PART # 01

ALGEBRA

EXERCISE # 01

SECTION-1 : (ONE OPTION CORRECT TYPE)

1. Number of solutions of $|z - 1| + |z + 1| = 4$ and $|2z - 1 + i| = \sqrt{14}$ is :

(A) 2 (B) 3 (C) 4 (D) none of these

2. Let X be the set of three digit numbers, which when divided by its sum of its digits give maximum value and Y be the set of all possible real values of a for which the $x^3 - 3ax^2 + 3(298a + 299)x - 2 = 0$ have a positive point of maxima, then the number of elements in $X \cap Y$, is :

(A) 0 (B) 6 (C) 7 (D) 9

3. Let $f(x) = x^2 - bx + c$, b is a odd positive integer, $f(x) = 0$ have two prime numbers as roots and $b + c = 35$. Then the global minimum value of f(x) is

(A) $-\frac{183}{4}$ (B) $\frac{173}{16}$

(C) $-\frac{81}{4}$ (D) data not sufficient

4. If z_1, z_2, z_3, z_4 are the reflections of the complex number z, with respect to the origin, real axis and imaginary axis respectively in an argand plane, then the value of $\arg(z_1^4 \cdot z_2^5 \cdot z_3^4 \cdot z_4^5 + 5)$ is

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{2}$ (C) $\frac{2\pi}{3}$ (D) none of these

5. If $a = e^{1/e}$ then the number of point of intersection of the curve $y = \log_a x$ and the line $y = x$, is

(A) three (B) zero (C) one (D) two

6. The coefficient of $a^8b^4c^9d^9$ in $(abc + abd + acd + bcd)^{10}$ is

(A) 10! (B) $\frac{10!}{8!4!9!9!}$

(C) 2520 (D) None of these.

7. Sum of all divisors of 5400 whose units digit is 0 is

(A) 5400 (B) 10800

(C) 16800 (D) None of these.

8. Sequence $\{t_n\}$ is a G.P. If t_6, 2, 5, t_{14} form another G.P in that order, then $t_1.\ t_2.\ t_3.....\ t_{19}$ is equal to

(A) 190 (B) 10^{10} (C) $10^{\frac{19}{2}}$ (D) 10^9

9. If $|\beta_k| < 3$, $1 \le k \le n$, then all the complex numbers z satisfying the equation

$1 + \beta_1 z + \beta_2 z^2 + \ldots + \beta_n z^n = 0$, $|z| < 1$

(A) lie inside the circle $|z| = \frac{1}{4}$ (B) lie in $\frac{1}{3} < |z| < \frac{1}{2}$

(C) lie on the circle $|z| = \frac{1}{4}$ (D) lie outside the circle $|z| = \frac{1}{4}$

10. The sum of the series ${}^{4n}C_0 + {}^{4n}C_4 + {}^{4n}C_8 + \ldots + {}^{4n}C_{4n}$ is

(A) $2^{4n-2} + (-1)^n 2^{2n-1}$ (B) $2^{4n-2} + (-1)^{n+1} 2^{2n-1}$

(C) $2^{4n-2} - 2^{2n-1}$ (D) $2^{4n-2} + 2^{2n-1}$

11. In a shooting competition, a man can score 5, 4, 3, 2 or 0 points for each shot. In how many ways he can achieve a score of 30 in just 7 shots

(A) 455 (B) 460 (C) 420 (D) 495

12. The product $\left(\frac{2^3-1}{2^3+1}\right)\left(\frac{3^3-1}{3^3+1}\right)\left(\frac{4^3-1}{4^3+1}\right)$ … (to infinity) is equal to

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

13. If $\alpha, \alpha^2, \ldots, \alpha^{n-1}$ be the n^{th} roots of unity, then $\left(\frac{3^n-1}{3^{n-1}}\right)\left(\sum_{r=1}^{n-1}\frac{1}{3-\alpha^r}+\frac{1}{2}\right) =$

(A) $-n$ (B) 0 (C) n (D) 1

14. If $\text{Re}\left(\frac{z-8i}{z+6}\right) = 0$, then $z = x + iy$ lies on the curve

(A) $x^2 + y^2 + 6x - 8y = 0$ (B) $4x - 3y + 24 = 0$

(C) $x^2 + y^2 - 8 = 0$ (D) none of these

15. The set of values of 'a' for which $x^3 + ax^2 + \sin^{-1}(x^2 - 4x + 5) + \cos^{-1}(x^2 - 4x + 5) = 0$ has atleast one solution is

(A) $\frac{\pi}{8}+2$ (B) $\frac{\pi}{8}+1$ (C) $-\left(\frac{\pi}{8}+1\right)$ (D) $-\left(\frac{\pi}{8}+2\right)$

