6xy + 1 = 0$

55.(C) $x^4 - 62x^2 + 1 = 0$

$x^2 + \frac{1}{x^2} = 62$

$x + \frac{1}{x} = 8$

$\therefore \qquad x^3 + \frac{1}{x^3} = 512 - 3(8)$

$= 488$

56.(A) $x^4 + \frac{1}{x^4} = 34$

$x^2 + \frac{1}{x^2} = 6$

$x - \frac{1}{x} = 2$

$\therefore x^3 - \frac{1}{x^3} = 8 + 6 = 14$

57.(A) $\left(5 - \frac{x^2}{3}\right)^3$

$= 125 - \left(\frac{x^2}{3}\right)^3 - 3 \times 25 \times \frac{x^2}{3} + 3(5)\ \frac{x^4}{9}$

Cofficient of $x^2 = -25$

ALGEBRA
बीजगणित

(SSC CGL (PRE) - 2019)

(Previous Year Questions)

1. If $x - y = 4$ and $xy = 45$, then the value of $x^3 - y^3$ is :
यदि $x - y = 4$ और $xy = 45$ है, तो $x^3 - y^3$ का मान _____ है।
(A) 151 (B) 822
(C) 82 (D) 604

2. If x, y, z are three integers such that $x + y = 8$, $y + z = 13$ and $z + x = 17$, then the value of $\frac{x^2}{yz}$ is:
यदि x, y, z तीन ऐसे पूर्णांक हैं कि $x + y = 8$, $y + z = 13$ और $z + x = 17$ है, तो $\frac{x^2}{yz}$ का मान ज्ञात कीजिए।
(A) $\frac{7}{5}$ (B) 1 (C) 0 (D) $\frac{18}{11}$

3. If $x^{2a} = y^{2b} = z^{2c} \neq 0$ and $x^2 = yz$, then the value of $\frac{ab + bc + ca}{bc}$ is :
यदि $x^{2a} = y^{2b} = z^{2c} \neq 0$ और $x^2 = yz$ है, तो $\frac{ab + bc + ca}{bc}$ का मान ज्ञात कीजिए।
(A) 3 (B) 3ac
(C) 3ab (D) 3bc

4. The expression $(a + b - c)^3 + (a - b + c)^3 - 8a^3$ is equal to :
व्यंजक $(a + b - c)^3 + (a - b + c)^3 - 8a^3$ का मान ज्ञात करें।
(A) $6a(a + b - c)(a - b + c)$
(B) $6a(a - b + c)(c - a - b)$
(C) $3a(a + b - c)(a - b + c)$
(D) $3a(a - b + c)(c - a - b)$

5. If $x^4 + x^2y^2 + y^4 = 21$ and $x^2 + xy + y^2 = 7$, then the value of $\left(\frac{1}{x^2} + \frac{1}{y^2}\right)$ is :
यदि $x^4 + x^2y^2 + y^4 = 21$ और $x^2 + xy + y^2 = 7$ है, तो $\left(\frac{1}{x^2} + \frac{1}{y^2}\right)$ का मान ज्ञात करें।
(A) $\frac{5}{4}$ (B) $\frac{7}{4}$ (C) $\frac{7}{3}$ (D) $\frac{5}{2}$

6. If $x^2 + 3x + 1 = 0$, then what is the value of $x^6 + \frac{1}{x^6}$?
यदि $x^2 + 3x + 1 = 0$ है, तो $x^6 + \frac{1}{x^6}$ का मान क्या होगा ?
(A) 324 (B) 327
(C) 322 (D) 318

7. $(a + b - c + d)^2 - (a - b + c - d)^2 = ?$
$(a + b - c + d)^2 - (a - b + c - d)$ का मान बताइए।
(A) $4a(b - d + c)$ (B) $2a(b + c - d)$
(C) $4a(b + d - c)$ (D) $2a(a + b - c)$

8. The value of $27a^3 - 2\sqrt{2b^3}$ is equal to :
$27a^3 - 2\sqrt{2b^3}$ का मान ..... के बराबर है।
(A) $\left(3a - \sqrt{2}b\right)\left(9a^2 - 2b^2 - 3\sqrt{2}ab\right)$
(B) $\left(3a - \sqrt{2}b\right)\left(9a^2 - 2b^2 + 6\sqrt{2}ab\right)$
(C) $\left(3a - \sqrt{2}b\right)\left(9a^2 + 2b^2 + 3\sqrt{2}ab\right)$
(D) $\left(3a - \sqrt{2}b\right)\left(9a^2 + 2b^2 + 6\sqrt{2}ab\right)$

9. If $a + b + c = 11$, $ab + bc + ca = 3$ and $abc = -135$, then what is the value of $a^3 + b^3 + c^3$?
यदि $a + b + c = 11$, $ab + bc + ca = 3$ और $abc = -135$ है, तो $a^3 + b^3 + c^3$ का मान क्या होगा ?
(A) 823 (B) 929
(C) 925 (D) 827

10. If $5x + \frac{1}{3x} = 4$, then what is the value of $9x^2 + \frac{1}{25x^2}$?
यदि $5x + \frac{1}{3x} = 4$ है, तो $9x^2 + \frac{1}{25x^2}$ का मान क्या होगा ?
(A) $\frac{174}{125}$ (B) $\frac{144}{125}$ (C) $\frac{114}{25}$ (D) $\frac{119}{25}$

HEAD OFFICE : 201, Himmat Nagar, Gopalpura Pulia, Tonk Road, Jaipur-302018
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11. On Simplification $\frac{x^3-y^3}{x\left[(x+y)^2-3xy\right]} \div \frac{y\left[(x-y)^2+3xy\right]}{x^3+y^3} \times \frac{(x+y)^2-(x-y)^2}{x^2-y^2}$ is equal to :

का मान ज्ञात कीजिए।

(A) 4 (B) 1 (C) $\frac{1}{2}$ (D) $\frac{1}{4}$

12. If P = $\frac{x^4-8x}{x^3-x^2-2x}$, Q = $\frac{x^2+2x+1}{x^2-4x-5}$ and R = $\frac{2x^2+4x+8}{x-5}$, then (P × Q) ÷ R is equal to :

हो, तो (P × Q) ÷ R का मान ज्ञात कीजिए।

(A) $\frac{1}{2}$ (B) 1
(C) 2 (D) 4

13. If a + b + c = 7 and ab + bc + ca = –6, then the value of $a^3 + b^3 + c^3 - 3abc$ is :
यदि a + b + c = 7 और ab + bc + ca = –6 है, तो $a^3 + b^3 + c^3 - 3abc$ का मान ..... होगा।
(A) 469 (B) 472
(C) 463 (D) 479

14. If $30x^2 - 15x + 1 = 0$, then what is the value of $25x^2 + (36x^2)^{-1}$?
यदि $30x^2 - 15x + 1 = 0$ है, तो $25x^2 + (36x^2)^{-1}$ का मान ज्ञात करें।

(A) $\frac{9}{2}$ (B) $6\frac{1}{4}$ (C) $\frac{65}{12}$ (D) $\frac{55}{12}$

15. If x + y + z = 3, and $x^2 + y^2 + z^2 = 101$, then what is the value of $\sqrt{x^3 + y^3 + z^3 - 3xyz}$?
यदि x + y + z = 3, और $x^2 + y^2 + z^2 = 101$, है, तो $\sqrt{x^3 + y^3 + z^3 - 3xyz}$ का मान क्या है ?
(A) 19 (B) 21
(C) 24 (D) 28

16. If $12x^2 - 21x + 1 = 0$, then what is the value of $9x^2 + (16x^2)^{-1}$?
यदि $12x^2 - 21x + 1 = 0$ है, तो $9x^2 + (16x^2)^{-1}$ का मान क्या है ?

(A) $\frac{429}{8}$ (B) $\frac{465}{16}$ (C) $\frac{417}{16}$ (D) $\frac{453}{8}$

17. If $2x^2 + y^2 + 8z^2 - 2\sqrt{2}xy + 4\sqrt{2}yz - 8zx = (Ax + y + Bz)^2$, then the value of $(A^2 + B^2 - AB)$ is:
यदि $2x^2 + y^2 + 8z^2 - 2\sqrt{2}xy + 4\sqrt{2}yz - 8zx = (Ax + y + Bz)^2$, है, तो $(A^2 + B^2 - AB)$ का मान ज्ञात कीजिये।
(A) 16 (B) 14
(C) 6 (D) 18

18. If $16a^4 + 36a^2b^2 + 81b^4 = 91$ and $4a^2 + 9b^2 - 6ab = 13$, then what is the value of 3ab?
यदि $16a^4 + 36a^2b^2 + 81b^4 = 91$ और $4a^2 + 9b^2 - 6ab = 13$ है, तो 3ab का मान क्या है ?

(A) –3 (B) 5 (C) $\frac{3}{2}$ (D) $-\frac{3}{2}$

19. If P = $\frac{x^3+y^3}{(x-y)^2+3xy}$, Q = $\frac{(x+y)^2-3xy}{x^3-y^3}$ and R = $\frac{(x+y)^2-(x-y)^2}{x^2-y^2}$ then what is the value of (P ÷ Q) × R ?
है, तो (P ÷ Q) × R का मान क्या है ?
(A) 2xy (B) $2(x^2 + y^2)$
(C) $x^2 + y^2$ (D) 4xy

20. If $x^2 - 2\sqrt{5}x + 1 = 0$, then what is the value of $x^5 + \frac{1}{x^5}$?

यदि $x^2 - 2\sqrt{5}x + 1 = 0$ है, तो $x^5 + \frac{1}{x^5}$ का मान क्या है ?

(A) $408\sqrt{5}$ (B) $610\sqrt{5}$
(C) $406\sqrt{5}$ (D) $612\sqrt{5}$

21. If $x^4 + x^2y^2 + y^4 = 273$ and $x^2 - xy + y^2 = 13$ then the alue of xy is :
यदि $x^4 + x^2y^2 + y^4 = 273$ और $x^2 - xy + y^2 = 13$ है, तो xy का मान क्या होगा ?
(A) 4 (B) 10
(C) 6 (D) 8

22. If $20x^2 - 30x + 1 = 0$, then what is the value of $25x^2 + \frac{1}{16x^2}$?

यदि $20x^2 - 30x + 1 = 0$ है, तो $25x^2 + \frac{1}{16x^2}$ का मान क्या होगा ?

(A) $58\frac{3}{4}$ (B) $53\frac{3}{4}$ (C) $53\frac{1}{2}$ (D) $58\frac{1}{2}$

23. If $x - \frac{1}{x} = 11$, then $x^3 - \frac{1}{x^3}$ is :

यदि $x - \frac{1}{x} = 11$ है, तो $x^3 - \frac{1}{x^3}$ का मान बताइए।

(A) 1474 (B) 1188
(C) 1364 (D) 1298

24. $(a + b + c - d)^2 - (a - b - c + d)^2 = ?$
$(a + b + c - d)^2 - (a - b - c + d)^2$ का मान बताइए।
(A) $2a(b + c + d)$ (B) $4a(b + c - d)$
(C) $2a(b + c - d)$ (D) $4a(b + c + d)$

25. The coefficient of x^2 in $(2x + y)^4$ is :
$(2x + y)^3$ में x^2 का गुणांक _____ है।
(A) $12y^2$ (B) $12y$
(C) 8 (D) 12

26. If $3^a = 27^b = 81^c$ and abc = 144, then the value of $12\left(\frac{1}{a} + \frac{1}{2b} + \frac{1}{5c}\right)$ is

यदि $3^a = 27^b = 81^c$ और abc = 144 है, तो $12\left(\frac{1}{a} + \frac{1}{2b} + \frac{1}{5c}\right)$ का मान ज्ञात कीजिये।

(A) $\frac{18}{120}$ (B) $\frac{18}{10}$ (C) $\frac{33}{10}$ (D) $\frac{17}{120}$

27. If $a + b + c = 9$ and $ab + bc + ca = -22$, then the value of $a^3 + b^3 + c^3 - 3abc$ is :
यदि $a + b + c = 9$ और $ab + bc + ca = -22$ है, तो $a^3 + b^3 + c^3 - 3abc$ का मान ज्ञात कीजिये।
(A) 783 (B) 1323
(C) 1571 (D) 487

28. If the value of $(a + b - 2)^2 + (b + c - 5)^2 + (c + a - 5)^2 = 0$, then the value of $\sqrt{(b+c)^a + (c+a)^b - 1}$ is :
यदि $(a + b - 2)^2 + (b + c - 5)^2 + (c + a - 5)^2 = 0$, है, तो $\sqrt{(b+c)^a + (c+a)^b - 1}$ का मान ज्ञात कीजिये।
(A) 1 (B) 2
(C) 3 (D) 0

29 If $a + \frac{1}{a} = 5$ then $a^3 + \frac{1}{a^3}$ is :

यदि $a + \frac{1}{a} = 5$ हैं, तो $a^3 + \frac{1}{a^3}$ का मान क्या होगा ?

(A) 140 (B) 10
(C) 80 (D) 110

30. The coefficient of x in $(x - 3y)^3$ is :
$(x - 3y)^3$ में x का गुणांक _____ है।
(A) $-3y^2$ (B) $27y^2$
(C) $-28y^2$ (D) $3y^2$

31. If $a^3 + \frac{1}{a^3} = 52$, then the value of $2\left(a + \frac{1}{a}\right)$ is:

यदि $a^3 + \frac{1}{a^3} = 52$ है, तो $2\left(a + \frac{1}{a}\right)$ का मान क्या है ?

(A) 4 (B) 8
(C) 6 (D) 2

32. If $x^2 - 4x + 4 = 0$, then the value of $16\left(x^4 - \frac{1}{x^4}\right)$ is

यदि $x^2 - 4x + 4 = 0$ है, तो $16\left(x^4 - \frac{1}{x^4}\right)$ का मान ज्ञात कीजिये।

(A) $\frac{127}{16}$ (B) 127 (C) $\frac{255}{16}$ (D) 255

33. If $b + c = ax$, $c + a = by$, $a + b = cz$, then the value of $\frac{1}{9}\left[\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}\right]$ is

यदि $b + c = ax$, $c + a = by$, $a + b = cz$ है, तो $\frac{1}{9}\left[\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}\right]$ का मान ज्ञात करें।

(A) 0 (B) 1 (C) $\frac{1}{9}$ (D) $\frac{1}{3}$

34. The coefficient of y in the expansion of $(2y - 5)^3$, is :
$(2y - 5)^3$ के प्रसरण में y का गुणांक ज्ञात कीजिये।
(A) 150 (B) 50
(C) –30 (D) –150

35. If $1 - 64x^3 - 12x + px^2 = (1 - 4x)^3$, then the value of p is :
यदि $1 - 64x^3 - 12x + px^2 = (1 - 4x)^3$ है, तो p का मान ज्ञात कीजिये।
(A) 48 (B) –12
(C) –48 (D) 16

36. The value of $151^2 - 149^2$ is :
$151^2 - 149^2$ का मान बताइए।
(A) 600 (B) 300
(C) 2^2 (D) 400

37. Expand $\left(\frac{x}{3}+\frac{y}{5}\right)^3$.

$\left(\frac{x}{3}+\frac{y}{5}\right)^3$ का विस्तार क्या होगा ?

(A) $\frac{x^3}{27}+\frac{x^2y}{25}+\frac{xy^2}{25}+\frac{y^3}{125}$

(B) $\frac{x^3}{27}+\frac{x^2y}{15}+\frac{xy^2}{25}+\frac{y^3}{125}$

(C) $\frac{x^3}{25}+\frac{x^2y}{15}+\frac{xy^2}{25}+\frac{y^3}{125}$

(D) $\frac{x^3}{27}+\frac{xy}{15}+\frac{xy^2}{25}+\frac{y^3}{125}$

38. If $a^2 + b^2 + c^2 = 300$ and $ab + bc + ca = 50$, then what is the value of $a + b + c$? (given that, a, b and c are all positive)

यदि $a^2 + b^2 + c^2 = 300$ और $ab + bc + ca = 50$ है, तो $a + b + c$ का मान क्या है ? (दिया गया है कि a, b और c सभी धनात्मक हैं।)

(A) 25 (B) 22
(C) 20 (D) 15

39. If $x + y + z = 10$ and $xy + yz + zx = 15$, then find the value of $x^3 + y^3 + z^3 - 3xyz$.

यदि $x + y + z = 10$ और $xy + yz + zx = 15$ है, तो $x^3 + y^3 + z^3 - 3xyz$ का मान ज्ञात करो।

(A) 525 (B) 575
(C) 550 (D) 660

40. $25a^2 - 9$ is factored as :

$25a^2 - 9$ का गुणनखंड ..... है।

(A) $(5a + 3)(5a - 3)$ (B) $(5a - 3)^2$
(C) $(25a + 1)(a - 9)$ (D) $(5a + 1)(5a - 9)$

41. Find the product of $(a + b + 2c)(a^2 + b^2 + 4c^2 - ab - 2bc - 2ca)$

$(a + b + 2c)(a^2 + b^2 + 4c^2 - ab - 2bc - 2ca)$ का गुणनफल ज्ञात करें।

(A) $a^3 + b^3 + 8c^3 - abc$
(B) $a^3 + b^3 + 8c^3 - 6abc$
(C) $a^3 + b^3 + 8c^3 - 2abc$
(D) $a^3 + b^3 + 6c^3 - 6abc$

42. If $a^4 + \frac{1}{a^4} = 50$, $a > 0$, then find the value of $a^3 + \frac{1}{a^3}$.

यदि $a^4 + \frac{1}{a^4} = 50$, $a > 0$ हो, तो $a^3 + \frac{1}{a^3}$ का मान ज्ञात करो ?

(A) $\sqrt{2\left(1+\sqrt{13}\right)}\left(-1-2\sqrt{13}\right)$

(B) $\sqrt{2\left(1-\sqrt{13}\right)}\left(-1+2\sqrt{13}\right)$

(C) $\sqrt{2\left(1+\sqrt{13}\right)}+\left(-1+2\sqrt{13}\right)$

(D) $\sqrt{2\left(1+\sqrt{13}\right)}\left(-1+2\sqrt{13}\right)$

43. If $A + B = 12$ and $AB = 17$, what is the value of $A^3 + B^3$?

यदि $A + B = 12$ और $AB = 17$ है, तो $A^3 + B^3$ का मान क्या होगा ?

(A) 1116 (B) 1106
(C) 1213 (D) 1166

44. Expand $(4a + 3b + 2c)^2$

$(4a + 3b + 2c)^2$ का विस्तार करें।

(A) $16a^2 + 9b^2 + 4c^2 + 24ab + 12bc + 16ca$
(B) $4a^2 + 3b^2 + 2c^2 + 24ab + 12ab + 16ca$
(C) $16a^2 - 9b^2 + 4c^2 - 24ab + 12bc - 16ca$
(D) $16a^2 + 9b^2 + 4c^2 - 24ab - 12ab - 16ca$

45. $(3a - 4b)^3$ is equal to :

निम्न में से किसके बराबर है ?

(A) $27a^3 - 64b^3$
(B) $27a^3 - 64b^3 - 108a^2b + 144ab^2$
(C) $9a^2 - 16b^2$
(D) $9a^2 - 24ab + 16b^2$

46. If x, y, z are three numbers such that $x + y = 13$, $y + z = 15$ and $z + x = 16$, then the value of $\frac{xy + xz}{xyz}$ is :

यदि x, y, z तीन संख्याएँ इस प्रकार हैं कि $x + y = 13$, $y + z = 15$ और $z + x = 16$ है, तो $\frac{xy + xz}{xyz}$ का मान है—

(A) $\frac{5}{18}$ (B) $\frac{36}{5}$ (C) $\frac{5}{36}$ (D) $\frac{18}{5}$

47. If $a = 2b = 8c$ and $a + b + c = 13$ then the value of $\frac{\sqrt{a^2 + b^2 + c^2}}{2c}$ is :

यदि $a = 2b = 8c$ और $a + b + c = 13$ है, तो $\frac{\sqrt{a^2 + b^2 + c^2}}{2c}$ का मान है—

(A) $-\frac{5}{6}$ (B) $\frac{5}{6}$ (C) $-\frac{9}{2}$ (D) $\frac{9}{2}$

48. If $a^2 + b^2 - c^2 = 0$, then the value of $\frac{2(a^6 + b^6 - c^6)}{3a^2b^2c^2}$ is :

यदि $a^2 + b^2 - c^2 = 0$ है, तो $\frac{2(a^6 + b^6 - c^6)}{3a^2b^2c^2}$ का मान ज्ञात कीजिये।

(A) 1 (B) –2
(C) 0 (D) 3

49. If $p + q = 7$ and $pq = 5$, then the value of $p^3 + q^3$ is :
यदि $p + q = 7$ और $pq = 5$ है, तो $p^3 + q^3$ का मान ज्ञात कीजिये।
(A) 238 (B) 34
(C) 448 (D) 64

50. If $x + 3y + 2 = 0$ then value of $x^3 + 27y^3 + 8 - 18xy$ is
यदि $x + 3y + 2 = 0$ है, तो $x^3 + 27y^3 + 8 - 18xy$ का मान ज्ञात कीजिये।
(A) –2 (B) 2
(C) 0 (D) 1

Solution

1. (D) $x - y = 4$
$xy = 45$
Let $x = 9$; $y = 5$
$x^3 - y^3 = 729 - 125$
$= 604$

2. (D) $x + y = 8$
$y + z = 13$
$z + x = 17$
$2(x + y + z) = 38$
$x + y + z = 19$
From equations
$x = 6$; $y = 2$; $z = 11$

$$\frac{x^2}{yz} = \frac{6 \times 6}{11 \times 2} = \frac{18}{11}$$

3. (A) $x^{2a} + y^{2b} = 2^{2c} = k$

$$x = k^{\frac{1}{2a}}$$

$$y = k^{\frac{1}{2b}}$$

$$z = k^{\frac{1}{2c}}$$

$$x^2 = yz$$

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

$$\frac{1}{a} = \frac{b + c}{2bc}$$

$2bc = ab + ac$ .... (1)

$$\frac{ab + bc + ac}{bc}$$

Put value from eq. (1)

$$\frac{3bc}{bc} = 3$$

4. (A) $(a + b - c)^3 + (a - b + c)^3 + 8a^3$
$[\because a^3 + b^3 + c^3 = 3abc;$ if $a + b + c = 0]$
$= 6a(a + b - c)(a - b + c)$

5. (A) $x^4 + x^2y^2 + y^4 = 21$
$x^2 + xy + y^2 = 7$ ... (i)

$$x^2 - xy + y^2 = \frac{21}{7} = 3 \quad \text{... (ii)}$$

From eq. (i) and (ii)
$x^2 + y^2 = 5$
$x^2 y^2 = 4$

$$\frac{1}{x^2} + \frac{1}{y^2} = \frac{x^2 + y^2}{x^2y^2}$$

Put values from equations

$$\frac{x^2 + y^2}{x^2y^2} = \frac{5}{4}$$

6. (C) $x^2 + 3x + 1 = 0$

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

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

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

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

$$x^6 + \frac{1}{x^6} = (-18)^2 - 2$$

$= 324 - 2$
$= 322$

7. (C) $(a + b - c + d)^2 - (a - b + c - d)^2$
$[\because a^2 - b^2 = (a + b)(a - b)]$
$= [a + b - c + d + a - b + c - d][a + b - c + d - a + b - c + d]$
$= 2a[2(b + d - c)]$
$= 4a(b + d - c)$

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8. (C) $27a^3 - 2\sqrt{2}b^3$

$(3a)^3 - \left(\sqrt{2}b\right)^3$

$[\because a^3 - b^3 = (a - b)(a^2 + b^2 + ab)]$

$= (3a - \sqrt{2}\,b)(9a^2 + 2b^2 + 3\sqrt{2}\,ab)$

9. (D) $a + b + c = 11$

$ab + bc + ac = 3$

$abc = -135$

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

$121 = a^2 + b^2 + c^2 + 2 \times 3$

$\because a^2 + b^2 + c^2 = 115$

Put values

$a^3 + b^3 + c^3 + 405 = (11)(115 - 3)$

$a^3 + b^3 + c^3 = 1232 - 405$

$a^3 + b^3 + c^3 = 827$

10. (C) $5x + \dfrac{1}{3x} = 4$

$3x + \dfrac{1}{5x} = \dfrac{12}{5}$

$9x^2 + \dfrac{1}{25x^2} = \dfrac{144}{25} - 2 \times \dfrac{3}{5} = \dfrac{114}{25}$

11. (A) $\dfrac{x^3 - y^3}{x\left[(x+y)^2 - 3xy\right]} \div \dfrac{y\left[(x-y)^2 + 3xy\right]}{x^3 + y^3} \times \dfrac{(x+y)^2 - (x-y)^2}{x^2 - y^2}$

$= \dfrac{x^3 - y^3}{x(x^2 + y^2 - xy)} \times \dfrac{x^3 + y^3}{y(x^2 + y^2 + xy)} \times \dfrac{4xy}{x^2 - y^2}$

$= \dfrac{4(x+y)(x^2 - xy + y^2) \times (x-y)(x^2 + y^2 + xy)}{(x^2 + y^2 - xy)(x^2 + y^2 + xy) \times (x^2 - y^2)}$

$= 4$

12. (A) $P = \dfrac{x^4 - 8x}{x^3 - x^2 - 2x}$; $Q = \dfrac{x^2 + 2x + 1}{x^2 - 4x - 5}$; $R = \dfrac{2x^2 + 4x + 8}{x - 5}$

$(P \times Q) \div R = \left[\dfrac{x^4 - 8x}{x^3 - x^2 - 2x} \times \dfrac{x^2 + 2x + 1}{x^2 - 4x - 5}\right] \times \dfrac{x - 5}{2x^2 + 4x + 8}$

$= \dfrac{(x-2)(x^2 + 4 + 2x)}{(x^2 - x - 2)} \times \dfrac{(x+1)^2}{(x^2 - 4x - 5)} \times \dfrac{x - 5}{2(x^2 + 2x + 4)}$

$= \dfrac{(x-2)}{(x+1)(x-2)} \times \dfrac{(x+1)^2}{(x+1)(x-5)} \times \dfrac{(x-5)}{2} = \dfrac{1}{2}$

13. (A) $a + b + c = 7$

$ab + bc + ac = -6$

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

$[\because (a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ac)]$

$49 = a^2 + b^2 + c^2 + 2(-6)$

$a^2 + b^2 + c^2 = 61$

$a^3 + b^3 + c^3 - 3abc = 7[61 + 6]$

$= 67 \times 7 = 469$

14. (D) $30x^2 - 13x + 1 = 0$

$30x^2 + 1 = 15x$

$5x + \dfrac{1}{6x} = \dfrac{5}{2}$

Square both side

$25x^2 + \dfrac{1}{36x^2} = \dfrac{25}{4} - \dfrac{5}{3}$

$25x^2 + (36x^2)^{-1} = \dfrac{75 - 20}{12} = \dfrac{55}{12}$

15. (B) $x + y + z = 3$, $x^2 + y^2 + z^2 = 101$

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zh)$

$xy + y + zx = -46$

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[x^2 + y^2 + z^2 - (xy + xz + yz)]$

$\Rightarrow 3[101 + 46]$

$= 441$

$= 21$

16. (C) $12x^2 + 1 = 21x$

$12x + \dfrac{1}{x} = 21$

divide by 4

$3x + \dfrac{1}{4x} = \dfrac{21}{4}$

After squarin both side

$9x^2 + \dfrac{1}{16x^2} + 2.3.\dfrac{1}{4} = \dfrac{441}{16}$

$9x^2 + \dfrac{1}{16x^2} = \dfrac{417}{16}$

17. (B) $2x^2 + y^2 + 8z^2 - 2\sqrt{2}xy + 4\sqrt{2}yz - 8zx$

$= (AX + Y + Bz)^2$

$\left(y - \sqrt{2}x + 2\sqrt{2}z\right)^2$

$= (Ax + y + Bz)^2$

$A = -\sqrt{2}$; $B = 2\sqrt{2}$

$A^2 + B^2 - AB = 2 + 8 + 4 = 14$

18. (D) $16a^4 + 36a^2b^2 + 81b^4 = 91$

$4a^2 + 9b^2 - 6ab = 13$ .... (i)

$[\because a^4 + a^4 + a^2b^2 = (a^2 + b^2 + ab)(a^2 + b^2 - ab)]$

So, $4a^2 + 9b^2 + 6ab = \dfrac{91}{13} = 7$ .... (ii)

From eq. (i) & (ii)

$12ab = -6$

$3ab = -\dfrac{3}{2}$

19. (D) $P = \dfrac{x^3 + y^3}{(x-y)^2 + 3xy}, Q = \dfrac{(x+y)^2 - 3xy}{x^3 - y^3}$

$R = \dfrac{(x+y)^2 - (x-y)^2}{x^2 - y^2}$

$(P \div Q) \times R = \dfrac{x^3 + y^3}{(x-y)^2 + 3xy} \times \dfrac{x^3 - y^3}{(x+y)^2 - 3xy}$

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

$= \dfrac{(x+y)(x^2 + y^2 - 2xy)}{(x^2 + y^2 + xy)} \times \dfrac{(x-y)(x^2 + y^2 + xy)}{(x^2 + y^2 - xy)}$

$\times \dfrac{4xy}{(x-y)(x+y)} = 4xy$

20. (B) $x^2 - 2\sqrt{5}x + 1 = 0$ $\quad x + \dfrac{1}{x} = 2\sqrt{5}$

$\left[x^5 + \dfrac{1}{x^5} = (x^3 + \dfrac{1}{x^3})(x^2 + \dfrac{1}{x^2}) - (x + \dfrac{1}{x})\right]$

$x^3 + \dfrac{1}{x^3} = (2\sqrt{5})^3 - 3(2\sqrt{5})$

$= 40\sqrt{5} - 6\sqrt{5} = 34\sqrt{5}$

$x^4 + \dfrac{1}{x^4} = 20 - 2 = 18$

So, $34\sqrt{5} \times 18 - 2\sqrt{5} = 610\sqrt{5}$

21. (A) $x^4 + x^2y^2 + y^4 = 273$

$x^2 - xy + y^2 = 13$ ...(i)

$x^2 + xy + y^2 = \dfrac{273}{13} \Rightarrow 21$ ...(ii)

eq. (i) & (ii)

$2xy = 8$

$xy = 4$

22. (B) $20x^2 - 30x + 1 = 0$

$5x + \dfrac{1}{4x} = \dfrac{15}{2}$

$25x^2 + \dfrac{1}{16x^2} + \dfrac{5}{2} = \dfrac{225}{4}$

$25x^2 + \dfrac{1}{16x^2} = \dfrac{215}{4} = 53\dfrac{3}{4}$

23. (C) $x - \dfrac{1}{x} = 11$

$x^3 - \dfrac{1}{x^3} = 1331 + 33 = 1364$

24. (B) $(a + b + c - d)^2 - (a - b - c + d)^2 = ?$

Let, $a = b = c = D$

$(a + b)^2 - 0 = 4a^2$

go through option

(B) $4a(b + c - d)$

$= 4a(a) = 4a^2$

25. (B) $(2x + y)^3 = 8x^3 + y^3 + 3 \times 2x \times y(2x + y)$

$= 8x^3 + y^3 + 6xy^2 + 12x^2y$

coefficient of $x^2 = 12y$

26. (C) $3^a = 27^b = 81^c$

$3^a = 3^{3b} = 3^{4c}$

$\Rightarrow a = 3b = 4c = k$

K. $\dfrac{K}{3} \cdot \dfrac{K}{4} = 144$

$K = 12$

$a = 12, b = 4, c = 3$

$12\left(\dfrac{1}{a} + \dfrac{1}{2b} + \dfrac{1}{5c}\right) = 12\left(\dfrac{1}{12} + \dfrac{1}{8} + \dfrac{1}{15}\right)$

$= 1 + \dfrac{3}{2} + \dfrac{4}{5} = \dfrac{33}{10}$

27. (B) $a + b + c = 9$, $ab + bc + ca = -22$

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

$81 = a^2 + b^2 + c^2 - 44$

$a^2 + b^2 + c^2 = 125$

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

$[a^2 + b^2 + c^2 - ab - bc - ac]$

$= 9[125 + 22] \Rightarrow 9[147] = 1323$

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28. (C) $(a + b - 2)^2 + (b + c - 5)^2 + (c + a - 5)^2 = 0$

$a + b = 2$ ...(i)

$b + c = 5$ ...(ii)

$c + a = 5$ ...(iii)

from equation (i), (ii) and (iii)

$b = 1, \quad a = 1$

29. (D) $a + \frac{1}{a} = 5 \qquad a^3 + \frac{1}{a^3} = 5^3 - 3 \times 5$

$= 125 - 15$

$= 110$

30. (B) $(x - 3y)^3 = x^3 - 27y^3 - 3x \cdot 3y\,(x - 3y)$

$= x^3 - 27y^3 - 9x^2y + 27xy^2$

Coefficient of x is $27y^2$

31. (B) $a^3 + \frac{1}{a^3} = 52$

If $a + \frac{1}{a} = m$ then $a^3 + \frac{1}{a^3} = m^3 - 3m$

$m^3 - 3m = 52$

$m = 4$

$2(a + \frac{1}{a}) = 8$

32. (D) $x^2 - 4x + 4 = 0$

$(x - 2)^2 = 0$

$x = 2$

$16\left(x^4 - \frac{1}{x^4}\right) = 16\left(16 - \frac{1}{16}\right)$

$= 256 - 1 = 255$

33. (C) $b + c = ax, \; c + a = by, \; a + b = cz$

$2(a + b + c) = ax + by + cz$

$x = 2, y = 2, z = 2$

$\frac{1}{9}\left[\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}\right] = \frac{1}{9}\left[\frac{1}{3} + \frac{1}{3} + \frac{1}{3}\right] = \frac{1}{9}$

34. (A) $(2y - 5)^3 = 8y^3 - 125 - 30y\,(2y - 5)$

$= 8y^3 - 125 - 60y^2 + 150y$

coefficient of y = 150

35. (A) $1 - 64x^3 - 12x + px^2 = (1 - 4x)^2$

$1 - 64x^3 - 12x + px^2 = 1 - 64x^3 - 3 \times 4x\,(1 - 4x)$

$= 1 - 64x^3 - 12x + 48x^2$

P = 48 will

36. (A) $151^2 - 149^2 = (151 + 149)\,(151 - 149)$

$= 300 \times 2 = 600$

37. (B) $\left(\frac{x}{3} + \frac{y}{5}\right)^3 = \frac{x^3}{27} + \frac{y^3}{125} + \frac{x^2y}{15} + \frac{xy^2}{25}$

$\therefore (x + y)^3 = x^3 + y^3 + 3x^2y + 3xy^2$

38. (C) $a^2 + b^2 + c^2 = 300, \; ab + bc + ca = 50$

$a + b + c = ?$

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

$= 300 + 100 = 400$

$a + b + c = 20$

39. (C) $x + y + z = 10, \; xy + yz + zx = 15$

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]$

$= 10(100 - 45) = 550$

40. (A) $(25a^2 - 9) \Rightarrow (5a - 3)\,(5a + 3)$

$A^2 - B^2 = (A + B)\,(A - B)$

41. (B) $(a + b + 2c)\,[a^2 + b^2 + 4c^2 - ab - 2bc - 2ca]$

Let, $a = 1, b = 1, c = 1$

$(1 + 1 + 2)\,[1 + 1 + 4 - 1 - 2 - 2] \Rightarrow 4$

Each the option

$a^3 + b^3 + 8c^3 - 6abc \Rightarrow 1 + 1 + 8 - 6 = 4$

So option B is true

42. (D) $a^4 + \frac{1}{a^4} = 50, \; a^3 + \frac{1}{a^3} = ?$

$a^2 + \frac{1}{a^2} = 2\sqrt{13}$

$a + \frac{1}{a} = \sqrt{2\sqrt{13} + 2}$

$\left(a^3 + \frac{1}{a^3}\right) = 2\sqrt{13} + 2 \quad \sqrt{2\sqrt{13} + 2} - 3\sqrt{2\sqrt{13} + 2}$

$= \sqrt{2\sqrt{13} + 2}\,\left[2\sqrt{13} + 2 - 3\right]$

$= \sqrt{2\sqrt{13} + 2}\left[2\sqrt{13} - 1\right]$

43. (A) $A + B = 12; \qquad AB = 17$

$A^3 + B^3 = (A + B)^3 - 3AB\,(A + B)$

$= (12)^3 - 3 \times 17 \times 12$

$= 1782 - 612$

$= 1116$

44. (A) $(4a + 3b + 2c)^2$
$= 16a^2 + 9b^2 + 4c^2 + 24ab + 12bc + 16ac$

45. (B) $(3a - 4b)^3$
$= 27a^3 - 64b^3 - 36ab\,(3a - 4b)$
$= 27a^3 - 64b^3 - 108a^2b + 144ab^2$

46. (A) $x + y = 13$ ... (i)
$y + z = 15$ ... (ii)
$z + x = 16$ ... (iii)
From eq. (i) (ii) and (iii)
$x + y + z = 22$
So, $x = 7, y = 6, z = 9$

Now, $\frac{xy + xz}{xyz} = \frac{1}{z} + \frac{1}{y} = \frac{1}{9} + \frac{1}{6}$

$= \frac{2+3}{18} = \frac{5}{18}$

47. (D) $a = 2b = 8c$; $a + b + c = 13$

So, $\begin{matrix} a & : & b & : & c \\ 8 & : & 4 & : & 1 \end{matrix}$

$\frac{\sqrt{a^2 + b^2 + c^2}}{2c}$

put values from equations

$\frac{\sqrt{64 + 16 + 1}}{2 \times 1} = \frac{\sqrt{81}}{2} = \frac{9}{2}$

48. (B) $a^2 + b^2 - c^2 = 0$
$a^2 + b^2 = c^2$
Cube both sides $(a^2 + b^2)^3 = c^6$
$a^6 + b^6 + 3a^2b^2(a^2 + b^2) = c^6$
$(\therefore\ a^2 + b^2 = c^2)$
$c^6 = a^6 + b^6 + 3a^2b^2c^2$ .... (i)
From Question

$\frac{2(a^6 + b^6 - c^6)}{3a^2b^2c^2}$

Put value from eq. ... (i)

$\frac{2(a^6 + b^6 - a^6 - b^6 - 3a^2b^2c^2)}{3a^2b^2c^2}$

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

49. (A) $p + q = 7$; $pq = 5$
$p^3 + q^3 = (p+q)^3 - 3pq(p+q)$
$p^3 + q^3 = 7^3 - 3 \times 5\,(7)$
$= 343 - 105 = 238$

50. (C) $x + 3y + 2 = 0$
$x + 3y = -2$
Cube both sides
$(x+3y)^3 = -8$
$x^3 + 27y^3 + 3.x.3y(x+3y) = -8$
$x^3 + 27y^3 + 3.x.3y\,(-2) = -8$
$x^3 + 27y^3 - 18xy + 8 = 0$

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ALGEBRA
बीजगणित

(SSC CGL (PRE) - 2018)

(Previous Year Questions)

1. If $(5\sqrt{5}x^3 - 81\sqrt{3}y^3) \div (\sqrt{5}x - 3\sqrt{3}y) = (Ax^2 + By^2 + Cxy)$, then the value of $(6A + B - \sqrt{15}C)$ is :

यदि $(5\sqrt{5}x^3 - 81\sqrt{3}y^3) \div (\sqrt{5}x - 3\sqrt{3}y) = (Ax^2 + By^2 + Cxy)$ है, तो $(6A + B - \sqrt{15}C)$ का मान क्या होगा ?

(A) 10 (B) 9
(C) 15 (D) 12

2. If $x + y + z = 19$, $x^2 + y^2 + z^2 = 133$ and $xz = y^2$, then the difference between z and x is:

यदि $x + y + z = 19$, $x^2 + y^2 + z^2 = 133$ और $xz = y^2$ है, तो z और x के बीच अंतर है :

(A) 5 (B) 3
(C) 6 (D) 4

3. If $x^4 + x^{-4} = 194$, $x > 0$, then the value of $(x - 2)^2$ is :

यदि $x^4 + x^{-4} = 194$, $x > 0$ है, तो $(x - 2)^2$ का मान क्या होगा ?

(A) 1 (B) 6
(C) 2 (D) 3

4. If $16x^2 + 9y^2 + 4z^2 = 24(x - y + z) - 61$, then the value of $(xy + 2z)$ is:

यदि $16x^2 + 9y^2 + 4z^2 = 24(x - y + z) - 61$ है, तो $(xy + 2z)$ का मान होगा :

(A) 1 (B) 2
(C) 3 (D) 7

5. If $x + y + z = 19$, $xy + yz + zx = 114$, then the value of $\sqrt{x^3 + y^3 + z^3 - 3xyz}$ is :

यदि $x + y + z = 19$, $xy + yz + zx = 114$ है, तो $\sqrt{x^3 + y^3 + z^3 - 3xyz}$ का मान होगा :

(A) 21 (B) 17
(C) 19 (D) 13

6. If $[8(x + y)^3 - 27(x - y)^3] \div (5y - x) = Ax^2 + Bxy + Cy^2$, then the value of (A + B + C) is:

यदि $[8(x + y)^3 - 27(x - y)^3] \div (5y - x) = Ax^2 + Bxy + Cy^2$ है, तो (A + B + C) का मान होगा :

(A) 26 (B) 19
(C) 16 (D) 13

7. If $a^2 + b^2 + 64c^2 + 16c + 3 = 2(a + b)$, then the value of $4a^7 + b^7 + 8c^2$ is:

यदि If $a^2 + b^2 + 64c^2 + 16c + 3 = 2(a + b)$ है , तो $4a^7 + b^7 + 8c^2$ का मान ज्ञात कीजिये ?

(A) $3\frac{7}{8}$ (B) $4\frac{7}{8}$ (C) $4\frac{1}{8}$ (D) $5\frac{1}{8}$

8. If $x + y = 1$ and $xy(xy - 2) = 12$, then the value of $x^4 + y^4$ is:

यदि $x + y = 1$ और $xy(xy - 2) = 12$ है , तो $x^4 + y^4$ का मान ज्ञात कीजिये ?

(A) 19 (B) 25
(C) 20 (D) 23

9. If $(27x^3 - 343y^3) \div (3x - 7y) = Ax^2 + By^2 + 7Cyx$, then the value of (4A – B + 5C) is :

यदि $(27x^3 - 343y^3) \div (3x - 7y) = Ax^2 + By^2 + 7Cyx$, है, तो (4A – B + 5C) का मान ज्ञात कीजिये ?

(A) 0 (B) 3
(C) 2 (D) 1

10. If $a^2 + b^2 + c^2 = 21$, and $a + b + c = 7$, then $(ab + bc + ca)$ is equal to:

यदि $a^2 + b^2 + c^2 = 21$, और $a + b + c = 7$ है, तो $(ab + bc + ca)$ का मान ज्ञात कीजिये ?

(A) 12 (B) 28
(C) 14 (D) 8

11. If ab + bc + ca = 8 and $a^2 + b^2 + c^2 = 20$, then a possible value of $\frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$ is:

यदि ab + bc + ca = 8 और $a^2 + b^2 + c^2 = 20$ है, तो $\frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$ का एक संभव मान है:

(A) 72 (B) 56
(C) 84 (D) 80

12. If $(8x^3 - 27y^3) \div (2x - 3y) = (Ax^2 + Bxy + Cy^2)$, then the value of (2A + B – C) is:

यदि $(8x^3 - 27y^3) \div (2x - 3y) = (Ax^2 + Bxy + Cy^2)$ है, तो (2A + B – C) का मान है:

(A) 4 (B) 6
(C) 5 (D) 3

13. If $x = a + \frac{1}{a}$ and $y = a - \frac{1}{a}$ then $\sqrt{x^4 + y^4 - 2x^2y^2}$ is equal to:

यदि $x = a + \frac{1}{a}$ और $y = a - \frac{1}{a}$ है तो $\sqrt{x^4 + y^4 - 2x^2y^2}$ बराबर है:

(A) $16a^2$ (B) 8 (C) $\frac{8}{a^2}$ (D) 4

14. If $2x^2 + y^2 + 6x - 2xy + 9 = 0$, Then the value of $(4x^3 - y^3 + x^2y^2)$ is:

यदि $2x^2 + y^2 + 6x - 2xy + 9 = 0$ है, तो $(4x^3 - y^3 + x^2y^2)$ का मान है:

(A) 0 (B) 9
(C) –3 (D) –9

15. If $x + y = 12$ and $xy = 27$, $x>y$, then the value of $(x^3 - y^3)$ is:

यदि $x + y = 12$ और $xy = 271$, $x> y$, है, तो $(x^3 - y^3)$ का मान है:

(A) 720 (B) 702
(C) 724 (D) 710

16. If $x^2 + y^2 + z^2 = 133$, $xy + yz + zx = 114$ and $xyz = 216$, then the value of $x^3 + y^3 + z^3$ is:

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

(A) 948 (B) 999
(C) 942 (D) 1009

17. If $3\sqrt{3}x^3 - 2\sqrt{2}y^3 = \left(\sqrt{3}x - \sqrt{2}y\right)(Ax^2 By' + Cxy)$, then the value of $(A \times B) \div C$ is:

यदि $3\sqrt{3}x^3 - 2\sqrt{2}y^3 = \left(\sqrt{3}x - \sqrt{2}y\right)(Ax^2+By^2+Cxy)$, तो $(A \times B) \div C$ का मान है:

(A) $6\sqrt{6}$ (B) $6\sqrt{3}$
(C) $\sqrt{3}$ (D) $\sqrt{6}$

18. If $a + \frac{1}{a} = 3$, then $\left(a^4 + \frac{1}{a^4}\right)$ is equal to:

यदि $a + \frac{1}{a} = 3$ है, तो $\left(a^4 + \frac{1}{a^4}\right)$ बराबर है:

(A) 77 (B) 47
(C) 81 (D) 27

19. If $a + b + c = 2$, $a^2 + b^2 + c^2 = 26$, then the value of $a^3 + b^3 + c^3 - 3abc$ is:

यदि $a + b + c = 2$, $a^2 + b^2 + c^2 = 26$, तब $a^3 + b^3 + c^3 - 3abc$ का मान है:

(A) 71 (B) 74
(C) 69 (D) 78

20. If $(x^3 - 2\sqrt{2}\,y^3) \div (x - \sqrt{2}\,y) = (Ax^2+Bxy+Cy^2)$ then, $(2A + 4\sqrt{2}\,B - 4C) = ?$

यदि $(x^3 - 2\sqrt{2}\,y^3) \div (x - \sqrt{2}\,y) = (Ax^2 + Bxy + Cy^2)$ है, तो $(2A + 4\sqrt{2}\,B - 4C) = ?$

(A) 4 (B) 2
(C) 1 (D) 0

21. If $x^4 - 6x^2 - 1 = 0$, then the value of $x^6 - 5x^2 + \frac{5}{x^2} - \frac{1}{x^6} + 5$ is:

यदि $x^4 - 6x^2 - 1 = 0$ है, तो $x^6 - 5x^2 + \frac{5}{x^2} - \frac{1}{x^6} + 5$ का मान है:

(A) 219 (B) 209
(C) 204 (D) 239

22. If $x = 2 - p$, then $x^3 + 6xp + p^3$ is equal to:

यदि $x = 2 - p$ है, तो $x^3+6xp + p^3$ बराबर है:

(A) 12 (B) 6
(C) 8 (D) 4

23. If $9a^2 + 4b^2 + c^2 + 21 = 4(3a + b - 2c)$, then the value of $(9a + 4b - c)$

यदि $9a^2 + 4b^2 + c^2 + 21 = 4(3a + b - 2c)$, तो $(9a + 4b - c)$ का मान है:

(A) 2 (B) 16
(C) 6 (D) 12

24. If $\left(135\sqrt{5}x^3 - 2\sqrt{2}y^3\right) \div \left(3\sqrt{5}x - \sqrt{2}y\right) = Ax^2 + By^2 + \sqrt{10}Cxy$, then the value of $(A + B - 9c)$ is:

यदि $\left(135\sqrt{5}x^3 - 2\sqrt{2}y^3\right) \div \left(3\sqrt{5}x - \sqrt{2}y\right) = Ax^2 + By^2 + \sqrt{10}Cxy$, तो $(A + B - 9c)$ का मान है:

(A) 18 (B) 12
(C) 20 (D) 10

25. If $x^2 - 3x - 1 = 0$, then the value of $(x^2 + 8x - 1)(x^3 + x^{-1})^{-1}$ is

यदि $x^2 - 3x - 1 = 0$, तो $(x^2 + 8x - 1)(x^3 + x^{-1})^{-1}$ का मान है:

(A) $\frac{3}{8}$ (B) 8
(C) 1 (D) 3

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26. If $(8x^3 + 27y^3) \div (2x + 3y) = (Ax^2 + Bxy + Cy^2)$, Then the value of (5A + 4B + 3C) is:
यदि $(8x^3 + 27y^3) \div (2x + 3y) = (Ax^2 + Bxy + Cy^2)$ हो, तो (5A + 4B + 3C) का मूल्य है:
(A) 26 (B) 23
(C) 24 (D) 27

27. If $\frac{6x}{(2x^2+5x-2)} = 1$, x>0, then the value of $x^3 + \frac{1}{x^3}$ is:
यदि $\frac{6x}{(2x^2+5x-2)} = 1$, x>0 हो, तो $x^3 + \frac{1}{x^3}$ का मूल्य है:
(A) $\frac{3}{8}\sqrt{17}$ (B) $\frac{5\sqrt{17}}{8}$
(C) $\frac{5\sqrt{17}}{16}$ (D) $\frac{3}{4}\sqrt{17}$

28. If $4x^2 - 6x + 1 = 0$, then the value of $8x^3 + (8x^3)^{-1}$ is:
यदि $4x^2 - 6x + 1 = 0$ है, तो $8x^3 + (8x^3)^{-1}$ का मान है :
(A) 36 (B) 13
(C) 18 (D) 11

29. If x + y + z = 0, then the value of $(x^2 + y^2 + z^2) \div (z^2 - xy)$ is :
यदि x + y + z = 0 है, तो $(x^2 + y^2 + z^2) \div (z^2 - xy)$ का मान है :
(A) 1 (B) 2
(C) –2 (D) –1

30. If $a^2 + b^2 + c^2 + 27 = 6(a + b + c)$, then what is the value of $\sqrt[3]{a^3+b^3-c^3}$?
यदि $a^2 + b^2 + c^2 + 27 = 6(a + b + c)$ है, तो $\sqrt[3]{a^3+b^3-c^3}$ का मान है :
(A) 3 (B) 1
(C) 9 (D) 6

31. If/यदि $x + \frac{1}{x} = 3$, then/है, तो $x^3 + \frac{1}{x^3}$ is equal to/बराबर है:
(A) 27 (B) 36
(C) 24 (D) 18

32. If/यदि $\sqrt{x} - \frac{1}{\sqrt{x}} = 4$, then/है, तो $x^2 + \frac{1}{x^2}$ is equal to/बराबर है :
(A) 192 (B) 326
(C) 322 (D) 256

33. If a + b + c = 13 and ab + bc + ca = 54, then $a^3 + b^3 + c^3 - 3abc$ is equal to :
यदि a + b + c = 13 और ab + bc + ca = 54 है, तो $a^3 + b^3 + c^3 - 3abc$ किसके बराबर होगा ?
(A) 793 (B) 273
(C) 91 (D) 182

34. If $x + \frac{1}{x} = \sqrt{5}$, then $x^3 + \frac{1}{x^3}$ is equal to :
यदि $x + \frac{1}{x} = \sqrt{5}$ है, तो $x^3 + \frac{1}{x^3}$ बराबर है :
(A) $3\sqrt{5}$ (B) $4\sqrt{5}$
(C) $2\sqrt{5}$ (D) $5\sqrt{5}$

35. If $(3x - 1)^3 + (4x - 3)^3 + (2x + 1)^3 = 3(3x - 1)(4x - 3)(2x + 1)$ and $x \neq \frac{1}{3}$, then x = ?
यदि $(3x - 1)^3 + (4x - 3)^3 + (2x + 1)^3 = 3(3x - 1)(4x - 3)(2x + 1)$ और $x \neq \frac{1}{3}$ है तो x = ?
(A) $\frac{1}{2}$ (B) 2 (C) $\frac{1}{4}$ (D) 1

36. If a + b + c = 11 and ab + bc + ca = 38, then $a^3 + b^3 + c^3 - 3abc$ is equal to :
यदि a + b + c = 11 और ab + bc + ca = 38 है, तो $a^3 + b^3 + c^3 - 3abc$ बराबर है :
(A) 44 (B) 77
(C) 55 (D) 66

37. If/यदि $x - 5\sqrt{x} - 1 = 0$, then/है, तो $x^2 + \frac{1}{x^2}$ is equal to/बराबर है :
(A) 625 (B) 731
(C) 729 (D) 727

38. If/यदि $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{6}$, then/है, तो $x^2 + \frac{1}{x^2}$ is equal to/बराबर है:
(A) 62 (B) 14
(C) 16 (D) 36

39. If a + b + c = 8 and ab + bc + ca = 12, then $a^3 + b^3 + c^3 - 3abc$ is equal to:
यदि a + b + c = 8 तथा ab + bc + ca = 12 हो, तो $a^3 + b^3 + c^3 - 3abc$ बराबर है:
(A) 192 (B) 224
(C) 144 (D) 400

40. If a + b = 5 and ab = 3, then ($a^3 + b^3$) is equal to:
यदि a + b = 5 और ab = 3 है, तो ($a^3 + b^3$) का मान क्या होगा ?
(A) 70 (B) 75
(C) 80 (D) 65

41. If $a + b + c = 6$ and $ab + bc + ca = 4$, then $a^3 + b^3 + c^3 - 3abc$ is equal to:
यदि $a + b + c = 6$ तथा $ab + bc + ca = 4$ है, तो $a^3 + b^3 + c^3 - 3abc$ बराबर होगा ?
(A) 148 (B) 154
(C) 160 (D) 144

42. If $(a + b) = 6$ and $ab = \frac{16}{3}$, then $(a^3 + b^3)$ is equal to:
यदि $(a + b) = 6$ और $ab = \frac{16}{3}$ है, तो $(a^3 + b^3)$ बराबर है ?
(A) 190 (B) 150
(C) 220 (D) 120

43. If $\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{6}$, then $x^2 + \frac{1}{x^2}$ is equal to :
यदि $\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{6}$ है, तो $x^2 + \frac{1}{x^2}$ बराबर है ?
(A) 62 (B) 40
(C) 54 (D) 66

44. If $a + b = 8$ and $ab = \frac{32}{3}$, then $(a^3 + b^3)$ is equal to:
यदि $a + b = 8$ और $ab = \frac{32}{3}$ है, तो $(a^3 + b^3)$ बराबर है:
(A) 256 (B) 128
(C) 320 (D) 384

45. If $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{7}$, then $x^3 + \frac{1}{x^3}$ is equal to :
यदि $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{7}$ है, तो $x^3 + \frac{1}{x^3}$ बराबर है:
(A) 140 (B) 130
(C) 120 (D) 110

46. If $a + b + c = 4$ and $ab + bc + ca = 2$, then $a^3 + b^3 + c^3 - 3abc$ is equal to :
यदि $a + b + c = 4$ और $ab + bc + ca = 2$ है, तो $a^3 + b^3 + c^3 - 3abc$ बराबर है:
(A) 36 (B) 32
(C) 48 (D) 40

47. If (a + b) = 6 and ab = 8, then ($a^3 + b^3$) is equal to:
यदि (a + b) = 6 और ab = 8 है, तो ($a^3 + b^3$) बराबर है :
(A) 216 (B) 108
(C) 144 (D) 72

48. If a + b + c = 6 and ab + bc + ca = 5, then $a^3 + b^3 + c^3 - 3abc$ is equal to :
यदि a + b + c = 6 और ab + bc + ca = 5 है, तो $a^3 + b^3 + c^3 - 3abc$ बराबर है :
(A) 116 (B) 126
(C) 98 (D) 108

49. If/यदि $\sqrt{x} + \frac{1}{\sqrt{x}} = 2\sqrt{2}$, then/है, तो $x^2 + \frac{1}{x^2}$ is equal to/बराबर है :
(A) 34 (B) 64
(C) 36 (D) 32

50. If $\sqrt{x} - \frac{1}{\sqrt{x}} = 2\sqrt{2}$, then $x^2 + \frac{1}{x^2}$ is equal to :
यदि $\sqrt{x} - \frac{1}{\sqrt{x}} = 2\sqrt{2}$ है, तो $x^2 + \frac{1}{x^2}$ बराबर है :
(A) 102 (B) 98
(C) 104 (D) 100

51. If $a + b + c = 6$ and $a^3 + b^3 + c^3 - 3abc = 126$, then ab + bc + ca is equal to :
यदि $a + b + c = 6$ और $a^3 + b^3 + c^3 - 3abc = 126$ है तो ab + bc + ca बराबर है :
(A) 5 (B) 6
(C) 12 (D) 8

52. If a + b = 5 and ab = 3, then ($a^3 + b^3$) is equal to:
यदि a + b = 5 और ab = 3 है तो ($a^3 + b^3$) बराबर है :
(A) 75 (B) 80
(C) 70 (D) 65

53. If a + b + c = 7 and ab + bc + ca = 1, then $a^3 + b^3 + c^3 - 3abc$ is equal to :
यदि a + b + c = 7 तथा ab + bc + ca = 1 है, तो $a^3 + b^3 + c^3 - 3abc$ बराबर है :
(A) 322 (B) 325
(C) 412 (D) 422

54. If a – b = 5 and ab = 2, then $a^3 - b^3$ is equal to:
यदि a – b = 5 तथा ab = 2 है, तो $a^3 - b^3$ बराबर है :
(A) 95 (B) 155
(C) 145 (D) 125

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55. If $\sqrt{x}-\frac{1}{\sqrt{x}}=3\sqrt{2}$, then $x^2+\frac{1}{x^2}$ is equal to :

यदि $\sqrt{x}-\frac{1}{\sqrt{x}}=3\sqrt{2}$ है, तो $x^2+\frac{1}{x^2}$ बराबर है :

(A) 402 (B) 324
(C) 326 (D) 398

56. If (a – b) = 4 and ab = 2, then ($a^3 - b^3$) is equal to:
यदि (a – b) = 4 तथा ab = 2, तो ($a^3 - b^3$) बराबर है :
(A) 92 (B) 88
(C) 84 (D) 80

57. If $\sqrt{x}-\frac{1}{\sqrt{x}}=\sqrt{5}$ then $x^2+\frac{1}{x^2}$ is equal to :

यदि $\sqrt{x}-\frac{1}{\sqrt{x}}=\sqrt{5}$ है, तो $x^2+\frac{1}{x^2}$ बराबर है :

(A) 45 (B) 49
(C) 47 (D) 41

58. If a + b + c = 8 and ab + bc + ca = 20, then $a^3 + b^3 + c^3 - 3abc$ is equal to :
यदि a + b + c = 8 तथा ab + bc + ca = 20, तो $a^3 + b^3 + c^3 - 3abc$ बराबर है :
(A) 30 (B) 24
(C) 32 (D) 36

59. If $\sqrt{x}+\frac{1}{\sqrt{x}}=\sqrt{6}$, then $x^2+\frac{1}{x^2}$ is equal to :

यदि $\sqrt{x}+\frac{1}{\sqrt{x}}=\sqrt{6}$ है, तो $x^2+\frac{1}{x^2}$ बराबर है:

(A) 18 (B) 14
(C) 16 (D) 12

60. If a + b + c = 10 and ab + bc + ca = 32 then $a^3 + b^3 + c^3 - 3abc$ is equal to :
यदि a + b + c = 10 और ab + bc + ca = 32 है, तो $a^3 + b^3 + c^3 - 3abc$ बराबर है:
(A) 50 (B) 40
(C) 60 (D) 70

61. If a – b = 5 and ab = 6, then ($a^3 - b^3$) is equal to:
यदि a – b = 5 तथा ab = 6 है, तो ($a^3 - b^3$) बराबर है:
(A) 225 (B) 155
(C) 90 (D) 215

62. If $x+\frac{1}{x}=5$, then $x^3+\frac{1}{x^3}$ is equal to:

यदि $x+\frac{1}{x}=5$ है, तो $x^3+\frac{1}{x^3}$ का मान है :

(A) 110 (B) 130
(C) 125 (D) 145

63. If $(x-5)^3 + (x-6)^3 + (x-7)^3 = 3(x-5)(x-6)(x-7)$, then what is the value of x?
यदि $(x-5)^3 + (x-6)^3 + (x-7)^3 = 3(x-5)(x-6)(x-7)$ है, तो x का मान क्या है ?
(A) 18 (B) 6
(C) 5 (D) 7

64. If $a^3 - b^3 = 208$ and a – b = 4, then $(a+b)^2 - ab$ is equal to :
यदि $a^3 - b^3 = 208$ और a – b = 4 है, तो $(a+b)^2 - ab$ का मान है :
(A) 32 (B) 38
(C) 52 (D) 42

Solution

1. (D) $\frac{\left(\sqrt{5}x\right)^3-\left(3\sqrt{3}y\right)^3}{\sqrt{5}x-3\sqrt{3}y}$

As we know,

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

here, $a = \sqrt{5}x$

$b = 3\sqrt{3}y$

$$\Rightarrow \frac{\left(\sqrt{5}x\right)^3-\left(3\sqrt{3}y\right)^3}{\sqrt{5}x-3\sqrt{3}y}$$

$$= \left(\sqrt{5}x\right)^2 + \left(3\sqrt{3}y\right)^2 + \sqrt{5}x \times 3\sqrt{3}y$$

$$= 5x^2 + 27y^2 + 3\sqrt{15}xy$$

Comparing it with,

$Ax^2 + By^2 + cxy$

$\Rightarrow a = 5, B = 27, C = 3\sqrt{15}$

$\Rightarrow 6A + B - \sqrt{15}C$

$= 6(5) + 27 - \sqrt{15}\left(3\sqrt{15}\right)$

$= 30 + 27 - 45$

$= 57 - 45 = 12$

2. (A) As we know,

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

Here, $zx = y^2$

$361 = 133 + 2(xy + yz + y^2)$

$228 = 2y(x + y + z)$

$$y = \frac{114}{19} = 6$$

$x + z = 13$

by squaring $(xz = y^2 = (6)^2 = 36)$

$x^2 + z^2 = 97$

By hit and trial $x = 4, z = 9$

Diff. between z and x is = 5

3. (D) $x^4 + \frac{1}{x^4} = 194; \quad x^2 + \frac{1}{x^2} = 14$

$$x + \frac{1}{x} = 4$$

$$x^2 + 1 = 4x$$

$$x^2 - 4x + 4 = 3$$

$$(x-2)^2 = 3$$

4. (D) $(4x)^2 + (3y)^2 + (2z)^2 - 24x + 24y - 24z + 61 = 0$

$[(4x)^2 - 2 \times 4 \times 3x + 9] + [(3y)^2 + 2 \times 3 \times 4y + 16] + [(2z)^2 - 2 \times 2z \times 6 + 36] = 0$

$(4x-3)^2 + (3y-4)^2 + (2z-6)^2 = 0$

$\Rightarrow x = \frac{3}{4}, y = \frac{4}{3}, z = 3$

$\Rightarrow xy + 2z = \frac{3}{4} \times \frac{4}{3} + 2 \times 3$

$= 1 + 6 = 7$

5. (C) As we know,

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

$\sqrt{x^3 + y^3 + z^3} = \sqrt{19(361 - 3 \times 114)}$

$= \sqrt{19(361-342)}$

$= \sqrt{19 \times 19}$

$= 19$

6. (C) $[2(x + y)]^3 - [3(x - y)]^3$

$[2(x + y) - 3(x - y)] \times [4(x - y)^2 + 9(x - y)^2 + 6(x^2 - y^2)]$

$(5y - x)(4x^2 + 4y^2 + 8xy + 9x^2 + 9y^2 - 18xy + 6x^2 - 6y^2)$

$= (5y - x)(19x^2 + 7y^2 - 10xy)$

Acc. to question

$A = 19, B = 7, C = -10$

$A + B + C = 19 + 7 - 10$

$= 16$

7. (D) $(a^2 - 2a + 1) + (b^2 - 2a + 1) + [(8c)^2 + 2(8c)(1) + 1] = 0$

$(a-1)^2 + (b-1)^2 + (8c+1)^2 = 0$

$\Rightarrow a = 1, b = 1, c = -\frac{1}{8}$

$4a^7 + b^7 + 8c^2$

$4(1) + (1) + 8 \times \frac{1}{8 \times 8} \Rightarrow 5 + \frac{1}{8} = \frac{41}{8} = 5\frac{1}{8}$

8. (B) $x + y = 1$

given, $(xy)^2 - 2xy = 12$

$x^4 + y^4 = (x^2 + y^2) - 2x^2y^2$

$= [(x+y)^2 - 2xy]^2 - 2x^2y^2$

$= (1 - 2xy)^2 - 2x^2y^2$

$= 1 - 4xy + 2x^2y^2$

$= 1 + 24 = 25$

9. (C) $\frac{(3x)^3 - (7y)^3}{3x - 7y}$

$= 9x^2 + 49y^2 + 21xy = Ax^2 + By^2 + 7Cyx$

$A = 9, B = 49, 7C = 21$

$C = 3$

$4A - B + 5C = 4(9) - 49 + 5(3)$

$= 36 + 15 - 49$

$= 51 - 49 = 2$

10. (C) As we know,

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

$(7)^2 = 21 + 2(ab + bc + ca)$

$\frac{49-21}{2} = ab + bc + ca$

$\Rightarrow ab + bc + ca = \frac{28}{2} = 14$

11. (A) $ab + bc + ca = 8, a^2 + b^2 + c^2 = 20$

Put $c = 0$

$ab = 8, \quad a^2 + b^2 = 20$

$a + b = 6$

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

$\Rightarrow 6(12 - 8)$

$= 6(12)$

$= 72$

12. (C) $\frac{(2x)^3 - (3y)^3}{2x - 3y} = \frac{(2x - 3y) \times (4x^2 + 9y^2 + 6xy)}{(2x - 3y)}$

$= 4x^2 + 9y^2 + 6xy$

Comparing

$A = 4, B = 6, C = 9$

$\Rightarrow 2A + B - C = 2(4) + 6 - 9$

$= 5$

13. (D) $x = a + \frac{1}{a} \qquad y = a - \frac{1}{a}$

Put $a = 1$

$\Rightarrow x = 2$

$\Rightarrow y = 0$

$\Rightarrow \sqrt{x^4 + y^4 - 2x^2y^2} = \sqrt{2^4} = 4$

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14. (A) $x^2 + x^2 + y^2 + 6x - 2xy + 9 = 0$

$(x^2 + 6x + 9) + (x^2 + y^2 - 2xy) = 0$

$(x + 3)^2 + (x - y)^2 = 0$

$\Rightarrow x = -3 \quad x = y$

$\Rightarrow 4(-3)^3 - (-3)^3 + (-3)^4$

$\Rightarrow -27 \times 3 + 81$

$\Rightarrow 0$

15. (B) $x + y = 12 \qquad xy = 27$

By hit and Trial

$x = 9, y = 3$

$x^3 - y^3 = 9^3 - 3^3$

$= 729 - 27$

$= 702$

16. (D) $x^3 + y^3 + z^3 - 3xyz$

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

$x^3 + y^3 + z^3 - 3 \times 216 = (133 - 114)(x + y + z)$

$\therefore (x + y + z)^2 = 133 + 2(114)$

$= 133 + 228$

$= 361$

$x + y + z = 19$

$x^3 + y^3 + z^3 - 648 = 19 \times 19$

$x^3 + y^3 + z^3 = 361 + 648$

$x^3 + y^3 + z^3 = 1009$

17. (D) $\left(\sqrt{3}x\right)^3 - \left(\sqrt{2}y\right)^3 = \left(\sqrt{3}x - \sqrt{2}y\right)\left(3x^2 + 2y^2 + \sqrt{6}xy\right)$

$= A = 3, B = 2, C =$

$\Rightarrow \frac{A \times B}{C} = \frac{3 \times 2}{\sqrt{6}} = \frac{6}{\sqrt{6}} = \sqrt{6}$

18. (B) $a + \frac{1}{a} = 3; \qquad a^2 + \frac{1}{a^2} = 7$

$a^4 + \frac{1}{a^4} = 49 - 2 = 47$

19. (B) As we know,

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

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

$4 = 26 + 2(ab + bc + ca)$

$ab + bc + ca = -11$

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

$\Rightarrow a^3 + b^3 + c^3 - 3abc = (2)(26 + 11)$

$\Rightarrow 2 \times 37 = 74$

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

by comparing the equ^n

$Ax^2 + Bxy + Cy^2 = x^2 + \sqrt{2}xy + 2y^2$

$A = 1 : B = \sqrt{2}, C = 2$

So $\quad 2A + 4\sqrt{2}B - 4C = 2$

21. (B) Given $x^2 - \frac{1}{x^2} = 6$ then

$x^6 - \frac{1}{x^6} = 234$

$x^6 - \frac{1}{x^6} - 5\left(x^2 - \frac{1}{x^2}\right) + 5$

$= 234 - 5(6) + 5$

$= 209$

22. (C) $x + p = 2$

$x^3 + p^3 + 6xp = 8$

23. (D) $9a^2 + 4b^2 + c^2 + 21 - 12a - 4b + 8c = 0$

$(3a - 2)^2 + (2b - 1)^2 + (c + 4)^2 = 0$

$a = \frac{2}{3}, \; b = \frac{1}{2}, c = -4$

$9a + 4b - c = 12$

24. (C) $\frac{\left(A^3 - B^3\right)}{(A - B)} = A^2 + AB + B^2$

$= \frac{135\sqrt{5}x^3 - 2\sqrt{2}y^3}{\left(3\sqrt{5}x - \sqrt{2}y\right)} = 45x^2 + 2y^2 + 3\sqrt{10}xy$

$A + B - 9C = 47 - 27 = 20$

25. (C) $x^2 - 3x - 1 = 0 \qquad x - \frac{1}{x} = 3$

$\Rightarrow \quad x^2 + \frac{1}{x^2} = 11$

$= \frac{x^2 + 8x - 1}{x^3 + \frac{1}{x}} \Rightarrow \frac{x\left(x - \frac{1}{x} + 8\right)}{x\left(x^2 + \frac{1}{x^2}\right)}$

$\Rightarrow \frac{(3 + 8)}{11} = \frac{11}{11} = 1$

26. (B) $(8x^3 + 27y^3) = Ax^4 + Bxy + Cy^4$

$\Rightarrow \frac{(2x + 3y)\left[(2x)^2 - (2x)(3y) + (3y)^2\right]}{(2x + 3y)}$

$= Ax^4 + Bxy + Cy^4$

$\Rightarrow (4x^2 - 6xy + 9y^2) = Ax^2 + Bxy + cy^2$

comparing both sides, we have

$A = 4, B = b, C = 9$

$\Rightarrow (5A + 4B + 3C) = 5 \times 4 - 4 \times 6 + 3 \times 9$

$= 20 - 24 + 27 = +23$

27. (B) $\frac{6x}{(2x^2+5x-2)} \Rightarrow \frac{2x^2+5x-2}{6x} = 1$

$\Rightarrow \frac{(2x^2-2)}{6x} + \frac{5}{6} = 1$

$\Rightarrow \frac{1}{3}\left(x-\frac{1}{x}\right) = \frac{1}{6}$

$x - \frac{1}{x} = \frac{1}{2} \Rightarrow x + \frac{1}{x} = \sqrt{\frac{1}{4}+4} = \frac{\sqrt{17}}{2}$

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

$= \frac{17}{8}\sqrt{17} - \frac{3}{2}\sqrt{17} = \frac{5}{8}\left(\sqrt{17}\right)$

28. (C) $4x + \frac{1}{x} = 6$

$2x + \frac{1}{2x} = 3$

$8x^3 + \frac{1}{8x^3} + 3 \times 3 = 27$

$8x^3 + \frac{1}{8x^3} = 27 - 9 = 18$

29. (B) $x + y + z = 0$

Put $z = 0$

$x = 1$

$y = -1$

$\frac{x^2+y^2+z^2}{z^2-xy} = \frac{1+1}{+1} = 2$

30.(A) $a^2 + b^2 + c^2 + 27 - 6a - 6b - 6c = 0$

$(a-3)^2 + (b-3)^2 + (c-3)^2 = 0$

$\Rightarrow a = b = c = 3$

$\Rightarrow \sqrt{a^2 + b^2 - c^2} = a = 3$

31. (D) $x + \frac{1}{x} = 3$

$x^3 + \frac{1}{x^3} = 27 - 9 = 18$

32. (C) $\sqrt{x} - \frac{1}{\sqrt{x}} = 4$

$x + \frac{1}{x} = 18$

$x^2 + \frac{1}{x^2} = 322$

33. (C) $a^3 + b^3 + c^3 - 3abc = (13)(169 - 3 \times 54)$

$= (13)(169 - 162)$

$= 13 \times 7 = 91$

34. (C) As we know,

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

$x^3 + \frac{1}{x^3} = \left(\sqrt{5}\right)^3 - 3\sqrt{5} = 5\sqrt{5} - 3\sqrt{5} = 2\sqrt{5}$

35. (B) $a^3 + b^3 + c^3 - 3abc = 0$

$\Rightarrow a + b + c = 0$

$3x - 1 + 4x - 3 + 2x + 1 = 0$

$9x - 3 = 0$

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

but $x \neq \frac{1}{3}$

$\Rightarrow a = b = c$

$3x - 1 = 4x - 3$

$\boxed{x = 2}$

36. (B) $a^3 + b^3 + c^3 - 3abc$

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

$a^3 + b^3 + c^3 - 3abc = (11)(121 - 3 \times 38)$

$= (11)(121 - 114)$

$= 11 \times 7 = 77$

37. (D) $x - 5\sqrt{x} = 1$

Divide by $\sqrt{x}$

$\sqrt{x} - 5 = \frac{1}{\sqrt{x}}$

$\sqrt{x} - \frac{1}{\sqrt{x}} = 5$

$x + \frac{1}{x} = 27$

$x^2 + \frac{1}{x^2} = 729 - 2$

$= 727$

38. (B) $x + \frac{1}{x} = 4$; $x^2 + \frac{1}{x^2} = 14$

39. (B) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$(8)^2 = a^2 + b^2 + c^2 + 2(12)$

$\Rightarrow a^2 + b^2 + c^2 = 64 - 24 = 40$

$a^3 + b^3 + c^3 - 3abc$

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

$a^3 + b^3 + c^3 - 3abc = (8)[40 - 12]$

$= 8[40 - 12]$

$= 8 \times 28 = 224$

40. (C) As we know,

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

$a^3 + b^3 = (5)^3 - 3 \times 3 \times 5$

$= 125 - 45 = 80$

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41. (D) As we know,

$a^3 + b^3 + c^3 - 3abc$

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

$a^3 + b^3 + c^3 - 3abc = (6)(36 - 3 \times 4)$

$= 6(36 - 12)$

$= 6 \times 24 = 144$

42. (D) As we know

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

$a^3 + b^3 = (6)^3 - 3 \times \frac{16}{3} \times 6$

$= 216 - 96$

$= 120$

43. (A) $\sqrt{x} - \frac{1}{\sqrt{x}} = \sqrt{6}$

$x + \frac{1}{x} = 8$

$x^2 + \frac{1}{x^2} = 62$

44. (A) $a^3 + b^3 = (a + b)^3 - 3ab(a + b)$

$= (8)^3 - 3 \times \frac{32}{3}(8)$

$= 512 - 32 \times 8$

$= 512 - 256 = 256$

45. (D) $\sqrt{x} + \frac{1}{\sqrt{x}} = \sqrt{7}$

$x + \frac{1}{x} = 5$

$x^3 + \frac{1}{x^3} = 125 - 3 \times 5 = 110$

46. (D) $a^3 + b^3 + c^3 - 3abc$

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

$a^3 + b^3 + c^3 - 3abc$

$= (4)(16 - 3 \times 2)$

$= 4(10) = 40$

47. (D) As we know,

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

$a^3 + b^3 = (6)^3 - 3 \times 8 \times 6$

$= 216 - 144$

$= 72$

48. (B) $a^3 + b^3 + c^3 - 3abc$

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

$a^3 + b^3 + c^3 - 3abc = (6)(36 - 3 \times 5)$

$= 6 \times 21$

$= 126$

49. (A) $x + \frac{1}{x} = 6 \Rightarrow x^2 + \frac{1}{x^2} = 34$

50. (B) $\sqrt{x} - \frac{1}{\sqrt{x}} = 2\sqrt{2}$

$x + \frac{1}{x} = 8 + 2 = 10$

$x^2 + \frac{1}{x^2} = 98$

51. (A) As we know,

$a^3 + b^3 + c^3 - 3abc$

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

$126 = (6)[36 - 3(ab + bc + ca)]$

$21 = 36 - 3(ab + bc + ca)$

$\Rightarrow ab + bc + ca = \frac{15}{3} = 5$

52. (B) As we know,

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

$a^3 + b^3 = (5)^3 - 3 \times 3 \times 5$

$= 125 - 45$

$= 80$

53. (A) As we know,

$a^3 + b^3 + c^3 - 3abc$

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

$a^3 + b^3 + c^3 - 3abc = (7)(49 - 3 \times 1)$

$= 7 \times 46 = 322$

54. (B) As we know,

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

$a^3 - b^3 = (5)^3 + 3 \times 2 \times 5$

$= 125 + 30 = 155$

55. (D) Given

$\sqrt{x} - \frac{1}{\sqrt{x}} = 3\sqrt{2}$

Squaring both side

$x + \frac{1}{x} - 2 = 18$

$\Rightarrow x + \frac{1}{x} = 20$

Squaring both side

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 400$

$\Rightarrow x^2 + \frac{1}{x^2} = 398$

56. (B) $a^3 - b^3 = (a - b)^3 + 3ab(a - b)$

$= 64 + 3(2)(4)$

$= 64 + 24 \rightarrow 88$

57. (C) $\sqrt{x}-\frac{1}{\sqrt{x}}=\sqrt{5}$

Squaring both sides

$$x+\frac{1}{x} = 7$$

Again squaring both sides

$$x^2+\frac{1}{x^2} = 47$$

58. (C) $a + b + c = 8$

$ab + bc + ca = 20$

$a^3 + b^3 + c^3 - 3abc$

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

$a^3 + b^3 + c^3 - 3abc = (8)(64 - 3(20))$

$= 8 + 4 = 32$

59. (B) $\sqrt{x}+\frac{1}{\sqrt{x}}=\sqrt{6}$

$$x+\frac{1}{x} = 4$$

$$x^2+\frac{1}{x^2} = 14$$

60. (B) As we know,

$a^3 + b^3 + c^3 - 3abc$

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

$a^3 + b^3 + c^3 - 3abc = 10\,(10^2 - 3 \times 32)$

$= 10\,(100 - 96)$

$= 40$

61. (D) Put a = 6, b = 1

$6^3 - 1^3 = 216 - 1$

$= 215$

62. (A) As we know,

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

$$x+\frac{1}{x} = 5$$

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

$= 125 - 15 = 110$

63. (B) Here $a^3 + b^3 + c^3 - 3abc = 0$

$\Rightarrow a + b + c = 0$

here, $a = x - 5$

$b = x - 6$

$c = x - 7$

$\Rightarrow x - 5 + x - 6 + x - 7 = 0$

$\Rightarrow 3x - 18 = 0$

$\Rightarrow x = 6$

64. (C) Put a = 6, b = 2

$\Rightarrow (8)^2 - 6 \times 2 \rightarrow 64 - 12$

$\Rightarrow 52$

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ALGEBRA
बीजगणित

(SSC CGL (PRE) - 2018)

(Previous Year Questions)

1. If $x = \frac{2+\sqrt{3}}{2-\sqrt{3}}$, then what is the value of $x + \frac{1}{x}$?

यदि $x = \frac{2+\sqrt{3}}{2-\sqrt{3}}$, तो $x + \frac{1}{x}$ का मान क्या है?

(A) 14 (B) $8\sqrt{3}$

(C) 0 (D) 18

2. If $x=2+\sqrt{3}$, then what is the value of $\sqrt{2x} + \frac{1}{\sqrt{2x}}$?

यदि $x= 2+\sqrt{3}$, तो $\sqrt{2x} + \frac{1}{\sqrt{2x}}$ का मान क्या है?

(A) $2\sqrt{3}$ (B) $3\sqrt{3}$

(C) $(3\sqrt{3}+1)/2$ (D) $2\sqrt{3}+1$

3. If $x+\frac{1}{x} = 4$, then what is the value of $x^6+\frac{1}{x^6}$?

यदि $x+\frac{1}{x} = 4$, तो $x^6+\frac{1}{x^6}$ का मान क्या है?

(A) 52 (B) 256

(C) 1026 (D) 2707

4. If $y = \frac{2-x}{1+x}$, then what is the value of $\frac{1}{y+1} + \frac{2y+1}{y^2-1}$?

यदि $y = \frac{2-x}{1+x}$, है तो $\frac{1}{y+1} + \frac{2y+1}{y^2-1}$ का मान क्या होगा?

(A) $\frac{(1+x)(2-x)}{2x-1}$ (B) $\frac{(1-x)(2+x)}{x-1}$

(C) $\frac{(1+x)(2-x)}{1-2x}$ (D) $\frac{(1+x)(1-2x)}{2-x}$

5. What is the difference of the cube and square of the common root of $(x^2 - 8x + 15) = 0$ and $(y^2 + 2y - 35) = 0$?

$(x^2 - 8x + 15) = 0$ तथा $(y^2 + 2y - 35) = 0$ के उभयनिष्ठ शून्य के घन तथा वर्ग के बीच का अंतर क्या होगा?

(A) 76 (B) 100

(C) 294 (D) 318

6. If $\left(x-\frac{1}{3}\right)^2 + (y-4)^2 = 0$, then find $\frac{y+x}{y-x}$.

यदि $\left(x-\frac{1}{3}\right)^2 + (y-4)^2 = 0$ है तो $\frac{y+x}{y-x}$ का मान ज्ञात करें।

(A) $\frac{11}{13}$ (B) $\frac{13}{11}$ (C) $\frac{16}{9}$ (D) $\frac{9}{16}$

7. What is the difference of the factors of the expression $x^2 + \left(\frac{1}{x^2}\right) - 6$?

व्यंजक $x^2 + \left(\frac{1}{x^2}\right) - 6$ के गुणनखंडों का अंतर क्या है?

(A) 0 (B) 1

(C) 2 (D) 4

8. If $x + (1/x) = \sqrt{13}$, then what is the value of $x^5 - \frac{1}{x^5}$?

यदि $x + (1/x) = \sqrt{13}$ तो $x^5 - \frac{1}{x^5}$ का मान ज्ञात कीजिए।

(A) 169 (B) $169\sqrt{3}$

(C) 393 (D) 507

9. If $a^3 + b^3 = 35$ and $ab = 6$, then what is the value of $a + b$?

यदि $a^3 + b^3 = 35$ और $ab = 6$ है, तो $a + b$ का मान क्या है?