16. Let $a_1 = 1$, $a_n = n(a_{n-1} + 1)$ for $n = 2, 3, \ldots$

define $P_n = \left(1+\frac{1}{a_1}\right)\left(1+\frac{1}{a_2}\right)\ldots\left(1+\frac{1}{a_n}\right)$. Then $\lim_{n\to\infty} P_n$ must be

(A) $1 + e$ (B) e (C) 1 (D) ∞

17. If n is a positive integer then $\sum_{k=1}^{n} k^3\left(\frac{{}^nC_k}{{}^nC_k-1}\right)^2$ equals

(A) $\frac{n}{12}(n+1)^2(n+2)$ (B) $\frac{n}{12}(n+1)(n+2)^2$

(C) $\frac{n}{12}(n+1)(n+2)$ (D) none of these

18. If $|z - 25i| \le 15$, then maximum of arg(z) – minimum of arg(z) equals

(A) $2\cos^{-1}\left(\frac{3}{5}\right)$ (B) $2\cos^{-1}\left(\frac{4}{5}\right)$ (C) $\frac{\pi}{2}+\cos^{-1}\left(\frac{3}{5}\right)$ (D) $\sin^{-1}\left(\frac{3}{5}\right)-\cos^{-1}\left(\frac{3}{5}\right)$

19. The least value of the expression $x^2 + 4y^2 + 3z^2 - 2x - 12y - 6z + 14$ is

(A) 0 (B) 1

(C) no least value (D) none of these

20. The largest term of the sequence $a_n = \dfrac{n}{n^2 + 10}$ is

(A) $\dfrac{3}{19}$ (B) $\dfrac{2}{13}$ (C) 1 (D) $\dfrac{1}{7}$

21. The number of positive integral solution of $x^2 + 9 < (x + 3)^2 < 8x + 25$ is

(A) 2 (B) 3 (C) 4 (D) 5

22. $n.{}^{n-2}C_{r-1} = r(k^2 - 3)\,{}^{n}C_{r-1} + {}^{n-2}C_{r-1}$, then the value of k is

(A) $(-\infty, -2]$ (B) $\left(-\infty, -\sqrt{3}\right) \cup \left(\sqrt{3}, 2\right]$

(C) $\left[-2, -\sqrt{3}\right) \cup \left(\sqrt{3}, 2\right]$ (D) $\left[-2, -\sqrt{3}\right) \cup \left(\sqrt{3}, \infty\right]$

23. If the ratio of the squares of the roots of the equation $x^2 + px + q = 0$ be equal to the ratio of the roots of the equation $x^2 + lx + m = 0$, then

(A) $q^2m^2 = (p^2 - 2q)^2\, l$ (B) $(p^2 - 2q)^2\, m = q^2l^2$

(C) $q^2p^2 = (l^2 - 2q)^2\, q$ (D) none of these

24. The equation $|z - 2i| + |z + 2i| = k$, $k > 0$, can represent on ellipse if k is

(A) 2 (B) 3

(C) 4 (D) 5

25. If n boys and n girls sit along a line alternately in x ways and along a circle in y ways such that x = 12 y then the number of ways in which n boys can sit at a round table so that all shall not have same neighbors is

(A) 6 (B) 120

(C) 60 (D) 12

26. If [.] denotes the greatest integer function, then the domain of the real valued function $\log_{[x+1/2]} |x^2 = x - 6|$ is

(A) $\left(\dfrac{1}{2}, 1\right] \cup (1, \infty)$ (B) $\left[\dfrac{3}{2}, 2\right) \cup (2, +\infty)$

(C) $\left(0, \dfrac{3}{2}\right] \cup (2, +\infty)$ (D) $(0, 1] \cup \left(\dfrac{3}{2}, +\infty\right)$

27. Equation $\dfrac{a^2}{x-\alpha} + \dfrac{b^2}{x-\beta} + \dfrac{c^2}{x-\gamma} = m - n^2x$ $(a, b, c, m, n \in R)$ has necessarily

(A) all the roots real (B) all the roots imaginary

(C) 2 real and 2 imaginary (D) 2 rational and 2 irrational

28. The number of non-integral solutions of $\left||4x - x^2| - 1\right| = 3$ is

(A) four (B) two (C) three (D) none of these

29. The coefficient of x^n in the polynomial $\left(x + {}^{2n+1}C_0\right)\left(x + {}^{2n+1}C_1\right)\left(x + {}^{2n+1}C_2\right)....\left(x + {}^{2n+1}C_n\right)$ is

(A) 2^{n+1} (B) $2^{2n+1} - 1$

(C) 2^{2n} (D) None of these

30. The inequality $(x - 3m)(x - m - 3) < 0$ is satisfied for x in [1, 3]. Determine the value of m for which this holds

(A) (1, 2) (B) (0, 1/3) (C) (1, 3) (D) none of these

31. If the equation $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$ has equal roots where a, b, c are distinct positive numbers and $n \in N$, then

(A) $a^n + c^n \geq 2b^n$ (B) $a^n + c^n > 2b^n$ (C) $a^n + c^n \leq 2b^n$ (D) $a^n + c^n < 2b^n$

32. If z_1 and z_2 are two complex numbers such that $|z_1| = |z_2| + |z_1 - z_2|$, then

(A) $\operatorname{Im}\left(\frac{z_1}{z_2}\right) = 0$ (B) $\operatorname{Re}\left(\frac{z_1}{z_2}\right) = 0$

(C) $\operatorname{Re}\left(\frac{z_1}{z_2}\right) = \operatorname{Im}\left(\frac{z_1}{z_2}\right)$ (D) none of these

33. If α, β are roots of $2x + \frac{1}{x} = 2$ and $f(x) = \frac{8x^6 + 1}{x^3}$, then

(A) $f(\alpha) - f(\beta) = 0$ (B) $f(\alpha) + f(\beta) = 8$ (C) $f(\alpha) - f(\beta) = 2$ (D) $f(\alpha) + f(\beta) = 12$

34. If f(x) = 0 is a cubic equation with positive and distinct roots α, β, γ such that β is the H.M of the roots of $f'(x) = 0$. Then α, β, γ are in

(A) A.P. (B) G.P.

(C) H.P. (D) none of these

35. The number of ways in which the squares of a 8×8 chess board can be painted red or blue so that each 2×2 square has two red and two blue squares is

(A) 2^9 (B) $2^9 - 1$

(C) $2^9 - 2$ (D) none of these

36. All the roots of the equation $11z^{10} + 10iz^9 + 10iz - 11 = 0$ lie

(A) inside |z| = 1 (B) on |z| = 1

(C) outside |z| = 1 (D) can't say

37. Let f(x), g(x) and h(x) be quadratic polynomials having positive leading co-efficients and real and distinct roots. If each pair of them has a common root, then the roots of f(x) + g(x) + h(x) = 0 are

(A) always real and distinct (B) always real and may be equal

(C) may be imaginary (D) always imaginary

38. If x is positive and x – [x], [x] and x are in G.P., then {x} is equal to, (where [.] denotes the greatest integer function and {.} denotes the fractional part of x)

(A) $\frac{\sqrt{5}-1}{2}$ (B) $\frac{\sqrt{5}+1}{4}$ (C) $\frac{\sqrt{5}-1}{4}$ (D) none of these

39. The value of $\sum_{r=0}^{n-1}\left(\frac{n+1}{n}\right)\left(\frac{r \cdot {}^nC_r \, {}^nC_{r+1}}{r+2}\right)$ is

(A) ${}^{2n-1}C_{n+1}$ (B) ${}^{2n}C_{n-1}$ (C) ${}^{2n-1}C_{n-1}$ (D) ${}^{2n-1}C_{n-2}$

40. The number of points in the cartesian plane with integral co-ordinates satisfying the inequation $|x| \leq 10$, $|y| \leq 10$, $|x - y| \leq 10$ is

(A) 321 (B) 331 (C) 341 (D) none of these

41. The value of $\sum_{r=1}^{n} r^4 - \sum_{r=-1}^{n+2} (n+1-r)^4$ is equal to

(A) $-[1 + n^4 + (n+1)^4]$ (B) $-[1 + (n+1)^4 + (n+2)^4]$

(C) $-[1 + (n-1)^4 + n^4]$ (D) none of these

42. The value of a (a < 0) for which least value of quadratic expression $4x^2 - 4ax + a^2 - 2a + 2$ on the interval $0 \le x \le 2$ is equal to 3 is

(A) $-\sqrt{2}$ (B) $\sqrt{2} - 2$

(C) $1 - \sqrt{2}$ (D) none of these

43. The perpendicular distance of line $(1 - i) z + (1 + i)\bar{z} + 3 = 0$, from $(3 + 2i)$ will be

(A) 13 (B) $\frac{13}{2}$ (C) 26 (D) none of these

44. If the complex numbers z_1, z_2 satisfying $|z_1| = 16$ and $|z_2 - 2 - 3i| = 7$ the minimum value of $|z_1 - z_2|$

(A) 0 (B) 1

(C) 7 (D) 2

45. Find the value of $\frac{1}{3.5} + \frac{1}{7.9} + \frac{1}{11.13} + ... \infty$ terms :

(A) $\frac{1}{4} - \frac{\pi}{2}$ (B) $\frac{\pi}{8} - \frac{1}{9}$

(C) $\frac{1}{2} - \frac{\pi}{8}$ (D) none of these

46. If a, b > 0, a + b = 1, then the minimum value of $\left(a + \frac{1}{a}\right)^2 + \left(b + \frac{1}{b}\right)^2$ is

(A) 8 (B) 16

(C) 18 (D) $\frac{25}{2}$

47. The results of 10 cricket matches (win, lose or draw) have to be predicted. How many different forecasting can contain exactly 7 correct results?