(A) 5 (B) 8

(C) 2 (D) -8

10. If $(x-2)^2 + (y+3)^2 + (z-15)^2 = 0$, then what is the value of $x + y + z - 5$?
यदि $(x-2)^2 + (y+3)^2 + (z-15)^2 = 0$ है, तो $x + y + z - 5$ का क्या मान है?
(A) 5 (B) 9
(C) 15 (D) 20

11. If $a^3 + b^3 = 28$ and $a + b = 4$, then what is the value of ab?
यदि $a^3 + b^3 = 28$ और $a + b = 4$ है, तो ab का मान क्या है?
(A) –3 (B) 2
(C) 8 (D) 3

12. If $x + \left(\frac{1}{x}\right) = 2$, then what is the value of $x^{64} + \frac{1}{x^{121}}$?
यदि $x + \left(\frac{1}{x}\right) = 2$, तो $x^{64} + \frac{1}{x^{121}}$ का मान क्या होगा?
(A) 0 (B) 1
(C) 2 (D) –2

13. If $x = 6 + 2\sqrt{6}$, then what is the value of $\sqrt{x-1} + \frac{1}{\sqrt{x-1}}$?
यदि $x = 6 + 2\sqrt{6}$, तो $\sqrt{x-1} + \frac{1}{\sqrt{x-1}}$ का मान क्या है?
(A) $2\sqrt{3}$ (B) $3\sqrt{2}$
(C) $2\sqrt{2}$ (D) $3\sqrt{3}$

14. If $a + b + c = 27$, then what is the value of $(a-7)^3 + (b-9)^3 + (c-11)^3 - 3(a-7)(b-9)(c-11)$?
यदि $a + b + c = 27$, $(a-7)^3 + (b-9)^3 + (c-11)^3 - 3(a-7)(b-9)(c-11)$ का मान क्या है?
(A) 0 (B) 9
(C) 27 (D) 81

15. If $(x^2/yz) + (y^2/zx) + (z^2/xy) = 3$, then what is the value of $(x + y + z)^3$?
यदि $(x^2/yz) + (y^2/zx) + (z^2/xy) = 3$ है, तो $(x + y + z)^3$ का मान क्या होगा?
(A) 0 (B) 1
(C) 2 (D) 3

16. If $x^{1/4} + x^{-1/4} = 2$, then what is the value of $x^{81} + \frac{1}{x^{81}}$?
यदि If $x^{1/4} + x^{-1/4} = 2$ है, तो $x^{81} + \frac{1}{x^{81}}$ का मान क्या होगा?
(A) -2 (B) 0
(C) 1 (D) 2

17. If $a(a + b + c) = 45$, $b(a + b + c) = 75$ and $c(a + b + c) = 105$, then what is the value of $(a^2 + b^2 + c^2)$?
यदि $a(a + b + c) = 45$, $b(a + b + c) = 75$ तथा $c(a + b + c) = 105$ है,तो $(a^2 + b^2 + c^2)$ का मान क्या होगा?
(A) 75 (B) 83
(C) 217 (D) 225

18. If $x^2 + \frac{1}{x^2} = 1$, then what is the value of $x^{48} + x^{42} + x^{36} + x^{30} + x^{24} + x^{18} + x^{12} + x^6 + 1$?
यदि $x^2 + \frac{1}{x^2} = 1$ है, तो $x^{48} + x^{42} + x^{36} + x^{30} + x^{24} + x^{18} + x^{12} + x^6 + 1$ का मान क्या होगा?
(A) -9 (B) 0
(C) 1 (D) 9

19. If $\frac{11-13x}{x} + \frac{11-13y}{y} + \frac{11-13z}{z} = 5$, then what is the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$?
यदि $\frac{11-13x}{x} + \frac{11-13y}{y} + \frac{11-13z}{z} = 5$ है,तो $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ का मान क्या है?
(A) 1 (B) 13/11
(C) 13/5 (D) 4

20. If $2x + (9/x) = 9$, then what is the minimum value of $x^2 + (1/x^2) = ?$
यदि $2x + (9/x) = 9$, तो $x^2 + (1/x^2)$ का न्यूनतम मान क्या होगा?
(A) 95/36 (B) 97/36
(C) 86/25 (D) 623/27

21. If $(5x - y)/(5x + y) = 3/7$, then what is the value of $(4x^2 + y^2 - 4xy)/(9x^2 + 16y^2 + 24xy)$?
यदि $(5x - y)/(5x + y) = 3/7$,तो$(4x^2 + y^2 - 4xy)/(9x^2 + 16y^2 + 24xy)$ का मान क्या होगा?
(A) 0 (B) 3/7
(C) 18/49 (D) 1/6

22. If $(x + y)^2 = xy + 1$ and $x^3 - y^3 = 1$, then what is the value of $x - y$?
यदि $(x + y)^2 = xy + 1$ तथा $x^3 - y^3 = 1$, तो $x - y$ का मान क्या होगा?
(A) 1 (B) 0
(C) -1 (D) 2

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23. If $(x-2)$ and $(x+3)$ are the factors of the equation $x^2 + k_1x + k_2 = 0$, then what are the values of k_1 and k_2?
यदि समीकरण $x^2 + k_1x + k_2 = 0$ के गुणनखण्ड $(x-2)$ तथा $(x+3)$ हैं, तो k_1 तथा k_2 का मान क्या है ?
(A) $k_1 = 6, k_2 = -1$ (B) $k_1 = 1, k_2 = -6$
(C) $k_1 = 1, k_2 = 6$ (D) $k_1 = -6, k_2 = 1$

24. If $(x-y) = 7$, then what is the value of $(x-15)^3 - (y-8)^3$?
यदि $(x-y) = 7$ हो, तो $(x-15)^3 - (y-8)^3$ का मान क्या है ?
(A) 0 (B) 343
(C) 392 (D) 2863

25. The value of $\sqrt{-\sqrt{3} + \sqrt{3 + 8\sqrt{7 + 4\sqrt{3}}}}$.
$\sqrt{-\sqrt{3} + \sqrt{3 + 8\sqrt{7 + 4\sqrt{3}}}}$ का मान क्या होगा ?
(A) 2 (B) 3
(C) $\sqrt{2}$ (D) $2\sqrt{3}$

26. If $p/q = r/s = t/u = \sqrt{5}$, then what is the value of $[(3p^2 + 4r^2 + 5t^2)/(3q^2 + 4s^2 + 5u^2)]$?
यदि $p/q = r/s = t/u = \sqrt{5}$ हो, तो $[(3p^2 + 4r^2 + 5t^2)/(3q^2 + 4s^2 + 5u^2)]$ का मान क्या है ?
(A) 1/5 (B) 5
(C) 25 (D) 60

27. If $(1/x) + (1/y) + (1/z) = 0$ and $x + y + z = 9$, then what is the value of $x^3 + y^3 + z^3 - 3xyz$?
यदि $(1/x) + (1/y) + (1/z) = 0$ तथा $x + y + z = 9$ है,तो $x^3 + y^3 + z^3 - 3xyz$ का मान क्या होगा ?
(A) 81 (B) 361
(C) 729 (D) 6561

28. If $x^4 + (1/x^4) = 34$, then what is the value of $x^3 - (1/x^3)$?
यदि $x^4 + (1/x^4) = 34$, तो $x^3 - (1/x^3)$ का मान क्या होगा ?
(A) 0 (B) 6
(C) 8 (D) 14

29. If $x = 1 - y$ and $x^2 = 2 - y^2$, then what is the value of xy?
यदि $x = 1 - y$ तथा $x^2 = 2 - y^2$,तो xy का मान क्या होगा ?
(A) 1 (B) 2
(C) $-1/2$ (D) -1

30. If $x + [1/(x+7)] = 0$, then what is the value of $x - [1/(x+7)]$?
यदि $x + [1/(x+7)] = 0$ है, तो $x - [1/(x+7)]$ का मान क्या होगा ?
(A) $3\sqrt{5}$ (B) $3\sqrt{5} - 7$
(C) $3\sqrt{5} + 7$ (D) 8

31. If $4^{(x+y)} = 256$ and $(256)^{(x-y)} = 4$, then what is the value of x and y?
यदि $4^{(x+y)} = 256$ तथा $(256)^{(x-y)} = 4$ है, तो, x तथा y का मान क्या होगा ?
(A) 17/8, 15/8 (B) 17/4, 15/4
(C) 9/17, 15/17 (D) 8/17, 8/15

32. If the expression $px^3 - qx^2 - 7x - 6$ is completely divisible by $x^2 - x - 6$, then what is the value of p and q respectively?
यदि व्यंजक $px^3 - qx^2 - 7x - 6$, $x^2 - x - 6$ से पूर्णत: विभाजित होता है, तो क्रमश: p तथा q का मान क्या है ?
(A) 0, 1 (B) 1, 0 (C) 2, 1 (D) 1, 2

33. If the expression $px^3 - 2x^2 - qx + 18$ is completely divisible by $(x^2 - 9)$, then what is the ratio between p and q respectively?
यदि व्यंजक $px^3 - 2x^2 - qx + 18$, $(x^2 - 9)$ से पूर्णत: विभाजित है, तो क्रमश: p तथा q के बीच का अनुपात क्या होगा ?
(A) 1:9 (B) 1:3 (C) 3:1 (D) 9:1

34. If $x + \frac{1}{x} = 5$, then what is the value of $x^5 + \frac{1}{x^5}$?
यदि $x + \frac{1}{x} = 5$, तो $x^5 + \frac{1}{x^5}$ का मान क्या है ?
(A) 1875 (B) 2525
(C) 2530 (D) 3120

35. If $(x/y)^{a-4} = (y/x)^{2a-5}$, then what is the relation between x and y?
यदि $(x/y)^{a-4} = (y/x)^{2a-5}$ है, तो x तथा y के बीच क्या संबंध होगा ?
(A) $x > y$
(B) Cannot be determined/ज्ञात नहीं किया जा सकता
(C) $x < y$
(D) $x = y$

36. If $3a - (3/a) - 3 = 0$, then what is the value of $a^3 - (1/a^3) + 2$?
यदि $3a - (3/a) - 3 = 0$ है, तो $a^3 - (1/a^3) + 2$ का मान क्या है ?
(A) 0 (B) 2
(C) 4 (D) 6

37. $5(x^2+y^2+z^2) = 4(xy+yz+zx)$ then $x+y+z = ?$
$5(x^2+y^2+z^2) = 4(xy+yz+zx)$ है, तो $x+y+z = ?$
(A) 1 (B) 0
(C) 5 (D) 4

38. If $x^3 + 2x^2 - 5x + k$ is divisible by $x + 1$, then what is the value of k?
यदि $x^3 + 2x^2 - 5x + k$, $x + 1$ से विभाजित होता है, तो K का मान क्या है ?
(A) – 6 (B) – 1
(C) 0 (D) 6

39. If $3x + [1/(5x)] = 7$, then what is the value of $5x/(15x^2 + 15x + 1)$?
यदि $3x + [1/(5x)] = 7$ तो $5x/(15x^2 + 15x + 1)$ का मान क्या होगा ?
(A) 1/5 (B) 1/10
(C) 2/5 (D) 10

40. If $x + [1/(4x)] = 5/2$, then what is the value of $(64x^6 + 1)/8x^3$?
यदि $x + [1/(4x)] = 5/2$ तो $(64x^6 + 1)/8x^3$ का मान क्या होगा ?
(A) 110 (B) 115
(C) 125 (D) 140

41. If $x^2 + x = 19$, then what is the value of $(x + 5) + [1/(x + 5)]$?
यदि $x^2 + x = 19$ है, तो $(x + 5) + [1/(x + 5)]$ का मान क्या होगा ?
(A) 7 (B) 9
(C) 8 (D) 3

42. If $\frac{a}{1-a}+\frac{b}{1-b}+\frac{c}{1-c}=2$ than what the value of $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}=?$

यदि $\frac{a}{1-a}+\frac{b}{1-b}+\frac{c}{1-c}$ तो $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}$ का मान क्या होगा ?
(A) 0 (B) 5
(C) -5 (D) 1

43. If α and β are roots of the equation $3x^2 - 13x + 14 = 0$, then what is the value of $(\alpha/\beta) + (\beta/\alpha)$?
यदि α तथा β है, तो व्यंजक $3x^2 - 13x + 14 = 0$, तो $(\alpha/\beta) + (\beta/\alpha)$ का मान क्या है ?
(A) 65/28 (B) 53/14
(C) 9 (D) 85/42

44. If $a + b + c = 9$ and $ab + bc + ca = 18$, then what is the value of $a^3 + b^3 + c^3 - 3abc$?
यदि $a + b + c = 9$ तथा $ab + bc + ca = 18$, तो $a^3 + b^3 + c^3 - 3abc$ का मान क्या है ?
(A) 189 (B) 243
(C) 361 (D) 486

45. If $(x/y) + (y/x) = 1$, then what is the value of $x^3 + y^3$?
यदि $(x/y) + (y/x) = 1$ है, तो $x^3 + y^3$ का मान क्या है ?
(A) - 1 (B) 0
(C) 1 (D) 3

46. If $5^x = 30^y = 6^z$, then what is the value of $(xy + yz + zx)/xyz$?
यदि $5^x = 30^{-y} = 6^z$ तो $(xy + yz + zx)/xyz$ का मान क्या है ?
(A) 0 (B) 1 (C) 2 (D) 3

47. What is the value of $\frac{1}{x^{(p-q)}+1}+\frac{1}{x^{(q-p)}+1}$?

$\frac{1}{x^{(p-q)}+1}+\frac{1}{x^{(q-p)}+1}$ का मान क्या है ?
(A) 0 (B) 1
(C) $x^{(p-q)}$ (D) $x^{(p+q)}$

48. If $x = 8 + 2\sqrt{15}$, then what is the value of $\sqrt{x}+\frac{1}{\sqrt{x}}$?

यदि $x = 8 + 2\sqrt{15}$ तो $\sqrt{x}+\frac{1}{\sqrt{x}}$ का मान क्या है ?
(A) $2\sqrt{5}$ (B) $2\sqrt{3}$
(C) $(3\sqrt{5} + \sqrt{3})/2$ (D) $(3\sqrt{3} - \sqrt{5})/2$

49. What is the value of $\frac{1+a}{a^{1/2}+a^{-1/2}}-\frac{a^{1/2}+a^{-1/2}}{1+a}+a^{-1/2}$?

$\frac{1+a}{a^{1/2}+a^{-1/2}}-\frac{a^{1/2}+a^{-1/2}}{1+a}+a^{-1/2}$ का मान क्या है ?
(A) $\sqrt{a}$ (B) $1/\sqrt{a}$
(C) $\sqrt{a} + 1$ (D) $\sqrt{a} - 1$

50. If $\frac{p}{q}=\frac{x+3}{x-3}$, then what is the value of $\frac{p^2+q^2}{p^2-q^2}$?

यदि $\frac{p}{q}=\frac{x+3}{x-3}$ तो $\frac{p^2+q^2}{p^2-q^2}$ का मान क्या है ?
(A) $\frac{x^2+9}{3x}$ (B) $\frac{x^2+18}{6x}$ (C) $\frac{x^2+18}{3x}$ (D) $\frac{x^2+9}{6x}$

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51. For what value of k, the expression $x^6 - 18x^3 + k$ will be a perfect square?
K के किस मान के लिए व्यंजक $x^6 - 18x^3 + k$ एक पूर्ण वर्ग होगा ?
(A) – 9 (B) – 81
(C) + 9 (D) + 81

52. If $\frac{\sqrt{5+x}+\sqrt{5-x}}{\sqrt{5+x}-\sqrt{5-x}}=3$, then what is the value of x?
यदि $\frac{\sqrt{5+x}+\sqrt{5-x}}{\sqrt{5+x}-\sqrt{5-x}}=3$ है, तो x का मान क्या है ?
(A) 5/2 (B) 25/3
(C) 4 (D) 3

53. If (x + y + z) = 12, xy + yz + zx = 44 and xyz = 48, then what is the value of $x^3 + y^3 + z^3$?
यदि (x + y + z) = 12, xy + yz + zx = 44 तथा xyz = 48 है, तो $x^3 + y^3 + z^3$ का मान क्या है ?
(A) 104 (B) 144
(C) 196 (D) 288

54. If $x = \frac{4\sqrt{ab}}{\sqrt{a}+\sqrt{b}}$, then what is the value of $\frac{x+2\sqrt{a}}{x-2\sqrt{a}}+\frac{x+2\sqrt{b}}{x-2\sqrt{b}}$ (when $a \neq b$)?
यदि $x = \frac{4\sqrt{ab}}{\sqrt{a}+\sqrt{b}}$ हो, तो $\frac{x+2\sqrt{a}}{x-2\sqrt{a}}+\frac{x+2\sqrt{b}}{x-2\sqrt{b}}$ का मान क्या है (जब $a \neq b$ हो) ?
(A) 0 (B) 2
(C) 4 (D) $\frac{\left(\sqrt{a}+\sqrt{b}\right)}{\left(\sqrt{a}-\sqrt{b}\right)}$

55. If $x(2x + 3) = 90$ and $7y^{-1/2} + 2y^{-1/2} = y^{1/2}$ (x and y are positive numbers), then what is the value of $x^2 + y^2$?
यदि $x(2x + 3) = 90$ तथा $7y^{-1/2} + 2y^{-1/2} = y^{1/2}$ (x तथा y धनात्मक संख्या है), तो $x^2 + y^2$ का मान क्या होगा ?
(A) 45 (B) 109
(C) 117 (D) 126

56. If x/y = 4/9, then what is the value of $(7x^2 - 19xy + 11y^2)/y^2$?
यदि x/y = 4/9, तो $(7x^2 - 19xy + 11y^2)/y^2$ का मान क्या होगा ?
(A) 59/81 (B) 100/27
(C) 319/81 (D) 913/81

57. If $x - 3 + [1/(x-3)] = 4$ what is the value of $(x-3)^3 + [1/(x-3)^3]$?
यदि $x - 3 + [1/(x-3)] = 4$ $(x-3)^3 + [1/(x-3)^3]$ का मान क्या होगा ?
(A) 14 (B) 18
(C) 52 (D) 76

58. If $x^2 + y^2 + z^2 = xy + yz + zx$, then what is the value of $(7x + 3y - 5z)/5x$?
यदि $x^2 + y^2 + z^2 = xy + yz + zx$ तो $(7x + 3y - 5z)/5x$ का मान क्या होगा ?
(A) 0 (B) 1
(C) 5 (D) 33/5

59. If a + b + c = 11 and ab + bc + ca = 17, then what is the value of $a^3 + b^3 + c^3 - 3abc$?
यदि a + b + c = 11 तथा ab + bc + ca = 17 है, तो $a^3 + b^3 + c^3 - 3abc$ का मान क्या होगा ?
(A) 121 (B) 168
(C) 300 (D) 770

60. If $x^4 + \frac{1}{x^4} = 62$, then what is the value of $x^6 + \frac{1}{x^6}$?
यदि $x^4 + \frac{1}{x^4} = 62$ है, तो $x^6 + \frac{1}{x^6}$ का मान क्या है ?
(A) 144 (B) 288
(C) 396 (D) 488

61. If x + y = 4, then what is the value of $\frac{2}{x-2}+\frac{2}{y-2}$?
यदि x + y = 4, है, तो $\frac{2}{x-2}+\frac{2}{y-2}$ का मान क्या होगा ?
(A) -1 (B) 0
(C) 4 (D) 16

62. If (x/5) + (5/x) = - 2, then what is the value of x^3?
यदि (x/5) + (5/x) = - 2 है, तो x^3 का मान क्या होगा ?
(A) -125 (B) 5
(C) 1/125 (D) 625

63. If $x + (1/x) = 2$, then what is the value of $x^{21} + (1/x^{1331})$?
यदि $x + (1/x) = 2$, तो $x^{21} + (1/x^{1331})$ का मान क्या होगा ?
(A) 0 (B) 1
(C) 2 (D) 4

64. If $x^3-y^3 = 81$ and $x-y = 3$, then what is the value of $x^2 + y^2$?
यदि $x^3-y^3 = 81$ तथा $x-y = 3$, $x^2 + y^2$ का मान क्या होगा ?
(A) 18 (B) 21
(C) 27 (D) 36

65. If $\sqrt{5x-6} + \sqrt{5x+6} = 6$, then what is the value of x?
यदि $\sqrt{5x-6} + \sqrt{5x+6} = 6$, तो x का मान क्या है ?
(A) -4 (B) 0
(C) 2 (D) 4

66. If $2x + \frac{1}{2x} = 2$, then what is the value of $\sqrt{2\left(\frac{1}{x}\right)^4 + \left(\frac{1}{x}\right)^5}$?
यदि $2x + \frac{1}{2x} = 2$, तो $\sqrt{2\left(\frac{1}{x}\right)^4 + \left(\frac{1}{x}\right)^5}$ का मान क्या है ?
(A) 1 (B) 2
(C) 4 (D) 8

67. When $[x + (1/x)] = 5$, then what is the value of $[x-(1/x)]$?
जब $[x + (1/x)] = 5$ है, तो $[x-(1/x)]$ का मान क्या है ?
(A) 11 (B) $+\sqrt{22}$
(C) 21 (D) $\pm\sqrt{21}$

68. If $x = (\sqrt{2}+1)/(\sqrt{2}-1)$, then what is the value of $(x^5 + x^4 + x^2+x)/x^3$?
यदि $x = (\sqrt{2}+1)/(\sqrt{2}-1)$ है, तो $(x^5 + x^4 + x^2+x)/x^3$ का मान क्या है ?
(A) 40 (B) 37.5
(C) 38 (D) $20\sqrt{2}$

69. If $x = 5 - 2\sqrt{6}$, then what is the value of $\sqrt{x} + \frac{1}{\sqrt{x}}$?
यदि $x = 5 - 2\sqrt{6}$ है, तो $\sqrt{x} + \frac{1}{\sqrt{x}}$ का मान क्या है ?
(A) 5 (B) 2
(C) $2\sqrt{3}$ (D) $2\sqrt{2}$

70. If $27^x + 27^{|x-(1/3)|} = 972$, then what is the value of x ?
यदि $27^x + 27^{[x-(1/3)]} = 972$ है, तो x का मान क्या है ?
(A) 2 (B) 3
(C) 4 (D) 5

71. If a = 73, b = 74 and c = 75, then what is the value of $a^3 + b^3 + c^3 - 3abc$?
यदि a = 73, b = 74 तथा c = 75, तो $a^3 + b^3 + c^3 - 3abc$ का मान क्या होगा ?
(A) 365 (B) 444
(C) 666 (D) 999

72. If $x^2 + (1/x^2) = 31/9$ and $x > 0$, then what is the value of $x^3 + (1/x^3)$?
यदि $x^2 + (1/x^2) = 31/9$ तो $x^3 + (1/x^3)$ का मान क्या होगा ?
(A) 70/9 (B) 154/27
(C) 349/27 (D) 349/7

73. What is the value of
$\left(\frac{x^2-5x+6}{x^2-3x+2}\right) \div \left(\frac{x^2-7x+12}{x^2-5x+4}\right)$?
$\left(\frac{x^2-5x+6}{x^2-3x+2}\right) \div \left(\frac{x^2-7x+12}{x^2-5x+4}\right)$ का मान क्या है ?
(A) 1 (B) 2
(C) (x-2)/(x-1) (D) (x + 3)/(x +1)

74. If $x - (1/x) = 3$, then what is the value of $(2x^4+3x^3+13x^2-3x+2)/(3x^4+3)$?
यदि $x - (1/x) = 3$, तो $(2x^4+3x^3+13x^2-3x+2)/(3x^4+3)$ इसका मान क्या होगा ?
(A) 1/3 (B) 2/3
(C) 4/3 (D) 5/3

75. If $x + y = 5$, $x^3 + y^3 = 35$, then what is the positive difference between x and y ?
यदि $x + y = 5$, $x^3 + y^3 = 35$, तो x तथा y का धनात्मक अंतर कितना है ?
(A) 0 (B) 1
(C) 5 (D) 6

76. If $x = \sqrt{\frac{2+\sqrt{3}}{2-\sqrt{3}}}$, then what is the value of $x^2 + x - 9$
यदि $x = \sqrt{\frac{2+\sqrt{3}}{2-\sqrt{3}}}$, तो $x^2 + x - 9$ का मान क्या है ?
(A) 0 (B) $3\sqrt{2}$
(C) $3\sqrt{3}$ (D) $5\sqrt{3}$

77. If $x + y + z = 0$, then what is the value of
$\frac{x^2}{3z} + \frac{y3}{3xz} + \frac{z^2}{3x}$?

यदि $x + y + z = 0$, तो $\frac{x^2}{3z} + \frac{y3}{3xz} + \frac{z^2}{3x}$ का मान क्या है ?

(A) 0 (B) xz

(C) y (D) 3y

78. If $x - \frac{1}{x} = 1$ then what is the value of

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

यदि $x - \frac{1}{x} = 1$, तो $\left(\frac{1}{x-1} - \frac{1}{x+1} + \frac{1}{x^2+1} - \frac{1}{x^2-1}\right)$

का मान क्या है ?

(A) $\pm\sqrt{5}$ (B) 2/5

(C) $\pm 2/\sqrt{5}$ (D) $\pm\sqrt{5}/2$

79. If $7x - [3(2x-3)]/2 = 1/2$, then what is the value of x ?

यदि $7x - [3(2x-3)]/2 = 1/2$ है, तो x का मान क्या होगा ?

(A) -1 (B) 1

(C) 3 (D) -3

80. If $a + b = 4$ and $ab = 3$, then what is the value of $a^3 + b^3$?

यदि $a + b = 4$ और $ab = 3$ हो, तो $a^3 + b^3$ का मान क्या होगा ?

(A) 21 (B) 17 (C) 28 (D) 31

81. The sum of a fraction and 7 times its reciprocal is 11/2. What is the fraction?

एक भिन्न और उसके व्युत्क्रम के 7 गुणा का योग 11/2 वह भिन्न क्या है ?

(A) 7/2 (B) 2/7

(C) 3/4 (D) 4/3

82. If $5x - (1/2)(2x-7) = 5.5$, then what is the value of x?

यदि $5x - (1/2)(2x-7) = 5.5$ है, तो x का मान क्या है ?

(A) 3/2 (B) 1/2 (C) -1/2 (D) -3/2

83. If $a + b = 4$ and $ab = -5$ then what is the value of $a^3 + b^3$?

यदि $a + b = 4$ और $ab = -5$ है तो $a^3 + b^3$ का मान क्या है ?

(A) 34 (B) 36

(C) 124 (D) 126

84. The sum of a number and 4 times its reciprocal is 5. What is the number ?

एक संख्या और उसके व्युत्क्रम के 4 गुणा का योग 5 है। वह संख्या क्या है ?

(A) 4 (B) 5 (C) 6 (D) 7

85. If $x/3\ [5(7x/5-4/3)]1/2 = x/6$, then what is the value of x?

यदि $x/3\ [5(7x/5-4/3)]1/2 = x/6$, तो x का मान क्या है ?

(A) 10/9 (B) -10/9

(C) -9/10 (D) 9/10

86. If $a^3 + b^3 = 19$ and $a + b = 1$, then what is the value of ab?

यदि $a^3 + b^3 = 19$ और $a + b = 1$ है, तो ab का मान क्या है ?

(A) 5 (B) -6

(C) 7 (D) -9

87. A fraction is greater than its reciprocal by (72)/(77). What is the fraction?

एक भिन्न अपने व्युत्क्रम से (72)/(77) से अधिक है। वह भिन्न क्या है ?

(A) 7/11 (B) 11/7

(C) 4/7 (D) 7/4

88. If $[7(5x/3-3/2)]/2 + 3/2 = 1/4$, then what is the value of x?

यदि $[7(5x/3-3/2)]/2 + 3/2 = 1/4$ है, तो x का मान क्या है ?

(A) 35/24 (B) 24/35

(C) -24/35 (D) -35/24

89. If $a^3 + b^3 = 19$ and $ab = -6$, then what is the value of a + b?

यदि $a^3 + b^3 = 19$ और $ab = -6$ है, तो $a + b$ का मान क्या है ?

(A) 5 (B) 7

(C) 1 (D) -5

90. Sum of four times a fraction and 6 times its reciprocal is 11. What is the fraction?

एक भिन्न के चार गुणा और उस भिन्न के व्युत्क्रम के 6 गुणा का योग 11 है। वह भिन्न क्या है ?

(A) 3/4 (B) 4/3

(C) 4/7 (D) 7/4

91. If $17/3 + [3(2x - 5/3)]/2 = 1/6$, then what is the value of x?

यदि $17/3 + [3(2x - 5/3)]/2 = 1/6$ है, तो x का मान क्या है ?

(A) 1 (B) 3

(C) -3 (D) -1

92. If $a + b = 5$ and $ab = 6$, then what is the value of $a^3 + b^3$?

यदि $a + b = 5$ और $ab = 6$ है, तो $a^3 + b^3$ का मान क्या है ?

(A) 32 (B) 38

(C) 35 (D) 34

93. The sum of a fraction and 3 times its reciprocal is 37/10. What is the fraction?
एक भिन्न और उसके व्युत्क्रम के 3 गुणा का योग 37/10 है। वह भिन्न क्या है ?
(A) 5/2 (B) 2/5
(C) 5/4 (D) 4/5

94. If 5x/2- [7(6x-3/2)]4/ = 5/8, then what is the value of x?
यदि 5x/2-[7(6x-3/2)]/4 = 5/8, तो x का मान क्या होगा ?
(A) 1/4 (B) -1/4
(C) 4 (D) -4

95. If $a^3 - b^3 = 91$ and a-b = 1 then what is the value of ab. ?
$a^3 - b^3 = 91$ और a-b = 1 है, तो ab का मान क्या है ?
(A) 27 (B) 6
(C) 9 (D) 30

96. A fraction is greater than twice its reciprocal by 7/15. What is the fraction?
एक भिन्न अपने व्युत्क्रम के दोगुने से 7/15 अधिक है। वह भिन्न क्या है ?
(A) 3/5 (B) 5/3
(C) 3/4 (D) 4/3

97. If [4(2x/5 - 3/2)]/3 + 7/5 = 37/5, then what is the value of x?
यदि [4(2x/5 - 3/2)]/3 + 7/5 = 37/5 है, तो x का मान क्या है ?
(A) -15 (B) 7/5
(C) 15 (D) -7/5

98. If a - b = 4 and ab = -3, then what is the value of $a^3 - b^3$?
यदि a - b = 4 और ab = -3 है, तो $a^3 - b^3$ का मान क्या है ?
(A) 21 (B) 28
(C) 23 (D) -20

99. Sum of twice a fraction and 3 times its reciprocal is 29/3. What is the fraction?
एक भिन्न के दो गुणा और उस भिन्न के व्युत्क्रम के 3 गुणा का योग 29/3 है। वह भिन्न क्या है ?
(A) 2/9 (B) 5/4
(C) 4/5 (D) 9/2

100. If 8x/3 + [7(5 - 2x/3)]/2 = 1/2 , then what is the value of x?
यदि 8x/3 + [7(5 - 2x/3)]/2 = 1/2 है, तो x का मान क्या है ?
(A) -17 (B) 51 (C) -51 (D) 17

101. If a - b = -1 and ab = 6, then what is the value of $a^3 - b^3$?
यदि a - b = -1 और ab = 6 है, तो $a^3 - b^3$ का मान क्या है ?
(A) 33 (B) -19
(C) 18 (D) 35

102. The sum of a fraction and 3 times its reciprocal is 31/6. What is the fraction?
एक भिन्न और उसके व्युतक्र के 3 गुणा का योग 31/6 है। वह भिन्न क्या है ?
(A) 2/9 (B) 9/2
(C) 5/4 (D) 4/5

103. If x/2 – [4(15/2 – x/3)]/3 = -x/18, then what is the value of x?
यदि x/2 – [4(15/2 – x/3)]/3 = -x/18तो x का मान क्या है ?
(A) -10 (B) 9/8
(C) 10 (D) -9/8

104. If $a^3 + b^3 = 152$ and a + b = 8, then what is the value of ab?
यदि $a^3 + b^3 = 152$ और a + b = 8 है, तो ab का मान क्या है ?
(A) 2 (B) 11 (C) -10 (D) 15

105. A fraction is greater than its reciprocal by 9/20. What is the fraction?
एक भिन्न अपने व्युत्क्रम से 9/20 से अधिक है। वह भिन्न क्या है ?
(A) 5/4 (B) 4/5
(C) 3/4 (D) 4/3

106. If 5x + 6(3-2x) = 4, then what is the value of x?
यदि 5x + 6(3–2x) = 4 तो x का मान क्या है ?
(A) 1 (B) 3 (C) 2 (D) 4

107. If a + b = 1 and ab = -6, then what is the value of $a^3 + b^3$?
यदि a + b = 1 और ab = -6, तो $a^3 + b^3$ का मान क्या है ?
(A) 17 (B) 15
(C) 19 (D) 13

108. The sum of a non-zero number and twenty times its reciprocal is 9. What is the number?
एक गैर-शून्य संख्या और इसके व्युत्क्रमानुपाती के बीस गुना का योग 9 है। तो वह संख्या क्या है ?
(A) -5 (B) 3 (C) -3 (D) 5

109. If 9x – [5(2x + 1)/2] = 9/2, then what is the value of x is?
यदि 9x – [5(2x + 1)/2] = 9/2 तो x का मान क्या है ?
(A) 7/4 (B) -7/4
(C) 4/7 (D) -4/7

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110. If a + b = 4 and ab = -21, then what is the value of $a^3 + b^3$?
यदि a + b = 4 और ab = -21 तो $a^3 + b^3$ का मान क्या है ?
(A) 370 (B) 158
(C) 185 (D) 316

111. The sum of a fraction and 10 times its reciprocal is 37/4. What is the fraction?
एक भिन्न और उस भिन्न के व्युत्क्रम के 10 गुना का योग 37/4 है। भिन्न क्या है ?
(A) 5/4 (B) 4/5
(C) 3/4 (D) 4/3

112. If (-1/2) × (x - 5) + 3 = -5/2, then what is the value of x?
यदि (-1/2) × (x - 5) + 3 = -5/2 तो x का मान क्या है ?
(A) 16 (B) 4
(C) -6 (D) -4

113. If a - b = 1 and ab = 6, then what is the value of $a^3 - b^3$?
यदि a - b = 1 और ab = 6 तो $a^3 - b^3$ का मान क्या है ?
(A) 21 (B) 23
(C) 19 (D) 25

114. A number is greater than 58 times its reciprocal by 3/4. What is the number?
एक संख्या अपने व्युत्क्रमानुपाती के 58 गुना से 3/4 बड़ी है। वह संख्या कौन सी है ?
(A) -8 (B) 12
(C) -12 (D) 8

115. If 5/2(8x/3 – 1/2) + 13/2 = 2x/3, then what is the value of x?
यदि 5/2(8x/3 – 1/2) + 13/2 = 2x/3 तो x का मान क्या है ?
(A) 7/8 (B) 8/7
(C) -8/7 (D) -7/8

116. If $a^3 + b^3 = 72$ and ab = 8 , then what is the value of a + b?
यदि $a^3 + b^3 = 72$ और ab = 8 है, तो a + bका मान क्या है ?
(A) 2 (B) 5
(C) 6 (D) 3

117. Sum of four times a fraction and 7 times its reciprocal is 16. What is the fraction?
एक भिन्न का चार गुना और उसके व्युत्क्रम के 7 गुना का योग 16 है। वह भिन्न कौन सा है ?
(A) 2/7 (B) 7/2
(C) 4/7 (D) 7/4

118. If 14/3 + (1/2)(x - 7/3) = -2x/3, then the value of x is?
यदि 14/3 + (1/2)(x - 7/3) = -2x/3 तो x का मान क्या है ?
(A) -3 (B) 3
(C) 6 (D) -6

119. If a + b = 10 and ab = 24, then what is the value of $a^3 + b^3$?
यदि a + b = 10 और ab = 24 है, तो $a^3 + b^3$ का मान क्या है ?
(A) 280 (B) 152
(C) 140 (D) 72

120. The sum of a fraction and 3 times its reciprocal is 19/4. What is the fraction?
एक भिन्न और उस भिन्न के व्युत्क्रम के 3 गुना का योग 19/4 है। वह भिन्न क्या है ?
(A) 3/4 (B) 4/3
(C) 5/4 (D) 4/5

121. If 5/2 – (6/5)(x - 15/2) = -x/5, then what is the value of x?
यदि 5/2 – (6/5)(x – 15/2) = -x/5, तो x का मान क्या है ?
(A) -23/2 (B) 13/2
(C) -13/2 (D) 23/2

122. If a - b = 2 and ab = 24, then what is the value of $a^3 - b^3$?
यदि a – b = 2 और ab = 24 है, $a^3 - b^3$ का मान क्या है ?
(A) 280 (B) 124
(C) 140 (D) 152

123. Sum of twice a fraction and its reciprocal is 17/6. What is the fraction?
एक भिन्न के दोगुना और उसके व्युतक्रम का योग 17/6 है। वह भिन्न क्या है ?
(A) 4/3 (B) 5/4
(C) 3/4 (D) 4/5

124. If -3/2 + (2/3)(3x + 9) = x/2, then what is the value of x?
यदि -3/2 + (2/3)(3x + 9) = x/2 तो x का मान क्या है।/ ?
(A) -9 (B) 11
(C) 9 (D) -3

125. If a – b = 2 and ab = 8, then what is the value of $a^3 - b^3$?
यदि a – b = 2 और ab = 8, तो $a^3 - b^3$ का मान क्या है ?
(A) 65 (B) 34
(C) 43 (D) 56

126. A non-zero number is greater than 7 times its reciprocal by 9.3. What is the number?
एक गैर शून्य संख्या अपने व्युत्क्रमानुपाती के 7 गुना से 9.3 बड़ी है। वह संख्या कौन सी है ?
(A) 10 (B) 20
(C) 5 (D) 14

127. If -3[1-(x/2)] + 5x/3 = 1/6, then what is the value of x?
यदि -3[1-(x/2)] + 5x/3 = 1/6, तो x का मान क्या है ?
(A) 2 (B) -1
(C) 1 (D) -2

128. If a + b = 3 and ab = -4, then what is the value of $a^3 + b^3$?
यदि a + b = 3 और ab = – 4, फिर $a^3 + b^3$ का मान क्या है ?
(A) 36 (B) 63
(C) 12 (D) -15

129. The sum of a non-zero number and 9 times its reciprocal is 10. What is the number?
एक गैर-शून्य संख्या और इसके व्युत्क्रमानुपाती के 9 गुना का योग 10 है। तो वह संख्या क्या है ?
(A) 10 (B) 11
(C) 9 (D) 90

130. If 10x/3 + 5/2(2 – x/3) = 7/2, then the value of x is?
यदि 10x/3 + 5/2(2 – x/3)=7/2, तो x का मान क्या है ?
(A) 3/5 (B) -5/3
(C) 5/3 (D) -3/5

131. If a – b = 2 and ab = 15, then what is the value of $a^3 - b^3$?
यदि a – b = 2 और ab = 15 है, तो $a^3 - b^3$ का मान क्या है ?
(A) 152 (B) 112
(C) 108 (D) 98

132. The sum of a fraction and 4 times its reciprocal is 13/3. What is the fraction?
एक भिन्न और उस भिन्न के व्युत्क्रम के 4 गुना का योग 13/3 है। वह भिन्न क्या है ?
(A) 4/3 (B) 3/4
(C) 5/4 (D) 4/5

133. If 7x – (3/2)*(4x – 9) = 6.5, then what is the value of x?
यदि 7x – (3/2)*(4x – 9) = 6.5, तो x का मान क्या है ?
(A) 7 (B) 20
(C) -7 (D) -20

134. If a + b = 8 and ab = 15, then what is the value of $a^3 + b^3$?
यदि a + b = 8 और ab = 15 है, तो $a^3 + b^3$ का मान क्या है ?
(A) 98 (B) 152
(C) 124 (D) 260

135. The sum of a non-zero number and 4 times its reciprocal is 17/2. What is the number?
एक गैर-शून्य संख्या और उस संख्या के व्युत्क्रम के 4 गुना का योग 17/2 है। संख्या कौन सी है ?
(A) 8 (B) 12
(C) 16 (D) 4

136. If 1/3(12x/5 – 1/2) + 6/5 = 7/6, then what is the value of x?
यदि 1/3(12x/5 – 1/2) + 6/5 = 7/6 है, तो x का मान क्या है ?
(A) 1/6 (B) -1/6
(C) 1/5 (D) -1/5

137. If a - b = 10 and ab =-21, then what is the value of $a^3 - b^3$?
यदि a - b = 10 और ab =-21 है, तो $a^3 - b^3$ का मान क्या है ?
(A) 316 (B) 370
(C) 185 (D) 158

138. Sum of twice a fraction and 5 times its reciprocal is 7. What is the fraction?
एक भिन्न का दोगुना और उसके व्युत्क्रम के 5 गुना का योग 7 है। वह भिन्न कौन सा है ?
(A) 2/5 (B) 5/4
(C) 5/2 (D) 4/5

139. If $\frac{2}{3}\left(\frac{6x}{5}-\frac{1}{4}\right)+\frac{1}{3}=\frac{9x}{5}$, then what is the value of x?
यदि $\frac{2}{3}\left(\frac{6x}{5}-\frac{1}{4}\right)+\frac{1}{3}=\frac{9x}{5}$ है, तो x का मान क्या है ?
(A) $\frac{1}{6}$ (B) $-\frac{1}{6}$
(C) $\frac{1}{5}$ (D) $-\frac{1}{5}$

140. If $a^3 + b^3 = 341$ and ab = 30, then what is the value of a + b?
यदि $a^3 + b^3 = 341$ और ab = 30 है, तो a + b का मान क्या है ?
(A) 1 (B) 9
(C) 7 (D) 11

141. Sum of a fraction and thrice its reciprocal is 31/6. What is the fraction?
एक भिन्न और उसके व्युत्क्रम के 3 गुना का योग $\frac{31}{6}$ है। वह भिन्न कौन सा है ?
(A) $\frac{2}{9}$ (B) $\frac{9}{4}$
(C) $\frac{9}{2}$ (D) $\frac{4}{9}$

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Solution

1. (A) $\frac{2+\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} \Rightarrow 7 + 4\sqrt{3}$

$\frac{1}{x} = 7 - 4\sqrt{3}$

A. T. Q. $x + \frac{1}{x} = 7 + 4\sqrt{3} + 7 - 4\sqrt{3} = 14$

2.(C) $x = 2 + \sqrt{3} \Rightarrow \sqrt{2x} + \frac{1}{\sqrt{2x}}$

$\sqrt{4+2\sqrt{3}} + \frac{1}{\sqrt{4+2\sqrt{3}}} \Rightarrow \sqrt{\left(\sqrt{3}+1\right)^2} + \frac{1}{\sqrt{\left(\sqrt{3}+1\right)^2}}$

$= \left(\sqrt{3}+1\right) + \frac{1}{\left(\sqrt{3}+1\right)} = \frac{3\sqrt{3}+1}{2}$

3.(D) $x + \frac{1}{x} = 4$

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

$x^3 + \frac{1}{x^3} = 4^3 - 3 \times 4$

$x^3 + \frac{1}{x^3} = 64 - 12$

$x^3 + \frac{1}{x^3} = 52$

A.T.Q $\left(x^3 + \frac{1}{x^3}\right)^2 = x^6 + \frac{1}{x^6} + 2$

$52 \times 52 = x^6 + \frac{1}{x^6} + 2$

$2704 = x^6 + \frac{1}{x^6} + 2$

$x^6 + \frac{1}{x^6} = 2702$

4.(C) $\frac{1}{1+y} + \frac{2y+1}{y^2-1} \Rightarrow$

$\frac{y-1}{(y+1)(y-1)} + \frac{2y+1}{(y+1)(y-1)}$

$\frac{3y}{(y+1)(y-1)} \Rightarrow \frac{3\left[\frac{2-x}{1+x}\right]}{\left(\frac{2-x}{1+x}+1\right)\left(\frac{2-x}{1+x}-1\right)}$

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

5. (B) $x^2 - 8x + 15 = 0 \quad : \quad y^2 + 2y - 35 = 0$
$x^2 - 5x - 3x + 15 = 0 \quad : \quad y^2 + 7y - 5y - 35 = 0$
$x(x-5) - 3(x-5) = 0 \quad : \quad y(y+7) - 5(y+7) = 0$
$(x-3)(x-5) = 0 \quad : \quad (y+7)(y-5) = 0$
$x = 3, 5 \quad : \quad y = 5, -7$
Common root is 5 so difference of its cube and square will be
$5^3 - 5^2 = 125 - 25 = 100$

6. (B) $\left(x - \frac{1}{3}\right)^2 + (y-4)^2 = 0$ then $\frac{y+x}{y-x}$
Since $x = \frac{1}{3}$, $y = 4$

then, $\frac{y+x}{y-x} = \frac{4+\frac{1}{3}}{4-\frac{1}{3}} = \frac{13}{11}$

7. (D) Expression is $x^2 + \frac{1}{x^2} - 6$

then its later $\left(x^2 + \frac{1}{x^2} - 2\right) - 4$

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

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

Difference between factors

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

8. (C) $x + \frac{1}{x} = \sqrt{13}$ so $x - \frac{1}{x} = 3$

$x^5 + \frac{1}{x^5} = \left[x^3 + \frac{1}{x^3}\right] \times \left[x^2 - \frac{1}{x^2}\right] - \left[x - \frac{1}{x}\right]$

$x - \frac{1}{x} = 3$ then $x^3 - \frac{1}{x^3} = 36$

$$x^2 - \frac{1}{x^2} = 11$$

$$x^5 - \frac{1}{x^5} = 36 \times 11 - 3 = 396 - 3$$

$$= x^5 - \frac{1}{x^5} = 393$$

9. (A) $a^3+b^3 = 35$, $ab = 6$, $(a + b) = ?$

$(a + b)^3 = a^3 + b^3 + 3\,ab(a + b)$

$(a + b)^3 = 35 + 3\,(6)\,(a + b)$

$(a + b) = 5$

10. (B) $(x - 2)^2 + (y + 3)^2 + (z - 15)^2 = 0$

$x = 2, y = -3, z = 15$

$\Rightarrow 2 - 3 + 15 - 5 = 9$

11. (D) $(a+b)^3 = a^3 + b^3 + 3ab\,(a + b)$

$(4)^3 = 28 + 3ab \times 4$

$64 = 28 + 12ab$

$36 = 12\,ab$

$ab = 3$

12. (C) $x + \frac{1}{x} = 2$

$x^2 - 2x + 1 = 0$

$x = 1$

then $x^{61} + \frac{1}{x^{121}} = 1 + 1 = 2$

13. (A) $x - 1 = 6 + 2\sqrt{6} - 1$

$= 5 + 2\sqrt{6}$

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

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

$\frac{1}{\sqrt{x-1}} = \sqrt{3} - \sqrt{2}$

$\sqrt{x-1} + \frac{1}{\sqrt{x-1}} = 2\sqrt{3}$

14. (A) If $a + b + c = 0$

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

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

15. (A) $\frac{x^2}{yz} + \frac{y^2}{zx} + \frac{z^2}{xy} = 3$

$\Rightarrow \frac{x^3 + y^3 + z^3}{xyz} = 3$

$\Rightarrow x^3 + y^3 + z^3 = 3xyz$

ie. $(x + y + z) = 0$

$\therefore (x + y + z)^3 = 0$

16. (D) $x^{\frac{1}{4}} + \frac{1}{x^{\frac{1}{4}}} = 2$ $\qquad x = 1$

$x^{81} + \frac{1}{x^{81}} = 2$

17. (B) $a(a + b + c) = 45$

$b\,(a + b + c) = 75$

$c(a + b + c) = 105$

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

Let $a + b + c = K$

$a = \frac{45}{k}, b = \frac{75}{k}, c = \frac{105}{k}$

$(a + b + c) = \frac{45}{k} + \frac{75}{k} + \frac{105}{k}$

$\Rightarrow k^2 = 225$

$\Rightarrow k = 15$

$a = 3, b = 5, c = 7$

$\Rightarrow (a^2 + b^2 + c^2) = (9 + 25 + 49) = \mathbf{83}$

18. (C) $x^2 + \frac{1}{x^2} = 1$ $\qquad \Rightarrow x + \frac{1}{x} = \sqrt{3}$

$\Rightarrow x^6 = -1$

$x^{48} + x^{42} + x^{36} + x^{30} + x^{24} + x^{18} + x^{12} + x^6 + 1 = ?$

$\Rightarrow 1 + x^6 + 0 + 0 + 0 + 1$

$= 2 - 1$

$= 1$

19. (D) $\frac{11}{x} + \frac{11}{y} + \frac{11}{z} = 44$

$11\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right) = 44$

$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = \frac{44}{11}$ $\qquad \Rightarrow \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 4$

20. (B) $2x^2 - 9x + 9 = 0$

$2x^2 - 6x - 3x + 9 = 0$

$2x\,(x - 3) - 3\,(x - 3) = 0$

$x = \frac{3}{2}, 3$

Minimum value of $x^2 + \frac{1}{x^2}$

$= \left(\frac{3}{2}\right)^2 + \left(\frac{2}{3}\right)^2 = \frac{97}{36}$

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21. (A) $\frac{5x-y}{5x+y}=\frac{3}{7}$

Let, Hit & Trial x = 1; y = 2

$$\frac{4x^2+y^2-4xy}{9x^2+16y^2+24xy} \Rightarrow \frac{4(1)^2+(2)^2-4\times1\times2}{9(1)^2+16(2)^2+24\times1\times2}$$

$$=\frac{8-8}{9+64+48}=\frac{0}{121}=0$$

22. (A) $\Rightarrow (x+y)^2 = xy+1$

$\Rightarrow x^2+y^2+xy=1$

$x^3-y^3=1 \quad (\therefore x^3-y^3=(x-y)(x^2+y^2+xy))$

$(x-y)(x^2+y^2+xy)=1$

$(x-y)=1$

23. (B) $x^2+k_1x+k_2$

factors $(x-2)$ & $(x+3)$

$\Rightarrow x=2$

$4+2k_1+k_2=0 \quad$ .... (i) × 3

$x=-3$

$9-3k_1+k_2=0 \quad$ ..... (ii) × 2

$12+6k_1+3k_2=0$

$18-6k_1+2k_2=0$

$5k_2=-30$

$k_2=-6$

$k_1=1$

24. (A) $(x-y)=7 \quad$ ..... (1)