(A) 100 (B) 120

(C) 960 (D) None of these

48. Let z_1, z_2 be two distinct complex numbers with non-zero real and imaginary parts such that $\arg(z_1 + z_2) = \pi/2$, then $\arg(z_1 - \bar{z}_1) - \arg(z_2 + \bar{z}_2)$ is equal to

(A) $\frac{\pi}{2}$ (B) π

(C) $-\frac{\pi}{2}$ (D) None of these.

49. The number of ways in which 4 persons P_1, P_2, P_3, P_4 can be arranged in a row such that P_2 does not follow P_1, P_3 does not follow P_2 and P_4 does not follow P_3 is

(A) 24 (B) 12

(C) 11 (D) 10

50. Let $z \in$ C and if $A = \left\{z : \arg(z) = \frac{\pi}{4}\right\}$ and $B = \left\{z : \arg(z - 3 - 3i) = \frac{2\pi}{3}\right\}$ then $n(A \cap B)$ is equal to

(A) 1 (B) 2

(C) 3 (D) 0

SECTION–2 : (MORE THAN ONE OPTION CORRECT TYPE)

51. If α, β are roots of $2x + \frac{1}{x} = 2$ and $f(x) = \frac{8x^6 + 1}{x^3}$, then

(A) $f(\alpha) - f(\beta) = 0$ (B) $f(\alpha) + f(\beta) = -8$

(C) $f(\alpha) - f(\beta) = 2$ (D) $f(\alpha) + f(\beta) = 8$

52. If z_1, z_2, z_3, z_4 be the vertices of a parallelogram taken in anticlockwise direction and $|z_1 - z_2| = |z_1 - z_4|$, then

(A) $\sum_{r=1}^{4} (-1)^r z_r = 0$ (B) $z_1 + z_2 - z_3 - z_4 = 0$

(C) $\arg\left(\frac{z_4 - z_2}{z_3 - z_1}\right) = \frac{\pi}{2}$ (D) $\arg\left(\frac{z_4 - z_1}{z_2 - z_1}\right) = \frac{\pi}{2}$

53. The coefficient of 3 consecutive terms in the expansion of $(1 + x)^n$ are in the ratio 1 : 7 : 35 the

(A) n is divisible by 5

(B) n is not divisible by any number other than 1 and itself

(C) n is divisible by 35 (D) n is divisible by 23

54. Let $f(n) = 2^n + 7^n$ where n is a positive integer, then

(A) if f(n) is divisible by 5, then f(n + 1) is also divisible by 5

(B) if f(n) is not divisible by 5, then f(n + 1) is not divisible by 5

(C) f(3) is not divisible by 5 (D) f(n) is not divisible by 5 for all n

55. The number of non negative integral solutions of $x_1 + x_2 + x_3 \leq n$ is

(A) ${}^{n+2}C_2$ (B) ${}^{n+3}C_3$ (C) ${}^{n+2}C_n$ (D) ${}^{n+3}C_n$

56. If $a, b, c \in R$ such that $a^2 + b^2 + c^2 < 2(ab + bc + ca)$, then

(A) either a, b, c are all positive or all negative (B) atleast two of a, b, c are equal

(C) none of a, b, c can be zero (D) a, b, c are all distinct

57. If $\frac{\tan\alpha - i\left(\sin\frac{\alpha}{2} + \cos\frac{\alpha}{2}\right)}{1 + 2i\sin\frac{\alpha}{2}}$ is purely imaginary, then α is given by

(A) $2n\pi + \frac{\pi}{4}$ (B) $2n\pi$ (C) $n\pi + \frac{\pi}{4}$ (D) $n\pi - \frac{\pi}{4}$

58. Values of x for which the sixth term of the expansion of $E = \left(3^{\log_3 \sqrt{9^{|x-2|}}} + 7^{1/5 \log_7 [4 \cdot 3^{|x-2|} - 9]}\right)^7$ is 567 are

(A) 3 (B) 1 (C) 2 (D) 4

59. For a positive integer n, let $a(n) = 1 + \frac{1}{2} + \frac{1}{3} + \ldots + \frac{1}{2^n - 1}$, then

(A) $a(n) < n$ (B) $a(n) > \frac{n}{2}$

(C) $a(2n) > n$ (D) $a(2n) < 2n$

60. The value of x, for which the 6^{th} term in the expansion of $\left[10^{\log_{10} \sqrt{9^{x-1} + 7}} + \frac{1}{10^{1/5 \log_{10} 3^{x-1} + 1}}\right]^7$ is 84 is equal to

(A) 1 (B) 2

(C) 3 (D) 4

61. If a + ib $\geq$ 8 – 6i, then

(A) a = 8, b = 6
(B) a = 8, b = – 6
(C) a = – 6, b = 8
(D) inequality is not defined in case of complex number

62. $\frac{1}{\sqrt{2}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{11}}+\cdots$ n terms value of the above expression is

(A) $\frac{\sqrt{3n+2}-\sqrt{2}}{3}$ (B) $\frac{n}{\sqrt{2+3n}+\sqrt{2}}$ (C) less than n (D) less than $\sqrt{\frac{n}{3}}$

63. If $|z_1 + z_2| = |z_1 - z_2|$ and $|z_1| = |z_2|$, then

(A) $z_1 = z_2$ (B) $z_1 = -z_2$ (C) $z_1 = \pm iz_2$ (D) $z_2 = \pm iz_1$

64. For a positive integers n, if the expansion of $\left(\frac{5}{x^2}+x^4\right)^n$ has term independent of x, then 'n' can be

(A) 18 (B) 21 (C) 27 (D) 99

65. If $x^2 + mx + 1 = 0$ and $(b - c)x^2 + (c - a)x + (a - b) = 0$ have both roots common then

(A) m = – 2 (B) m = – 1
(C) a, b, c are in A.P. (D) a, b, c are in H.P.

66. The modulus equation $||x - 3| + a| = 25$ ($a \in R$) can have real solutions for x if a lies on the interval

(A) $(-\infty, 25]$ (B) $[-25, 25]$ (C) $(-\infty, -25]$ (D) $(25, \infty)$

67. If x, y, a, b are real numbers such that $(x + iy)^{1/5} = a + ib$ and $P=\frac{x}{a}-\frac{y}{b}$, then

(A) (a – b) is a factor of P (B) (a + b) is a factor of P
(C) (a + ib) is a factor of P (D) (a – ib) is a factor of P

68. The complex numbers z_1, z_2, z_3 are the vertices of a triangle, find all the complex numbers z which make the triangle into parallelogram

(A) $z = z_1 + z_2 - z_3$ (B) $z = z_1 + z_3 - z_2$ (C) $z = z_2 + z_3 - z_1$ (D) $z = z_1 + z_2 + z_3$

69. $z_0=\left(\frac{1-i}{2}\right)$ then the value of the product $(1 + z_0)(1 + z_0^2)\left(1+z_0^{2^2}\right)\cdots\left(1+z_0^{2^n}\right)$ must be

(A) $2^{2^{n-1}}$ (B) $(1-i)\left(1-\frac{1}{2^{2^n}}\right)$ (C) $\frac{5}{4}(1-i)$ if n = 1 (D) 0

70. If α, β are the roots of $8x^2 - 10x + 3 = 0$ then the equation whose roots are $(\alpha + i\beta)^{100} + (\alpha - i\beta)^{100}$ is

(A) $x^2 + x + 1 = 0$ (B) $x^2 - x + 1 = 0$ (C) $\frac{x^3-1}{x-1}=0$ (D) none of these

71. All the three roots of $az^3 + bz^2 + cz + d = 0$ have negative real parts ($a, b, c \in R$), then

(A) ab > 0 (B) bc > 0 (C) ad > 0 (D) bc – ad > 0

72. If $a, b, c \in R$ such that $a^2 + b^2 + c^2 < 2(ab + bc + ca)$, then

(A) either a, b, c are all positive or all negative (B) atleast two of a, b, c are equal
(C) none of a, b, c can be zero (D) a, b, c are all distinct

73. If z_1, z_2 be two complex numbers ($z_1 \neq z_2$) satisfying $\left|z_1^2 - z_2^2\right| = \left|\bar{z}_1^2 + \bar{z}_2^2 - 2\bar{z}_1\bar{z}_2\right|$, then

(A) $|\arg z_1 - \arg z_2| = \pi$ (B) $|\arg z_1 - \arg z_2| = \frac{\pi}{2}$

(C) $\frac{z_1}{z_2}$ is purely imaginary (D) $\frac{z_1}{z_2}$ is purely real

74. a, b $\in$ I satisfies equation $a(b - 1) = 3 + b - b^2$, then a + b is equal to

(A) 2 (B) 3

(C) 1 (D) – 1

75. Let $f(x) = ax^2 + bx + 2$, such that $a + b + 2 < 0$ and $a - 2b + 8 < 0$, then

(A) a < 0, f(x) has one real root in (0, 2) (B) f(x) has one real root in the interval (0, 1)

(C) f(x) has one real root in the interval (1, 2) (D) f(x) has one real root in the interval $\left(-\frac{1}{2}, 0\right)$

76. A woman has 11 close friend. Number of ways in which she can invite 5 of them to dinner, if two particular of them are not on speaking terms & will not attend together is -