$(x-15)^3-(y-8)^3=?$

First value for $(x-15)-(y-8)$

$x-15-y+8$

$=x-y=7$

$=0$

i.e. $(x-15)-(y-8)=0$

25. (A) $\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{7+4\sqrt{3}}}}$

$$=\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{4+3\sqrt{12}}}}$$

$$=\sqrt{-\sqrt{3}+\sqrt{3+8\left(2+\sqrt{3}\right)}}$$

$$=\sqrt{-\sqrt{3}+\sqrt{3+16+2\sqrt{48}}}=\sqrt{-\sqrt{3}+\sqrt{16}+\sqrt{3}}$$

$$=\sqrt{\sqrt{16}}=\sqrt{4}=2$$

26. (B) $\frac{p}{q}=\frac{r}{s}=\frac{t}{u}=\sqrt{5}$

$p=\sqrt{5}q$

$r=\sqrt{5}s$

$t=\sqrt{5}u$

$$=\frac{3p^2+4r^2+5t^2}{3q^2+4s^2+5u^2}$$

using above relations

$$=\frac{3.5.q^2+4.5s^2+5.5.u^2}{3q^2+4s^2+5u^2}$$

$$=5\frac{\left(3q^2+4s^2+5u^2\right)}{\left(3q^2+4s^2+5u^2\right)}=5$$

27. (C) $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=0$

$xy+yz+xz=0$

$x+y+z=9$

$(x+y+z)^2=81$

$\Rightarrow x^2+y^2+z^2+2(xy+yz+xz)=81$

$\Rightarrow x^2+y^2+z^2=81$

$\Rightarrow x^3+y^3+z^3-3xyz$

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

$=9\times(81-0)$

$=729$

28. (D) $x^4+\frac{1}{x^4}=34$

$$(x^2)^2+\left(\frac{1}{x^2}\right)^2+2=36$$

$$=\left(x^2+\frac{1}{x^2}\right)^2=(6)^2$$

$$=x^2+\frac{1}{x^2}=6$$

Again

$$\Rightarrow x^2+\frac{1}{x^2}-2=6-2$$

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

$$\Rightarrow x^3-\frac{1}{x^3}=2^3+3.2$$

$=8+6=14$

29. (C) $x=1-y$

$\Rightarrow x+y=1$

$\Rightarrow x^2+y^2+2xy=1 \quad$ .... (ii)

$\Rightarrow x^2+y^2=2 \quad$ .... (i)

(ii) — (i)

$2xy=-1$

$xy=-\frac{1}{2}$

30. (B) $x + \frac{1}{x+7} = 0$

$x = -\frac{1}{x+7}$

$x^2 + 7x + 1 = 0$

$x = \frac{-7 \pm \sqrt{49-4}}{2}$

$x = \frac{-7 \pm 3\sqrt{5}}{2}$ .... (1)

$x - \frac{1}{x+7}$

$= \frac{-2}{x+7}$

$= \frac{-2}{\frac{-7 \pm 3\sqrt{5}}{2} + 7} = \frac{-2}{\frac{-7 \pm 3\sqrt{5} + 14}{2}} = \frac{-2 \times 2}{3\sqrt{5} + 7}$

Expresssion $\pm 3\sqrt{5}$ की +ve Value लेकर

$= \frac{-4}{(3\sqrt{5}+7)} \times \frac{(3\sqrt{5}-7)}{(3\sqrt{5}-7)} = \frac{-4(3\sqrt{5}-7)}{-4}$

$= 3\sqrt{5} - 7$

31. (A) $(4)^{x+y} = 256$

$(4)^{x+y} = 4^4$

$x + y = 4$ .... (i)

$4^{4(x-y)} = 4$

$4^{(x-y)} = 1$

$x - y = \frac{1}{4}$ .... (ii)

(i) + (ii)

$2x = \frac{17}{4}$

$x = \frac{17}{8}$; $y = \frac{15}{8}$

32. (B) $px^3 - qx^2 - 7x - 6$ .... (i)

$x^2 - x - 6$ ये पूर्णतः विभाजित हैं।

$\Rightarrow x^2 - 3x + 2x - 6$

$\Rightarrow (x-3)(x+2)$

$\Rightarrow x = 3, -2$

Use it in eqn (i)

$27p - 9q - 21 - 6 = 0$

$27p - 9q = 27$

$9p - 3q = 9$ ..... (ii)

$-8p - 4q + 14 - 6 = 0$

$-8p - 4q = -8$

$2p + q = 2$ ..... (iii) × 3

$6p + 3q = 6$ (ii) + (iii)

$15p = 15$

$p = 1$

$q = 0$

33. (A) $px^3 - 2x^2 - qx + 18$

$x^2 - 9 = 0$

$x = \pm 3$

$\Rightarrow 27p - 18 - 3q + 18 = 0$

$\Rightarrow 27p = 3q$

$\Rightarrow \frac{p}{q} = \frac{3}{27} = \frac{1}{9}$

$\Rightarrow p : q = 1 : 9$

34. (B) $x + \frac{1}{x} = 5$; $x^5 + \frac{1}{x^5} = ?$

$\left(x^2 + \frac{1}{x^2}\right) = 23$

$\left(x^3 + \frac{1}{x^3}\right) = 110$

$x^5 + \frac{1}{x^5} = \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right) - \left(x + \frac{1}{x}\right)$

$= 110 \times 23 - 5$

$= 2525$

35. (D) $\left(\frac{x}{y}\right)^{a-4} = \left(\frac{y}{x}\right)^{2a-5}$

$= x^{a-4}.x^{2a-5} = y^{2a-5}.y^{a-4}$

$= x^{3a-9} = y^{3a-9}$

$x = y$

36. (D) $3a - \frac{3}{a} - 3 = 0$

$3a - \frac{3}{a} = 3; \quad a - \frac{1}{a} = 1$

$a^3 - \frac{1}{a^3} = 1 + 3 \times 1 = 4$

so $a^3 - \frac{1}{a^3} + 2 = 4 + 2 = 6$

37. (B) $5(x^2 + y^2 + z^2) = 4(xy + yz + zx)$

$4x^2 - 4xy + y^2 + 4y^2 - 4yz + z^2 + 4z^2 - 4zx + x^2 = 0$

$(2x - y)^2 + (2y - z)^2 + (2z - x)^2 = 0$

$2x - y = 0, \ 2y - z = 0, \ 2z - x = 0$

On adding $x + y + z = 0$

38.(A) $x^3 + 2x^2 - 5x + k$, $x + 1$ से विभाजित है।

$\therefore x = -1$ रखने पर $= -1 + 2 + 5 + k = 0$

$k + 6 = 0$

$k = -6$

39.(B) $3x + \frac{1}{5x} = 7$

$15x^2 + 1 = 35x$ ..... (1)

then $\frac{5x}{15x^2+15x+1}$

$\frac{5x}{35x+15x}$ from (1)

$\frac{5x}{50x} = \frac{1}{10}$

40.(A) $x + \frac{1}{4x} = \frac{5}{2}$

$\Rightarrow 2x + \frac{1}{2x} = 5$

$\Rightarrow 8x^3 + \frac{1}{8x^3} = (5)^3 - 3 \times 5$

$= 125 - 15 = 110$

$\left(\frac{64x^6+1}{8x^3}\right) = 110$

41. (B) $x^2 + x = 19$ then $(x + 5) + \frac{1}{x+5} = ?$

from (1) $(y - 5)^2 + y - 5 = 19$ Let $x + 5 = y$

$y^2 + 25 - 10y + y - 5 = 19$

then $x = y - 5$.... (1)

$y^2 - 9y = -1$

$y + \frac{1}{y} = 9$

Put the value of $y = (x + 5) + \frac{1}{(x+5)} = 9$

42. (B) $\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c} = 2$

$\frac{a}{1-a} + 1 + \frac{b}{1-b} + \frac{c}{1-c} + 1 = 2 + 3$

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

43. (D) $3x^2 - 13x + 14 = 0$

α and β are the roots of this eq.

then

$\alpha + \beta = \frac{13}{3}; \quad \alpha \times \beta = \frac{14}{3}$

$\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2+\beta^2}{\alpha\beta}$

$= \frac{(\alpha+\beta)^2 - 2\alpha\beta}{\alpha\beta} = \frac{\left(\frac{13}{3}\right)^2 - 2 \times \frac{14}{3}}{\frac{14}{3}} = \frac{85}{42}$

44. (B) $a + b + c = 9$

$ab + bc + ca = 18$

$a^3 + b^3 + c^3 - 3abc = ?$

$\Rightarrow (a + b + c)^2 = 81$

$\Rightarrow a^2 + b^2 + c^2 + 2(ab + bc + ca) = 81$

$\Rightarrow a^2 + b^2 + c^2 = 81 - 2 \times 18$

$= 81 - 36 = 45$

Now,

$a^3 + b^3 + c^3 - 3abc$

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

$= 9.[45-18]$

$= 9 \times 27 = 243$

45. (B) $\frac{x}{y} + \frac{y}{x} = 1$

$\frac{x^2+y^2}{xy} = 1$

then $x^3 + y^3 = ?$

$\Rightarrow x^2 + y^2 - xy = 0$

Now, $x^3 + y^3 = (x + y)\ (x^2 + y^2 - xy)$

$= 0$

46. (A) $5^x = 30^y = 6^z$

$30^{-y} = 5^y \times 6^y$

Let $5^x = k \Rightarrow 5 = k^{\frac{1}{x}}$

$30^{-y} = k \Rightarrow 30 = k^{\frac{1}{y}}$

$6^z = k \Rightarrow 6 = k^{\frac{1}{z}}$

$\Rightarrow k^{\frac{1}{x}\,\frac{1}{z}} = k^{\frac{1}{y}}$ $\Rightarrow \frac{1}{x} + \frac{1}{z} = -\frac{1}{y}$

$\Rightarrow \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$ $\Rightarrow \frac{xy+yz+zx}{xyz} = 0$

47. (B) $\frac{1}{x^{p-q}+1} + \frac{1}{x^{q-p}+1}$

$= \frac{1}{x^{p-q}+1} + \frac{1}{\frac{1}{x^{p-q}}+1} = \frac{1}{x^{p-q}+1} + \frac{x^{p-q}}{x^{p-q}+1}$

$= \frac{1+x^{p-q}}{1+x^{p-q}}$

$= 1$

48. (C) $x = 8 + 2\sqrt{15}$

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

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

$\sqrt{x} = \sqrt{5} + \sqrt{3}$

or $\frac{1}{\sqrt{x}} = \frac{1}{\left(\sqrt{5} + \sqrt{3}\right)} = \frac{\left(\sqrt{5} - \sqrt{3}\right)}{2}$

$\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) = \sqrt{5} + \sqrt{3} + \frac{\sqrt{5}}{2} - \frac{\sqrt{3}}{2}$

$= \frac{3\sqrt{5}}{2} + \frac{\sqrt{3}}{2}$

49. (A) $\frac{1+a}{a^{\frac{1}{2}} + a^{\frac{1}{2}}} - \frac{a^{\frac{1}{2}} + a^{\frac{1}{2}}}{1+a} + a^{-\frac{1}{2}} = ?$

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

$= \frac{(1+a)\sqrt{a}}{(a+1)} - \frac{(a+1)}{\sqrt{a}(a+1)} + \frac{1}{\sqrt{a}}$

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

$= \sqrt{a}$

50. (D) $\frac{p}{q} = \frac{x+3}{x-3}$ $\qquad \frac{p^2 + q^2}{p^2 - q^2} = ?$

$\frac{p^2}{q^2} = \frac{(x+3)^2}{(x-3)^2}$

$= \frac{p^2 + q^2}{p^2 - q^2} = \frac{(x+3)^2 + (x-3)^2}{(x+3)^2 - (x-3)^2}$

$= \frac{2\left(x^2 + 9\right)}{2(6x)}$

$= \frac{x^2 + 9}{6x}$

51. (D) $x^6 - 18x^3 + k$

Value of 'k' to be a perfect square

use $x = -1$

We'll get = $1 + 18 + k$

$k + 19$

for this to be square

We'll take from options $k = 81$

That since $100 = (10)^2$

52. (D) $\frac{\sqrt{5+x} + \sqrt{5-x}}{\sqrt{5+x} + \sqrt{5-x}} = 3$

C & D

$\frac{\sqrt{5+x}}{\sqrt{5-x}} = \frac{3+1}{3+1} = \frac{4}{2} = 2$

Squaring

$\Rightarrow \frac{5+x}{5-x} = 4$

$\Rightarrow 5 + x = 20 - 4x$

$\Rightarrow x = \frac{15}{5} = 3$

53. (D) $x + y + z = 12$

$xy + yz + xz = 44$

$xyz = 48$

$x^3 + y^3 + z^3 = ?$

$(x + y + z)^2 = 144$

$x^2 + y^2 + z^2 + 2(xy + yz + xz) = 144$

$\Rightarrow x^2 + y^2 + z^2 = 144 - 88$

$\Rightarrow x^2 + y^2 + z^2 = 56$

$x^3 + y^3 + z^3 - 3xyz$

$= (x + y + z)\ [x^2 + y^2 + z^2 - (xy + yz + zx)]$

$\Rightarrow x^3 + y^3 + z^3 - 144 = 12\ [56 - 44]$

$\Rightarrow x^3 + y^3 + z^3 = 144 + 144$

$\Rightarrow x^3 + y^3 + z^3 = 288$

54. (B) $x = \frac{4\sqrt{ab}}{\sqrt{a} + \sqrt{b}}$ $\qquad a \neq b$

find $\frac{x + 2\sqrt{a}}{x - 2\sqrt{a}} + \frac{x + 2\sqrt{b}}{x - 2\sqrt{b}} = ?$

$= \frac{\left(x + 2\sqrt{a}\right)\left(x - 2\sqrt{b}\right) + \left(x + 2\sqrt{b}\right)\left(x + 2\sqrt{a}\right)}{\left(x - 2\sqrt{a}\right)\left(x - 2\sqrt{b}\right)}$

$= \frac{2x^2 - 8\sqrt{ab}}{x^2 - 4\sqrt{ab}} = 2\frac{\left(x^2 - 4\sqrt{ab}\right)}{\left(x^2 - 4\sqrt{ab}\right)} = 2$

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55.(C) $x(2x + 3) = 90$

$$\frac{7}{\sqrt{y}} + \frac{2}{\sqrt{y}} = \sqrt{y}$$

$= y = 9$ ——(i)

$x = 6$ ——(ii)

$x^2 + y^2 = 36 + 81$

$= 117$

56.(C) $\frac{x}{y} = \frac{4}{9}$

$x = 4K$

$y = 9K$

$$\frac{7x^2 - 19xy + 11y^2}{y^2} = ?$$

$$\frac{(112 - 19\times 36 + 11\times 81)K^2}{81K^2} = \frac{319}{81}$$

57.(C) $(x - 3) + \frac{1}{(x-3)} = 4$

$(x - 3)^3 + \frac{1}{(x-3)^3} = ?$

$= 4^3 - 3 \times 4 = 52$

58.(B) $x^2 + y^2 + z^2 = xy + yz + zx$

$x = y = z$

$$\Rightarrow \frac{7x + 3y - 5z}{5x} = \frac{10x - 5x}{5x} = 1$$

59. (D) $ab + bc + ca = 17$

$a + b + c = 11$

Squaring both sides, we get

$(a + b + c)^2 = 11^2$

$a^2 + b^2 + c^2 + 2(ab + bc + ac) = 121$

$a^2 + b^2 + c^2 + 2 \times 17 = 121$

$a^2 + b^2 + c^2 = 121 - 34 = 87$

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

$= 11(87 - 17)$

$= 11 \times 70 = 770$

60. (D) $x^4 + \frac{1}{x^4} = 62$

$$x^4 + \frac{1}{x^4} + 2x^2\frac{1}{x^2} = 62 + 2$$

$$\left(x^2 + \frac{1}{x^2}\right)^2 = 64$$

$$x^2 + \frac{1}{x^2} = 8$$

cubing both sides, we get

$$\left(x^2 + \frac{1}{x^2}\right)^3 = (8)^3$$

$$x^6 + \frac{1}{x^6} + 3x^2.\frac{1}{x^2}\left(x^2 + \frac{1}{x^2}\right) = 512$$

$$x^6 + \frac{1}{x^6} + 3 \times 8 = 512$$

$$x^6 + \frac{1}{x^6} = 512 - 24 = 488$$

61. (B) $x + y = 4$

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

$$= \frac{(2y-4)+(2x-4)}{(x-2)(y-2)} = \frac{2(x+y)-8}{(x-2)(y-2)}$$

$$\frac{x^2 + 25}{5x} = -2$$

$x^2 + 10x + 25 = 0$

$(x + 5)^2 = 0$

$x = -5$

$\therefore x^3 = -125$

$$= \frac{2\times 4 - 8}{(x-2)(y-2)} = 0$$

62. (A) $\frac{x}{5} + \frac{5}{x} = -2$

$$\frac{x^2 + 25}{5x} = -2$$

$x^2 + 10x + 25 = 0$

$(x + 5)^2 = 0$

$x = -5$

$\therefore x^3 = -125$

63. (C) $x + \frac{1}{x} = 2$ $\qquad x = 1, \frac{1}{x} = 1$

$$x^{21} + \frac{1}{x^{1331}} = 2$$

64. (B) $x^3 - y^3 = 81$

$x - y = 3$ ..... (1)

$x^2 + y^2 = ?$

$(x^2 + y^2 + xy)(x - y) = 81$

$$x^2 + y^2 + xy = \frac{81}{3} = 27$$

$$\frac{x^2 + y^2 - 2xy = 9}{3xy = 18}$$

$xy = 6$

$x^2 + y^2 = 27 - 6 = 21$

65. (C) $\sqrt{5x-6}+\sqrt{5x-6}=6$

$(\sqrt{5x-6}+\sqrt{5x-6})^2=36$

$10x+2\sqrt{25x^2-36}=36$

$2\sqrt{25x^2-36}=36-10x$

Square

$25x^2-36=324+25x^2-180x$

$\Rightarrow 180x=360$

$x=2$

or from options we can satisfy the ans.

66. (D) $2x+\frac{1}{2x}=2;\quad \sqrt{2\left[\frac{1}{x}\right]^4+\left[\frac{1}{x}\right]^5}=?$

$4x^2+1=4x$

$\Rightarrow \quad 4x^2+1=4x$

$4x^2-4x+1=0$

$(2x-1)^2=0$

$2x=1$

$x=\frac{1}{2}$

$\frac{1}{x}=2$

Using the given eq.

$\sqrt{2.2^4+2^5}$

$\sqrt{2^5+2^5}=\sqrt{2^6}=2^3=8$

67. (D) $x+\frac{1}{x}=5$

$x-\frac{1}{x}=\pm\sqrt{21}$

68. (A) $x=\left(\sqrt{2}+1\right)/\left(\sqrt{2}-1\right)$

$x=\frac{\left(\sqrt{2}+1\right)}{\left(\sqrt{2}-1\right)}=\frac{1}{x}=\left(\frac{\sqrt{2}-1}{\sqrt{2}+1}\right)$

Then

$\frac{x^5+x^4+x^2+x}{x^3}$

$\Rightarrow x^2+x+\frac{1}{x}+\frac{1}{x^2}$

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

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

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

eq. (1)

$=\left(3+2\sqrt{2}\right)^2+\left(3-2\sqrt{2}\right)^2+\left(\sqrt{2}+1\right)^2+\left(\sqrt{2}-1\right)^2$

$=17+17+3+3=40$

69. (C) $x=5-2\sqrt{6}$

$\sqrt{x}+\frac{1}{\sqrt{x}}=?$

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

$\sqrt{x}=\sqrt{3}-\sqrt{2}$

$\frac{1}{\sqrt{x}}=\sqrt{3}+\sqrt{2}\ \Rightarrow\ \sqrt{x}+\frac{1}{\sqrt{x}}=2\sqrt{3}$

70. (A) $27^x+27^{\left(x\ \frac{1}{3}\right)}=972$

$x=?$

$27^x+\frac{27^x}{27^{1/3}}$

$27^x\left[1+\frac{1}{3}\right]=972$

$27^x=\frac{972\times3}{4}=243\times3$

$27^x=729=(27)^2$

$x=2$

71.(C) $a=73$

$b=74 \qquad c=75$

$a^3+b^3+c^3-3abc$

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

$=\frac{1}{2}(222)\left[1+1+4\right]$

$=666$

72.(B) $x^2+\frac{1}{x^2}=\frac{31}{9}$

$x+\frac{1}{x}=\frac{7}{3}$

$x^3+\frac{1}{x^3}=\frac{343}{27}-3\times\frac{7}{3}=\frac{154}{27}$

73.(A) $\frac{(x^2-5x+6)}{(x^2-3x+2)} \div \frac{(x^2-7x+12)}{(x^2-5x+4)}$

$= \frac{(x^2-3x-2x+6)}{(x^2-2x-x+2)} \times \frac{(x^2-4x-x+4)}{(x^2-4x-3x+12)}$

$= \frac{(x-3)(x-2)}{(x-2)(x-1)} \times \frac{(x-4)(x-1)}{(x-4)(x-3)} = 1$

74. (C) $x - \frac{1}{x} = 3$

$= \frac{(2x^4+3x^3+13x^2-3x+2)}{(3x^4+3)}$

$= \frac{x^2\left(2x^2+3x+13-\frac{3}{x}+\frac{2}{x^2}\right)}{x^2 3\left(x^2+\frac{1}{x^2}\right)}$

$= \frac{2\left(x^2+\frac{1}{x^2}\right)+3\left(x-\frac{1}{x}\right)+13}{3\left(x^2+\frac{1}{x^2}\right)}$

$= x^2 + \frac{1}{x^2} = 11$

$= \frac{2\times 11+3\times 3+13}{3\times 11} = \frac{44}{33} = \frac{4}{3}$

75.(B) $x + y = 5$

$x^3 + y^3 = 35$

$x = 2,\ y = 3$

Diff. $= 1$

76.(D) $x = \sqrt{\frac{2+\sqrt{3}}{2-\sqrt{3}}}$

$x^2 + x - 9 = ?$

$\Rightarrow \frac{2+\sqrt{3}}{2-\sqrt{3}} + \sqrt{\frac{2+\sqrt{3}}{2-\sqrt{3}} \times \frac{(2+\sqrt{3})}{(2+\sqrt{3})}} - 9$

$= \frac{2+\sqrt{3}}{2-\sqrt{3}} + (2+\sqrt{3}) - 9$

$= \frac{2+\sqrt{3}+1-9(2-\sqrt{3})}{2-\sqrt{3}}$

$= \frac{3+\sqrt{3}-18+9\sqrt{3}}{2-\sqrt{3}} = 10\sqrt{3}-15$

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

77.(C) If $x + y + z = 0$

$= \frac{x^3}{3z} + \frac{y^3}{3xz} + \frac{z^2}{3x}$

$= \frac{x^3+y^3+z^2}{3xz} = \frac{3xyz}{3xz} = y$

78.(C) $x - \frac{1}{x} = 1$

$x + \frac{1}{x} = \pm\sqrt{5}$

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

$= \left[\frac{2}{x^2-1} + \frac{1}{x^2+1} + -\frac{1}{x^2-1}\right]$

$= \left[\frac{1}{x^2-1} + \frac{1}{x^2+1}\right]$

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

$= \frac{\pm 2}{1.\sqrt{5}} = \frac{\pm 2}{\sqrt{5}}$

79. (A) $7x - \frac{3}{2}(2x-3) = \frac{1}{2}$

$\Rightarrow 14x - 6x + 9 = 1$

$\Rightarrow 8x = -8$

$\Rightarrow x = -1$

80. (C) $a = 3,\ b = 1$

$a + b = 4$

$ab = 3$

$a^3 + b^3 = ?$

$27 + 1 = 28$

81. (A) Let the fraction be $\frac{p}{q}$

then $\frac{p}{q} + 7.\frac{q}{p} = \frac{11}{2}$

$\Rightarrow p^2 + 7q^2 = \frac{11pq}{2}$

$\Rightarrow 2p^2 + 147q^2 - 11pq = 0$

$\Rightarrow 2p^2 - 17pq - 4pq + 14q^2 = 0$

$\Rightarrow p(2p-7q) - 2q(2p-7q) = 0$

$\Rightarrow (p-2q)(2p-7q) = 0$

$\frac{p}{q} = 2 \quad \frac{p}{q} = \frac{7}{2}$

82. (B) $5x - \frac{1}{2}(2x - 7) = 5.5$

$= 5x - x + \frac{7}{2} = 5.5$

$= 4x = 5.5 - 3.5 = 2$

$= x = \frac{1}{2}$

83. (C) $a + b = 4$

$ab = -5$

Here $a = 5$

$b = -1$

$a^3 + b^3$

$= 53 + (-1)^3$

$= 125 - 1 = 124$

84. (A) Let No. be 'p'

A.T.Q.

$P + \frac{4}{P} = 5$

Here $P = 4$

85. (A) $\frac{x}{3} - \left[5\left(\frac{7x}{5} - \frac{4}{3}\right)\right] \times \frac{1}{2} = \frac{-x}{6}$

$\Rightarrow \frac{x}{3} - \left[7x - \frac{20}{3}\right] \times \frac{1}{2} = \frac{-x}{6}$

$\Rightarrow \frac{x}{3} + \frac{x}{6} = \frac{7x}{2} + \frac{10}{3}$

$\Rightarrow \frac{x}{2} - \frac{7x}{2} = -\frac{10}{3}$

$\Rightarrow 3x = \frac{10}{3} \Rightarrow n = \frac{10}{9}$

86. (B) $a^3 + b^3 = +19$

$a + b = 1$

$ab = ?$

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

$\Rightarrow + 19 = 1 - 3\,(1).ab$

$\Rightarrow + 19 - 1 = -3ab$

$\Rightarrow .18 = -3ab$

$\Rightarrow ab = -6$

87. (B) Let the fraction be $\frac{p}{q}$

$\frac{p}{q} = \frac{q}{p} + \frac{72}{77}$

$\frac{p}{q} - \frac{q}{p} = \frac{72}{77}$

$77p^2 - 77q^2 = 77pq$

$\Rightarrow 77p^2 - 121pq + 49pq - 77q^2 = 0$

$\Rightarrow 17\,(7p - 11q) + 7q\,(7p - 11q) = 0$

$\Rightarrow 7p = 11q = \frac{p}{q} = \frac{11}{7}$

88. (B) $\frac{7\left(\frac{5x}{3} - \frac{3}{2}\right)}{2} + \frac{3}{2} = \frac{1}{4}$

$\Rightarrow 7\left(\frac{5x}{3} - \frac{3}{2}\right) = \frac{1}{2} - 3 \Rightarrow \frac{35x}{3} - \frac{21}{2} = \frac{-5}{2}$

$\Rightarrow \frac{35x}{3} = \frac{16}{2} \Rightarrow x = \frac{24}{35}$

89. (C) $a^3 + b^3 = 19$

$ab = -6$

$a + b = ?$

from (1)

$(a + b)^3 = a^3 + b^3 + 3ab\,(a + b)$

$= 19 + 3\,(-6)\,(a + b)$

$(a + b)^3 + 18\,(a + b) = 19$

From options

$(a + b) = 1$

90. (A) Let fraction $= \frac{a}{b}$

A.T.Q. $\frac{4a}{b} + \frac{6b}{a} = 11$

$\Rightarrow 4a^2 + 6b^2 = 11ab$

$\Rightarrow 4a^2 - 8ab - 3ab + 6b^2 = 0$

$\Rightarrow 4a\,(a - 2b) - 3b\,(a - 2b) = 0$

$\Rightarrow 4a = 3b \qquad a = 2b$

$\Rightarrow \frac{a}{b} = \frac{3}{4} \qquad \frac{a}{b} = 2$

91. (D) $\frac{17}{3} + 3x\left[2x - \frac{5}{3}\right] \times \frac{1}{2} = \frac{1}{6}$

$\Rightarrow \frac{17}{3} + [6x - 5] \times \frac{1}{2} = \frac{1}{6}$

$\Rightarrow \frac{17}{3} + 3x - \frac{5}{2} = \frac{1}{6}$

$\Rightarrow 3x = \frac{5}{2} + \frac{1}{6} - \frac{17}{3} \Rightarrow 3x = \frac{15 + 1 - 34}{6}$

$\Rightarrow 3x = \frac{-18}{6} \Rightarrow x = -1$

92. (C) $a + b = 5$

$ab = 6$

$a = 3, b = 2$

$a^3 + b^3 = 27 + 8 = 35$

93. (A) Let the fraction be $\frac{a}{b}$

$\frac{a}{b} + \frac{3b}{a} = \frac{37}{10}$

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$$\Rightarrow \frac{a^2+3b^2}{ab}=\frac{37}{10}$$

$\Rightarrow a = 5, b = 2$

$$= \frac{5}{2}$$

94.(A) $\frac{5x}{2} - \left[7\left(6x-\frac{3}{2}\right)\right]\frac{1}{4}$

$$\frac{5x}{2} - \frac{21x}{2}+\frac{21}{8}=\frac{5}{8}$$

$$\frac{16x}{2} = \frac{16}{8} \Rightarrow x = \frac{1}{4}$$

95.(D) $a^3 - b^3 = 91$

$a - b = 1$

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

$\because a - b = 1$

$a^2 + b^2 - 2ab = 1$

$a^2 + b^2 = 1 + 2ab$ ... (ii)

From (i) and (ii)

$91 = 1 (1 + 2ab + ab)$

$91 = 1 + 3ab$

$3ab = 90$

$\boxed{ab = 30}$

96. (B) Let the fraction is $\underline{x}$

$$\text{the } x - \frac{2}{x} = \frac{7}{15}$$

$15x^2 - 7x - 30 = 0$

$15x^2 - 25x + 18x - 30 = 0$

$5x (3x - 5) + 6 (3x - 5) = 0$

$3x - 5 = 0$

$$\boxed{x=\frac{5}{3}}$$

97. (C) $\left[4\left(\frac{2x}{5}-\frac{3}{2}\right)\right]\times\frac{1}{3}+\frac{7}{5}=\frac{37}{5}$

$$\left(\frac{8x}{5}-6\right)\frac{1}{3}=6$$

$$\frac{8x}{5} = 24$$

$$x = \frac{24\times5}{8} = x = 15$$

98. (B) $a - b = 4$ ..... (1)

$a b = -3$ ..... (2)

from (1)

$(a - b)^2 = 16$

$a^2 + b^2 - 2ab = 16$

$a^2 + b^2 = 16 + 2 \times (-3)$ from 2

$a^2 + b^2 = 10$ ..... (3)

Now,

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

$= 4 (10 + (-3))$

$a^3 - b^3 = 28$

99. (D) Let fraction = x

$$\text{then, } 2x + \frac{3}{x} = \frac{29}{3}$$

$\Rightarrow 6x^2 - 29x + 9 = 0$

$6x2 - 27x - 2x + 9 = 0$

$3x (2x - 9) - 1 (2x - 9) = 0$

$$x = \frac{1}{3}, \frac{9}{2}$$

According to option $x = \frac{9}{2}$

100.(C) $\frac{8x}{3}+7\left(5-\frac{2x}{3}\right)\times\frac{1}{2}=\frac{1}{2}$

$$\Rightarrow \frac{8x}{3}+\frac{35}{2}-\frac{7X}{3}=\frac{1}{2}$$

$$\Rightarrow \frac{x}{3}=\frac{-34}{2}$$

$x = -51$

101.(B) $a - b = 1$ ..... (1)

$a b = 6$ ..... (2)

from (1)

$a^2 + b^2 - 2ab = 1$

$a^2 + b^2 = 1 + 2 \times 6$

$a^2 + b^2 = 13$

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

$= -1 (13 + 6)$

$= - 19$

102.(B) Do by option

If we take $= \frac{9}{2}$

$$\text{then, } \frac{9}{2}+\frac{2}{9}\times3$$

$$= \frac{9}{2}+\frac{2}{3}=\frac{31}{6}$$

So, $\frac{9}{2}$ is the fraction

103. (C) $\frac{x}{2}-\left[4\left(\frac{15}{2}-\frac{x}{3}\right)\right]\times\frac{1}{3}=-\frac{x}{18}$

$\frac{x}{2}-\left(30-\frac{4x}{3}\right)\times\frac{1}{3}=\frac{-x}{18}$

$\frac{x}{2}+\frac{4x}{9}-10=\frac{-x}{18}$

$\frac{x}{2}+\frac{4x}{9}+\frac{x}{18}=10 \Rightarrow \frac{9x+8x+x}{18}=10$

$x = 10$

104. (D) $a^3 + b^3 = 152$ ..... (1)

$a + b = 8$ ..... (2)

By (2)

$(a + b)^2 = 64$

$a^2 + b^2 + 2ab = 64$

$a^2 + b^2 + 2ab = 64$

$a^2 + b^2 - 2ab = 64 - 3ab$

Now from (1)

$a^3 + b^3 = 152$

$(a + b)(a^2 + b^2 - ab) = 152$

$8(64 - 3ab) = 152$

$64 - 3ab = 19$

$3ab = 45$

$ab = 15$

105. (A) Do by options

If we take option (A)

the $\frac{5}{4}-\frac{4}{5}=\frac{9}{20}$

So option (A) is correct

106. (C) $5x + 6(3 - 2x) = 4$

$5x + 18 - 12x = 4$

$7x = 14$

$x = 2$

107. (C) $a + b = 1$ ..... (1)

$ab = -6$ ..... (2)

From (1)

$a^2 + b^2 + 2ab = 1$

$a^2 + b^2 = 1 - 2ab$

(from 2)

$a^2 + b^2 = 13$

Now,

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

$a^3 + b^3 = 1(13 - (-6))$

$a^3 + b^3 = 19$

108. (D) $x+\frac{20}{x}=9$

$x^2 - 9x + 20 = 0$

$x^2 - 5x - 4x + 20 = 0$

$x(x - 8) - 4(x - 5) = 0$

$x = 4, 5$

By option $x = 5$

109. (A) $9x-\left[\frac{5(2x+1)}{2}\right]=\frac{9}{2}$

$\Rightarrow 9x - 5x - \frac{5}{2}=\frac{9}{2}$

$\Rightarrow 4x=\frac{14}{2} \Rightarrow x=\frac{7}{4}$

110. (D) $a + b = 4$ ..... (1)

$ab = -21$ ..... (2)

From (1)

$a^2 + b^2 + 2ab = 16$

$a^2 + b^2 = 16 + 42$ (from 2)

$a^2 + b^2 = 58$

Now,

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

$a^3 + b^3 = 4(58 - (-21))$

$a^3 + b^3 = 4 \times 79$

$a^3 + b^3 = 316$

111. (A) $x+\frac{10}{x}=\frac{37}{4}$

$4x - 37x + 40 = 0$

$4x^2 - 32x - 5x + 40 = 0$

$4x(x - 8) - 5(x - 8) = 0$

$x = 8, \frac{5}{4}$

According to option $x=\frac{5}{4}$

112. (A) $\frac{-1}{2}\times(x-5)+3=\frac{-5}{2}$

$\Rightarrow \frac{-x}{2}+\frac{5}{2}+3=\frac{-5}{2}$

$\Rightarrow \frac{-x}{2}=-5-3$

$x = 16$

113. (C) $a - b = 1$ ..... (1)

$ab = 6$ ..... (2)

$a^2 + b^2 = 13$ ..... (3)

Now

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

$a^3 - b^3 = 1(13 + 6)$

$a^3 - b^3 = 19$

114. (D) $x-\frac{58}{x}=\frac{3}{4}$

$4x^2 - 3x - 232 = 0$

$4x^2 - 32x + 29x - 232 = 0$

$4x(x - 8) + 29(x - 8) = 0$

$x = 8$

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115. (D) $\frac{5}{2}\left(\frac{8x}{3}-\frac{1}{2}\right)+\frac{13}{2}=\frac{2x}{3}$

$\Rightarrow \frac{20x}{3}-\frac{5}{4}+\frac{13}{2}=\frac{2x}{3}$

$\Rightarrow \frac{20x}{3}-\frac{2x}{3}=\frac{5}{4}-\frac{13}{2}$

$\Rightarrow \frac{18x}{3}=\frac{5-26}{4}$

$\Rightarrow 6x=\frac{-21}{4}$

$x=\frac{-21}{6\times 4}\Rightarrow\frac{-7}{8}$

116. (C) $a^3+b^3=72$

$ab=8$

let $a=4$

$b=2$

then $= a+b=6$

117. (B) let fraction is = x

A.T.Q.

$4x+\frac{7}{x}=16$

$\Rightarrow 4x^2+7=16x$

$\Rightarrow 4x^2-16x+7=0$

$\Rightarrow 4x^2-14x-2x+7=0$

$\Rightarrow 2x(2x-1)-7(2x-1)=0$

$(2x-7)(2x-1)=0$

$x=\frac{7}{2},\frac{1}{2}$

$x=\frac{7}{2}$

118.(A) $\frac{14}{3}+\frac{1}{2}\left(x-\frac{7}{3}\right)=\frac{-2x}{3}$

$\Rightarrow \frac{14}{3}+\frac{x}{2}-\frac{7}{6}=\frac{-2x}{3}$

$\Rightarrow \frac{x}{2}+\frac{2x}{3}=\frac{7}{6}-\frac{14}{3}$

$\Rightarrow \frac{7x}{6}=\frac{-21}{6}$

$\Rightarrow x=-3$

119.(A) $a+b=10$ ..... (1)

$ab=24$ ..... (2)

From (1)

$a^2+b^2+2ab=100$

$a^2+b^2=100-48$

$a^2+b^2=52$ ..... (3)

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

$10(52-24)$

$a^3+b^3=280$

120.(A) $x+\frac{3}{x}=\frac{19}{4}$

$4x^2-19x+12=0$

$4x^2-16x-3x+12=0$

$4x(x-4)-3(x-4)=0$

$x=\frac{3}{4},4$

According to the option $x=\frac{3}{4}$

121. (D) $\frac{5}{2}-\frac{6}{5}\left(x-\frac{15}{2}\right)=\frac{-x}{5}$

$\frac{5}{2}-\frac{6x}{5}+9=\frac{-x}{5}$

$x=\frac{23}{2}$

122.(D) $a-b=2$ ..... (1)

$ab=24$ ..... (2)

From (1)

$(a-b)^2=4$

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

$a^2+b^2=52$ ..... (3)

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

$a^3-b^3=2(52+24)$

$a^3-b^3=152$

123.(C) $2x+\frac{1}{x}=\frac{17}{6}$

$12x^2-17x+6=0$

$12x^2-8x-9x+6=0$

$4x(3x-2)-3(3x-2)=0$

$x=\frac{2}{3},\frac{3}{4}$

According to the option $x=\frac{3}{4}$

124. (D) $\frac{-3}{2}+\frac{2}{3}(3x+9) = \frac{x}{2}$

$\frac{-3}{2}+2x+6 = \frac{x}{2}$

$\frac{3}{2}x = \frac{-9}{2}$

$x = -3$

125. (D) $a - b = 2$

$ab = 8$

$a^3 - b^3 = ?$

So,

Let $a = 4$

$b = 2$

$a - b = 2$

$ab = 4 \times 2 = 8$

So, $a^3 - b^3 = 4^3 - 2^3$

$= 64 - 8 = 56$

or

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

$2^3 = a^3 - b^3 - 3 \times 8 \times 2$

$a^3 - b^3 = 56$

126. (A) So, let number is x

$x - \frac{7}{x} = 9.3$

Best to solve this type we can put the options easly

let $x = 10$

$10 - \frac{7}{10} = 9.3$

So $x = 10$

127.(C) $-3\left(1-\frac{x}{2}\right)+\frac{5x}{3} = \frac{1}{6} \Rightarrow \frac{19x}{16} = 3+\frac{1}{6}$

$\Rightarrow \frac{19x}{6} = \frac{19}{6}$

$x = 1$

128.(B) $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$

$3^3 = a^3 + b^3 + 3 \times 4 \times 3 \Rightarrow a^3 + b^3 = 63$

129.(C) Let number = x

$x + \frac{9}{x} = x^2 + 9 = 10x \Rightarrow x^2 - 10x + 9 = 0$

$x = 9$

130.(D) $\frac{10x}{3}+\frac{5}{2}\left(2-\frac{x}{3}\right)=\frac{7}{2}$

$\frac{10x}{3}+5-\frac{5x}{6}=\frac{7}{2}$

$\frac{15x}{6}=\frac{-3}{2}$

$x = \frac{-3}{5}$

131.(D) $a - b = 2$ ..... (1)

$ab = 15$ ..... (2)

$(a - b)^2 = 4$

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

$a^2 + b^2 = 34$ ..... (3)

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

$a^3 - b^3 = 2(34 + 15)$

$a^3 - b^3 = 98$

132.(A) $x + \frac{4}{x} = \frac{13}{3}$

$3x^2 - 13x + 12 = 0$

$3x^2 - 9x - 4x + 12 = 0$

$3x(x - 3) - 4(x - 3) = 0$

$x = \frac{4}{3}, 3$

According to option $x = \frac{4}{3}$

133.(C) $7x - \frac{3}{2} \times (4x - 9) = \frac{13}{2} \Rightarrow 14x - 12x + 27 = 13$

$2x = -14 \Rightarrow x = -7$

134.(B) $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$

$8^3 = a^3 + b^3 + 3 \times 15 \times 8 \Rightarrow a^3 + b^3 = 152$

135.(A) Let number = x

$x + \frac{4}{x} = \frac{17}{2} \Rightarrow \frac{x^2+4}{x} = \frac{17}{2}$

$\Rightarrow 2x^2 - 17x + 8 = 0$

$x = \frac{1}{2}, 8$

136.(A) $\frac{1}{3}\left(\frac{12x}{5}-\frac{1}{2}\right)+\frac{6}{5}=\frac{7}{6}$

$\frac{4x}{5}-\frac{1}{6}+\frac{6}{5}=\frac{7}{6}$

$\frac{4x}{5}=\frac{4}{30} \Rightarrow x = \frac{1}{6}$

137.(B) $a - b = 10$ .... (1)

$ab = -21$ ..... (2)

from (1)

$a^2 + b^2 - 2ab = 100$

$a^2 + b^2 = 58$ ..... (3)

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

$= 10(58 - 21)$

$a^3 - b^3 =$ **370**

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138.(C) $2x + \frac{5}{x} = 7$

$2x^2 - 7x + 5 = 0$

$2x^2 - 5x - 2x + 5 = 0$

$x(2x - 5) - 1(2x - 5) = 0$

$x = 1, \frac{5}{2}$

According to option $x = \frac{5}{2}$

139. (B) $\frac{2}{3}\left(\frac{6x}{5} - \frac{1}{4}\right) + \frac{1}{3} = \frac{9x}{5}$

$\frac{12x}{15} - \frac{1}{6} + \frac{1}{3} = \frac{9x}{5}$

$\frac{12x}{15} - \frac{9x}{5} = -\frac{1}{6}$

$\frac{12x - 27x}{15} = -\frac{1}{6}$

$\frac{-15x}{15} = -\frac{1}{6}$

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

140. (D) $a^3 + b^3 = 341$

$ab = 30$

Here $a = 6, b = 5$

So, $a + b = 11$

141. (C) Assume that Fraction is x

according to question

$x + \frac{1}{x} \times 3 = \frac{31}{6}$

$\frac{x^2 + 3}{x} = \frac{31}{6}$

$6x^2 + 18 = 31x$

$6x^2 - 31x + 18 = 0$

$6x^2 - 27x - 4x + 18 = 0$

$3x(2x - 9) - 2(2x - 9) = 0$

$x = \frac{9}{2}$

ALGEBRA
बीजगणित
(Previous Year Questions)

CDS – [2022-2021]

CDS [2022-I]

1. If $x = 7 + 4\sqrt{3}$, then what is the value of $\sqrt{x} + \frac{1}{\sqrt{x}}$?

यदि $x = 7 + 4\sqrt{3}$, तो $\sqrt{x} + \frac{1}{\sqrt{x}}$ का मान क्या है?

(A) 1 (B) 2
(C) 3 (D) 4

2. What is the value of the following?

$$\frac{(5.4)^3 - 0.064}{(5.4)^2 + 2.16 + 0.16}$$

$\frac{(5.4)^3 - 0.064}{(5.4)^2 + 2.16 + 0.16}$ का मान क्या है?

(A) 4 (B) 4.4
(C) 5 (D) 5.4

3. If $x = 9999$, then what is the value of the following?

$$\frac{4x^3 - x}{(2x+1)(6x-3)}$$

यदि x = 9999, तो $\frac{4x^3 - x}{(2x+1)(6x-3)}$ का मान क्या है?

(A) 1111 (B) 2222
(C) 3333 (D) 6666

4. If $\left(x + \sqrt{1+x^2}\right)\left(y + \sqrt{1+y^2}\right) = 1$, where x and y are real numbers, then what is the value of $(x + y)^2$?