(A) ${}^{11}C_5 - {}^{9}C_3$ (B) ${}^{9}C_5 + 2\,{}^{9}C_4$

(C) $3\,{}^{9}C_4$ (D) None of these

77. If f(x) = 0 is a polynomial whose coefficients all $\pm$ 1 and whose roots are all real, then the degree of f(x) can be equal to

(A) 1 (B) 2

(C) 3 (D) 4

78. The diagonals of a square are along the pair represented by $2x^2 - 3xy - 2y^2 = 0$. If (2, 1) is the vertex of the square, then the other vertices are

(A) (–1, 2) (B) (1, –2)

(C) (–2,–1) (D) (1,2)

79. If p, q, r are in H.P and p, q, – 2r are in G.P; (p, q, r > 0) then

(A) p^2, q^2, r^2 are in G.P.

(B) p^2, q^2, r^2 are in A.P.

(C) 2p, q, 2r are in A.P.

(D) p + q + r = 0

80. If the equations $\bar{a}z + a\bar{z} + b = 0$ and $\bar{a}z - a\bar{z} + b_1 = 0$ represent two lines C_1 and C_2 in the complex plane then

(A) L_1 and L_2 are perpendicular (B) b is purely real

(C) b_1 is purely imaginary (D) b_1 is purely real

81. If α is a real root of $x^3 + 2x^2 + 10x - 20 = 0$, then

(A) α is rational (B) α^2 is rational

(C) α is irrational (D) α^2 is irrational

82. If z_1 lies on $|z| = 1$ and z_2 lies on $|z| = 2$, then

(A) $3 \le |z_1 - 2z_2| \le 5$ (B) $1 \le |z_1 + z_2| \le 3$

(C) $|z_1 - 3z_2| \ge 5$ (D) $|z_1 - z_2| \ge 1$

83. If z_1, z_2, z_3, z_4 are root of the equation $a_0z^4 + z_1z^3 + z_2z^2 + z_3z + z_4 = 0$, where a_0, a_1, a_2, a_3 and a_4 are real, then

(A) $\bar{z}_1, \bar{z}_2, \bar{z}_3, \bar{z}_4$ are also roots of the equation

(B) z_1 is equal to at least one of $\bar{z}_1, \bar{z}_2, \bar{z}_3, \bar{z}_4$

(C) $-\bar{z}_1, -\bar{z}_2, -\bar{z}_3, -\bar{z}_4$ are also roots of the equation (D) none of these

84. If $a^3 + b^3 + 6\,abc = 8\,c^3$ & ω is a cube root of unity then :

(A) a, c, b are in A.P. (B) a, c, b are in H.P.

(C) $a + b\omega - 2\,c\omega^2 = 0$ (D) $a + b\omega^2 - 2\,c\omega = 0$

85. The points z_1, z_2, z_3 on the complex plane are the vertices of an equilateral triangle if and only if :

(A) $\Sigma\,(z_1 - z_2)\,(z_2 - z_3) = 0$ (B) $z_1^2 + z_2^2 + z_3^2 = 2\,(z_1z_2 + z_2z_3 + z_3z_1)$

(C) $z_1^2 + z_2^2 + z_3^2 = z_1z_2 + z_2z_3 + z_3z_1$ (D) $2\,(z_1^2 + z_2^2 + z_3^2) = z_1z_2 + z_2z_3 + z_3z_1$

86. If $|z_1 + z_2| = |z_1 - z_2|$ then

(A) $|\text{amp } z_1 - \text{amp } z_2| = \frac{\pi}{2}$ (B) $|\text{ amp } z_1 - \text{amp}_2| = \pi$

(C) $\frac{z_1}{z_2}$ is purely real (D) $\frac{z_1}{z_2}$ is purely imaginary

87. If $\cos\alpha + \cos\beta + \cos\gamma = 0$ and also $\sin\alpha + \sin\beta + \sin\gamma = 0$, then which of the following is true.

(A) $\cos 2\alpha + \cos 2\beta + \cos 2\gamma = \sin 2\alpha + \sin 2\beta + \sin 2\gamma$

(B) $\sin 3\alpha + \sin 3\beta + \sin 3\gamma = 3\sin(\alpha + \beta + \gamma)$

(C) $\cos 3\alpha + \cos 3\beta + \cos 3\gamma = 3\cos(\alpha + \beta + \gamma)$

(D) $\sin 2\alpha + \sin 2\beta + \sin 2\gamma = 0$

88. If $\sum_{r=1}^{n} r(r+1)\,(2r + 3) = an^4 + bn^3 + cn^2 + dn + e$, then

(A) $a + c = b + d$ (B) $e = 0$

(C) $a, b - 2/3, c - 1$ are in A.P. (D) c/a is an integer

89. The sides of a right triangle form a G.P. The tangent of the smallest angle is

(A) $\sqrt{\frac{\sqrt{5}+1}{2}}$ (B) $\sqrt{\frac{\sqrt{5}-1}{2}}$ (C) $\sqrt{\frac{2}{\sqrt{5}+1}}$ (D) $\sqrt{\frac{2}{\sqrt{5}-1}}$

90. Sum to n terms of the series $S = 1^2 + 2(2)^2 + 3^2 + 2(4^2) + 5^2 + 2(6^2) + \ldots$ is

(A) $\frac{1}{2}n\,(n + 1)^2$ when n is even (B) $\frac{1}{2}n^2\,(n + 1)$ when n is odd

(C) $\frac{1}{4}n^2\,(n + 2)$ when n is odd (D) $\frac{1}{4}n(n + 2)^2$ when n is even.

91. If a, b, c are in H.P., then:

(A) $\frac{a}{b+c-a}, \frac{b}{c+a-b}, \frac{c}{a+b-c}$ are in H.P.

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

(C) $a - \frac{b}{2}, \frac{b}{2}, c - \frac{b}{2}$ are in G.P. (D) $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in H.P.

92. If b_1, b_2, b_3 ($b_i > 0$) are three successive terms of a G.P. with common ratio r, the value of r for which the inequality $b_3 > 4b_2 - 3b_1$ holds is given by

(A) $r > 3$ (B) $r < 1$ (C) $r = 3.5$ (D) $r = 5.2$

93. If a, b are non-zero real numbers, and α, β the roots of $x^2 + ax + b = 0$, then

(A) α^2, β^2 are the roots of $x^2 - (2b - a^2)x + a^2 = 0$

(B) $1/\alpha, 1/\beta$ are the roots of $bx^2 + ax + 1 = 0$

(C) $\alpha/\beta, \beta/\alpha$ are the roots of $bx^2 + (2b - a^2)x + b = 0$

(D) $-\alpha, -\beta$ are the roots of $x^2 + ax - b = 0$

94. $x^2 + x + 1$ is a factor of $ax^3 + bx^2 + cx + d = 0$, then the real root of above equation is ($a, b, c, d \in R$)

(A) $-d/a$ (B) d/a (C) $(b - a)/a$ (D) $(a - b)/a$

95. If $(x^2 + x + 1) + (x^2 + 2x + 3) + (x^2 + 3x + 5) + \ldots\ldots + (x^2 + 20x + 39) = 4500$, then x is equal to:

(A) 10 (B) -10 (C) 20.5 (D) -20.5

96. $\cos\alpha$ is a root of the equation $25x^2 + 5x - 12 = 0$, $-1 < x < 0$, then the value of $\sin 2\alpha$ is:

(A) 24/25 (B) $-12/25$ (C) $-24/25$ (D) 20/25

97. If the quadratic equations, $x^2 + abx + c = 0$ and $x^2 + acx + b = 0$ have a common root then the equation containing their other roots is/are:

(A) $x^2 + a(b + c)x - a^2bc = 0$ (B) $x^2 - a(b + c)x + a^2bc = 0$

(C) $a(b + c)x^2 - (b + c)x + abc = 0$ (D) $a(b + c)x^2 + (b + c)x - abc = 0$

98. ${}^{n+1}C_6 + {}^nC_4 > {}^{n+2}C_5 - {}^nC_5$ for all 'n' greater than:

(A) 8 (B) 9 (C) 10 (D) 11

99. There are 10 points $P_1, P_2, \ldots, P_{10}$ in a plane, no three of which are collinear. Number of straight lines which can be determined by these points which do not pass through the points P_1 or P_2 is:

(A) ${}^{10}C_2 - 2.\,{}^9C_1$ (B) 27 (C) ${}^8C_2$ (D) ${}^{10}C_2 - 2.\,{}^9C_1 + 1$

100. You are given 8 balls of different colour (black, white,...). The number of ways in which these balls can be arranged in a row so that the two balls of particular colour (say red & white) may never come together is:

(A) $8! - 2.7!$ (B) $6.\,7!$ (C) $2.\,6!.\,{}^7C_2$ (D) none

101. A man is dealt a poker hand (consisting of 5 cards) from an ordinary pack of 52 playing cards. The number of ways in which he can be dealt a "straight" (a straight is five consecutive values not of the same suit, eg. {Ace· 2· 3· 4· 5}, {2, 3, 4, 5, 6}......................... & {10· J· Q· K· Ace}) is

(A) $10(4^5 - 4)$ (B) $4! \cdot 2^{10}$ (C) $10 \cdot 2^{10}$ (D) 10200

102. Number of ways in which 3 numbers in A.P. can be selected from 1, 2, 3,...... n is:

(A) $\left(\frac{n-1}{2}\right)^2$ if n is even (B) $\frac{n(n-2)}{4}$ if n is odd