यदि $\left(x + \sqrt{1+x^2}\right)\left(y + \sqrt{1+y^2}\right) = 1$, जहाँ x और y वास्तविक संख्याएँ हैं, तो $(x+y)^2$ का मान क्या है?

(A) 0 (B) 1
(C) 4 (D) 9

5. If $43^x \times 47^y = (2021)^2, x \neq 0, y \neq 0$, then what is the value of the following?

$$\frac{4xy + x + y}{2xy - x - y}$$

यदि $43^x \times 47^y = (2021)^2, x \neq 0, y \neq 0,$ तो $\frac{4xy + x + y}{2xy - x - y}$ का मान क्या है?

(A) 5 (B) 15
(C) 25 (D) 45

6. If $x^2 = 17x + y$ and $y^2 = x + 17y$, $x \# y$, then what is the value of $\sqrt{x^2 + y^2 + 1}$?

यदि $x^2 = 17x + y$ और $y^2 = x + 17y$, $x \# y$, तो $\sqrt{x^2 + y^2 + 1}$ का मान क्या है?

(A) 17 (B) 19
(C) 23 (D) 27

7. What is the least value of n if $194480 + n = m^4$, where m and n are natural numbers?

n का न्यूनतम मान क्या है, यदि $194480 + n = m^4$, जहाँ m और n धनपूर्ण संख्याएँ हैं?

(A) 1 (B) 2
(C) 3 (D) 4

8. If $\frac{x-y}{x\sqrt{y} + y\sqrt{x}} = \frac{1}{\sqrt{x}}; (x > 0, y > 0)$, then what is the value of $\frac{x}{y}$?

यदि $\frac{x-y}{x\sqrt{y} + y\sqrt{x}} = \frac{1}{\sqrt{x}}; (x > 0, y > 0)$, तो $\frac{x}{y}$ का मान क्या है?

(A) 1 (B) 2
(C) 4 (D) 8

HEAD OFFICE : 201, Himmat Nagar, Gopalpura Pulia, Tonk Road, Jaipur-302018
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9. Consider a question and two statements:

Question : Is 3x + 2y positive?

Statement-I : $x^3 = -29.8$

Statement-II : $y^3 = 3x$

Which one of the following is correct in respect of the question and the statements?
एक प्रश्न और दो कथनों पर विचार कीजिए:
प्रश्न : क्या 3x + 2y धनात्मक है ?
कथन-I : $x^3 = -29.8$
कथन-II : $y^3 = 3x$
प्रश्न और कथनों के बारे में निम्नलिखित में से कौन-सा एक सही हैं ?
(A) प्रश्न का उत्तर देने के लिए केवल कथन-I ही पर्याप्त है
Statement-I alone is sufficient to answer the question
(B) प्रश्न का उत्तर देने के लिए केवल कथन-II ही पर्याप्त है
Statement-II alone is sufficient to answer the question
(C) प्रश्न का उत्तर देने के लिए कथन-I और कथन-II दोनों मिलकर ही पर्याप्त है
Both Statement-I and Statement-II are together sufficient to answer the question
(D) प्रश्न का उत्तर देने के लिए कथन-I और कथन-II दोनों मिलकर ही पर्याप्त नहीं है
Both statement-I and Statement-II are not sufficient to answer the question

10. Consider a question and two statements:

Question : Does the equation $ax^2 + bx + c = 0$ have real roots of opposite sign?

Statement-I : The discriminatant D > 0

Statement-II : c / a > 0

Which one of the following is correct in respect of the question and the statements?
एक प्रश्न और दो कथनों पर विचार कीजिए:
प्रश्न : क्या समीकरण $ax^2 + bx + c = 0$ विपरीत चिन्ह वाले वास्तविक मूल है ?
कथन-I : विविक्तकर D > 0
कथन-II : c / a > 0
प्रश्न और कथनों के बारे में निम्नलिखित में से कौन-सा एक सही है ?
(A) प्रश्न का उत्तर देने के लिए केवल कथन-I ही पर्याप्त है
Statement-I alone is sufficient to answer the question
(B) प्रश्न का उत्तर देने के लिए केवल कथन-II ही पर्याप्त है
Statement-II alone a sufficient to answer the question
(C) प्रश्न का उत्तर देने के लिए कथन-I और कथन-II दोनों मिलकर ही पर्याप्त है
Both Statement-I and Statement-II are together sufficient to answer the question
(D) प्रश्न का उत्तर देने के लिए कथन-I और कथन-II दोनों मिलकर ही पर्याप्त नहीं है
Both statement-I and Statement-II are not sufficient to answer the question

11. Consider a question and two statements:

Question : Is $a^2 + b^2 + c^2 - ab - bc - ca$ (a, b, c are distinct real numbers) always positive?

Statement-I : a > b > c

Statement-II : a + b + c = 0

Which one of the following is correct in respect of the question and the statements?
एक प्रश्न और दो कथनों पर विचार कीजिए:
प्रश्न : क्या $a^2 + b^2 + c^2 - ab - bc - ca$ (a, b, c भिन्न वास्तविक संख्याएँ हैं) सर्वदा धनात्मक हैं ?
कथन-I : a > b > c
कथन-II : a + b + c = 0
प्रश्न और कथनों के बारे में निम्नलिखित में से कौन-सा एक सही है ?
(A) प्रश्न का उत्तर देने के लिए केवल कथन-I ही अपेक्षित है
Statement-I alone is required to answer the question
(B) प्रश्न का उत्तर देने के लिए केवल कथन-II ही अपेक्षित है
Statement-II alone is rqeuired to answer the question
(C) प्रश्न का उत्तर देने के लिए कथन-I और कथन-II दोनों अपेक्षित है
Both Statement-I and Statement-II are required to answer the question
(D) प्रश्न का उत्तर देने के लिए न तो कथन-I और न ही कथन-II अपेक्षित है
Neither Statement-I not Statement-II required to answer the question

12. Consider a question and two statements:

Question : Is $\frac{x^6 + y^6}{x^4 + y^4}$ always greater than

$$\frac{x^4 + y^4}{x^2 + y^2}(x \neq y \neq 0)?$$

Statement-I : $x > y$

Statement-II : $x^2 + y^2 > 2xy$

Which one of the following is correct in respect of the question and the statements?
एक प्रश्न और दो कथनों पर विचार कीजिए:

प्रश्न : क्या $\frac{x^6 + y^6}{x^4 + y^4}$ हमेशा $\frac{x^4 + y^4}{x^2 + y^2}(x \neq y \neq 0)$ से बड़ा हैं ?

कथन-I : $x > y$

कथन-II : $x^2 + y^2 > 2xy$

(A) प्रश्न का उत्तर देने के लिए केवल कथन-I ही अपेक्षित है
Statement-I alone is required to answer the question

(B) प्रश्न का उत्तर देने के लिए केवल कथन-II ही अपेक्षित है
Statement-II alone is rqeuired to answer the question

(C) प्रश्न का उत्तर देने के लिए कथन-I और कथन-II दोनों अपेक्षित है
Both Statement-I and Statement-II are required to answer the question

(D) प्रश्न का उत्तर देने के लिए न तो कथन-I और न ही कथन-II अपेक्षित है
Neither Statement-I nor Statement-II required to answer the question

13. How many quadratic equations have the sum of their roots equal to the product of their roots?
कितने द्विघात समीकरणों में उनके मूलों के योग, उनके मूलों के गुणनफल के बराबर होते हैं ?

(A) Zero / शुन्य
(B) One / एक
(C) Two / दो
(D) Infinitely many / अनंततः अनेक

Solution

1. (D) $x = 7 + 4\sqrt{3}$

$x = \left(\sqrt{3}\right)^2 + (2)^2 + 4\sqrt{3}$ Square root

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

$\frac{1}{\sqrt{x}} = 2 - \sqrt{3}$

$\sqrt{x} + \frac{1}{\sqrt{x}} = 4$

2. (C) $\frac{(5.4)^3 - (.4)^3}{(5.4)^2 + 5.4 \times .4 + (.4)^2}$

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

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

$5.4 - 0.4 = 5$

3. (C) $x = 9999$

$\Rightarrow \frac{4x^3 - x}{(2x-1)(6x-3)}$

$\Rightarrow \frac{x\left(4x^2 - 1\right)}{(2x+1)3(2x-1)}$

$\Rightarrow \frac{x(2x-1)(2x+1)}{3(2x+1)(2x-1)}$

$\Rightarrow \frac{x}{3} = \frac{9999}{3} = 3333$

4. (A) x and y are real numbers
So x = 0 and y = 0

$\left(0 + \sqrt{1 + 0^2}\right)\left(0 + \sqrt{1 + 0^2}\right) = 1$

$1 = 1$

$(0 + 0)^2 = 0$

5. (A) $43^x \times 47^y = (2021)^2$

$43^x \times 47^y = 43^2 \times 47^2$

$x = 2$

$y = 2$

$\Rightarrow \frac{16 + 2 + 2}{8 - 2 - 2} = \frac{20}{4} = 5$

6. (A) $x^2 = 17x + y$ ....(i)

$y^2 = x + 17y$ ....(ii) $x \neq y$

eq. (i) + (ii)

$x^2 + y^2 = 18(x + y)$

eq. (i) - (ii)

$x^2 - y^2 = 16(x - y)$

$(x - y)(x + y) = 16(x - y)$

$x + y = 16$

$x^2 + y^2 = 18 \times 16$

eq.(i) add 1 bothside

$x^2 + y^2 + 1 = 288 + 1$

$\sqrt{x^2+y^2+1} = \sqrt{289}$ square root

$\sqrt{x^2+y^2+1} = 17$

7. (A) $194480 + n = m^4$ $\quad n = 1, m = 21$

$194480 + 1 = (21)^4$

$194481 = 194481$

8. (C) $\dfrac{x-y}{x\sqrt{y}+y\sqrt{x}} = \dfrac{1}{\sqrt{x}}$

$\dfrac{x-y}{\sqrt{x}\sqrt{y}\left(\sqrt{x}+\sqrt{y}\right)} = \dfrac{1}{\sqrt{x}}$

$\therefore (a-b) = \left(\sqrt{a}+\sqrt{b}\right)\left(\sqrt{a}-\sqrt{b}\right)$

$\dfrac{\left(\sqrt{x}-\sqrt{y}\right)\left(\sqrt{x}+\sqrt{y}\right)}{\sqrt{x}\sqrt{y}\left(\sqrt{x}+\sqrt{y}\right)} = \dfrac{1}{\sqrt{x}}$

$\sqrt{x} - \sqrt{y} = \sqrt{y}$

$\sqrt{x} = 2\sqrt{y}$

$x = 4y$

$\Rightarrow \dfrac{x}{y} = 4$

9. (C) Equation - $3x + 2y$

Statement - I = $x^3 = -29.8$

Statement - II = $y^3 = 3x$

Both statements are required to solving the equation.

10. (D) Equation - $ax^2 + bx + c = 0$

Roots are same and opposite sign

$\alpha + B = 0 \quad \alpha = -B$

$\dfrac{-b}{a} = 0$

$-\alpha B < 0$

$\dfrac{c}{a} < 0$

Statement (ii) is wrong.

$\sqrt{D} = \sqrt{b^2 - 4ac}$

Real roots then $D > 0$

Because $b^2 - 4ac > 0$

Statement (i) right.

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

equation is multiple by 2 and divided 2

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

neither statements required because result of square is always positive.

12.(D) Statement (i) $x > y$

$x = 1, y = -1$

$\dfrac{1+1}{1+1} = \dfrac{1+1}{1+1}$

$1 = 1$

Statement I wrong

Statement (ii)

$x^2 + y^2 - 2xy > 0$

$(x-y)^2 > 0$

$(x-y)^2$ is always greater then zero

$x = 1, y = -1$

$(2)^2 > 0$

$x = -1, y = 1$

$(-2)^2 > 0$

Statement II is right.

13. (D) $x^2 + 4x + 4 = 0$

$(x+2)(x+2) = 0$

$x^2 - x + 1 = 0$

$x = -2, -2$

$4x^2 - 4x + 4 = 0$

$-\dfrac{b}{a} = \dfrac{4}{4}$

$\dfrac{c}{a} = \dfrac{4}{4}$

$-\dfrac{b}{a} = \dfrac{1}{1} = \alpha + b$

$\dfrac{c}{a} = \dfrac{1}{1} = \alpha b$

$\alpha + b = 1, \alpha b = 1$

Infinitely many.

CDS – [2021-II]

1. Which one of the following is a factor of the polynomal
$(x-1)(x-2)(x-4)-90$?
निम्नलिखित में से कौन-सा बहुपद $(x-1)(x-2)(x-4)-90$ का गुणनखंड है ?
(A) $x+14$ (B) $x-14$
(C) $x-6$ (D) $x-7$

2. What is the sum of the linear factors (in x and y) of the expression.
$2x^2+xy-3y^2$?
व्यंजक $2x^2+xy-3y^2$ के रैखिक गुणनखंडों (x और y में) का योगफल क्या है ?
(A) $2x-3y$ (B) $3x-2y$
(C) $3x+2y$ (D) $2x+3y$

3. Which one of the following is equations does not have real roots?
निम्नलिखित में से किस समीकरण के वास्तविक मूल नहीं हैं ?
(A) $2x^2+16x+3=0$
(B) $2x^2+10x-1=0$
(C) $x^2+8x+1=0$
(D) $4x^2+9x+6=0$

4. The sum and the product of the roots of a quadratic equation are 7 and 12 respectively. If the bigger root is halved and the smaller root is doubled. then what is the resulting quadratic equation?
एक द्विघात समीकरण के मूलों के योगफल और गुणनफल क्रमशः 7 और 12 हैं। यदि बृहत् मूल को आधा और लघु मूल को दोगुना कर दिया जाए, तो परिणामी द्विघात समीकरण क्या है ?
(A) $x^2-6x+12=0$
(B) $x^2-8x+12=0$
(C) $x^2+8x+12=0$
(D) $x^2-10x+12=0$

5. For which values of k, does the equation $x^2-kx+2=0$ have real and distinct solutions?
k के किन मानों के लिए, समीकरण $x^2-kx+2=0$ के वास्तविक और भिन्न हल हैं ?
(A) $-2\sqrt{2}<k<2\sqrt{2}$
(B) $k<-2\sqrt{2}$ only/केवल
(C) $k>2\sqrt{2}$ only/केवल
(D) $k<-2\sqrt{2}$ or $k>2\sqrt{2}$

6. If $\alpha+\beta+\gamma=\alpha\beta+\beta\gamma+\gamma a$, then what is $(1-\alpha)(1-\beta)(1-\gamma)$ equal to ?
यदि $\alpha+\beta+\gamma=\alpha\beta+\beta\gamma+\gamma a$ है, तो $(1-\alpha)(1-\beta)(1-\gamma)$ किसके बराबर है ?
(A) $1-\alpha\beta\gamma$ (B) $1+\alpha\beta\gamma$
(C) $\alpha^2+\beta^2+\gamma^2$ (D) $(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$

7. If one of the roots of the equation $ax^2-4ax+15=0$ is $\frac{3}{2}$, then what is the sum of the squares of the roots ?
यदि समीकरण $ax^2-4ax+15=0$ के मूलों में से एक मूल $\frac{3}{2}$ है, तो मूलों के वर्गों का योगफल क्या है ?
(A) $\frac{15}{2}$ (B) $\frac{17}{2}$
(C) $\frac{19}{2}$ (D) $\frac{21}{2}$

8. If $2x-3y-7=0$ then what is the value of $8x^3-36x^2y+54xy^2-27y^3-340$?
यदि $2x-3y-7=0$ है, तो $8x^3-36x^2y+54xy^2-27y^3-340$ का मान क्या है ?
(A) -1 (B) 0
(C) 1 (D) 3

9. If $\frac{x}{b+c-a}=\frac{y}{b-c-a}=\frac{z}{a+b-c}=k$, then what is $x^2+y^2+z^2-2xy-2yz+2zx$ eaual to ?
यदि $\frac{x}{b+c-a}=\frac{y}{b-c-a}=\frac{z}{a+b-c}=k$ है, तो $x^2+y^2+z^2-2xy-2yz+2zx$ किसके बराबर है ?
(A) $k^2(a^2+b^2+c^2)$ (B) $k^2(a^2-b^2+c^2)$
(C) $k^2(a+b+c)^2$ (D) $k^2(a-b+c)^2$

10. Consider the following inequalities :
1. $\frac{a^2-b^2}{a^2+b^2}>\frac{a-b}{a+b}$ where $a>b>0$
2. $\frac{a^3+b^3}{a^2+b^2}>\frac{a^2+b^2}{a+b}$ only when $a>b>0$

Which of the above is/are correct ?
निम्नलिखित असमिकाओं पर विचार कीजिए :

1. $\frac{a^2-b^2}{a^2+b^2} > \frac{a-b}{a+b}$ जहां $a > b > 0$

2. $\frac{a^3+b^3}{a^2+b^2} > \frac{a^2+b^2}{a+b}$ केवल तब, जब $a > b > 0$

उपर्युक्त में से कौन-सा/कौन-से सही है/हैं ?

(A) Only 1/केवल 1

(B) Only 2/केवल 2

(C) Both 1 and 2/1 और 2 दोनों

(D) Neither 1 nor 2/न तो 1, न ही 2

11. If $\frac{ay-bx}{c} = \frac{cx-ax}{b} = \frac{bz-cy}{a}$, then which of the following is/are correct ?

यदि $\frac{ay-bx}{c} = \frac{cx-ax}{b} = \frac{bz-cy}{a}$ है, तो निम्नलिखित में कौन-सा/कौन-से सही है/हैं ?

1. $\frac{x}{a} = \frac{y}{b}$

2. $\frac{x+y+z}{a+b+c} = \frac{z}{c}$

Select the correct answer using the code given below :

नीचे दिए कूट का प्रयोग कर सही उत्तर चुनिए :

(A) Only 1/केवल 1

(B) Only 2/केवल 2

(C) Both 1 and 2/ 1 और 2 दोनों

(D) Neither 1 nor 2/ न तो 1 न ही 2

Solution

1. (D) Put $x = 7$
$6 \times 5 \times 3 - 90$
$= 90 - 90$
$= 0$
It satisfies ...(D)

2. (C) $2x^2 + xy - 3y^2$
$(x-y)(2x+3y)$
factors $\rightarrow x - y$ & $2x + 3y$
sum of factors $\rightarrow x - y + 2x + 3y$
$= 3x + 2y$

3. (D) If an equation has no real roots, $D = b^2 - 4ac$
< 0
$4x^2 + 9x + 6 = 0$
$D = 81 - 4 \times 4 \times 6$
$= 81 - 96$
$= -15 < 0$
$\therefore$ it satisfies our condition.

4. (B) $\alpha + \beta = 7$
$\alpha\beta = 12$
$\Rightarrow \alpha = 4, \beta = 3$
$\Rightarrow \alpha_1 = 2, \beta_1 = 6$
equation $\rightarrow x^2 - (\alpha + \beta)x + \alpha\beta$
$= x^2 - 8x + 12 = 0$

5. (D) $x^2 - kx + 2 = 0$
Roots are real and distinct.
So,
$b^2 - 4ac > 0$
$\Rightarrow k^2 - 4(1)(2) > 0$
$K^2 > 8$

$K > 2\sqrt{2}$ or $k < -2\sqrt{2}$

6. (A) If $\alpha + \beta + \gamma = \alpha\beta + \beta\gamma + \gamma$ .....(i)
then,
$(1-\alpha)(1-\beta)(1-\gamma)$
$= (1 - \alpha - \beta + \alpha\beta)(1 - \gamma)$
$= (1 - \alpha - \beta + \alpha\beta - \gamma + \alpha\gamma + \gamma\beta - \alpha\beta\gamma)$
$= (1 - \alpha\beta\gamma + (\alpha\beta + \gamma\beta + \alpha\gamma) - (\alpha + \beta + \gamma))$
from equation ..... (i)

$\boxed{1 - \alpha\beta\gamma}$

7. (B) $ax^2 - 4ax + 15 = 0$
let roots are $\alpha + \beta$

one root is $= \frac{3}{2}$

$a \times \left(\frac{3}{2}\right)^2 - 4a\left(\frac{3}{2}\right) + 15 = 0$

$a \times \frac{9}{4} - 6a + 15 = 0$

$\frac{15a}{4} = 15$

$\boxed{a = 4}$

equation $= 4x^2 - 16x + 15 = 0$

$\alpha + \beta = \frac{+16}{4} = 4$

$\Rightarrow \beta = 4 - \frac{3}{2} = \frac{5}{2}$

$\Rightarrow \alpha^2 + \beta^2 = \frac{9}{4} + \frac{25}{4} = \frac{34}{4} = \frac{17}{2}$

8. (D) $2x - 3y - 7 = 0$ Then,

$2x - 3y = 7$
Cubing both side
$8x^3 - 27y^3 - 36x^2y + 54xy^2 = 343$
$8x^3 - 36x^2y + 54xy^2 - 27y^3 - 340 = 3$

9. (C) $\frac{x}{b+c-a} = \frac{y}{b-c-a} = \frac{z}{a-b-c} = K$
Put C = O
$x = k(b - a)$ $x = y$
$y = k(b - a)$
$z = K(a + b)$
Now put the value of x, y, z in question
$\Rightarrow x^2 + x^2 + z^2 - \frac{2}{x^2} - \frac{2x}{z} + \frac{2z}{x}$
$\Rightarrow z^2$
$\Rightarrow k^2(a + b)^2$
or
$k^2(a+b+c)^2$
Method-2
Put,
$a = b = c = 1$

10. (A) $\frac{a^2 - b^2}{a^2 + b^2} > \frac{a - b}{a + b}$
Where $(a > b > 0)$
By putting value of a & b it holds.

11. (C) We know,

If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = K$

then, $\frac{a + c + e}{b + d + f} = k$

(i) $\frac{x}{a} = \frac{y}{b} = \frac{z}{c} = k$

(ii) $\frac{x + y + z}{a + b + c} = k = \frac{z}{c}$
Both are correct.

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ALGEBRA
बीजगणित
(Previous Year Questions)

CDS – [2021-2016]

CDS [2021-I]

1. If a + b + c = 0, then which of the following are correct ?
यदि a + b + c = 0, है, तो निम्नलिखित में से कौन-से सही हैं ?
(CDS-2021)
i) $a^3 + b^3 + c^3 = 3abc$
ii) $a^2 + b^2 + c^2 = -2(ab + bc + ca)$
iii) $a^3 + b^3 + c^3 = -3ab(a + b)$
Select the correct answer using the code given below
नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए :
(A) 1 and 2 only (B) 2 and 3 only
(C) 1 and 3 only (D) 1, 2 and 3

2. If $\frac{x}{a}+\frac{y}{b} = a + b$ and $\frac{x}{a^2}+\frac{y}{b^2} = 2$ then what is $\frac{x}{a^2}-\frac{y}{b^2}$ equal to ?
यदि $\frac{x}{a}+\frac{y}{b} = a + b$ और $\frac{x}{a^2}+\frac{y}{b^2} = 2$ है, तो $\frac{x}{a^2}-\frac{y}{b^2}$ किसके बराबर है ?
(CDS-2021)
(A) –2 (B) –1
(C) 0 (D) 1

3. If (x – k) is the HCF of $x^2 + ax + b$ and $x^2 + cx + d$, then what is the value of k ?
यदि $x^2 + ax + b$ और $x^2 + cx + d$ का म.स. (एच.सी.एफ.) (x – k) है, तो k का मान क्या है ?
(CDS-2021)
(A) $\frac{d-b}{c-a}$ (B) $\frac{d-b}{a-c}$
(C) $\frac{d+b}{c+a}$ (D) $\frac{d-b}{c+a}$

4. Consider the following statements :
i) If x is directly proportional to z and y is directly proportional to z, then $(x^2 - y^2)$ is directly proportional to z^2.
ii) If x is inversely proportional to z and y is inversely proportional to z, then (xy) is inversely proportional to z^2.
Which of the above statements is/are correct?
निम्नलिखित कथनों पर विचार कीजिए : **(CDS-2021)**
i) यदि x, z के अनुक्रमानुपाती है और y, z के अनुक्रमानुपाती है, तो $(x^2 - y^2)$, z^2 के अनुक्रमानुपाती है।
ii) यदि x, z के व्युत्क्रमानुपाती है और y, z के व्युत्क्रमानुपाती है, तो (xy), z^2 के व्युत्क्रमानुपाती है।
उपरोक्त कथनों में से कौन-सा/से सही है/हैं ?
(A) i only (B) ii only
(C) Both i and ii (D) Neither i nor ii

5. What is $\frac{8x}{1-x^4}-\frac{4x}{x^2+1}+\frac{x+1}{x-1}+\frac{x-1}{x+1}$ equal to ?
$\frac{8x}{1-x^4}-\frac{4x}{x^2+1}+\frac{x+1}{x-1}+\frac{x-1}{x+1}$ किसके बराबर है ?
(CDS-2021)
(A) 0 (B) 1
(C) 2 (D) 4

6. If $x(x-1)(x-2)(x-3) + 1 = k^2$, then which one of the following is a possible expression for k ?
यदि $x(x-1)(x-2)(x-3) + 1 = k^2$ है, तो निम्नलिखित में से कौन-सा एक व्यंजक (एक्सप्रेशन) k के लिए संभव है ?
(CDS-2021)
(A) $x^2 - 3x + 1$ (B) $x^2 - 3x - 1$
(C) $x^2 + 3x - 1$ (D) $x^2 - 2x - 1$

7. What is $\frac{1}{bc(a-b)(a-c)} + \frac{1}{ca(b-c)(b-a)} + \frac{1}{ab(c-a)(c-b)}$ equal to.
$\frac{1}{bc(a-b)(a-c)} + \frac{1}{ca(b-c)(b-a)} + \frac{1}{ab(c-a)(c-b)}$ किसके बराबर है ? **(CDS-2021)**
(A) a + b + c (B) 3
(C) ab + bc + ca (D) 0

8. For how many real values of k is $6kx^2 + 12kx - 24x + 16$ a perfect square for every integer x ?
k के कितने वास्तविक मानों के लिए $6kx^2 + 12kx - 24x + 16$ प्रत्येक पूर्णांक x के लिए एक पूर्ण वर्ग है ? **(CDS-2021)**
(A) 0 (B) 1
(C) 2 (D) 4

9. If $x + \frac{1}{x} = \frac{5}{2}$, then what is $x^4 - \frac{1}{x^4}$ equal to ?
यदि $x + \frac{1}{x} = \frac{5}{2}$ है, तो $x^4 - \frac{1}{x^4}$ किसके बराबर है ? **(CDS-2021)**
(A) $\frac{195}{16}$ (B) $\frac{255}{16}$ (C) $\frac{625}{16}$ (D) 0

10. If the equation $4x^2 - 2kx + 3k = 0$ has equal roots, then what are the value of k ?
यदि समीकरण $4x^2 - 2kx + 3k = 0$ के मूल एक समान हैं, तो k के मान क्या हैं ? **(CDS-2021)**
(A) 4,12 (B) 4,8
(C) 0,12 (D) 0, 8

11. If the sum as well as the product of the roots of the equation $px^2 - 6x + q = 0$ is 6, then what is (p + q) to ?
यदि समीकरण $px^2 - 6x + q = 0$ के मूलों का गुणनफल और योगफल दोनों ही 6 है, तो (p + q) किसके बराबर है ? **(CDS-2021)**
(A) 8 (B) 7
(C) 6 (D) 5

12. If $\frac{1}{1\times2} + \frac{1}{2\times3} + \frac{1}{3\times4} + \ldots\ldots + \frac{1}{n(n+1)} = \frac{99}{100}$
then what is the value of n ?
यदि $\frac{1}{1\times2} + \frac{1}{2\times3} + \frac{1}{3\times4} + \ldots\ldots + \frac{1}{n(n+1)} = \frac{99}{100}$ है, तो n का मान क्या है ? **(CDS-2021)**
(A) 98 (B) 99
(C) 100 (D) 101

Solution

1. (A) $\because$ $a + b + c = 0$
then,
$a^3 + b^3 + c^3 - 3abc = 0$
and $a^2 + b^2 + c^2 + 2(ab + bc + ca) = 0$
$\therefore$ option (A) is correct

2. (C) ATQ,

$$\frac{x}{a} + \frac{y}{b} = a + b \quad \ldots\ldots\ldots(1)$$

$$\frac{x}{a^2} + \frac{y}{b^2} = 2 \quad \ldots\ldots\ldots(2)$$

multiplying by b in (2) and substracting from (1) then

$$\Rightarrow \frac{x}{a} + \frac{y}{b} - \left(\frac{xb}{a^2} + \frac{yb}{b^2}\right) = a + b - 2b$$

$$\Rightarrow \left(\frac{x}{a} - \frac{xb}{a^2}\right) + \left(\frac{y}{b} - \frac{y}{b}\right) = a - b$$

$$\Rightarrow x\left[\frac{a-b}{a^2}\right] = a - b \qquad \Rightarrow \frac{x}{a^2} = 1$$

$$\Rightarrow x = a^2$$

Putting $x = a^2$ in (1)

$$\Rightarrow \frac{a^2}{a} + \frac{y}{b} = a + b$$

$$\Rightarrow \frac{y}{b} = a + b - a = b$$

$$\Rightarrow y = b^2$$

hence,

$$\Rightarrow \frac{x}{a^2} - \frac{y}{b^2} = \frac{a^2}{a^2} - \frac{b^2}{b^2}$$

$$\Rightarrow 1 - 1 = 0$$

3. (B) HCF = x – k
and $x^2 + ax + b$ .....(i)
$x^2 + cx + d$ .....(ii)
Put x = k in eq. (i) and (ii)
$\therefore$ $k^2 + ka + b = 0$
$k^2 + kc + d = 0$
$\Rightarrow$ $k^2 + ka + b = k^2 + kc + d$

$$\Rightarrow k = \frac{d-b}{a-c}$$

4. (C) $x \propto z \Rightarrow x = kz$
$y \propto z \Rightarrow x = cz$
$\therefore$ $x^2 - y^2 = (k^2 - c^2)z^2$
$\Rightarrow$ $x^2 - y^2 \propto z^2$

and $x \propto \frac{1}{z}$ $\qquad x = \frac{k}{z}$

$y \propto \frac{1}{z}$ $\qquad y = \frac{c}{z}$

$$\Rightarrow xy = \frac{1}{z}(kc)$$

$$\Rightarrow xy \propto \frac{1}{z}$$

5. (A) $\frac{8x}{1-x^4}-\frac{4x}{x^2+1}+\frac{x+1}{x-1}-\frac{x-1}{x+1}$

Put x = 0

0 – 0 – 1 – (–1) = 0

6. (A) $x(x-1)(x-2)(x-3)+1=k^2$

Put x = 4

$4\times3\times2\times1+1=k^2$

$\therefore \quad k=\pm5$

(a) x^2-3x+1

put x = 4

16 – 12 + 1 = 5

7. (D) $\frac{1}{bc(a-b)(a-c)}+\frac{1}{ca(b-c)(b-a)}+$

$\frac{1}{ab(c-a)(c-b)}$

$\Rightarrow \frac{-a(b-c)-b(c-a)-c(a-b)}{abc(a-b)(b-c)(c-a)}$

$\Rightarrow -ab-ac-bc+ab-ac+bc=0$

8. (C) $6kx^2+12kx-24x+16$

for perfect square $b^2=4ac$

$\Rightarrow (12k-24)^2=4\times6k\times16$

$\Rightarrow 12\times12(k-2)^2=4\times16\times6k$

$\Rightarrow 3k^2-12k+12=8k$

$\Rightarrow 3k^2-20k+12=0$

$\Rightarrow b^2-4ac=400-144=256$

$\Rightarrow \sqrt{b^2-4ac}=16$

$\Rightarrow k=\frac{20\pm16}{6}=6,\frac{2}{3}$

9. (B) $x+\frac{1}{x}=\frac{5}{2}$

$x^2+\frac{1}{x^2}=\frac{17}{4}$

$x^4+\frac{1}{x^4}=\frac{257}{16}$

$x^4-\frac{1}{x^4}=\sqrt{\left(\frac{257}{16}\right)^2-4}=\frac{255}{16}$

10.(C) $4x^2-2kx+3k=0$

for equal roots $b^2=4ac$

$\Rightarrow \quad 4k^2=48k$

$\Rightarrow \quad k=0,12$

11.(B) $px^2-6x+q=0$

sum of roots $\frac{6}{p}=6 \quad \Rightarrow \quad p=1$

product $=\frac{q}{p}=6 \quad \Rightarrow \quad q=6$

$\therefore \quad p+q=7$

12.(B) $\frac{1}{1\times2}+\frac{1}{2\times3}+\frac{1}{3\times4}+.....+\frac{1}{n(n+1)}=\frac{99}{100}$

$=1-\frac{1}{2}+\frac{1}{2}-\frac{1}{3}+.....-\frac{1}{n+1}=\frac{99}{100}$

$=\frac{n+1-1}{n+1}=\frac{99}{100} \quad \Rightarrow \quad n=99$

CDS [2020-I]

1. If α and β are the roots of the quadratic equation $x^2 + kx - 15 = 0$ such that $\alpha - \beta = 8$, then what is the positive value of k ?

यदि α और β द्विघात समीकरण $x^2 + kx - 15 = 0$ के मूल इस प्रकार हैं कि $\alpha - \beta = 8$ हैं, तो k का धनात्मक मान क्या हैं ?

(A) 2 (B) 3
(C) 4 (D) 5

2. If (x + k) is the HCF of $x^2 + 5x + 6$ and $x^2 + 8x + 15$, then what is the value of k ?

यदि $x^2 + 5x + 6$ और $x^2 + 8x + 15$ का म.स (x + k) हैं तो k का मान क्या हैं ?

(A) 5 (B) 3
(C) 2 (D) 1

3. If $x^2 + 9y^2 = 6xy$ then what is y : x equal to ?

यदि $x^2 + 9y^2 = 6xy$ हैं तो y : x किसके बराबर हैं ?

(A) 1 : 3 (B) 1 : 2
(C) 2 : 1 (D) 3 : 1

4. What is $\frac{1}{a^{m-n}-1}+\frac{1}{a^{n-m}-1}$ equal to ?

$\frac{1}{a^{m-n}-1}+\frac{1}{a^{n-m}-1}$ किसके बराबर हैं ?

(A) 1 (B) –1
(C) 0 (D) $2a^{m-n}$

5. If $\frac{c}{a}$ and $z = \sqrt[6]{6}$ then which one of the following is correct ?

यदि $x = \sqrt{2}, y = 3\sqrt{3}$ और $z = \sqrt[6]{6}$ हैं तो निम्नलिखित में से कौन-सा एक सही हैं ?

(A) y < x < z (B) z < x < y
(C) z < y < x (D) x < y < z

6. What is the point on the xy-plane satisfying 5x + 2y = 7xy and 10x + 3y = 8xy ?

xy-समतल पर 5x + 2y = 7xy और 10x + 3y = 8xy को संतुष्ट करने वाला बिन्दु कौन-सा हैं ?

(A) $\left(-1,\frac{1}{6}\right)$ (B) $\left(\frac{1}{6},-1\right)$

(C) $\left(1,\frac{1}{6}\right)$ (D) $\left(-\frac{1}{6},1\right)$

7. If $\left(x^{8^{\frac{1}{x^8}}}\right) = 47$, what is the value of $\left(x^{6^{\frac{1}{x^6}}}\right) = ?$

यदि $\left(x^{8+\frac{1}{x^8}}\right)$ हैं, तो $\left(x^{6-\frac{1}{x^6}}\right)$ का मान क्या हैं ?

(A) 36 (B) 27
(C) 18 (D) 9

8. What are the values of p and q respectively, if (x – 1) and (x + 2) divide the polynomial $x^3 + 4x^2 + px + q$?

p और q के मान क्रमशः क्या हैं, यदि (x – 1) और (x + 2) बहुपद $x^3 + 4x^2 + px + q$ को विभाजित करते हैं ?

(A) 1, –6 (B) 2, –6
(C) 1, 6 (D) 2, 6

9. If $5^{x+1} - 5^{x-1} = 600$, then what is the value of 10^{2x} ?

यदि $5^{x+1} - 5^{x-1} = 600$ हैं, तो 10^{2x} का मान क्या हैं ?

(A) 1 (B) 1000
(C) 100000 (D) 1000000

10. If f(x) is divided by $(x-\alpha)(x-\beta)$ where $\alpha \neq \beta$, then what is the remainder ?

यदि f(x) को $(x-\alpha)(x-\beta)$ से विभाजित किया जाए, जहाँ $\alpha \neq \beta$ हैं, तो शेषफल क्या हैं ?

(A) $\frac{(x-\alpha)f(\alpha)-(x-\beta)f(\beta)}{\alpha-\beta}$

(B) $\frac{(x-\alpha)f(\beta)-(x-\beta)f(\alpha)}{\alpha-\beta}$

(C) $\frac{(x-\beta)f(\alpha)-(x-\alpha)f(\beta)}{\alpha-\beta}$

(D) $\frac{(x-\beta)f(\beta)-(x-\alpha)f(\alpha)}{\alpha-\beta}$

11. What is the area of the triangle having side lengths $\frac{y}{z}+\frac{z}{x}, \frac{z}{x}+\frac{x}{y}, \frac{x}{y}+\frac{y}{z}$?

उस त्रिभुज का क्षेत्रफल क्या हैं जिसकी भुजाओं की लम्बाई $\frac{y}{z}+\frac{z}{x}, \frac{z}{x}+\frac{x}{y}, \frac{x}{y}+\frac{y}{z}$ हैं ?

(A) $\frac{(x+y+z)2}{xyz}$ (B) $\frac{\sqrt{xyz}}{x+y+z}$

(C) $\frac{x}{y}+\frac{y}{z}+\frac{z}{x}$ (D) $\sqrt{\frac{xy+yz+zx}{xyz}}$

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12. How many integral values of x and y satisfy the equation $5x + 9y = 7$, where $-500 < x < 500$ and $-500 < y < 500$?
x और y के कितने पूर्णांक मान हैं जो समीकरण $5x + 9y = 7$ को संतुष्ट करते हैं, जहाँ $-500 < x < 500$ और $-500 < y < 500$ हैं ?
(A) 110 (B) 111
(C) 112 (D) None of the above

13. If $(x^2 - 1)$ is a factor of $ax^4 + bx^3 + cx^2 + dx + e$, then which one of the following is correct ?
यदि $(x^2 - 1)$, $ax^4 + bx^3 + cx^2 + dx + e$, का एक गुणनखंड हैं, तो निम्नलिखित में से कौन सा एक सही हैं ?
(A) $a + b + c = d + e$ (B) $a + b + e = c + d$
(C) $b + c + d = a + e$ (D) $a + c + e = b + d$

14. If $\frac{a}{b} = \frac{1}{3}, \frac{b}{c} = 2$, $\frac{c}{d} = \frac{1}{2}, \frac{d}{e} = 3$ and $\frac{e}{f} = \frac{1}{4}$ then what is the value of $\frac{abc}{def}$?
यदि $\frac{a}{b} = \frac{1}{3}, \frac{b}{c} = 2$, $\frac{c}{d} = \frac{1}{2}, \frac{d}{e} = 3$ और $\frac{e}{f} = \frac{1}{4}$ हैं, तो $\frac{abc}{def}$ का मान क्या हैं ?
(A) $\frac{1}{4}$ (B) $\frac{3}{4}$ (C) $\frac{3}{8}$ (D) $\frac{27}{4}$

CDS [2020-II]

15. $x^3 + x^2 + 16$ is exactly divisible by x, where x is a positive integer. The number of all such possible values of x is.
समीकरण $x^3 + x^2 + 16$, x से विभाज्य हैं, जहाँ x एक धनात्मक पूर्णांक हैं। तो x के सभी सम्भावित मान ज्ञात करें।
(A) 3 (B) 4 (C) 5 (D) 6

16. The number of (a, b, c) where a, b, c are positive integers such that abc = 30 is.
(a, b, c) की संख्या जहाँ a, b, c धनात्मक पूर्णांक हैं जैसे की abc = 30 हैं।
(A) 30 (B) 27
(C) 9 (D) 8

17. If the roots of the quadratic equation $x^2 - 4x - \log_{10} N = 0$ are real, then what is the minimum value of N ?
समीकरण $x^2 - 4x - \log_{10} N = 0$ के मूल वास्तविक हैं तो N की न्यूनतम मान क्या होगा।
(A) 1 (B) $\frac{1}{10}$ (C) $\frac{1}{100}$ (D) $\frac{1}{10000}$

18. The number of different solutions of the equation $x + y + z = 12$, where each of x, y and z is a positive integer is.
समीकरण $x + y + z = 12$ के विभिन्न समाधानों की संख्या क्या होगी जहाँ प्रत्येक x,y और z धनात्मक पूर्णांक हैं।
(A) 53 (B) 54
(C) 55 (D) 56

19. If $I = a^2 + b^2 + c^2$, where a and b are consecutive integers and c = ab then I is.
अगर $I = a^2 + b^2 + c^2$ जहाँ a और b लगातार पूर्णांक है और c = ab हो तो I का मान ज्ञात करें।
(A) an even number and it is not a square of an integer
एक सम संख्या और यह पूर्णांक का वर्ग नहीं हैं।
(B) an odd number and it is not a square of an integer
एक विषम संख्या और यह पूर्णांक का वर्ग नहीं हैं
(C) square of an even integer
एक सम पूर्णांक का वर्ग
(D) square of an odd integer
विषम पूर्णांक का वर्ग

20. $(x^n - a^n)$ is divisible by $(x - a)$ where $x \neq a$ every.
$(x^n - a^n)$, $(x - a)$ से विभाज्य हो जहाँ $x \neq a$.
(A) natural number n/n प्राकृतिक संख्या हैं
(B) even natural number n only
केवल n सम प्राकृतिक संख्या हैं
(C) odd natural number n only
केवल n विषम प्राकृति संख्या हैं
(D) prime number n only
केवल n अभाज्य संख्या हैं

21. What is the value of / का मान ज्ञात करें।
$$\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \ldots + \frac{1}{\sqrt{99}+\sqrt{100}} ?$$
(A) 1 (B) 5
(C) 9 (D) 10

22. If $x^m = \sqrt[14]{x\sqrt{x\sqrt{x}}}$ then what is the value of m ?
अगर $x^m = \sqrt[14]{x\sqrt{x\sqrt{x}}}$ हो तो m का मान ज्ञात करें।
(A) $\frac{1}{8}$ (B) $\frac{1}{4}$ (C) $\frac{3}{4}$ (D) $\frac{7}{4}$

23. If x men working x hours per day can do x units of works in x days, then y men working y hours per day in y day would be able to do k units of work. What is the value of k ?

यदि x व्यक्ति x घण्टें प्रति दिन काम करके x इकाई काम को x दिनों में पूरा करते हैं तब y व्यक्ति y घण्टें प्रति दिन काम करके y दिनों में k इकाई काम करते हैं तो k का मान ज्ञात करें।

(A) x^2y^{-3} (B) x^3y^{-2}

(C) y^2x^{-3} (D) y^3x^{-2}

24. If x varies as y then which of the following is/ are correct ?

यदि x ,y के अनुरूप बदलता हैं तो निम्न में से कौन-सा सही हैं ?

i. $x^2 + y^2$ varies as $x^2 - y^2$

ii. $\frac{x}{y^2}$ varies inversely as y

iii. $\sqrt[n]{x^2y}$ varies as $\sqrt[2n]{x^4y^2}$

Select the correct answer using the code given below

नीचे दिए गए कोड़ का उपयोग करके सही उत्तर चुनें।

(A) i and ii only (B) ii and iii only

(C) iii Only (D) i, ii and iii

25. If $ab + xy - xb = 0$ and $bc + yz - cy = 0$ then what is $\frac{x}{a} + \frac{c}{z}$ equal to ?

यदि $ab + xy - xb = 0$ और $bc + yz - cy = 0$ है तो $\frac{x}{a} + \frac{c}{z}$ किसके बराबर हैं ?

(A) $\frac{y}{b}$ (B) $\frac{b}{y}$ (C) 1 (D) 0

26. What is the HCF of the polynomials $x^6 - 3x^4 + 3x^2 - 1$ and $x^3 + 3x^2 + 3x + 1$?

बहुपद $x^6 - 3x^4 + 3x^2 - 1$ और $x^3 + 3x^2 + 3x + 1$ का म.स क्या हैं ?

(A) $(x + 1)$ (B) $(x + 1)^2$

(C) $x^2 + 1$ (D) $(x + 1)^3$

27. The HCF and the LCM of two polynomials are $3x + 1$ and $30x^3 + 7x^2 - 10x - 3$ respectively. If one polynomical is $6x^2 + 5x + 1$ then what is the other polynomical ?

दो बहुपद के म.स और ल.स क्रमश: $3x + 1$ और $30x^3 + 7x^2 - 10x - 3$ हैं। यदि एक बहुपद $6x^2 + 5x + 1$ है तो दुसरा बहुपद क्या हैं ?

(A) $15x^2 + 4x + 3$ (B) $15x^2 + 4x - 3$

(C) $15x^2 - 4x + 3$ (D) $15x^2 - 4x - 3$

28. If $(p + 2)(2q - 1) = 2pq - 10$ and $(p - 2)(2q - 1) = 2pq - 10$ then what is pq equal to ?

अगर $(p + 2)(2q - 1) = 2pq - 10$ और $(p - 2)(2q - 1) = 2pq - 10$ तो pq बराबर हैं ?

(A) –10 (B) –5

(C) 5 (D) 10

29. What is the value of/ का मान ज्ञात करें।

$$\frac{a^2 + ac}{a^2c - c^3} - \frac{a^2 - c^2}{a^2c + 2ac^2 + c^3} - \frac{2c}{a^2 - c^2} + \frac{3}{a + c} ?$$

(A) 0 (B) 1

(C) $\frac{ac}{a^2 + c^2}$ (D) $\frac{6}{a + c}$

30. What is the square root of $4x^4 + 8x^3 - 4x + 1$?

$4x^4 + 8x^3 - 4x + 1$ का वर्गमूल क्या हैं ?

(A) $2x^2 - 2x - 1$

(B) $2x^2 - x - 1$

(C) $2x^2 + 2x + 1$

(D) $2x^2 + 2x - 1$

31. If $\frac{x}{b + c} = \frac{y}{c + a} = \frac{z}{b - a}$ then which one of the following is correct ?

यदि $\frac{x}{b + c} = \frac{y}{c + a} = \frac{z}{b - a}$ फिर निम्नलिखित में से कौन-सा सही हैं ?

(A) $x + y + z = 0$

(B) $x - y - z = 0$

(C) $x + y - z = 0$

(D) $x + 2y + 3z = 0$

32. $1 - x - x^n + x^{n+1}$ where n is a natural number is divisible by.

$1 - x - x^n + x^{n+1}$ जहाँ n एक प्राकृतिक संख्या हैं, द्वारा विभाज्य हैं।

(A) $(1 + x)^2$

(B) $(1 - x)^2$

(C) $1 - 2x - x^2$

(D) $1 + 2x - x^2$

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Solution

1. (A) Given α and β are the roots of the quadratic equation $x^2 + kx - 15 = 0$

Sum of roots = $-\frac{b}{a} = k$

$\Rightarrow \alpha + \beta = -k$ .....(i)

Product of roots = $\frac{c}{a} = -15$

$\Rightarrow (\alpha.\beta) = -15$.....(ii)

Also , $\alpha - \beta = 8$ (Given)

We know that $(\alpha - \beta)^2 = (\alpha + \beta)^2 - 4\alpha\beta$

$\Rightarrow 64 = k^2 - 4(-15)$

$\Rightarrow k^2 = 64 - 60 = 4$

$\Rightarrow k = \pm 2$

According to question , k =2

2. (B) If (x + k) is the HCF of $x^2 + 5x + 6$ and $x^2 + 8x + 15$ then

x = –k will satisfy both equations $x^2 + 5x + 6$ and $x^2 + 8x + 15$

Put x = –k in equation $x^2 + 5x + 6$

$\Rightarrow k^2 - 5k + 6 = 0$.....(i)

Put x = –k in equation $x^2 + 8x + 15$

$\Rightarrow k^2 - 8k + 15 = 0$.....(ii)

Subtract (i) from (ii)

$\Rightarrow -3k + 9 = 0$

$\Rightarrow -3k = -9$

$\Rightarrow k = 3$

3. (A) Consider $x^2 + 9y^2 = 6xy$

$\Rightarrow x^2 + 9y^2 - 6xy = 0$

$\Rightarrow (x - 3y)^2 = 0$

$\Rightarrow x = 3y$

$\Rightarrow \frac{y}{x} = \frac{1}{3}$

Hence y : x = 1 : 3

4. (B) Consider $\frac{1}{a^{m-n}-1} + \frac{1}{a^{n-m}-1}$

$\Rightarrow \frac{1}{\frac{a^m}{a^n}-1} + \frac{1}{\frac{a^n}{a^m}-1}$

$\Rightarrow \frac{a^n}{a^m - a^n} + \frac{a^m}{a^n - a^m}$

$\Rightarrow \frac{a^n}{a^m - a^n} + \frac{a^m}{a^m - a^n}$

$\Rightarrow \frac{a^n - a^m}{a^m - a^n} = -\left(\frac{a^m - a^n}{a^m - a^n}\right) = -1$

5. (B) Consider $x = \sqrt{2}$, $y = \sqrt[3]{3}$ and $z = \sqrt[6]{6}$

$x = (2)^{\frac{1}{2}}, y = (3)^{\frac{1}{3}}$ & $z = (6)^{\frac{1}{6}}$

Now we will take LCM of 2,3,6

$\Rightarrow$ LCM (2, 3, 6) = 6

$x^6 = (2)^3$, $y^6 = (3)^2$ & $z^6 = (6)^1$

Clearly, $z^6 < x^6 < y^6$ .....(i)

Also x , y and z all are positive numbers.

So from equation (i) we can conclude that z < x < y

6. (B) 5x + 2y =7xy .....(i)

10x + 3y = 8xy.....(ii)

Multiply equation (i) by (ii)

10x + 4y = 14xy .....(iii)

Subtract equation (iii) from equation (ii)

$\Rightarrow$ –y = –6 xy

$\Rightarrow$ y = 6xy

$\Rightarrow x = \frac{1}{6}$

Put value of x in equation (i)

$\Rightarrow 5\left(\frac{1}{6}\right) + 2y = \frac{7}{6}y$

$\Rightarrow 2y - \frac{7}{6}y = -\frac{5}{6} \Rightarrow \frac{5}{6}y = -\frac{5}{6}$

$\Rightarrow y = -1$

7. (C) Given: $\left(x^{8-\frac{1}{x^6}}\right) = 47$

$\left(x^{8-\frac{1}{x^6}}\right) + 2 = 47 + 2$

Make perfect square

Then $\left(x^{4+\frac{1}{x^3}}\right) = 7$

Again add 2 both side and try to make a perfect square

$\left(x^{2-\frac{1}{x^3}}\right) + 2 = 7 + 2$

Then you will get, $\left(x^{2+\frac{1}{x^3}}\right) = 3 = k$

Then you know that $\left(x^{6+\frac{1}{x^6}}\right)^3$

$= k^3 - 3k = 3^3 - 3 \times 3$

$= 27 - 9 = 18$

Hence, option C is correct.

8. (A) If (x – 1) and (x+2) divide the polynomial $x^3 + 4x^2 + px + q$
Then x = 1 and x = –2 both will satisfy equation $x^3 + 4x^2 + px + q$
Put x = 1 in equation $x^3 + 4x^2 + px + q$
$\Rightarrow$ 1 + 4 + p + q = 0
$\Rightarrow$ p + q = –5 .....(i)
Put x= –2 in equation $x^3 + 4x^2 + px + q$
$\Rightarrow$ –8 + 16 – 2p + q = 0
$\Rightarrow$ –2p + q = –8 .....(ii)
Subtract (ii) from (i)
$\Rightarrow$ 3p = 3
$\Rightarrow$ p = 1
Put the value of p in equation (i)
q = –6

9. (D) Given $5^{x+1} - 5^{x-1} = 600$.....(i)
Also, $5^4 - 5^2 = 625 - 25 = 600$ .....(ii)
From (i) and (ii)
$\Rightarrow$ x + 1 = 4
$\Rightarrow$ x = 3
Hence , $10^{2x} = (10)^3 = 1000000$

10. (C) f(x) is divided by (x – α) (x – β) where $\alpha \neq \beta$
Then f(x) = (x – α) (x – β) g(x) + (ax + b) .....(i)
where g(x) is quotient and (ax + b) is linear remainder
Put x = α in ..... (i)
$f(\alpha) = a + b$ .....(ii)
Put x = β in ..... (i)
$f(\alpha) = \alpha\beta + b$ .....(iii)
Subtract (iii) from (ii)
$f(\alpha) - f(\beta) = aa + b - (\alpha\beta + b)$ .....(iii)

$$\alpha = \frac{f(\alpha) - f(\beta)}{\alpha - \beta} \text{.....(iv)}$$

Put the value of 'a' in equation (ii)

$$f\alpha = \left[\frac{f(\alpha) - f(\beta)}{\alpha - \beta}\right] a + b$$

$$af(\alpha) - \beta f(\alpha) = \alpha f(\alpha) - \alpha f(\beta) + b(\alpha - \beta)$$

$$b = \frac{\alpha f(\beta) - \beta f(\alpha)}{\alpha - \beta} \text{.....(v)}$$

Remainder = (ax + b)

$$= \frac{f(\alpha)x - f(\beta)x}{\alpha - \beta} + \frac{\alpha f(\beta) - \beta f(\alpha)x}{\alpha - \beta}$$

$$= \frac{(x - \beta) f(\alpha) - (x - \alpha) f(\beta)}{\alpha - \beta}$$

11. (C) Triangle having side lengths

$$\frac{y}{z} + \frac{z}{x}, \frac{z}{x} + \frac{x}{y}, \frac{x}{y} + \frac{y}{z}$$

As we can see from here all sides are of different length, then the triangle will be a scalene triangle,
a = cotθ.tanθ.cot2θ.tan2θ.cot3θ.tan3θ.....
Then the area of triangle = where a,b,c are the sides of the triangle

$$a = \frac{y}{z} + \frac{z}{x}, b = \frac{z}{x} + \frac{x}{y}, c = \frac{x}{y} + \frac{y}{z}$$

$$\text{Here, } s = \frac{\frac{x}{y} + \frac{y}{z} + \frac{z}{x} + \frac{x}{y} + \frac{y}{z} + \frac{z}{x}}{2} = \frac{x}{y} + \frac{y}{z} + \frac{z}{x}$$

$$S = \frac{x}{y} + \frac{y}{z} + \frac{z}{x}$$

Put the value of each term then you will get

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{\frac{x}{y} + \frac{y}{z} + \frac{z}{x}}$$

Hence option C is correct

12. (B) Here, the given equation is 5x + 9y = 7
Under the condition: x & y should be integer b/w –500 to 500.
Now, we have to check the value by hit and trial method and try to observe the relation
Here, 1st convert the given equation as

$$y = \frac{7 - 5x}{9}$$

Try to put some value of x (integer) to get y as integer

x	y
–1	12/9
–4	3
–13	8
–22	13
–31	18

Here, we can see that when we put x = –4, –13, –22, –31.....(common difference b/w each term = 9). Then y = integer value.
As $x \in [-500, 500]$
X may be –495, –486, ...–4, –13 ,–22, ..., 495 (common difference = 9)
It is nothing but an A.P having 1st term = -495 & last term = 495 and d (common difference) = 9
Then, no. of possible value (n) = no. of terms of the A.P

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$n = \frac{l-a}{d} + 1$

$= \frac{495-(-495)}{9} + 1 \Rightarrow \frac{990}{9} + 1$

$= 110 + 1 = 111$

Hence, option (B) is correct.

13. (D) Given: $(x^2 - 1)$ is a factor of $ax^4 + bx^3 + cx^2 + dx + e$

i.e, $(x-1)(x+1)$ is a factor of $ax^4 + bx^3 + cx^2 + dx + e$

then $x = 1$ & -1 will be the rots of the equation and will satisfy the given equation i.e remainder = 0

$f(-1) = 0$

$f(-1) = a(-1)^4 + b(-1)^3 + c(-1)^2 + d(-1) + e = 0$

$a - b + c - d + e = 0$

$a + c + e = b + d$

hence, option (D) is correct.

14. (C) Given $\frac{a}{b} = \frac{1}{3}$ .....(i)

$\frac{b}{c} = 2$..... (ii)

$\frac{c}{d} = \frac{1}{2}$.....(iii)

$\frac{d}{e} = 3$ .....(iv)

$\frac{e}{f} = \frac{1}{4}$.....(v)

Multiply (i) , (ii) and (iii)

$\frac{a}{b}.\frac{b}{c}\frac{c}{d} = \frac{1}{3} \times 2 \times \frac{1}{2}$

$\Rightarrow \frac{a}{d} = \frac{1}{3}$.....(vi)

Multiply (i) , (iii) and (iv)

$\frac{b}{c}.\frac{c}{d}.\frac{d}{e} = 2 \times \frac{1}{2} \times 3$

$\Rightarrow \frac{b}{e} = 3$ .....(vii)

Multiply (iii) , (iv) and (v)

$\frac{c}{d}.\frac{d}{e}.\frac{e}{f} = \frac{1}{2} \times 3 \times \frac{1}{4}$

$\Rightarrow \frac{c}{f} = \frac{3}{8}$.....(viii)

Multiply (vi) , (vii) and (viii)

$\frac{abc}{def} = \frac{1}{3} \times 3 \times \frac{3}{8} = \frac{3}{8}$

15. (C)

$$x \overline{)\, x^3 + x^2 + 16 \,|\, x^2 + x}$$
$$\underline{-x^3}$$
$$x^2 + 16$$
$$\underline{-x^2}$$
$$16$$

Possible value of x

1, 2, 4, 8, 16

16. (B) a, b, c are positive integers

$abc = 30$

$10, 3, 1 \longrightarrow 9$

$5, 6, 1 \longrightarrow 9$

$5, 2, 3 \longrightarrow 9$

Total possival value = 9 + 9 + 9 = 27

17. (D) $b^2 - 4ac > 0$

$b^2 > 4 \times 1 \times \log_{10} N$

$16 > 4 \times 1 \times \log_{10} N$

$16 > 4 \times 1 \times \log_{10}\left(\frac{1}{10000}\right)$

$16 > 4(-4) \Rightarrow 16 > (-16)$

18. (-)

19. (D) $I = a^2 + b^2 + c^2$

$I = a^2 + b^2 + a^2b^2 \quad \because c = ab$

$I = a^2 + b^2 + a^2b^2 + a^2b^2 - a^2b^2$

$I = \underbrace{(a+b)^2} - a^2b^2$

I = square of an odd integer

20. (A) $x^n - a^n$ is divisiable by $(x - a)$

n is a natural number

Ex $n = 1 \quad x - a$

$n = 2 \quad x^2 - a^2 \Rightarrow (x + a)(x - a)$

$n = 3 \quad x^2 - a^2 \Rightarrow (x + a)(x^2 - a^2 + ab)$

$n = \{1, 2, 3, 4.....\}$

21. (C) $\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \ldots \frac{1}{\sqrt{99}+\sqrt{100}}$

$\sqrt{2} - 1 + \sqrt{3} - \sqrt{2} + \sqrt{4} - \sqrt{3} + \ldots . \sqrt{100} - \sqrt{99}$

$-1 + 10 = 9$

22. (A) $x^m = \sqrt[14]{x\sqrt{x\sqrt{x}}}$

$\left(x^m\right)^{14} = \left(\sqrt[14]{x\sqrt{x\sqrt{x}}}\right)^{14}$

$x^{14m} = x\sqrt{x\sqrt{x}}$

Both side square

$x^{28m} = x^2 x\sqrt{x}$

Both side squre

$(x^{28m})^2 = x^4 x^2 x$

$x^{56m} = x^7$

$56\ m = 7$

$m = \frac{7}{56} = \frac{1}{8}$

23. (D) $\frac{m_1 d_1 h_1}{w_1} = \frac{m_2 d_2 h_2}{w_2}$

$x^3 \times k = y^3 \times x$

$k = \frac{y^3}{x^2}$

$k = y^3x^{-2}$

24. (D)

25. (C) $ab + xy - xb = 0$

$-ab = x(y - b)$

$\frac{x}{a} = \frac{b}{(b-y)}$ $\qquad yz = c(y - b)$

$\frac{c}{z} = \frac{y}{(y-b)}$

$\frac{x}{a} + \frac{c}{z} = \frac{b}{b-y} + \frac{y}{y-b}$

$= \frac{b}{b-y} - \frac{y}{b-y} = \frac{b-y}{b-y} = 1$

26. (D) $x^6 - 3x^4 + 3x^2 - 1$

$= (x^2 - 1)^3$

$= (x + 1)^3 (x - 1)^3$

$x^3 + 3x^2 + 3x + 1$

$= (x + 1)^3$

H.C.F $= (x + 1)^3$

27. (D) $N_1 = 6x^2 + 5x + 1$

H.C.F $= 3x + 1$

L.C.M $= 30x^3 + 7x^2 - 10x - 3$

$N_1 \times N_2$ = H.C.F × L.C.M

$(6x^2 + 5x + 1) = (3x + 1)(30x^3 + 7x^2 - 10x - 3)$

$N_2 = \frac{(3x+1)(30x^3 + 7x^2 - 10x - 3)}{(6x^2 + 5x + 1)}$

$= (3x + 1)(5x + 3)$

$= 15x^2 - 4x - 3$

28. (C) $2pq + 4q - p - 2 = 2pq - 10$

$4q - p = -8$

$p - 4q = 8$ .....(i)

$(p - 2)(2q - 1) = 2pq - 10$

$2pq - 4q - p + 2 = 2pq - 10$

$p + 4q = 12$ .....(ii)

Equation (i) & eq (ii)

$p + 4q = 12$

$\underline{p - 4q = 8}$

$2p = 20$

$p = 10$

$10 + 4q = 12$

$q = \frac{2}{4} = \frac{1}{2} \Rightarrow pq = 10 \times \frac{1}{2} = 5$

29. (D) $\frac{a^2 + ac}{a^2c - c^3} - \frac{a^2 - c^2}{a^2c + 2ac^2 + c^3} - \frac{2c}{a^2 - c^2} + \frac{3}{a + c}$

let = a = 1, b = 2

$\frac{(1)^2 + 1 \times 2}{(1)^2 \times 2 - (2)^3} - \frac{(1)^2 - (2)^2}{(1)^2 \times 2 + 2 \times 1 \times (2)^2 + (2)^3}$

$-\frac{2 \times 2}{(1)^2 - (2)^2} + \frac{3}{1+2}$

$\frac{1+2}{2-8} - \frac{1-4}{2+8+8} - \frac{4}{1-4} + \frac{3}{3}$

$-\frac{1}{2} + \frac{1}{6} + \frac{4}{3} + 1$

$-\frac{1}{2} + \frac{9}{6} + 1$

$-\frac{1}{2} + \frac{3}{2} + 1 = 2$

$\frac{6}{a+c} = \frac{6}{1+2} = 2$

30. (D) $4x^4 + 8x^3 - 4x + 1$

$2x^2+2x-1 \overline{)\,4x^4+8x^3-4x+1\,(\,2x^2+2x-1}$

$4x^4+4x^3-2x^2$

$- \quad - \quad +$

$4x^3 + 2x^2 - 4x$

$4x^3 + 4x^2 - 2x$

$- \quad - \quad +$

$-2x^2 - 2x + 1$

$-(2x^2 + 2x - 1)$

$\times$

31. (B) $\frac{x}{b+c} = \frac{y}{c+a} = \frac{z}{b-a} = k$

$x = k(b + c)$

$y = k(c + a)$

$z = k(b - a)$

$x - y - 2 = 0$

$k(b + c) - k(c + a) - k(b - a) = 0$

$b + c - c - a - b + a = 0$

32. (B) $1 - x - n^n + n^{n+1}$

let = n = 1

$1 - x - x + x^2$

$x^2 - 2x + 1$

$(x - 1)^2$

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CDS [2019-I]

1. If $\frac{a}{b+c}=\frac{b}{c+a}=\frac{c}{a+b}$ then which one of the following statements is correct?

यदि $\frac{a}{b+c}=\frac{b}{c+a}=\frac{c}{a+b}$ हैं, तो निम्नलिखित में से कौन-सा कथन सही हैं ?

(A) Each fraction is equal to 1 or –1
प्रत्येक भिन्न 1 या –1 के बराबर हैं।

(B) Each fraction is equal to $\frac{1}{2}$ or 1
प्रत्येक भिन्न $\frac{1}{2}$ या 1 के बराबर हैं।

(C) Each fraction is equal to $\frac{1}{2}$ or –1
प्रत्येक भिन्न $\frac{1}{2}$ या –1 के बराबर हैं।

(D) Each fraction is equal to 1.2 only
प्रत्येक भिन्न केवल $\frac{1}{2}$ के बराबर हैं।

2. If $3^x = 4^y = 12^z$, then z is equal to.
यदि $3^x = 4^y = 12^z$ है, तो z किसके बराबर हैं ?

(A) xy (B) x + y

(C) $\frac{xy}{x+y}$ (D) 4x + 3y

3. If (4a + 7b) (4c – 7d) = (4a – 7b) (4c + 7d), then which one of the following is correct ?
यदि (4a + 7b) (4c – 7d) = (4a – 7b) (4c + 7d) है, तो निम्नलिखित में से कौन-सा एक सही हैं ?

(A) $\frac{a}{b}=\frac{c}{d}$ (B) $\frac{a}{d}=\frac{c}{b}$ (C) $\frac{a}{b}=\frac{d}{c}$ (D) $\frac{4a}{7b}=\frac{c}{d}$

4. Given that the polynomial $(x^3 + ax + b)$ leaves that same remainder when by (x – 1) or (x + 1) What are the values of a and b respectively ?
दिया गया हैं कि बहुपद $(x^3 + ax + b)$ को (x – 1) अथवा (x + 1) से विभाजित करने पर शेषफल समान रहता हैं। a और b के मान क्रमशः क्या हैं ?

(A)4 and 0 (B) 0 and 3
(C) 3 and 0 (D) 0 and any interger

5. What is $\frac{(x-y)^3+(y-2)^3+(z-x)^3}{3(x-y)(y-z)(z-x)}$ equal to/
किसके बराबर हैं ?

(A) 1 (B) 0
(C) $\frac{1}{3}$ (D) 3

6. If $a^x = b^y = c^z$ and $b^2 = ac$, then what is $\frac{1}{x}+\frac{1}{z}$ equal to ?

यदि $a^x = b^y = c^z$ और $b^2 = ac$ हैं, तो $\frac{1}{x}+\frac{1}{z}$ किसके बराबर हैं ?

(A) $\frac{1}{y}$ (B) $-\frac{1}{y}$ (C) $\frac{2}{y}$ (D) $-\frac{2}{y}$

7. If p and q are the roots of the equation $x^2 – 15x + r = 0$ and p – q = 1, then what is the value of r ?
यदि p और q समीकरण $x^2 – 15x + r = 0$ के मूल हैं और p – q = 1 हैं तो r का मान क्या हैं ?

(A) 55 (B) 56
(C) 60 (D) 64

8. For the inequation $x^2 – 7x + 12 > 0$, which one of the following is correct ?
असमिका $x^2 – 7x + 12 > 0$ के लिए, निम्नलिखित में से कौन-सा एक सही हैं ?

(A) $3 < x < 4$ (B) $–\infty < x < 3$ only
(C) $4 < x < \infty$ only
(D) $–\infty < x < 3$ or $4 < x < \infty$

9. The expression $5^{2n} – 2^{3n}$ has a factor ?
व्यंजक $5^{2n} – 2^{3n}$ का गुणनखंड हैं ?

(A) 3 (B) 7
(C) 17 (D) None of these

10. For $x = \frac{4\sqrt{6}}{\sqrt{2}+\sqrt{3}}$, what is the value of $\frac{x+2\sqrt{2}}{x-2\sqrt{2}}+\frac{x+2\sqrt{3}}{x-2\sqrt{3}}$?

$x = \frac{4\sqrt{6}}{\sqrt{2}+\sqrt{3}}$ के लिए $\frac{x+2\sqrt{2}}{x-2\sqrt{2}}+\frac{x+2\sqrt{3}}{x-2\sqrt{3}}$ का मान क्या हैं ?

(A) 1 (B) $\sqrt{2}$ (C) $\sqrt{3}$ (D) 2

11. For any two real numbers a and b.
$\sqrt{(a-b)^2}+\sqrt{(b-a)^2}$
किन्ही दो वास्तविक संख्याओं a और b के लिए $\sqrt{(a-b)^2}+\sqrt{(b-a)^2}$ होगा।

(A) always zero/हमेशा शून्य
(B) never zero/कभी भी शून्य नहीं
(C) positive only if $a \neq b$/धनात्मक केवल यदि $a \neq b$
(D) positive if an only if a > b
धनात्मक यदि और केवल यदि a > b

12. If a : b = c : d = 1 : 6, then what is the value of $\frac{a^2+c^2}{b^2+d^2}$?

यदि If a : b = c : d = 1 : 6 हैं, तो $\frac{a^2+c^2}{b^2+d^2}$ का मान क्या हैं ?

(A) $\frac{1}{600}$ (B) $\frac{1}{60}$ (C) $\frac{1}{36}$ (D) $\frac{1}{6}$

13. For x > 0, what is the minimum value of $x + \frac{x+2}{2x}$?

x > 0 के लिये $x + \frac{x+2}{2x}$ का न्यूनतम मान क्या हैं ?

(A) 1 (B) 2 (C) $2\frac{1}{2}$

(D) Cannot be determined/निर्धारित नहीं किया जा सकता

14. If $\frac{1+px}{1-px}\sqrt{\frac{1-qx}{1+qx}} = 1$ then what are the non-zero solutions of x ?

यदि $\frac{1+px}{1-px}\sqrt{\frac{1-qx}{1+qx}} = 1$ हैं, तब x के शून्येतर हल क्या हैं ?

(A) $\pm\frac{1}{p}\sqrt{\frac{2p-q}{q}}, 2p \neq q$ (B) $\pm\frac{1}{p}\sqrt{p-q}, p \neq q$

(C) $\pm\frac{p}{q}\sqrt{\frac{2p-q}{q}}, 2p \neq q$ (D) $\pm\frac{p}{q}\sqrt{2p-q}, 2p \neq q$

15. Which of the following pair of numbers is the solution of the equation $3^{x+2} + 3^x = 10$?

संख्याओं की निम्नलिखित में से कौन-सा युग्म, समीकरण $3^{x+2} + 3^x = 10$ का हल हैं ?

(A) 0, 2 (B) 0, –2

(C) 1, –1 (D) 1, 2

16. If a, b and c are positive integers such that $\frac{1}{a+\frac{1}{b+\frac{1}{c+\frac{1}{2}}}} = \frac{16}{23}$ then what is the mean of a, b and c?

यदि a, b और c धनात्मक पूर्ण संख्याएँ इस प्रकार हैं कि $\frac{1}{a+\frac{1}{b+\frac{1}{c+\frac{1}{2}}}} = \frac{16}{23}$ हैं, तब a, b और c का माध्य क्या हैं ?

(A) 1 (B) 2

(C) 1.33 (D) 2.33

CDS [2019-II]

17. What is (x – a)(x – b) (x – c) equal to?

(x – a)(x – b) (x – c) किसके बराबर हैं ?

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

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

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

(D) $x^3 + (a + b + c)x^2 + (a + b + c)x + abc$

18. The quotient when $x^4 - x^2 + 7x + 5$ is divided by (x + 2) is $ax^3 + bx^2 + cx + d$. What are the values of a, b, c and d respectively ?

जब $x^4 - x^2 + 7x + 5$ को (x + 2) से विभाजित किया जाता हैं, तो भागफल $ax^3 + bx^2 + cx + d$ आता हैं। a, b, c और d के मान क्रमशः क्या हैं ?

(A) 1, –2, 3, 1 (B) –1, 2, 3, 1

(C) 1, –2, –3, –1 (D) –1, 2, –3, –1

19. Two numbers p and q are such that the quadratic equation $px^2 + 3x + 2q = 0$ has –6 as the sum and the product of the roots. What is the value of (p – q) ?

दो संख्याएँ p और q इस प्रकार हैं कि द्विघात समीकरण $px^2 + 3x + 2q = 0$ के मूलों का योगफल और गुणनफल –6 हैं। (p – q) का मान क्या हैं ?

(A) –1 (B) 1 (C) 2 (D) 3

20. What is the value of.

$\frac{(x-y)^3+(y-z)^3+(z-x)^3}{9(x-y)(y-z)(z-x)}$?

का मान क्या हैं ?

(A) 0 (B) $\frac{1}{3}$ (C) $\frac{1}{9}$ (D) 1

21. What is the LCM of the polynomials $x^3 + 3x^2 + 3x + 1$, $x^3 + 5x^2 + 5x + 4$ and $x^2 + 5x + 4$?

बहुपदों $x^3 + 3x^2 + 3x + 1$, $x^3 + 5x^2 + 5x + 4$ और $x^2 + 5x + 4$ का अल्पतम समापवर्ती ल.स क्या हैं ?

(A) $(x + 1)^3(x + 4)(x^2 + x + 1)$

(B) $(x + 4)(x^2 + x + 1)$ (C) $(x + 1)(x^2 + x + 1)$

(D) $(x + 1)^2(x + 4)(x^2 + x + 1)$

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22. What is the sum of all integer value of n for which $n^2 + 19n + 92$ is a perfect square ?
n के उन सभी पूर्णांक मानों का योगफल क्या हैं जिनके ली $n^2 + 19n + 92$ एक पूर्ण वर्ग हैं ?
(A) 21 (B) 19
(C) 0 (D) –19

23. If $a = \sqrt{7 + 4\sqrt{3}}$ then what is the value of $a + \frac{1}{a}$?
यदि $a = \sqrt{7 + 4\sqrt{3}}$ हैं, तो $a + \frac{1}{a}$ का मान क्या हैं ?
(A) 2 (B) 3
(C) 4 (D) 7

24. If (b – 6) is one root of the quadratic equation $x^2 - 6x + b = 0$, where b is an integer, then what is the maximum value of b^2 ?
यदि (b – 6) द्विघात समीकरण $x^2 - 6x + b = 0$ का एक मूल हैं, जहाँ b एक पूर्णांक हैं, तो b^2 का अधिकतम मान क्या हैं ?
(A) 36 (B) 49
(C) 64 (D) 81

25. The equation $x^2 + px + q = 0$ has roots equal to p and q where $q \neq 0$. What are the values of p and q respectively ?
समीकरण $x^2 + px + q = 0$ के मूल p और q के बराबर हैं, यहाँ $q \neq 0$ हैं। p और q के मान क्रमशः क्या हैं ?
(A) 1, –2 (B) 1, 2
(C) –1, 2 (D) –1, –2

26. If $\frac{36}{11} = 3 + \cfrac{1}{x + \cfrac{1}{y + \cfrac{}{z}}}$ where x, y and z are natural numbers, then what is (x + y + z) equal to?
यदि $\frac{36}{11} = 3 + \cfrac{1}{x + \cfrac{1}{y + \cfrac{}{z}}}$ हैं, जहाँ x, y और z प्राकृतिक संख्याएँ हैं, तो (x + y + z) किसके बराबर हैं ?
(A) 6 (B) 7
(C) 8 (D) 9

Solution

1. (C) $\frac{a}{(b+c)} = \frac{b}{(c+a)} = \frac{c}{(a+b)}$

Taking reciprocal and adding 1 to each ratio we get

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

Or

$\frac{(a+b+c)}{a} = \frac{(a+b+c)}{b} = \frac{(a+b+c)}{c}$

So this can only be equal when a = b = c or a + b + c = 0

When a=b=c we get $\frac{a}{(b+c)} = \frac{1}{2}$

When a + b + c = 0 we get b + c = –a

So $\frac{a}{(b+c)} = -1$

the ratios are $\frac{1}{2}$ or –1

2. (C) $3^x = 4^y = 12^z$

Taking log of all 3 we get

$x\ln 3 = y\ln 4 = z\ln 12 = k$

$z = \frac{k}{\ln 12} = \frac{k}{\ln(3\times 4)} = \frac{k}{\ln 3 + \ln 4} = \frac{k}{\frac{k}{x} + \frac{k}{y}}$

$= \frac{xy}{(x+y)}$

3. (C) (4a + 7b)(4c – 7d) = (4a – 7b)(4c+7d)

$\frac{(4a+7b)}{(4a-7b)} = \frac{(4a+7b)}{(4a-7b)}$

Using componendo and dividendo

$\frac{(4a+7b)}{(4a-7b)} = \frac{(4a+7b)}{(4a-7b)} =$

$\frac{(4c+7d)+(4c-7d)}{(4c+7d)-(4c-7d)}$

Or $\frac{8a}{14b} = \frac{8c}{14d}$

Or $\frac{a}{b} = \frac{c}{d}$

4. (D) Since $x^2 + ax + b$ when divided by $x - 1$ or $x + 1$ leaves the same remainder
So on putting $x = 1$ and $x = -1$ we get the same value $1 + a + b = 1 - a + b$
$2a = 0$
$a = 0$
here b can take any value as it will always get cancelled out

5. (A) We know that when $a + b + c = 0$, then
$a^3 + b^3 + c^3 = 3abc$
in the above question,
$(x - y) + (y - z) + (z - x) = 0$
Therefore,
$(x - y)^3 + (y - z)^3 + (z - x)^3 = 3(x - y)(y - z)(z - x)$

$$\frac{(x-y)^3+(y-z)^3+(z-x)^3}{3(x-y)(y-z)(z-x)} = 1$$

6. (C) $a^x = b^y = c^z = k$

$$a = k^{\frac{1}{x}}$$

$$b = k^{\frac{1}{y}}$$

$$c = k^{\frac{1}{z}}$$

given $b^2 = ac$, putting the above values of a,b,c in the equation we get

$$k^{\frac{2}{y}} = k^{\frac{1}{x}}.k^{\frac{1}{z}}$$

$$\frac{2}{y} = \frac{1}{x} + \frac{1}{z}$$

7. (B) In the below equation
$x^2 - 15x + r = 0$

$$\text{sum of roots} = p + q = \frac{-(-15)}{1} = 15$$

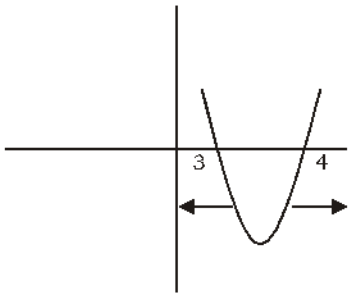
(sum of roots for equation $ax^2 + bx + c$ is $\frac{-b}{a}$)

$$\text{product of roots} = pq = \frac{r}{1} = r$$

(product of roots for equation $ax^2 + bx + c$ is $\frac{c}{a}$)

given $p - q = 1$
also we know that $p + q = 15$
subtracting the squares of both
$(p + q)^2 + (p - q)^2 = 15^2 - 1$
$p^2 + q^2 + 2pq - p^2 - q^2 + 2pq = 225 - 1$
$4pq = 224$
$4r = 224$
$r = 56$

8. (D)



As we can see from the graph of the quadratic equation, that the value of the equation is greater than zero for the values of $x < 3$ and $x > 4$

9. (C) $5^{2n} - 2^{3n} = (5^2)^n - (2^3)^n = (25)^n - (8)^n$
We know that $a^n - b^n$ always have a common factor $(a - b)$
Therefore one of the factor is $25 - 8 = 17$

10. (D) $x = \frac{4\sqrt{6}}{\sqrt{2}+\sqrt{3}}$
on rationalizing

$$x = \frac{4\sqrt{6}}{\sqrt{2}+\sqrt{3}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$$

$$x = 12\sqrt{2} - 8\sqrt{3}$$

putting the value of x in the equation

$$\frac{14\sqrt{2}-8\sqrt{3}}{10\sqrt{2}-8\sqrt{3}} + \frac{12\sqrt{2}-6\sqrt{3}}{12\sqrt{2}-10\sqrt{3}}$$

$$= \frac{7\sqrt{2}-4\sqrt{3}}{5\sqrt{2}-4\sqrt{3}} + \frac{6\sqrt{2}-3\sqrt{3}}{6\sqrt{2}-5\sqrt{3}}$$

$$\frac{2\sqrt{2}}{5\sqrt{2}-4\sqrt{3}} + 1 + 1 + \frac{2\sqrt{3}}{6\sqrt{2}-5\sqrt{3}}$$

$$2 + \frac{2\sqrt{2}\left(6\sqrt{2}-5\sqrt{3}\right) - 2\sqrt{3}\left(5\sqrt{2}-4\sqrt{3}\right)}{\left(5\sqrt{2}-4\sqrt{3}\right)\left(6\sqrt{2}-5\sqrt{3}\right)}$$

$$2 + \frac{24 - 10\sqrt{6} + 10\sqrt{6} - 24}{\left(5\sqrt{2}-4\sqrt{3}\right)\left(6\sqrt{2}-5\sqrt{3}\right)} = 2 + 0 = 2$$

11. (C) For the equation

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

The roots of number is always positive and hence it can be zero only at $a = b$
So the above equation is positive only when $a = b$

12. (C) Let a = x then b = 6x
Also let c = y then d = 6y

$$\frac{a^2+c^2}{b^2+d^2}=\frac{x^2+y^2}{(6x)^2+(6y)^2}=\frac{1}{36}$$

13. (C) For x > 0 Min of $\frac{x+(x+2)}{2x}$ = ?

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

So we have to find the minimum of $\frac{x+1}{x}$

and add $\frac{1}{2}$ to it

As AM > GM
So

$$\frac{\left(\frac{x+1}{x}\right)}{2}>\sqrt{\left(\frac{x\times1}{x}\right)}$$

Or $\frac{x+1}{x>2}$

So min of $x+\frac{x+2}{2x}=\frac{2+1}{2}=\frac{5}{2}$

14. (A) $\frac{1+px}{1-px}\sqrt{\frac{1-qx}{1+qx}}=1$

On squaring and cross multiplying, we get

$$\left(\frac{1+px}{1-px}\right)^2=\left(\sqrt{\frac{1+qx}{1-qx}}\right)^2$$

$$\frac{1+p^2+x^2+2px}{1+p^2x^2-2px}=\frac{1+qx}{1-qx}$$

On applying componendo and dividend

$$\frac{2(1+p^2x^2)}{-4px}=\frac{2}{-2qx}$$

On solving the above equation, we get

$$x=\pm\frac{1}{p}\sqrt{\frac{2p-q}{q}}$$

15. (B) $3^{x+2}+3^x=10$
Only powers of 3 that add upto 10 is
$3^2+3^0=10$
X + 2 = 0
X = –2 solution is consistent
Or x + 2 = 2
X= 0 solution is consistent
Thus x = 0, –2 are the solutions
Alternatively, we can put values from the options and check.

16. (B) $\frac{16}{23}=\frac{1}{\frac{23}{16}}=\frac{1}{1+\frac{7}{16}}$

$$=\frac{1}{1+\left(\frac{1}{\frac{16}{7}}\right)}=\frac{1}{1+\frac{1}{2+\left(\frac{2}{7}\right)}}$$

$$=\frac{1}{1+\left(\frac{1}{2+\left(\frac{1}{\frac{7}{2}}\right)}\right)}=\frac{1}{1+\left(\frac{1}{2+\left(3+\frac{1}{2}\right)}\right)}$$

On comparing equations we get a= 1 , b = 2 and c = 3

Mean = $\frac{a+b+c}{3}=\frac{6}{3}=2$

17. (A) We have,
$(x-a)(x-b)(x-c)$
$\Rightarrow (x^2-bx-ax+ab)(x-c)$
$\Rightarrow x^3-cx^2-bx^2+cbx-ax^2+acx+abx-abc$
$\Rightarrow x^3-(a+b+c)x^2+(bc+ca+ab)x-abc$

18. (A) We have

$$\begin{array}{r|l} x+2) & x^4-x^2+7x+5\ (x^3-2x^2+3x+1 \\ & x^4+2x^3 \\ & \text{– –} \\ \hline & -2x^3-x^2 \\ & -2x^3-4x^2 \\ & \text{+ +} \\ \hline & 3x^2+7x \\ & 3x^2+6x \\ & \text{– –} \\ \hline & x+5 \\ & x+2 \\ & \text{– –} \\ \hline & 3 \end{array}$$

So, here quotient $x^3 - 2x^2 + 3x + 1$ is compare with $ax^3 + bx^2 + cx + d$. Then a = 1, b = –2, c = 3, d = 1

19. (C) Consider $px^2 + 3x + 2q = 0$

= Sum of roots $= -\frac{3}{p}$

According to the question

$\Rightarrow -\frac{3}{p} = -6$

$\Rightarrow -6p = -3$

$\Rightarrow p = \frac{3}{6} = \frac{1}{2}$

$\Rightarrow$ Product of roots $= \frac{2q}{p}$

According to the question

$\Rightarrow \frac{2q}{p} = -6$

$\Rightarrow \frac{4q}{1} = -6$

$\Rightarrow 4q = -6$

$\Rightarrow q = -\frac{6}{4} = -\frac{3}{2}$

$p - q = \left(\frac{1}{2}\right) - \left(-\frac{3}{2}\right) = 2$

20. (B) Consider $\frac{(x-y)^3 + (y-z)^3 + (z-x)^3}{9(x-y)(y-z)(z-x)}$

We know that when A + B + C = 0 then $A^3 + B^3 + C^3 = 3ABC$

Clearly, (x–y) + (y–z) + (z–x) = 0

Hence, $(x-y)^3 + (y-z)^3 + (z-x)^3 = 3(x-y)(y-z)(z-x)$

$\Rightarrow \frac{(x-y)^3 + (y-z)^3 + (z-x)^3}{9(x-y)(y-z)(z-x)}$

$= \frac{3(x-y)(y-z)(z-x)}{9(x-y)(y-z)(z-x)} = \frac{1}{3}$

21. (A) We are interested in finding LCM of the polynomials

$x^3 + 3x^2 + 3x + 1$, $x^3 + 5x^2 + 5x + 4$ and $x^2 + 5x + 4$

$\Rightarrow x^3 + 3x^2 + 3x + 1 = (x+1)^3$

$\Rightarrow x^3 + 5x^2 + 5x + 4 = (x+4)(x^2 + x + 1)$

$\Rightarrow x^2 + 5x + 4 = (x+4)(x+1)$

Hence, LCM of the polynomials $x^3 + 3x^2 + 3x + 1$, $x^3 + 5x^2 + 5x + 4$ and $x^2 + 5x + 4 = (x+1)^3(x+4)(x^2 + x + 1)$

22. (D) If $n^2 + 19n + 92$ is a perfect square.

Then let $n^2 + 19n + 92 = k^2$

$\Rightarrow n^2 + 19n + 92 - k^2 = 0$

$\Rightarrow n = \frac{-19 \pm (19)^2 - 4(1)(92 - k^2)}{2(1)}$

$= \frac{-19 \pm \sqrt{361 - 368 + 4k^2}}{2(1)} = \frac{-19 \pm \sqrt{-7 + 4k^2}}{2(1)}$

Now, n will attain integer value only if $-7 + 4k^2$ is a perfect square of odd integer.

$\Rightarrow 4k^2 - 7 = (2x+1)^2$

$\Rightarrow 4k^2 - (2x+1)^2 = 7$

$\Rightarrow (2k + 2x + 1)(2k - 2x - 1) = 7$

$\Rightarrow (2k + 2x + 1)(2k - 2x - 1) = 7 \times 1$

Hence

$(2k - 2x - 1) = 1$ .....(i)

$(2k - 2x + 1) = 7$ .....(ii)

Adding (i) and (ii)

$\Rightarrow 4k = 8$

$\Rightarrow k = 2$

Put the value of k in (i)

$\Rightarrow 4 - 2x - 1 = 1$

$\Rightarrow -2x = 1 - 3 = -2$

$\Rightarrow x = 1$

Now, $n^2 + 19n + 92 = 4$

$\Rightarrow n^2 + 19n + 88 = 0$

$\Rightarrow n^2 + 11n + 8n + 88 = 0$

$\Rightarrow n(n+11) + 8(n+11) = 0$

$\Rightarrow (n+11)(n+8) = 0$

$\Rightarrow n = -11$ Or $n = -8$

Hence, Required Sum = –11 – 8 = –19

23. (C) Consider $a = \sqrt{7 + 4\sqrt{3}}$

$\Rightarrow a = \sqrt{7 + 4\sqrt{3}} = \sqrt{4 + 3 + 4\sqrt{3}}$

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

$= 2 + \sqrt{3}$

Now

$a + \frac{1}{a} = 2 + \sqrt{3} + \frac{1}{2 + \sqrt{3}}$

$= 2 + \sqrt{3} + \frac{1}{2 + \sqrt{3}} \times \frac{2 - \sqrt{3}}{2 - 3}$

$= 2 + \sqrt{3} + 2 - \sqrt{3} = 4$

24. (D) If (b – 6) is one root of the quadratic equation $x^2 - 6x + b = 0$, where b is an integer,

$\Rightarrow b^2 - 17b + 72 = 0$

$\Rightarrow b^2 - 8b - 9b + 72 = 0$

$\Rightarrow b(b-8) - 9(b-8) = 0$

$\Rightarrow b(b-8)(b-9) = 0$

$\Rightarrow b = 8$ or $b = 9$

Hence, maximum value of $b^2 = (9)^2 = 81$

25. (A) The equation $x^2 + px + q = 0$ has roots equal to p and q where $q \neq 0$.

Consider $x^2 + px + q = 0$

$\Rightarrow$ Sum of roots $= p + q = -\frac{p}{1} = -p$

$\Rightarrow 2p = -q$ .....(i)

Product of roots $= pq = \frac{q}{1} = q$

$\Rightarrow p = 1$

Put the value of p in (i)

$\Rightarrow q = -2$

26. (A) $\frac{36}{11} = 3 + \cfrac{1}{x + \cfrac{1}{y + \cfrac{}{z}}}$

$$\frac{36}{11} = 3 + \frac{3}{11} = 3 + \cfrac{1}{\cfrac{11}{3}} = 3 + \cfrac{1}{3 + \cfrac{2}{3}}$$

$$= 3 + \cfrac{1}{3 + \cfrac{1}{\cfrac{3}{2}}} = 3 + \cfrac{1}{3 + \cfrac{1}{1 + \cfrac{1}{2}}}$$

Hence, $3 + \cfrac{1}{x + \cfrac{1}{y + \cfrac{1}{z}}} = 3 + \cfrac{1}{3 + \cfrac{1}{1 + \cfrac{1}{2}}}$

After comparison, We can say that

$x = 3, y = 1$ and $z = 2$

Hence, $x + y + z = 3 + 1 + 2 = 6$

CDS [2018-I]

1. If a + b = 2c then what is the value of $\frac{a}{a-c}+\frac{c}{b-c}$?

यदि a + b = 2c है तो $\frac{a}{a-c}+\frac{c}{b-c}$ का मान क्या हैं ?

(A) –1 (B) 0
(C) 1 (D) 2

2. If $x = y^{1/a}$, $y = z^{1/b}$ and $z = x^{1/c}$ where $x \neq 1$, $y \neq 1$, $z \neq 1$, then what is the value of abc ?

यदि $x = y^a$, $y = z^{1/b}$ और $z = x^{1/c}$ जहाँ $x \neq 1$, $y \neq 1$ $z \neq 1$ है तो abc का मान क्या हैं ?

(A) –1 (B) 1
(C) 0 (D) 3

3. If 2b = a + c and $y^2 = xz$ then what $x^{b-c}y^{c-a}z^{a-b}$ is equal to ?

यदि 2b = a + c और $y^2 = xz$ है, तो $x^{b-c}y^{c-a}z^{a-b}$ किसके बराबर हैं ?

(A) 3 (B) 2
(C) 1 (D) –1

4. If the roots of the equation $px^2 + x + r = 0$ are reciprocal to each other, then which one of the following is correc ?

यदि समीकरण $px^2 + x + r = 0$ के मूल एक-दूसरे के व्युत्क्रम हैं, तो निम्नलिखित में से कौन-सा सही हैं ?

(A) p = 2r (B) p = r
(C) 2p = r (D) p = 4r

5. If 65x – 33y = 97 and 33x – 65y = 1 then what is xy equal to ?

यदि 65x – 33y = 97 और 33x – 65y = 1 हैं, तो xy किसके बराबर हैं ?

(A) 2 (B) 3
(C) –2 (D) –3

6. If $\frac{b}{y}+\frac{z}{c}=1$ and $\frac{c}{z}+\frac{x}{a}=1$ then what is $\frac{ab+xy}{bx}$ equal to ?

यदि $\frac{b}{y}+\frac{z}{c}=1$ और $\frac{c}{z}+\frac{x}{a}=1$ है तो $\frac{ab+xy}{bx}$ किसके बराबर हैं ?

(A) 1 (B) 2
(C) 0 (D) –1

7. If $\frac{a^2-1}{a}=5$ then what is the value of $\frac{a^6-1}{a^3}$?

यदि $\frac{a^2-1}{a}=5$ है तो $\frac{a^6-1}{a^3}$ का मान क्या है ?

(A) 125 (B) –125
(C) 140 (D) –140

8. If x + y + z = 0 then what is $(y + z – x)^3 + (z + x – y)^3 + (x + y – z)^3$ equal to ?

यदि x + y + z = 0 हैं, तो $(y + z – x)^3 + (z + x – y)^3 + (x + y – z)^3$ किसके बराबर हैं ?

(A) $(x + y + z)^3$ (B) 3(x + y)(y + z) (z + x)
(C) 24xyz (D) –24xyz

9. If (x + 3) is a factor of $x^3 + 3x^2 + 4x + k$ then what is the value of k ?

यदि (x + 3), $x^3 + 3x^2 + 4x + k$ का एक गुणनखण्ड हैं, तो k का मान क्या हैं ?

(A) 12 (B) 24
(C) 36 (D) 72

10. Which one of the following is a zero of the polynomial $3x^2 + 4x^2 – 7$.

बहुपद $3x^2 + 4x^2 – 7$ का शून्यक निम्नलिखित में से कौन-सा हैं ?

(A) 0 (B) 1
(C) 2 (D) –1

11. If α and β are the roots of the equation $ax^2 + bx + c = 0$ then what is the value of the expression (α + 1) (β + 1) ?

यदि α और β समीकरण $ax^2 + bx + c = 0$ के मूल हैं, तो व्यंजक (α + 1) (β + 1) का मान क्या हैं ?

(A) $\frac{a+b+c}{a}$

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

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

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

12. The remainder when $3x^3 + kx^2 + 5x – 6$ is divided by (x + 1) is –7. What is the value of k ?

जब $3x^3 + kx^2 + 5x – 6$ में (x + 1) से भाग दिया जाता हैं तो –7 शेष बचता हैं k का मान क्या हैं ?

(A) –14 (B) 14
(C) –7 (D) 7

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13. If f(x) and g(x) are polynomials of degree p and q respectively, then the degree of (f(x) ± g(x)) (if it is non-zero) is.

यदि f(x) और g(x) क्रमशः डिग्री p और q के बहुपद हैं, तो (f(x) ± g(x)) (यदि यह शून्येत्तर हैं) की डिग्री हैं।

(A) greater than min (p,q)/ min (p,q) से बड़ी

(B) greater than max (p,q) / max (p,q) से बड़ी

(C) less than or equal to max (p,q)
max (p,q) के बराबर या इससे कम

(D) equal to min (p,q)/ min (p,q) के बराबर

14. Solve it $\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}-\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$.

$\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}-\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ का मान क्या हैं ?

(A) $-2\sqrt{15}$ (B) $2\sqrt{15}$

(C) $\sqrt{15}$ (D) $-\sqrt{15}$

15. What is the value of

$$\frac{1}{1+x^{b-a}+x^{c-a}}+\frac{1}{1+x^{a-b}+x^{c-b}}+\frac{1}{1+x^{a-c}+x^{b-c}}$$

where $x \neq 0$?

$$\frac{1}{1+x^{b\ a}+x^{c\ a}}+\frac{1}{1+x^{a\ b}+x^{c\ b}}+\frac{1}{1+x^{a\ c}+x^{b\ c}}$$

जहाँ $x \neq 0$ हैं, का मान क्या हैं ?

(A) –1 (B) 0

(C) 1 (D) 3

16. A quadratic polynomial $ax^2 + bc + c$ is such that when it is divided by x,(x – 1) and (x + 1) the remainders are 3, 6 and 4 respectively. What is the value of (a + b) ?

एक द्विघात बहुपद $ax^2 + bc + c$ इस प्रकार हैं, कि जब इसे x,(x – 1) और (x + 1) से विभाजित किया जाता हैं, तो शेषफल क्रमशः 3, 6 और 4 रहते हैं। (a + b) का मान क्या होगा ?

(A) 3 (B) 2

(C) 1 (D) –1

17. The artithmetic mean of two numbers is 10 and their geometric means is 8. What are the two numbers ?

दो संख्याओं का समान्तर माध्य 10 हैं और उनका गुणोत्तर माध्य 8 हैं। दोनों संख्याएँ कौन-सी हैं ?

(A) 15.5 (B) 12.8

(C) 16.4 (D) 18.2

18. If the length of a side of a square is increased by 8 cm, its area increases by 120 square cm, What is the length of a side of the square ?

यदि एक वर्ग की भुजा की लम्बाई 8 सेमी बढ़ा दी जाए, तो उसका क्षेत्रफल 120 सेमी^{2} बढ़ जाएगा। वर्ग की भुजा की लम्बाई क्या हैं ?

(A) 2.5 सेमी (B) 3.5 सेमी

(C) 4.5 सेमी (D) 5.5 सेमी

CDS [2018-II]

19. If $x = y^a$, $y = z^b$ and $z = x^c$, then the value of abc is.

यदि $x = y^a$, $y = z^b$ और $z = x^c$ हैं तो abc का मान क्या हैं ?

(A) 1 (B) 2

(C) –1 (D) 0

20. If $x = 2 + 2^{2/3} + 3^{1/3}$ then the value of the expression $x^3 – 6x^2 + 6x$ will be.

यदि $x = 2 + 2^{2/3} + 3^{1/3}$ है, तो व्यंजक $x^3 – 6x^2 + 6x$ का मान क्या होगा ?

(A) 2 (B) 1

(C) 0 (D) –2

21. If $x^2 – 6x – 27 > 0$, then which one of the following is correc ?

यदि $x^2 – 6x – 27 > 0$ हैं, तो निम्नलिखित में से कौन-सा सही हैं ?

(A) $–3 < x < 9$ (B) $x < 9$ or $x > –3$

(C) $x > 9$ or $x < –3$ (D) $x < –3$ only

22. HCF and LCM of two polynomicals are (x + 3) and ($x^3 – 9x^2 – x + 105$) respectively. If one of the two polynomials is $x^2 – 4x – 21$, then the other is.

दो बहुपदों के महत्तम समापवर्तक और लघुत्तम समापवर्त्य क्रमशः (x + 3) और ($x^3 – 9x^2 – x + 105$) हैं। यदि उनमें से एक बहुपद $x^2 – 4x – 21$ हैं तो दूसरा बहुपद क्या हैं ?

(A) $x^2 + 2x – 21$ (B) $x^2 + 2x + 15$

(C) $x^2 – 2x – 15$ (D) $x^2 – x – 15$

23. If α and β are two real number such that $\alpha + \beta = -\frac{q}{p}$ and $\alpha\beta = \frac{r}{p}$ where $1 < p < q < r$ then which one of the following is the greatest ?

यदि α और β दो ऐसी वास्तविक संख्याएँ हैं कि $\alpha + \beta = -\frac{q}{p}$ और $\alpha\beta = \frac{r}{p}$ हैं, जहाँ $1 < p < q < r$ हैं, तो निम्नलिखित में से कौन-सा महत्तम हैं ?

(A) $\frac{1}{\alpha+\beta}$ (B) $\frac{1}{\alpha}+\frac{1}{\beta}$ (C) $-\frac{1}{\alpha\beta}$ (D) $\frac{\alpha\beta}{\alpha+\beta}$

24. 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 किसके बराबर हैं ?

(A) $\left(x^2 - 1 + \frac{1}{x^2}\right)$ (B) $\left(x^4 - 1 + \frac{1}{x^4}\right)$

(C) $\left(x^4 + 1 + \frac{1}{x^4}\right)$ (D) $\left(x^4 - 1 - \frac{1}{x^4}\right)$

25. If the sum of the squares of three consecutive natural numbers is 110, then the sum of their cubes is.

यदि तीन क्रमागत प्राकृतिक संख्याओं के वर्गों का योगफल 110 हैं, तो उनके घनों का योगफल क्या होगा ?

(A) 625 (B) 654
(C) 684 (D) 725

26. If $a^x = b^y = c^z$ and abc = 1 then the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ will be equal to.

यदि $a^x = b^y = c^z$ और abc = 1 हैं, तो $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ का मान किसके बराबर होगा ?

(A) –1 (B) 0
(C) 1 (D) 3

27. If α and β are the roots of the equation $ax^2 + bx + c = 0$ then the value $\frac{1}{a\alpha + b} + \frac{1}{a\beta + b}$ of is.

यदि α और β समीकरण $ax^2 + bx + c = 0$ के मूल है तो $\frac{1}{a\alpha + b} + \frac{1}{a\beta + b}$ इसका मान क्या है ?

(A) $\frac{a}{bc}$ (B) $\frac{b}{ac}$ (C) $\frac{c}{ab}$ (D) $\frac{1}{abc}$

28. If $a = xy^{p-1}$, $b = yz^{q-1}$, $c = zx^{r-1}$ then $a^{q-r}b^{r-p}c^{p-q}$ is equal to.

यदि $a = xy^{p-1}$, $b = yz^{q-1}$, $c = zx^{r-1}$ हैं, तो $a^{q-r}b^{r-p}c^{p-q}$ किसके बराबर हैं ?

(A) abc (B) xyz
(C) 0 (D) None of these

29. The minimum value of the expression $2x^2 + 5x + 5$ is.

व्यंजक $2x^2 + 5x + 5$ का न्यूनतम मान क्या हैं ?

(A) 1 (B) 2
(C) $\frac{P+Q}{PQ}$ (D) $\frac{PQ}{P+Q}$

30. The remainder when $3x^3 - 2x^2y - 13xy^2 + 10y^3$ is divided by (x – 2y) is equal to.

जब $3x^3 - 2x^2y - 13xy^2 + 10y^3$ को (x – 2y) से विभाजित किया जाता हैं, तो शेषफल किसके बराबर होता हैं ?

(A) 0 (B) y
(C) y – 5 (D) y + 3

31. If ab + bc + ca = 0 then the value of $(b^2 - ca)(c^2 - ab) + (a^2 - bc)\frac{(c^2 - ab) + (a^2 - bc) \times (b^2 - ca)}{(a^2 - bc)(b^2 - ca)(c^2 - ab)}$ is.

यदि ab + bc + ca = 0 हैं, तो $(b^2 - ca)(c^2 - ab) + (a^2 - bc)\frac{(c^2 - ab) + (a^2 - bc) \times (b^2 - ca)}{(a^2 - bc)(b^2 - ca)(c^2 - ab)}$ का मान क्या हैं ?

(A) –1 (B) 0
(C) 1 (D) 2

32. The solution of linear inequalities $x + y \geq 5$ and $x - y \leq 3$ lies.

रैखिक असमिकाओं $x + y \geq 5$ और $x - y \leq 3$ का हल कहाँ स्थित हैं ?

(A) Only in the first quadrant
केवल प्रथम चतुर्थांश में
(B) In the first and second quadrants
प्रथम और द्वितीय चतुर्थांशों में
(C) In the second and third quarants
द्वितीय और चतुर्थ चतुर्थांशों में
(D) In the third and fourth quadrants
तृतीय और चतुर्थ चतुर्थांशों में

33. It is given that equations $x^2 - y^2 = 0$ and $(x - a)^2 + y^2 = 1$ have single positive solution. For this the value of 'a' is.

यह दिया गया हैं कि समीकरणों $x^2 - y^2 = 0$ और $(x - a)^2 + y^2 = 1$ का एकल धनात्मक हल हैं। इसके लिए 'a' का मान क्या हैं ?

(A) $\sqrt{2}$ (B) 2
(C) $-\sqrt{2}$ (D) 1

34. If α, β and γ are the zeros of the polynomial $f(x) = ax^3 + bx^2 + cx + d$, then $\alpha^2 + \beta^2 + \gamma^2$ is equal to.

यदि α, β और γ बहुपद $f(x) = ax^3 + bx^2 + cx + d$ के शून्य हैं, तो $\alpha^2 + \beta^2 + \gamma^2$ किसके बराबर हैं ?

(A) $\frac{b^2 - ac}{a^2}$ (B) $\frac{b^2 - 2ac}{a}$
(C) $\frac{b^2 + 2ac}{b^2}$ (D) $\frac{b^2 - 2ac}{a^2}$

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Solution

1. (C) Given, a+b = 2c

Or a + b = c + c

Or a – c = c – b ..... (i)

Now, $\frac{a}{a-c}+\frac{c}{b-c}$

$= \frac{a}{c-b}-\frac{c}{c-b}$ (from Eq. (i))

$= \frac{a-c}{c-b}$

$= \frac{c-b}{c-b}$ (from Eq. (i))

= 1

2. (B) $x = y^{1/a}$...(i), $y = z^{1/b}$....(ii) and $z = x^{1/c}$.... (iii)

Now $x = y^{1/a}$ (from Eq. (i))

$\Rightarrow x = (x^{1/b})^{1/a}$ (from Eq. (ii))

$\Rightarrow x = ((x^{1/c})^{1/b})^{1/a}$ (from Eq. (iii))

$\Rightarrow x = x^{\frac{1}{abc}}$

Or abc = 1

3. (C) 2b = a + c (given) ..... (i)

Now $x^{b-c} \times (xz)^{1/2})^{c-a} \times z^{a-b}$ [$\because y^2 = xz$]

$\Rightarrow x^{b-c} \times (x)^{\left(\frac{c-a}{2}\right)} \times z^{\left(\frac{c-a}{2}\right)} \times z^{a-b}$

$\Rightarrow x^{\left(\frac{2b-2c+c-a}{2}\right)} \times z^{\left(\frac{c-a+2a-2b}{2}\right)}$

$\Rightarrow x^{\frac{2b-a-c}{2}} \times z^{\frac{(2b+a+c)}{2}}$

$= x^\circ \times y^\circ$ ($\because$ a + b = 2b)

= 1 × 1 = 1

4. (B) Let the roots of the equatin be 'α' and 'β'

According to the question.

$\alpha = \frac{1}{\beta}$.....(i)

From the equation

$px^2 + x + r = 0$

$\alpha \times \beta = \frac{r}{p}$ ($\because$ productions of roots = c/a)

or $\beta \times \frac{1}{\beta} = \frac{r}{p}$ (From Eq.(i))

or r = p

5. (A) 65x – 33y = 97 ..... (i)

33x – 65y = 1 .....(ii)

Adding Eqs (i) and (ii) we get

x – y = 1 ..... (iii)

Subracting Eqs (i) and (ii) we get

x + y = 3 ..... (iv)

Solving Eqs (iii) and (iv) we get

x = 2, y = 1

$\therefore$ xy = 2 × 1 = 2

6. (A) Let $\frac{z}{c} = p$

$\therefore \frac{b}{y} + p = 1$ and $\frac{1}{p}+\frac{x}{a} = 1$

$\Rightarrow \frac{b}{y} = 1 - p$ and $\frac{x}{a} = 1 - \frac{1}{p} = \frac{p-1}{p}$

$\Rightarrow \frac{y}{b} = \frac{1}{1-p}$ and $\frac{a}{x} = \frac{p}{p-1}$

Now adding Eqs (i) and (ii) we get

$\frac{y}{b}+\frac{a}{x} = \frac{1}{1-p}+\frac{p}{p-1}$

$\Rightarrow \frac{xy+ab}{bx} = \frac{1}{1-p}-\frac{p}{1-p}$

$\Rightarrow \frac{ab+xy}{bx} = \frac{1-p}{1-p} = 1$

7. (C) $\frac{a^2-1}{a} = 5$

$\therefore a - \frac{1}{a} = 5$

Cubing sides we get

$\left(a-\frac{1}{a}\right)^3 = 5^3$

$\Rightarrow a^3 - \frac{1}{a^3} - 3\left(a-\frac{1}{a}\right) = 125$

[$\because (a-b)^3 = a^3 - b^3 - 3ab(a-b)$]

$\Rightarrow a^3 - \frac{1}{a^3} = 125 + 3(5)$ (frp, Eq (i))

$\Rightarrow a^3 - \frac{1}{a^3} = 125 + 15 = 140$

8. (D) Given $x + y + z = 0$
We have to find the value of
$(y + z - x)^3 + (z + x - y)^3 + (x + y - z)^3$
Let $y + z - x = a$, $z + x - y = b$
and $x + y - z = c$
$\therefore$ $a + b + c = y + z - x + z + x + y - z = 0$
If $a + b + c = 0$
then $a^3 + b^3 + c^3 = 3abc$
$\therefore$ $(y + z - x)^3 + (z + x - y)^3 + (x + y - z)^3$
$= 3(y + z - x)(z + x - y)(x + y - z)$
$= 3(-2x)(-2y)(-2z)$ ($\because x + y + z = 0$)
$= -24xyz$

9. (A) As $(x + 3)$ is a factor of given equation
$\therefore$ $x = -3$
Now $p(x) = x^3 + 3x^2 + 4x + k$
$\therefore$ $p(-3) = 0$
$\Rightarrow (-3)^3 + 3(-3)^2 + 4(-3) + k = 0$
$\Rightarrow -27 + 27 - 12 + k = 0$
$\Rightarrow k = 12$

10. (B) Given $p(x) = 3x^3 + 4x^2 - 7$
Putting $x = 1$
$\Rightarrow p(1) = 3(1)^3 + 4(1)^2 - 7$
$\Rightarrow p(1) = 3 + 4 - 7 = 0$
Hence $x = 1$ a zero for polynomial
$3x^3 + 4x^2 - 7$

11. (C) α and β are the roots of the equation
$ax^2 + bx + c = 0$

$\therefore$ Sum of roots $= \alpha + \beta = \dfrac{-b}{a}$

And product of roots $= \alpha\beta = \dfrac{c}{a}$

$\therefore$ $(\alpha + 1)(\beta + 1) = \alpha\beta + \alpha + \beta + 1$
$= (\alpha\beta) + (\alpha + \beta) + 1$
$= \dfrac{-b}{a} + \dfrac{c}{a} + 1$

$= \dfrac{-b + c + a}{a} = \dfrac{a - b + c}{a}$

12. (D) $p(x) = 3x^3 + kx^2 + 5x - 6$
$x + 1 = 0$
$\therefore$ $x = -1$
$p(-1) = 3(-1)^3 + k(-1)^2 + 5(-1) - 6$
$= -3 + k - 5 - 6$
$= k = 14$
$\therefore$ Remainder $= k - 14$
But remainder $= -7$ (given)
$\therefore$ $k - 14 = -7$
$\therefore$ $k = -7 + 14 = 7$

13. (C) We have
degree of $f(x) = p$
degree of $g(x) = q$
degree $(f(x) + g(x)) = \max (p,q),\ p \neq q$
degree $(f(x) - g(x)) = p$ or q, $p = q$
degree $(f(x) - g(x))$ = less than or equal to $\max (p,q)$ $p = q$
$\therefore$ degree $(f(x) \pm g(x))$ = less than or equal to $\max (p,q)$

14. (A) $\dfrac{\sqrt{5} - \sqrt{3}}{\sqrt{5} + \sqrt{3}} + \dfrac{\sqrt{5} + \sqrt{3}}{\sqrt{5} - \sqrt{3}}$

$= \dfrac{\left(\sqrt{5} - \sqrt{3}\right)^2 - \left(\sqrt{5} + \sqrt{3}\right)^2}{\left(\sqrt{5}\right)^2 + \left(\sqrt{3}\right)^2}$

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

$= \dfrac{\left(5 + 3 - 2\sqrt{15}\right) - \left(5 + 3 + 2\sqrt{15}\right)}{2}$

($\because (a + b)^2 = a^2 + 2ab + b^2$
and $(a - b)^2 = a^2 - 2ab + b^2$)

$= \dfrac{8 - 2\sqrt{15} - 8 - 2\sqrt{15}}{2} = \dfrac{-4\sqrt{15}}{2} = -2\sqrt{15}$

15. (C)

$$\frac{1}{1 + x^{b-a} + x^{c-a}} + \frac{1}{1 + x^{a-b} + x^{c-b}} + \frac{1}{1 + x^{a-c} + x^{b-c}}$$

$$= \frac{1}{1 + \frac{x^b}{x^a} + \frac{x^c}{x^a}} + \frac{1}{1 + \frac{x^a}{x^b} + \frac{x^c}{x^b}} + \frac{1}{1 + \frac{x^a}{x^c} + \frac{x^b}{x^c}}$$

$$= \frac{x^a}{x^a + x^b + x^c} + \frac{x^b}{x^a + x^b + x^c} + \frac{x^c}{x^a + x^b + x^c}$$

$$= \frac{x^a + x^b + x^c}{x^a + x^b + x^c} = 1$$

16. (A) $p(x) = ax^2 + bx + c$
for $x = 0$
$p(0) = a(0)^2 + b(0) + c \Rightarrow c = 3$
for $x - 1 = 0$ i.e $x = 1$
$p(1) = 6$
$\therefore$ $a(1)^2 + b(1) + c = 6$
$a + b + 3 = 6$
$\Rightarrow$ $a + b = 3$

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17. (C) Let the two numbers be x and y
$\because$ Arithmetic mean = 10
and geometric mean = 0

$\therefore \frac{x+y}{2} = 10$ and $\sqrt{xy} = 8$

$\therefore$ x + y = 20 .....(i)
and xy = 64 .....(ii)
From Eq (ii) xy = 64
$\therefore$ x (20 – x) = 64 (from Eq. (i))
$20x - x^2 = 64$
$\Rightarrow x^2 - 20x + 64 = 0$
$\Rightarrow x^2 - 16x - 4x + 64 = 0$
$\Rightarrow x(x-16) - 4(x-16) = 0$
$\Rightarrow (x-4)(x-16) = 0$
$\therefore$ x = 4
Or x = 16
And y = 16 or y = 4

18. (B) Let the side of square be x cm
$\therefore$ New side of squre = x + 8 cm
According to the question
$(x+8)^2 - x^2 = 120$
($\because$ Area of square = side^2)
$\Rightarrow x^2 + 64 - 2(8)(x) - x^2 = 120$
($\because (a+b)^2 = a^2 + 2ab + b^2$)
$\Rightarrow 16x = 120 - 64$

$x = \frac{56}{16} = 3.5$ cm

Hence side of square = 3.5 cm.

19. (A) Given $x = y^a$
Or $x = (Z^b)^a$ (as $y = z^b$)
Or $x = ((x^c)^b)^a$(as $y = z^b$)
Or $x = x^{abc}$
Or, abc = 1

20. (A) Given $x = 2 + 2^{2/3} + 2^{1/3}$
$\Rightarrow x - 2 = 2^{2/3} + 2^{1/3}$
Cubing both sides we get
$(x-2)^3 = (2^{2/3} + 2^{1/3})^3$
$\Rightarrow x^3 - 2^3 - 3(x)(2)(x-2)$
$= (2^{2/3}) + (2^{1/3})^3 + 3(2)^{2/3}(2)^{1/3}(2^{2/3} + 2^{1/3})$
($\because (a-b)^3 = a^3 - b^3 - 3ab(a-b(a+b)^3 = a^3 + b^3$
$+ 3ab(a+b)$)
$\Rightarrow x^3 - 8 - 6x^2 + 12x = 2^2 + 2 + 6(x-2)$
$\Rightarrow x^3 - 6x^2 + 12x = 6 + 8 + 6x - 12$
$\Rightarrow x^3 - 6x^2 - 6x = 2$

21. (C) Given $x^2 - 6x - 27 > 0$
Orb $x^2 - 9x + 3x - 27 > 0$
$(x+3)(x-9) > 0$
Now for (x + 3) (x – 9) to be greater than 0.
Either (x + 3) and (x – 9) must be greater than 0.
Or both (x + 3) and (x – 9) must be less than 0.
$\therefore$ x > 9 and x < –3

22. (C) Given HCF of polynomials = x + 3
LCM of polynomials
$= x^3 - 9x^2 - x + 105$
One polnomial $= x^2 - 9x^2 - x + 105$
We know that (HCF × LCM) of two number = Product of two number
$\therefore$ Othen polynomial

$= \frac{(x+3)(x^3 - 9x^2 - x + 105)}{x^2 - 4x - 21}$

$= \frac{(x+3)(x^3 - 9x^2 - x + 105)}{(x-7)(x+3)}$

$= \frac{x^3 - 9x^2 - x + 105}{x - 7}$

$\Rightarrow$ Other polynomical = $x^2 - 2x = 15$

23. (C) Given $\alpha + \beta = \frac{-q}{p}$ $\alpha\beta = \frac{r}{p}$
and 1< p < q < r
From option (a) $\frac{1}{\alpha+\beta} = \frac{-p}{q}$
Option (B)

$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{-p}{q}$

Option (C)

$\frac{-1}{\alpha\beta} = \frac{-p}{r}$

Option (D)

$\frac{\alpha\beta}{\alpha+\beta} = \frac{r}{p} \times \left(\frac{-p}{q}\right) = \frac{-r}{q}$

Now except (d) in all other options the numerator is smaller than denominator
$\therefore$ Option (b) is smallest

Now from option (A) and (C) i.e $\frac{-p}{q}$

and $\frac{-p}{q}, \frac{-p}{q}$ greater as r > q

Now from option (C) and (B) i.e. $\frac{-p}{r}$ and $\frac{-q}{r}$

$\frac{-p}{r}$ is greather as $q > p$

$\therefore\ -\frac{1}{\alpha\beta}$ is greatest

24. (B) We know that

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

$\therefore\ x^6 + \frac{1}{x^6} = (x^2)^3 + \left(\frac{1}{x^2}\right)^3$

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

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

25. (C) Let the three consecutive natural numbers be

$(x - 1), x, (x + 1)$

According to the question

$\Rightarrow (x - 1)^2 + x^2 + (x + 1)^2 = 110$

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

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

$\Rightarrow x^2 + 1 - 2x + x^2 + x^2 + 1 + 2x = 110$

$\Rightarrow 3x^2 = 110 - 2$

$\Rightarrow x^2 = \frac{108}{3} = 36$

$\therefore$ The numbers are $(6 - 1), 6, (6 + 1)$

i.e. 5, 6 and 7

Now sum of their cubes

$= 5^3 + 6^3 + 7^3$

$= 125 + 216 + 343 = 684$

26. (B) Given $a^x = b^y = c^z = k$ (let)

and $abc = 1$

Now, $a^x = k$

Or $x = k^{1/x}$

Similarly $b = k^{1/y}$ and $c = k^{1/z}$

Now $abc = 1$ or $k^{1/x}.k^{1/z} = 1$

Or $k^{\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)} = 1$

Or $k^{\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)} = k^0$

Or $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$

27. (B) We have α, β are the roots of the equation

$ax^2 + bx + c = 0$

$\therefore\ \alpha + \beta = \frac{-b}{a}, \alpha\beta = \frac{c}{a}$

Now $\frac{1}{a\alpha + b} + \frac{1}{a\beta + b}$

$= \frac{a\alpha + b + a\alpha + b}{(a\alpha + b)(a\beta + b)}$

$= \frac{a(\alpha + \beta) + 2b}{a^2(\alpha\beta) + ab(\alpha + \beta) + b^2}$

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

28. (D) We have

$a = xy^{p-1}, b = yz^{q-1}, c = zx^{r-1}$

Now $a^{q-r}, b^{r-p}, c^{p-q}$

$= (xy^{p-1})^{q-r}(yz^{q-1})^{r-p}(zx^{r-1})^{p-q}$

$= x^{q-r}y^{(p-1)(q-r)}y^{r-p}z^{(q-1)(r-p)}z^{p-q}x^{(r-1)(p-q)}$

$= x^{(q-r)+(r-1)(p-q)}y^{(p-1)(q-r)+r-p}z^{(q-1)(r-p)+p-q}$

$= x^{q-r+pr+q-r-p+q}y^{pq-pr-q+r-r+p}z^{qr-pq-r+1+p-q}$

$= x^{2q-p-r+(p-q-1)}y^{2r-q+p(q-r-1)}z^{2p-r+q(r-p-1)}$

29. (B) Let

$y = 2x^2 + 5x + 5$

$\Rightarrow y = 2\left(x^2 + \frac{5}{2}x + \frac{5}{2}\right)$

$\Rightarrow y = 2\left(x^2 + \frac{5}{2}x + \frac{25}{16}\right) + 5 - \frac{25}{8}$

$\Rightarrow y = 2\left(x + \frac{5}{4}\right)^2 + \frac{15}{8}$

$\therefore$ Minimum value of $y\ \frac{15}{8}$

30. (A) $3x^3 - 2x^2y - 13xy^2 + 10y^3$

And $g(x) = x - 2y$

When $f(x)$ is divided by $g(x)$

$\therefore\ f(2y) = 3(2y)^3 - 2(2y)^2y - 132(2y)^2 + 10y^3$

$f(2y) = 24y^3 - 8y^3 - 26y^3 + 10y^3$

$f(2y) = 0$

Hence remainder = 0

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31. (B) We have ab + bc + ca = 0

Now

$$\frac{(b^2-ca)(c^2-ab)+(a^2-bc)(c^2-ab)+(a^2-bc)(b^2-ca)}{(a^2-bc)(b^2-ca)(c^2-ab)}$$

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

$$=\frac{1}{a^2+B+c}+\frac{1}{b^2+ab+bc}+\frac{1}{c^2+ab+ca}$$

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

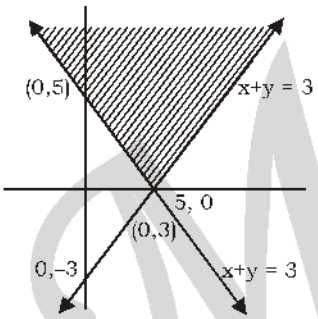
$$=\frac{1}{(a+B+c)}\left[\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right]$$

$$=\frac{1}{(a+B+c)}\left(\frac{ab+bc+ca}{abc}\right)=0$$

32. (B) We have

$x + y \geq 5$ and $x - y \leq 3$

The graph of liner equalities are below



Clearly, from graph solution lies in first and second quadrant

33. (A) We have $x^2 - y^2$ and $(x - a)^2 + y^2 = 1$

$\Rightarrow x^2 - y^2 = 0$

$\Rightarrow x^2 = y^2$

Put the value y^2 in we get

$(x - a)^2 + x^2 = 1$

$\Rightarrow 2x^2 - 2ax + a^2 - 1 = 0$

Equation have single positive solution

$\therefore D = 0$

$\Rightarrow 4a^2 - 4(a^2 - 1)(2) = 0$

$\Rightarrow 4a^2 - 8a^2 + 8 = 0$

$\Rightarrow a = \sqrt{2}$

34. (D) We have

$f(x) = ax^3 + bx^2 + cx + d$

$$\alpha, \beta, \gamma = -\frac{b}{a}$$

$$\alpha\beta\gamma = -\frac{d}{a}$$

$(\alpha + \beta + \gamma)^2 = \alpha^2 + \beta^2 + \gamma^2 + 2(\alpha\beta + \beta\gamma + \gamma\alpha)$

$$\Rightarrow \left(-\frac{b}{a}\right)^2 = \alpha^2 + \beta^2 + \gamma^2 + \frac{2c}{a}$$

$$\Rightarrow \alpha^2 + \beta^2 + \gamma^2 + \frac{b^2}{a^2} - \frac{2c}{a} = \frac{b^2 - 2ac}{a^2}$$

CDS [2017-I]

1. What is $\sqrt{\frac{0.064\times6.25}{0.081\times4.84}}$ equal to ?

$\sqrt{\frac{0.064\times6.25}{0.081\times4.84}}$ किसके बराबर हैं ?

(A) $\frac{10}{99}$ (B) $\frac{100}{99}$

(C) 9 (D) 99

2. (x + 4) is a factor of which one of the following expressions ?

(x + 4) निम्नलिखित व्यंजकों में से किसका गुणनखण्ड हैं ?

(A) $x^2 - 7x + 44$ (B) $x^2 + 7x - 44$

(C) $x^2 - 7x - 44$ (D) $x^2 + 7x + 44$

3. If α and β are the roots of the equadratic equation $2x^2 + 6x + k = 0$ what $k < 0$ is the maximum value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$?

यदि α और β द्विघात समीकरण $2x^2 + 6x + k = 0$ जहाँ $k < 0$ हैं, के मूल हैं, तो $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ का अधिकतम मान क्या हैं ?

(A) 2 (B) –2

(C) 9 (D) –9

4. What is the square root of $\frac{(0.35)^2 + 0.70 + 1}{2.25} + 0.19$?

$\frac{(0.35)^2 + 0.70 + 1}{2.25} + 0.19$ का वर्गमूल किसके बराबर हैं ?

(A) 1 (B) 2

(C) 3 (D) 4

5. If one root of $(a^2 - 5a + 3)x^2 + (3a - 1)x + 2 = 0$ is twice the other, then what is the value of 'a' ?

यदि समीकरण $(a^2 - 5a + 3)x^2 + (3a - 1)x + 2 = 0$ का एक मूल दूसरे मूल का दुगना हैं तो 'a' का मान क्या हैं ?

(A) $\frac{2}{3}$ (B) $-\frac{2}{3}$ (C) $\frac{1}{3}$ (D) $-\frac{1}{3}$

6. If $x = \frac{\sqrt{a+b} - \sqrt{a-b}}{\sqrt{a+b} + \sqrt{a-b}}$ then what is $bx^2 - 2ax + b$ equal to $(b \neq a)$? यायाया

यदि $x = \frac{\sqrt{a+b} - \sqrt{a-b}}{\sqrt{a+b} + \sqrt{a-b}}$ है तो $bx^2 - 2ax + b$ किसके बराबर हैं$(b \neq a)$?

(A) 0 (B) 1

(C) ab (D) 2ab

7. What si the valu of $\frac{(443+547)^2 + (443-547)^2}{443\times443 + 547\times547}$?

$\frac{(443+547)^2 + (443-547)^2}{443\times443 + 547\times547}$ का मान क्या हैं ?

(A) 0 (B) 1

(C) 2 (D) 3

8. If $x = t^{\frac{1}{t-1}}$ and $y = t^{\frac{1}{1-t}}$, $t > 0$, $t \neq 1$ then what is the relation between x and y ?

यदि $x = t^{\frac{1}{1-t}}$ और $y = t^{\frac{1}{t-1}}$, $t > 0$, $t \neq 1$ तो x और y के मध्य क्या सम्बन्ध हैं ?

(A) $y^x = x^{1/y}$ (B) $x^{1/y} = y^{1/x}$

(C) $x^y = y^x$ (D) $x^y = y^{1/x}$

9. If A : B = 3 : 4 then what is the value of the expression $\left(\frac{3A^2 + 4B}{3A - 4B^2}\right)$?

यदि A : B = 3 : 4 तो व्यंजक $\left(\frac{3A^2 + 4B}{3A - 4B^2}\right)$ का मान क्या हैं ?

(A) $\frac{43}{55}$ (B) $\frac{-43}{55}$ (C) $\frac{47}{55}$

(D) Cannot be determined / निकाला नहीं जा सकता

10. If $x = 2 + 2^{2/3} + 2^{1/3}$ then what is the value of $x^3 - 6x^2 + 6x$?

यदि $x = 2 + 2^{2/3} + 2^{1/3}$ तो $x^3 - 6x^2 + 6x$ का मान क्या हैं ?

(A) 3 (B) 2

(C) 1 (D) 0

11. If $\sqrt{\frac{x}{y}} = \frac{24}{5} + \sqrt{\frac{y}{x}}$ and x + y = 26 then what is the value of xy ?

यदि $\sqrt{\frac{x}{y}} = \frac{24}{5} + \sqrt{\frac{y}{x}}$ और x + y = 26 तो xy का मान क्या हैं ?

(A) 5 (B) 15

(C) 25 (D) 30

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12. If α and β are the roots of the equation $x^2 + px + q = 0$ then what is $\alpha^2 + \beta^2$ equal to ?
यदि α और β समीकरण $x^2 + px + q = 0$ मूल हैं, तो $\alpha^2 + \beta^2$ किसके बराबर हैं ?
(A) $p^2 - 2q$ (B) $q^2 - 2p$
(C) $p^2 + 2q$ (D) $q^2 - q$

13. If $a^3 = 335 + b^3$ and $a = 5 + b$ then what is the value of $a + b$ (given that $a > 0$ and $b > 0$) ?
यदि $a^3 = 335 + b^3$ और $a = 5 + b$ तो $a + b$ का मान क्या हैं (दिया गया हैं कि $a > 0$ और $b > 0$) ?
(A) 7 (B) 9
(C) 16 (D) 49

14. If $9^x3^y = 2187$ and $2^{3x}2^{2y} - 4^{xy} = 0$ then what can be the value of $(x + y)$?
यदि $9^x3^y = 2187$ और $2^{3x}2^{2y} - 4^{xy} = 0$ तो $(x + y)$ का मान क्या हो सकता हैं ?
(A) 1 (B) 3
(C) 5 (D) 7

15. The pair of linear equation $kx + 3y + 1 = 0$ and $2x + y + 3 = 0$ intersect each other, if
युगल रैखिक समीकरण $kx + 3y + 1 = 0$ और $2x + y + 3 = 0$ एक-दूसरे को प्रतिच्छेद करते हैं यदि
(A) $k = 6$ (B) $k \neq 6$
(C) $k = 0$ (D) $k \neq 0$

16. In a 100 m race A runs at a speed of $\frac{5}{3}$ m/s. If give a start of 4m to B and still beats him by 12 seconds what is speed of B.
100 मी की एक दोड़ में A, $\frac{5}{3}$ m/s की गति से दौड़ता हैं। यदि A की तुलना में B,4 मी, भागे (लक्ष्य की और) से दोड़ना शुरू करता हैं और फिर भी A उसे 12 सेकण्ड से हरा देता हैं B की गति क्या हैं ?
(A) $\frac{5}{4}$ m/s (B) $\frac{7}{5}$ m/s
(C) $\frac{4}{3}$ m/s (D) $\frac{6}{5}$ m/s

17. The values of x which satisfy the equation $5^{1+x} + 5^{1-x} = 26$ are.
समीकरण $5^{1+x} + 5^{1-x} = 26$ को सन्तुष्ट करने वाले x के मान कौन-से हैं ?
(A) $-1, 1$ (B) $0, 1$
(C) $1, 2$ (D) $-1, 0$

18. If $a + b = 5$ and $ab = 6$ then what is the value of $a^3 + b^3$?
यदि $a + b = 5$ और $ab = 6$ तो $a^3 + b^3$ का मान क्या हैं ?
(A) 35 (B) 40
(C) 90 (D) 125

19. What is the LCM of $x^2 + 8$, $x^2 + 5x + 6$ and $x^3 + 4x^2 + 4x$?
$x^2 + 8$, $x^2 + 5x + 6$ और $x^3 + 4x^2 + 4x$ का म.स क्या हैं ?
(A) $x(x + 2)^2 (x + 3)(x^2 - 2x + 4)$
(B) $x(x - 2)^2 (x - 3)(x^2 + 2x + 4)$
(C) $x(x + 2)^2 (x - 3)(x^2 - 2x + 4)$
(D) $x(x + 2)^2 (x - 3)(x^2 - 2x + 4)$

20. What is the value of $\sqrt[3]{4\frac{12}{125}}$?
$\sqrt[3]{4\frac{12}{125}}$ का मान क्या हैं ?
(A) $1\frac{3}{5}$ (B) $1\frac{2}{5}$ (C) $1\frac{4}{5}$ (D) $2\frac{2}{5}$

21. Aman and Alok attempted to solve a quadratic equation. Aman made a mistake in writing down the constant term and ended up in roots (4,3). Aloke made a mistake in writing down the coefficient of x to get roots (3,2). The correct roots of the equation are.
अमन और आलोक ने एक द्विघात समीकरण को हल करने का प्रयत्न किया। अमन ने नियत पद लिखते समय गलती कर दी और मूल (4, 3) निकाले। आलोक ने x का गुणांक लिखते समय गलती कर दी और मूल (3, 2) निकाले। समीकरण के सही मूल हैं।
(A) $-4, -3$ (B) $6, 1$
(C) $4, 3$ (D) $-6, -1$

22. The system of equation $2x + 4y = 6$ and $4x + 8y = 8$ is.
समीकरण निकाय $2x + 4y = 6$ और $4x + 8y = 8$.
(A) consistent with a unique solution
एक अद्वितीय हल के साथ संगत हैं
(B) consistent with infionitely infinitely many solutions
अनंततः अनेक हलों के साथ संगत हैं
(C) inconsistent / असंगत हैं
(D) None of the above / उपर्युक्त में से कोई नहीं

CDS [2017-II]

23. What is the value of $\alpha(\alpha \neq 0)$ for which $x^2 - 5x + \alpha$ and $x^2 - 7x + 2\alpha$ have a common factor ?
$\alpha(\alpha \neq 0)$ का वह मान क्या हैं, जिसके लिए $x^2 - 5x + \alpha$ और $x^2 - 7x + 2\alpha$ का एक सार्व गुणनखण्ड होता हैं ?
(A) 6 (B) 4
(C) 3 (D) 2

24. What are the factors of $x^3 + 4x^2 - 11x - 30$?
$x^3 + 4x^2 - 11x - 30$ के गुणनखण्ड क्या हैं ?
(A) (x – 2),(x + 3) and (x + 5)
(B) (x + 2),(x + 3) and (x – 5)
(C) (x – 2),(x + 3) and (x + 5)
(D) (x + 2),(x – 3) and (x – 5)

25. What is the positive value of m for which the roots of the equation $12x^2 + mx + 5 = 0$ are the the ratio 3 : 2 ?
m का वह धनात्मक मान क्या हैं, जिसके लिए समीकरण $12x^2 + mx + 5 = 0$ के मूल 3 : 2 के अनुपात में हैं ?
(A) $5\sqrt{10}$ (B) $\frac{5\sqrt{10}}{12}$ (C) $\frac{5}{12}$ (D) $\frac{12}{6}$

26. Let f(x) and g(x) be two polynomicals (with real coefficients) have degrees 3 and 4 respectiveluy. What is the degree of f(x) g(x) ?
माना f(x) और g(x) दो बहुपद (वास्तविक गुणांको के साथ) हैं, जिनकी घात क्रमश: 3 और 4 हैं। f(x) g(x) की घात क्या हैं ?
(A) 12 (B) 7
(C) 7 (D) 3

27. If $5x^3 + 5x^3 - 6x + 9$ is divided by (x + 3) then the remainder is.
यदि $5x^3 + 5x^3 - 6x + 9$ को (x + 3) से विभाजित किया जाता हैं, तो शेषफल क्या हैं ?
(A) 135 (B) –135
(C) 63 (D) –63

28. The product of two non-zero expression is $(x + y + z)p^3$. If their HCF is p^2. If their HCF is p^2. then their LCM is.
दो शून्येत्तर व्यंजकों का गुणनफल $(x + y + z)p^3$ हैं। यदि उनका महत्तम समापवर्तक p^2 है तो उनका लघुत्तम समापवर्त्य क्या हैं ?
(A) (x + y + z) (B) $(x + y + z)p^2$
(C) $(x + y + z)p^5$ (D) (x + y + z)p

29. The quotient of $8x^3 - y^3$ when divided by $2xy + 4x^2 + y^2$ is.
$8x^3 - y^3$ को $2xy + 4x^2 + y^2$ से विभाजित करने पर भागफल क्या होगा।
(A) 2x + y (B) x + 2y
(C) 2x – y (D) 4x – y

30. If (x + 2) is a common factor of $x^2 + ax + b$ and $x^2 + bx + a$ then the ratio a : b is equal to.
यदि (x + 2), $x^2 + ax + b$ और $x^2 + bx + a$ का एक सार्वगुणनखण्ड है जो अनुपात a : b किसके बराबर हैं ?
(A) 1 (B) 2
(C) 3 (D) 4

31. Let $f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \ldots\ldots + a_{n-1}x + a_n$ where $a_0, a_1, a_2, \ldots\ldots, a_n$ are real numbers If f(x) id divided (ax – b) by are real numbers.
मान लीजिए $f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \ldots\ldots + a_{n-1}x + a_n$, हैं, जहाँ $a_0, a_1, a_2, \ldots\ldots, a_n$ वास्तविक संख्याएँ हैं। यदि f(x) को (ax – b) से विभाजित किया जाए तो शेषफल क्या होगा ?
(A) $f\left(\frac{b}{a}\right)$ (B) $r\left(-\frac{b}{a}\right)$
(C) $r\left(\frac{a}{b}\right)$ (D) $r\left(-\frac{a}{b}\right)$

32. The product of the polynomials (x + 2), (x – 2), $(x^2 - 2x^2 + 4x - 8)$ and $(x^3 + 2x^2 + 4x + 8)$ is.
बहुपदों (x + 2), (x – 2), $(x^2 - 2x^2 + 4x - 8)$ और $(x^3 + 2x^2 + 4x + 8)$ का गुणनफल क्या हैं ?
(A) $x^8 - 256$ (B) $(x^4 - 16)^2$
(C) $(x^4 + 16)^2$ (D) $(x^2 - 4)^4$

33. The factors of x(x + 2)(x + 3)(x + 5) – 72 are.
x(x + 2)(x + 3)(x + 5) – 72 के गुणनखण्ड हैं
(A) x, (x + 3), (x + 4) and (x – 6)
(B) (x – 1), (x + 6) and $(x^2 - 2x - 12)$
(C) (x – 1), (x + 6) and $(x^2 + 5x + 12)$
(D) (x + 1), (x – 6) and $(x^2 - 5x - 12)$

34. If the HCF of polynomials $f(x) = (x - 1)(x^2 + 3x + a)$ and $g(x) = (x + 2)(x^2 + 2x + b)$ is $(x^2 + x - 2)$ then what are the values of a and b respectively ?
यदि बहुपद $f(x) = (x - 1)(x^2 + 3x + a)$ और $g(x) = (x + 2)(x^2 + 2x + b)$ का महत्तम समापवर्तक $(x^2 + x - 2)$ हैं, तो a और b के मान क्रमश: क्या हैं ?
(A) 2,2 (B) 2, –3
(C) –1, –3 (D) –2, –1

35. If the roots of the equation $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$ are equal then which one of the following is correct ?
यदि समीकरण $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$ के मूल बराबर हैं, तो निम्नलिखित में से कौन-सा सही हैं ?
(A) 2b = a + c (B) $b^2 = ac$
(C) $\frac{2}{b} = \frac{1}{a} + \frac{1}{c}$ (D) $\frac{1}{b} = \frac{1}{a} + \frac{1}{c}$

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36. The non-zero of the equation $\frac{a-x^2}{bx}-\frac{b-x}{c}=\frac{c-x}{b}-\frac{b-x^2}{cx}$ where $b \neq 0, c \neq 0$ is.

समीकरण $\frac{a-x^2}{bx}-\frac{b-x}{c}=\frac{c-x}{b}-\frac{b-x^2}{cx}$ जहाँ $b \neq 0$, $c \neq 0$ हैं, शून्येत्तर हल क्या हैं ?

(A) $\frac{b^2+ac}{b^2+c^2}$ (B) $\frac{b^2-ac}{b^2-c^2}$

(C) $\frac{b^2-ac}{b^2+c^2}$ (D) $\frac{b^2+ac}{b^2-c^2}$

37. If k is an integer then $x^2 + 7x - 14\left(k^2-\frac{7}{8}\right)=0$ has.

यदि k एक पूर्णांक हैं, तो $x^2 + 7x - 14\left(k^2-\frac{7}{8}\right)=0$ का/के

(A) Both integral roots / दोनों मूल पूर्णांक हैं

(B) At least one integral root
कम-से-कम एक मूल पूर्णांक हैं

(C) No integral root / कोई भी मूल पूर्णांक नहीं हैं

(D) Both positive integral roots
दोनों मूल धन पूर्णांक हैं

38. What is the value of u in the system of equations $3(2u + v) = 7uv$, $3(u + 3v) = 11uv$?
समीकरण निकाय $3(2u + v) = 7uv$, $3(u + 3v) = 11uv$ में u का मान क्या हैं ?

(A) 1 (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) 2

39. Five years ago, Ram was three times as old as Shyam. Four years from now, Ram will be only twice as old as Shyam. What is the present age of Ram ?
पाँच वर्ष पहले, राम की आयु, श्याम की आयु की तीन गुनी थी। अब से चार वर्ष बाद, राम की आयु, श्याम की आयु की केवल दोगुनी होगी। राम की वर्तमान आयु क्या हैं ?

(A) 30 years
(B) 32 years
(C) 36 years
(D) 40 years

40. If ab + bc + ca = 0 then what is the value of $\frac{a^2}{a^2-bc}+\frac{b^2}{b^2-ca}+\frac{c^2}{c^2-ab}$?

यदि If ab + bc + ca = 0 हैं तो $\frac{a^2}{a^2-bc}+\frac{b^2}{b^2-ca}+\frac{c^2}{c^2-ab}$ का मान क्या हैं ?

(A) 3 (B) 0
(C) 1 (D) –1

41. What $\frac{(x-y)(y-z)(z-x)}{(x-y)^3+(y-z)^3+(z-x)^3}$ equal to ?

$\frac{(x-y)(y-z)(z-x)}{(x-y)^3+(y-z)^3+(z-x)^3}$ किसके बराबर हैं ?

(A) $-\frac{1}{3}$ (B) $\frac{1}{3}$ (C) 3 (D) –3

Solution

1. (B) $\sqrt{\frac{0.064\times6.25}{0.081\times4.84}}$

$=\sqrt{\frac{64\times10^{-3}\times625\times10^{-2}}{81\times10^{-3}\times484\times10^{-2}}}$

$=\sqrt{\frac{64\times625}{81\times484}}=\frac{8\times25}{9\times22}=\frac{100}{99}$

2. (C) We have (x + 4) as a factor
∴ Put x = –4 in all the options
(a) $(-4)^2 - 7(-4) + 44$
$= 16 + 28 + 44 = 88 \neq 0$
(b) $(-4)^2 + 7(-4) - 44$
$= 16 - 28 - 44 = -56 \neq 0$
(c) $(-4)^2 - 7(-4) - 44$
$= 16 + 28 - 44 = 0$
(d) $(-4)^2 + 7(-4) + 44$
$= 16 - 28 + 44 = 32 \neq 0$
∴ (x + 4) is a factor of $x^2 - 7x - 44$

3. (d) We have $2x^2 + 6x + k = 0$
∴ $\alpha+\beta=-\frac{6}{2}=-3$ and $\alpha\beta=\frac{k}{2}$

Now $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{\alpha^2+\beta^2}{\alpha\beta}$

Since numerator is always positive and denominator will be always negative (k > 0)

$\therefore \quad \frac{\alpha^2+\beta^2}{\alpha\beta}$ will be a negative value

So option (a) and (c) are wrong

Now $\frac{\alpha^2+\beta^2}{\alpha\beta} = \frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}$

$= \frac{9-k}{k/2} = \frac{2(9-k)}{k}$

Put $\frac{2(9-k)}{k} = -2 \Rightarrow 9-k = -\frac{18}{7}$

Which is true

$\therefore$ Maximum value is –9

4. (A) Let $y = \frac{(0.35)^2+0.70+1}{2.25} + 0.19$

$= \frac{(0.35)^2+2\times0.35\times1+(1)^2}{(1.5)^2} + 0.19$

$= \frac{(0.35+1)^2}{(1.5)^2} + 1.19 = \left(\frac{1.35}{1.5}\right)^2 + 0.19$

$= (0.9)^2 + 0.19 = 0.81 + 0.19 = 1$

$\therefore \sqrt{y} = \sqrt{1} = 1$

5. (A) Let $\alpha, 2\alpha$ are the roots of the given equation

$\therefore \alpha + 2\alpha = \frac{-(3a-1)}{a^2-5a+1}$

$\Rightarrow 3\alpha = \frac{-(3a-1)}{a^2-5a+1}$

$\Rightarrow \alpha = \frac{-(3a-1)}{3(a^2-5a+3)}$ .....(i)

Also $(\alpha)(2\alpha) = \frac{2}{a^2-5a+3}$

$\Rightarrow \alpha^2 = \frac{1}{a^2-5a+3}$ .....(i)

From Eqs (i) and (ii)

$\therefore \left[\frac{-(3a-1)}{3(a^2-5a+3)}\right]^2 = \frac{1}{a^2-5a+3}$

$\Rightarrow \frac{(3a-1)^2}{9(a^2-5a+3)^2} = \frac{1}{a^2-5a+3}$

$\Rightarrow (3a-1)^2 = 9(a^2-5a+3)$

$\Rightarrow 9a^2-6a+1 = 9a^2-45a+27$

$\Rightarrow 39a = 26 \Rightarrow a = \frac{26}{39} = \frac{2}{3}$

6. (A) We have $x = \frac{\sqrt{a+b}-\sqrt{a-b}}{\sqrt{a+b}+\sqrt{a-b}}$

$\Rightarrow x = \frac{\sqrt{a+b}-\sqrt{a-b}}{\sqrt{a+b}+\sqrt{a-b}} \times \frac{\sqrt{a+b}-\sqrt{a-b}}{\sqrt{a+b}-\sqrt{a-b}}$

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

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

$\Rightarrow = \frac{2a-2\sqrt{a^2-b^2}}{2b}$

$\Rightarrow x = \frac{a-\sqrt{a^2-b^2}}{b}$

$\Rightarrow bx = a-\sqrt{a^2-b^2}$

$\Rightarrow a-bx = \sqrt{a^2-b^2}$

On squaring both the sides we get

$\Rightarrow (a-bx)^2 = a^2-b^2$

$\Rightarrow a^2+b^2x^2-2abx = a^2-b^2$

$\Rightarrow b^2x^2-2abx+b^2 = 0$

$\Rightarrow bx^2-2ax+b = 0$

7. (C) $\frac{(443+547)^2+(443-547)^2}{443\times443+547\times547}$

$= \frac{(443)^2+(547)^2+2\times443\times547}{+(443)^2+(547)^2-2\times443\times547}$

$= \frac{2\left[(443)^2+(547)^2\right]}{\left[(443)^2+(547)^2\right]} = 2$

8. (C) We have

$x = t^{\frac{1}{t-1}}$ and $y = t^{\left(1-\frac{1}{t}\right)}$, $t > 0, t \neq 1$

Now $y = \left[t^{\left(\frac{1}{t-1}\right)}\right]^t = x^t$.....(i)

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Again $\frac{y}{x} = \frac{t^{\frac{t}{t-1}}}{t^{\frac{t}{t-1}}} = t^{1-1} = t^0 = t$

$\Rightarrow \frac{y}{x} = t$ .....(ii)

From Eqs (i) and (ii) we get $y = x^{y/x}$

$\Rightarrow y^x = x^y$

9. (D) We have A : B = 3 : 4

$\Rightarrow \frac{A}{B} = \frac{3}{4} \Rightarrow A = \frac{3}{4}B$

Now

$$\frac{3A^2 + 4B}{3A - 4B^2} = \frac{3\left(\frac{3}{4}B\right)^2 + 4B}{3\left(\frac{3}{4}B\right) + 4B^2}$$

$$= \frac{\frac{27}{16}B^2 + 4B}{\frac{9}{4}B - 4B^2} = \frac{\left[\frac{27B^2 + 64B}{16}\right]}{\left[\frac{9B - 16B^2}{4}\right]}$$

$$= \frac{27B^2 + 64B}{4(9B - 16B^2)} = \frac{27B + 64}{4(9 - 16B)}$$

But we don't have the value of B

$\therefore$ The value of given expression cannot be determined

10. (B) We have

$x = 2 + 2^{2/3} + 2^{1/3}$ ..... (i)

$\Rightarrow x - 2 = 2^{1/3}(2^{1/3} + 1)$

On cubing both the sides we get

$(x - 2)^3 = 2(2^{1/3} + 1)^3$

$\Rightarrow x^3 - 3(x^2)(2) + 3(x)(2)^2 - 8$

$= 2[(2^{1/3})^3 + 3(2^{1/3})^2(1) + 3(2^{1/3})(1) + (1)^3]$

$\Rightarrow x^3 - 6x^2 + 12x - 8 = 2$

$[2 + 32^{2/3} + 32^{1/3} + 1]$

$\Rightarrow x^3 - 6x^2 + 12x - 8 = 2$

$[3 + 32^{2/3} + 32^{1/3}]$

$\Rightarrow x^3 - 6x^2 + 12x - 8 = 6\,[1 + 2^{2/3} + 2^{1/3}]$

$\Rightarrow x^3 - 6x^2 + 12x - 8 = 6[1 + x - 2]$

[From Eqs (i)]

$\Rightarrow x^3 - 6x^2 + 12x - 8 = 6(x - 1)$

$\Rightarrow x^3 - 6x^2 + 12x - 8 = 6x - 6$

$\Rightarrow x^3 - 6x^2 + 6x + 6x = 2$

11. (C) We have $\sqrt{\frac{x}{y}} = \frac{24}{5} + \sqrt{\frac{y}{x}}$

Let $\sqrt{\frac{x}{y}} = z$

$\therefore z = \frac{24}{5} + \frac{1}{z}$

$\Rightarrow z = \frac{24z + 5}{5z}$

$\Rightarrow 5z^2 - 24z - 5 = 0$

$\Rightarrow 5z^2 - 25z + z - 5 = 0$

$\Rightarrow 5z(z - 5) + 1(z - 5) = 0$

$\Rightarrow (z - 5)(5z + 1) = 0$

$\Rightarrow z = 5 \text{ or } -\frac{1}{5} \Rightarrow = \sqrt{\frac{x}{y}} = 5 \text{ or } -\frac{1}{5}$

$\Rightarrow \sqrt{\frac{x}{y}} = 5 \left[\because \sqrt{\frac{x}{y}} \neq -\frac{1}{5}\right]$

$\Rightarrow x = 25y$ ..... (i)

Again we have $x + y = 26$

$\Rightarrow 25y + y = 26$ [From Eqs (i)]

$\Rightarrow 26y = 26 \Rightarrow y = 1$

$\therefore x = 25$

$\therefore xy = 25 \times 1 = 25$

12. (A) We have α and β are the roots of the equation $x^2 + pz + q = 0$

$\therefore \alpha + \beta = -p$ and $\alpha\beta = q$

Now $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$

$= (-p)^2 - 2(q) = p^2 - 2q$

13. (B) We have $a^3 = 335 + b^3$

$\Rightarrow a^3 - b^3 = 335$ ..... (i)

and $a = 5 + b \Rightarrow a - b = 5$ .....(ii)

Now $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$

$\Rightarrow (5)^3 = 335 - 3ab(5)$

[$\because$ From Eqs (i) and (ii)]

$\Rightarrow 125 = 335 - 15ab \Rightarrow ab = 14$

Again

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

$= (5)^2 + 4(14) = 25 + 56$

$(a + b)^2 = 81$

$\therefore a + b = 9$

14. (C) We have

$9^x, 3^y = 2187 \Rightarrow (3^2)^x, 3^y = 2187$

$\Rightarrow 3^{2x + y} = 3^7 \Rightarrow 2x + y = 7$ ..... (i)

Again

$2^{3x} \cdot 2^{2y} - 4^{xy} = 0$

$\Rightarrow 2^{3x} \cdot 2^{2y} = 4^{xy}$

$\Rightarrow 2^{3x + 2y} = (2^2)^{xy}$

$\Rightarrow$ $3x + 2y = 2xy$ .....(ii)
From Eqs (i) and (ii)
$3x + 2(7 - 2x) = 2x(7 - 2x)$
$\Rightarrow$ $3x + 14 - 4x = 14x - 4x^2$
$\Rightarrow$ $4x^2 - 15x + 14 = 0$
$\Rightarrow$ $(x - 2)(4x - 7) = 0$

$\Rightarrow$ $x = 2, \frac{7}{4}$

$\therefore$ $y = 3, \frac{7}{2}$

$\therefore$ $x + y = 5$ or $\frac{21}{4}$

15. (B) For the system of linear equations
$a_1x + b_1y + c_1 = 0$ and
$a_2x + b_1y + c_2 = 0$
has unique solution

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

We have
$kx + 3y + 1 = 0$
$2x + y + 3 = 0$
For unique solution

$\frac{k}{2} \neq \frac{3}{1} \Rightarrow k \neq 6$

16. (C) Let the speed of B be x m/s. Then according to the question

$$\frac{96}{x} - \frac{100}{\left(\frac{5}{3}\right)} = 12$$

$\Rightarrow$ $\frac{96}{x} - 60 = 12 \Rightarrow \frac{96}{x} = 72$

$\Rightarrow$ $x = \frac{4}{3}$

$\therefore$ Speed of B is $\frac{4}{3}$ m/s

17. (A) We have
$5^{1+x} + 5^{1-x} = 26$
$\Rightarrow$ $5.5^x + 5.5^{-x} = 26$

$\Rightarrow$ $5.5^x + \frac{5}{5^x} = 26$

Let $5^x = y$

$\therefore$ $5y + \frac{5}{y} = 26 \Rightarrow 5y^2 - 26y + 5 = 0$
$\Rightarrow$ $5y^2 - 25y - y + 5 = 0$
$\Rightarrow$ $5y(y - 5) - 1(y - 5) = 0$

$\Rightarrow$ $(y - 5)(5y - 1) = 0 \Rightarrow y = 5, \frac{1}{5}$

$\Rightarrow$ $5^x = 5$ or $5^{-1} \Rightarrow x = 1$ or -1

18. (A) We know that
$a^3 + b^3 = (a + b)^3 - 3ab(a + b)$
$= (5)^3 - 3 \times 6 \times 5 = 125 - 90 = 35$

19. (A) We have
$x^3 + 8 = (x)^3 + (2)^3$
$= (x + 2)\{(x)^2 - (x)(2) + (2^2)\}$
$= (x + 2)(x^2 - 2x + 4)$
$x^2 + 5x + 6 = x^2 + 2x + 3x + 6$
$= x(x + 2) + 3(x + 2)$
$= (x + 2)(x + 3)$
and $x^3 + 4x^2 + 4x = x(x^2 + 4x + 4)$
$= x(x + 2)^2$
$\therefore$ LCM
$= x(x + 2)^2(x + 3)(x^2 - 2x + 4)$

20. (A) $\sqrt[3]{4\frac{12}{125}} = \sqrt[3]{\frac{4 \times 125 + 12}{125}}$

$$= \sqrt{\frac{500 + 12}{125}} = \sqrt{\frac{512}{125}} = \sqrt[3]{\left(\frac{8}{5}\right)^3}$$

$$= \left[\left(\frac{8}{5}\right)^3\right]^{\frac{1}{3}} = \left(\frac{8}{5}\right)^{3 \times \frac{1}{3}} = \frac{8}{5} = 1\frac{3}{5}$$

21. (B) Let quadratic equation be
$ax^2 + bc + c = 0$
If α and β are roots then.

$$\alpha + \beta = \frac{-b}{a} \text{ and } = \alpha\beta = \frac{c}{a}$$

Since Aman made a mistake in writing down the constant term.
$\therefore$ $\alpha + \beta = 4 + 3 = 7$
and Alok made a mistake in writing down the coefiicient of x.
$\therefore$ $\alpha\beta = 3 \times 2 = 6$
So equation will be
$x^2 - (\alpha + b)x + \alpha\beta = 0$
$\Rightarrow$ $x^2 - 7x + 6 = 0$
$\Rightarrow$ $(x - 6)(x - 1) = 0$
$\Rightarrow$ $x = 6, 1$

22. (C) We have
$2x + 4y = 6$
and $4x + 8y = 8$
$a_1 = 2, b_1 = 4, c_1 = -6$
$\therefore$ $a_2 = 4, b_2 = 8, c_2 = -8$

Now $\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{4}{8} = \frac{1}{2}$

$$\frac{c_1}{c_2} = \frac{-6}{-8} = \frac{3}{4}$$

Since $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\therefore$ System of equation is inconsistent

23. (A) We have
$x^2 - 5x + \alpha$ and $x^3 - 7x + 2\alpha$ have a common factor
Let
$x^2 - 5x + \alpha = (x - a)(x - b) = x^2 - (a + b)x + ab$
and $x^2 - 7x + 2\alpha = (x - a)(x - c)$
$= x^2 - (a + c)(x - c)$
By comparing we get
$a + b = 5$, $ab = \alpha$
$a + c = 7$, $ac = 2\alpha$
$\Rightarrow$ $ac = 2(ab) \Rightarrow c = 2b$
$a + b = 5$, $a + 2b = 7$
Solving these equation we get
$a = 3$, $b = 2$
$\therefore$ $\alpha = ab = 3 \times 2 = 6$

24. (C) We have
$x^3 + 4x^2 - 11x - 30$
$= (x + 2)(x - 3)(x + 5)$
$\therefore$ Factor of $x^3 + 4x^2 - 11x - 30$
$(x + 2)$ $(x - 3)$ and $(x + 5)$

25. (A) We have $12x^2 + mx + 5 = 0$
Let α, β are the roots of equations

$$\therefore \quad \alpha + \beta = -\frac{m}{12} \text{ and } \alpha\beta = \frac{5}{12}$$

$$\text{given } \frac{\alpha}{\beta} = \frac{3}{2} \Rightarrow \alpha = \frac{3\beta}{2}$$

$$\therefore \quad \left(\frac{3\beta}{2}\right)(\beta) = \frac{5}{12} \Rightarrow \beta^2 = \frac{10}{36}$$

$$\Rightarrow \beta = \frac{\sqrt{10}}{6} \text{ and } \alpha = \frac{3\sqrt{10}}{12}$$

$$\text{Hence } m = 12\left(\frac{3\sqrt{10}}{12} + \frac{\sqrt{10}}{6}\right) = 12\left(\frac{5\sqrt{10}}{12}\right)$$

$$\Rightarrow m = 5\sqrt{10}$$

26. (B) We have
degree of $f(x) = 3$
degree of $g(x) = 4$
New degree of $f(x)\, g(x)$ = degree of $f(x)$ + degree of $g(x) = 3 + 4 = 7$

27. (D) We have
$f(x) = 5x^2 + 5x^2 - 6x + 9$
$g(x) = x + 3 = 0$
$\Rightarrow$ $x = -3$
$f(-3) = 5(-3)^3 + 5(-3)^2 - 6(-3) + 9$
$= -135 + 45 + 18 + 9 = -63$
Hence $5x^3 + 5x^2 - 6x + 9$ is divided by $(x + 3)$ the remainder is -63.

28. (D) We know that
Product of two number = LCM of two number × H.C.F of two number
$\therefore$ $(x + y + z)\, p^3 = p^2 \times$ L.C.M
L.C.M $= (x + y + z)p$

29. (C) We have
$\therefore$ $8x^2 - y^3 = (2x)^3 - (y)^3$
$= (2x - y)(4x^2 + 2xy + y^2)$
$8x^3 - y^3$ is divided by $2xy + 4x^2 + y^2$ then quotient $= 2x - y$

30. (A) We have
$x + 2$ is factor of $x^2 + ax + b$
$\therefore$ $(-2)^2 + (-2)\, a + b = 0$
$\Rightarrow$ $b - 2a = -4$ ..... (i)
also $(x + 2)$ is factor of $x^2 + bx + a$
$\therefore$ $(-2)^2 + 2b + a = 0$
$\Rightarrow$ $a - 2b = -4$ ..... (ii)
solving (i) and (ii) we get
$\therefore$ $a = b = 4$
$\therefore$ $a : b = 1$

31. (A) Consider $ax - b = 0$

$$\Rightarrow x = \frac{b}{a}$$

Since $f(x)$ is divided by $ax - b$ therefore by remainder theorem remainder is given by $f\left(\frac{b}{a}\right)$.

32. (B) Let $f(x)$ be the product of given polynomials then
$f(x) = (x + 2)(x - 2)$
$(x^2 - 2x^2 + 4x - 8)$
$(x^3 + 2x^2 + 4x + 8)$
$= (x^2 - 2^2)\, (x^2(x - 2) + 4(x - 2))$
$(x^2(x + 2)(x^2 + 4))$
$((x + 2)(x^2 + 4))$
$= (x^4 - 4)\, (x^4 + 4)^2\, (x^2 - 2^2)$
$= (x^2 - 4)\, (x^2 + 4)^2\, (x^2 - 4)$
$= [(x^2 - 4)\, (x^2 + 4)]^2$
$= (x^2 - 4^2)^2 = (x^4 - 16)^2$

33. (C) Let
$f(x) = x(x + 2)(x + 3)(x + 5) - 72$
$= x(x + 2)\, [x^2 + 8x + 15] - 72$
$= x[x^3 + 8x^2 + 15x + 2x^2 + 16x + 30] - 72$
$= x(x^3 + 10x^2 + 31x + 30) - 72$
$= x^4 + 10x^2 + 31x^2 + 30x - 72$
Clearly $f(1) = 0$
Also $f(-6) = 0$
$\therefore$ $(x + 6)$ is a factor of (x)
Now to find other factors, let us divide $f(x)$ by $(x - 1)(x + 6)$ i.e., by

$$x^2+5x-6 \overline{)\, x^4+10x^3+31x^2+30x-72\,(\, x^2+5x+12}$$
$$x^4+5x^3-6x^2$$
$$(-)\ (-)\quad (+)$$
$$5x^3+37x^2+30x-72$$
$$5x^3+25x^2-30x$$
$$(-)\ (-)\ (+)$$
$$12x^2+60x-72$$
$$12x^2+60x-72$$
$$(-)\ (-)\quad (+)$$
$$0$$

34. (B) Let $h(x) = x^2 + x - 2$

$= x^2 + 2x - x - 2$

$= x(x + 2) - 1(x + 2) = (x + 2)(x - 1)$

Since h(x) is the H.C.F of f(x) and g(x)

$\therefore$ h(x) completely divides both f(x) and (x – 1) is a factor of g(x)

$\Rightarrow f(-2) = 0$ and $g(1) = 0$

$\Rightarrow (-3)(4 - 6 + a) = 0$

and $3(1 + 2 + b) = 0$

$\Rightarrow (a - 2) = 0$ and $b + 3 = 0$

$\Rightarrow a = 2$ and $b = -3$

35. (C) Given equation is

$a(b - c)x^2 + b(c - a)x + c(a - b) = 0$

Since it has equal roots therefore = D = 0

$\Rightarrow B^2 - 4AC = 0$

$\Rightarrow (b(c - a)^2 - 4a(b - c)(a - b) = 0$

$\Rightarrow (b(c - a)^2 - 4a(b - c)(a - b) = 0$

$\Rightarrow b^2(c^2 + a^2 - 2ac)$

$4ac(ab - b^2 - ac + bc) = 0$

$\Rightarrow b^2c^2 + b^2a^2 - 2acb^2 - 4a^2bc$

$+ 4acb^2 + 4a^2c^2 - 4abc^2 = 0$

$\Rightarrow (bc)^2 + (ab)^2 + (-2ac)^2 - 2acb^2$

$- 4a^2bc - 4abc^2 = 0$

$\Rightarrow (bc + ab - 2ac)^2 = 0$

$\Rightarrow bc + ab = 2ac$

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

36. (A) Given equation is

$$\frac{a - x^2}{bx} - \frac{b - x}{c} = \frac{c - x}{b} - \frac{b - x^2}{cx}$$

$$\Rightarrow \frac{a - x^2}{bx} + \frac{b - x^2}{cx} = \frac{c - x}{b} + \frac{b - x}{c}$$

$$\Rightarrow \frac{ac - cx^2 + b^2 - bx^2}{bcx}$$

$$\Rightarrow \frac{c^2 - cx + b^2 - bx}{bc}$$

$$\Rightarrow \frac{(b^2 + ac) - x^2(b + c)}{bcx}$$

$$\Rightarrow \frac{(b^2 + c^2) - x(b + c)}{bc}$$

$\Rightarrow (b^2 + ac) - x^2(b + c) = x(b^2 + c^2) - x^2(b + c)$

$\Rightarrow b^2 + ac = x(b^2 + c^2)$

$$\Rightarrow x = \frac{b^2 + ac}{b^2 + c^2}$$

37. (C) Given equation is

$$x^2 + 7x - 14\left(k^2 - \frac{7}{8}\right) = 0$$

$$\Rightarrow x = \frac{-7 \pm \sqrt{49 + 4(14)\left(k^2 - \frac{7}{8}\right)}}{2}$$

$$\Rightarrow x = \frac{-7 \pm \sqrt{49 + 56k^2 - 49}}{2}$$

$$\Rightarrow x = \frac{-7 \pm \sqrt{56k^2}}{2}$$

$$\Rightarrow x = \frac{-7 \pm 2\sqrt{14k}}{2}$$

Clearly x can't take any integral value, for any integer k.

$\therefore$ The given equation has no integral root.

38. (D) Given system of equations can be re-written as

$$\frac{6}{v} + \frac{3}{u} = 7 \text{ .....(i)}$$

$$\frac{3}{v} + \frac{9}{u} = 11 \text{ .....(ii)}$$

Now let $\frac{1}{u} = x$ and $\frac{1}{v} = y$ then above system of equations become

$3x + 6y = 7$.....(iii)

and $9x + 3y = 11$ .....(iv)

On multiplying Eq (iii) by 3 and then subtracting eq (iv) from it we get

$9x + 18 = 21$

$9x + 3y = 11$

$- \quad - \quad -$

$15y = 10$

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$\Rightarrow y = \frac{2}{3}$

On putting $y = \frac{2}{3}$ in eq (iv) we get

$9x + 2 = 11 \Rightarrow x = 1$

$\Rightarrow \frac{1}{u} = 1 \qquad \left[\because \frac{1}{u} = x\right]$

$\Rightarrow u = 1$

39. (B) Let the present age of Shyam be x years and age of Ram be y years. Then according to question

$(y - 5) = 3(x - 5)$ and $(y + 4) = 2(x + 4)$

$\Rightarrow \quad 3x - y = 10 \quad$ .....(i)

and $\quad 2x - y = -4 \quad$ .....(ii)

On subtracting Eq (i) from Eq (ii) we get

$28 - y = -4 \Rightarrow y = 32$

Thus present age of Ram is 32 years

40. (C) We have $ab + bc + ca = 0$

$\Rightarrow ab + ca = -bc \Rightarrow a = \frac{-bc}{b + c}$

$\Rightarrow a^2 = \frac{b^2c^2}{(b+c)^2}$

Now consider

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

$$= \frac{\frac{b^2c^2}{(b+c)^2}}{\frac{b^2c^2}{(b+c)^2} - bc} + \frac{b^2}{b^2 - c\left(\frac{-bc}{b+c}\right)} + \frac{c^2}{c^2 - b\left(\frac{-bc}{b+c}\right)}$$

$$= \frac{bc}{-\left(b^2 + c^2 + bc\right)} + \frac{b(b+c)}{b^2 + bc + c^2} + \frac{c(b+c)}{b^2 + c^2 + bc}$$

$$= \frac{-bc + b^2 + bc + c^2 + bc}{b^2 + c^2 + bc}$$

$$= \frac{b^2 + bc + c^2}{b^2 + c^2 + bc} = 1$$

41. (B) We know that if $a + b + c = 0$ then

$a^3 + b^3 + c^3 = 3abc$

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

$= x - y + y - z + z - x = 0$

$\therefore (x - y)^3 + (y - z)^3 + (z - x)^3$

$= 3(x - y)(y - z)(z - x) \qquad$ ...(i)

Now consider

$$\frac{(x - y)(y - z)(z - x)}{(x - y)^3 + (y - z)^3 + (z - x)^3}$$

$$= \frac{(x - y)(y - z)(z - x)}{3(x - y)(y - z)(z - x)} \text{ Using (i)} = \frac{1}{3}$$

CDS [2016-II]

1. What is the solution of

$$\log_{10}\left[1-\left\{1-\left(1-x^2\right)^{-1}\right\}^{-1}\right]^{\frac{1}{2}} = 1 ?$$

$\log_{10}\left[1-\left\{1-\left(1-x^2\right)^{-1}\right\}^{-1}\right]^{\frac{1}{2}} = 1$ का हल क्या हैं ?

(A) x = 100 (B) x = 10
(C) x = 1 (D) x = 0

2. If λ is an integer and α, β are the roots of $4x^2 - 16x + \frac{\lambda}{4} = 0$ such that $1 < \alpha < 2$ and $2 < \beta < 3$ then how many values can λ take ?

यदि λ एक पूर्णांक हैं और α, β समीकरण $4x^2 - 16x + \frac{\lambda}{4} = 0$ के मूल इस प्रकार हैं कि $1 < \alpha < 2$ और $2 < \beta < 3$ हैं, तो λ के कितने मान हो सकते हैं ?

(A) 3 (B) 9
(C) 14 (D) 15

3. What is $\frac{6^2+7^2+8^2+9^2+10^2}{\sqrt{7+4\sqrt{3}}-\sqrt{4+2\sqrt{3}}}$ equal to ?

$\frac{6^2+7^2+8^2+9^2+10^2}{\sqrt{7+4\sqrt{3}}-\sqrt{4+2\sqrt{3}}}$ किसके बराबर हैं ?

(A) 330 (B) 340
(C) 355 (D) 366

4. If $x^2 = y + z$, $y^2 = z + x$ and $z^2 = x + y$ then what is the value of $\frac{1}{x+1}+\frac{1}{y+1}+\frac{1}{z+1}$?

यदि $x^2 = y + z$, $y^2 = z + x$ और $z^2 = x + y$ हैं, तो $\frac{1}{x+1}+\frac{1}{y+1}+\frac{1}{z+1}$ का मान क्या हैं ?

(A) –1 (B) 1
(C) 2 (D) 4

5. What would be the maximum value of Q in the equation 5P9 + 4R7 + 2Q8 = 1114 ?

समीकरण 5P9 + 4R7 + 2Q8 = 1114 में Q का अधिकतम मान क्या होगा ?

(A) 9 (B) 8
(C) 5 (D) 4

6. If α and β are the two zeros of the polynomial $25x^2 - 16x + 2$, then what is a quadratic polynomial whose zeros are $(2\alpha)^{-1}$ and $(2\beta)^{-1}$?

यदि बहुपद $25x^2 - 16x + 2$ के बहुपद दो शून्यक α और β हैं, तो वह द्विघात बहुपद क्या होगा जिसके शून्यक $(2\alpha)^{-1}$ और $(2\beta)^{-1}$ हैं ?

(A) $x^2 + 30x + 2$ (B) $8x^2 - 30x + 25$
(C) $8x^2 - 30x$ (D) $x^2 + 30x$

7. If $2p + 3q = 12$ and $4p^2 + 4pq - 3q^2 = 126$ then what is the value of $p + 2q$?

यदि $2p + 3q = 12$ और $4p^2 + 4pq - 3q^2 = 126$ है तो $p + 2q$ का मान क्या हैं ?

(A) 5 (B) $\frac{21}{4}$ (C) $\frac{25}{4}$ (D) $\frac{99}{16}$

8. The sides of a triangle are given by $\sqrt{a^2+b^2}$, $\sqrt{c^2+a^2}$ and (b + c) where a, b, c are positive. What is the area of the triangle equal to ?

किसी त्रिभुज की भुजाओं को $\sqrt{a^2+b^2}$, $\sqrt{c^2+a^2}$ और (b + c) द्वारा व्यक्त किया गया हैं, जहाँ a, b, c धनात्मक हैं। त्रिभुज का क्षेत्रफल किसके बराबर हैं ?

(A) $\frac{\sqrt{a^2+b^2+c^2}}{2}$

(B) $\frac{\sqrt{a^2b^2+b^2c^2+c^2a^2}}{2}$

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

(D) $\frac{\sqrt{3\left(a^2b^2+b^2c^2+c^2a^2\right)}}{2}$

Solution

1. (A) As

$$\log_{10}^{1-\left\{1-\left(1-x^2\right)^{-1}\right\}^{-1-\frac{1}{2}}}$$

$$= \log_{10}^{1-\left\{1-\frac{1}{1-x^2}\right\}^{-\frac{1}{2}}} \qquad = \log_{10}^{\left|1-\left\{-\frac{x^2}{1-x^2}\right\}\right|^{\frac{1}{2}}}$$

$$= \log_{10}^{1-\left\{\frac{1-1+x^2}{1-x^2}\right\}^{-\frac{1}{2}}} \qquad = \log_{10}^{\left|\frac{1}{1-x^2}\right|^{\frac{1}{2}}}$$

$$= \log_{10}^{x^{2/-\frac{1}{2}}} \qquad = \log_{10}^{x}$$

According to question

$\log_{10}^{x} = 1$

Hence option = 10

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2. (D) As, $4x^2 - 16x + \frac{\lambda}{4} = 0$

$\Rightarrow x^2 - 4x + \frac{\lambda}{16} = 0$

Sum of roots $(\alpha + \beta) = 4$

Product of roots $(\alpha\beta) = \frac{\lambda}{16}$

As $1 < \alpha < 2$ ..... (i)

$2 < \beta < 3$ .....(ii)

From (i) and (ii)

$2 < \alpha\beta < 6$

$1 < \alpha\beta < 3$ [It is not possible because $\alpha + \beta = 4$]

So $1 \times 3 < \alpha\beta < 2 \times 2$

$3 < \alpha\beta < 4$

$\Rightarrow 3 < \alpha\beta < 4$

$\Rightarrow 3 < \frac{\lambda}{16} < 4$

Hence total value of would be 15.

Hence option (D)

3. (A) $\frac{6^2 + 7^2 + 8^2 + 9^2 + 10^2}{\sqrt{7 + 4\sqrt{3}} - \sqrt{4 + 2\sqrt{3}}}$

$= \frac{36 + 49 + 64 + 81 + 100}{\sqrt{4 + 3 + 4\sqrt{3}} + \sqrt{1 + 3 + 2\sqrt{3}}}$

$= \frac{330}{\sqrt{2^2 + \left(\sqrt{3}\right)^2 + 2 \times 2 \times \sqrt{3}} - \sqrt{1^2 + \left(\sqrt{3}\right)^2 + 2 \times 1 \times \sqrt{3}}}$

$= \frac{330}{\sqrt{\left(2 + \sqrt{3}\right)^2} - \sqrt{\left(1 + \sqrt{3}\right)^2}} = \frac{330}{2 + \sqrt{3} - 1 - \sqrt{3}}$

$= \frac{330}{1} = 330$

Hence option (A)

4. (B) As $x^2 = y + z$

Then $x^2 + x = x + y + z$

$\Rightarrow x(1 + x) = x + y + z$

$\Rightarrow \frac{1}{1 + x} = \frac{x}{x + y + z}$

Similarly

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

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

So

$\frac{1}{x + 1} + \frac{1}{y + 1} + \frac{1}{z + 1}$

$= \frac{x}{x + y + z} + \frac{y}{x + y + z} + \frac{z}{x + y + z}$

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

Hence option (B)

5. (A) As

5P9 + 3R7 + 2Q8 = 1114 ..... (i)

According to conceptof addition

9 + 7 + 8 = 24 ..... (ii)

5 + 3 + 2 = 10 ..... (iii)

From (i), (ii) and (iii)

We can simply say that

2 + P + R + Q = 11 ..... (iv)

Q would be maximum when P and R will be minimum.

So

P = R = 0

From (iv)

2 + 0 + 0 +Q = 11

$\Rightarrow$ Q = 11 – 2

$\Rightarrow$ Q = 9

Hence option (A)

6. (B) As $25x^2 - 15x + 2 = 0$ ..... (i)

If $\alpha + \beta = -\frac{(-15)}{25} = \frac{3}{5}$

$\alpha\beta = \frac{2}{25}$

If $(2\alpha)^{-1}$ and $(2\beta)^{-1}$ would be roots then

Sum of roots = $\frac{1}{2\alpha} \times \frac{1}{2\beta}$

$= \frac{\alpha + \beta}{2\alpha\beta} = \frac{\frac{3}{5}}{2 \times \frac{2}{25}} = \frac{3}{5} \times \frac{25}{4} = \frac{15}{4}$

Product of roots = $\frac{1}{2\alpha} \times \frac{1}{2\beta}$

$= \frac{1}{4\alpha\beta} = \frac{1 \times 25}{4 \times 2} = \frac{25}{8}$

Quadratic equation be

x^2 – (Sum of roots)x + Product of roots = 0

$\Rightarrow x^2 - \frac{15}{4}x + \frac{25}{8} = 0$

Hence quadratic polynomial be

$8x^2 - 30x + 25$

Hence option (B)

7. (D) $2p + 3q = 12$ ..... (i)

And $4p^2 + 4pq - 3q^2 = 126$

$\Rightarrow (2p)^2 + 2 \times 2p \times q + q^2 - 4q^2 = 126$

$\Rightarrow (2p + q)^2 - (2q)^2 = 126$

$\Rightarrow (2p + q + 2q)(2p + q - 2q) = 126$

$\Rightarrow 12 \times (2p - q) = 126$ [From (i)]

$\Rightarrow 2p - q = \frac{126}{12} = \frac{21}{2}$ .....(ii)

From (i) and (ii)

$4p = 12 - \frac{21}{2} = \frac{3}{2}$

$\Rightarrow q = \frac{3}{8}$

Putting the value of q in (i)

$2p = 12 - 3q = 12 - 3 \times \frac{3}{8}$

$\Rightarrow 2p = \frac{96 - 9}{8} = \frac{87}{8}$

$\Rightarrow p = \frac{87}{16}$

Now

$p + 2q = \frac{87}{16} + 2 \times \frac{3}{8}$

$= \frac{87 + 12}{16} = \frac{99}{16}$

Hence option (D)

8. (C)

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