(C) $\frac{(n-1)^2}{4}$ if n is odd (D) $\frac{n(n-2)}{4}$ if n is even

103. Consider the expansion $(a_1 + a_2 + a_3 + \ldots\ldots + a_p)^n$ where $n \in N$ and $n \le p$. The correct statement(s) is/are:

(A) number of different terms in the expansion is ${}^{n+p-1}C_n$

(B) co-efficient of any term in which none of the variables $a_1, a_2, \ldots, a_p$ occur more than once is 'n'

(C) co-efficient of any term in which none of the variables $a_1, a_2, \ldots, a_p$ occur more than once is n ! if n = p

(D) Number of terms in which none of the variables $a_1, a_2, \ldots\ldots, a_p$ occur more than once is $\binom{p}{n}$.

104. In the expansion of $(x + y + z)^{25}$

(A) every term is of the form ${}^{25}C_r.\,{}^rC_k.\,x^{25-r}.\,y^{r-k}.\,z^k$

(B) the coefficient of $x^8 y^9 z^9$ is 0

(C) the number of terms is 325 (D) none of these

SECTION - 3: (COMPREHENSION TYPE)

COMPREHENSION-1

Paragraph for Questions Nos. 105 to 107

Let t be a real number satisfying

$2t^3 - 9t^2 + 30 - a = 0$ . . . (1)

And $x + \frac{1}{x} = t$ . . . (2)

105. If equation (1) has three real and distinct roots then

(A) $a > 30$ (B) $a < 3$ (C) $3 < a < 30$ (D) $a < 3$ or $a > 30$

106. If equation (2) has two real and distinct roots then

(A) $-2 < t < 2$ (B) $-1 < t < 1$ (C) $t < -2$ or $t > 2$ (D) none of these

107. If $x + \frac{1}{x} = t$ gives six real and distinct values of x, then

(A) $3 < a < 30$ (B) $a \in \phi$ (C) $a \in (2, 5)$ (D) none of these

COMPREHENSION-2

Paragraph for Questions Nos. 108 to 110

Consider the equation $x + y - [x][y] = 0$, where $[\cdot]$ = Greatest integer function.

108. The number of integral solutions to the equation, is

(A) 0 (B) 1 (C) 2 (D) none of these

109. Equation of one of the lines on which the non integral solution of given equation, lies is

(A) $x + y = -1$ (B) $x + y = 0$ (C) $x + y = 1$ (D) $x + y = 5$

110. Number of the point of intersection between all the possible lines on which the non-integral solutions of the given equation lies, is

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

COMPREHENSION-3

Paragraph for Questions Nos. 111 to 113

$y = ax^2 + bx + c = 0$ is a quadratic equation which has real roots if and only if $b^2 - 4ac \geq 0$. If $f(x, y) = 0$ is a second degree equation, then using above fact we can get the range of x and y by treating it as quadratic equation in y or x. Similarly $ax^2 + bx + c \geq 0 \ \forall \ x \in R$ if $a > 0$ and $b^2 - 4ac \leq 0$.

111. If $0 < \alpha, \beta < 2\pi$, then the number of ordered pairs (α, β) satisfying $\sin^2(\alpha + \beta) - 2\sin\alpha \sin(\alpha + \beta) + \sin^2\alpha + \cos^2\beta = 0$ is:

(A) 2 (B) 0 (C) 4 (D) none of these

112. If $A + B + C = \pi$, then the maximum value of $\cos A + \cos B + k \cos C$ (where $k > 1/2$) is

(A) $\frac{1}{k} + \frac{k}{2}$ (B) $\frac{2k^2 + 1}{3}$ (C) $\frac{k^2 + 2}{2}$ (D) $\frac{1}{2k} + k$

113. A circle with radius |a| and centre on y-axis slides along it and a variable line through (a, 0) cuts the circle at points P and Q. The region in which the point of intersection of tangents to the circle at points P and Q lies is represented by

(A) $y^2 \geq 4(ax - a^2)$ (B) $y^2 \leq 4(ax - a^2)$ (C) $y \geq 4(ax - a^2)$ (D) $y \leq 4(ax - a^2)$

COMPREHENSION-4

Paragraph for Questions Nos. 114 to 116

Let N = $p_1^{\alpha_1} p_2^{\alpha_2} \cdots p_n^{\alpha_n}$ be a natural number where p_i $(1 \leq i \leq n)$ is a prime number. The total number of divisors of N is $(\alpha_1 + 1)(\alpha_2 + 1)\ldots(\alpha_n + 1)$. The sum of all divisors is $\left(\frac{p_1^{\alpha_1+1}-1}{p_1-1}\right)\left(\frac{p_2^{\alpha_2+1}-1}{p_2-1}\right)\cdots\left(\frac{p_n^{\alpha_n+1}-1}{p_n-1}\right)$. The number of ways in which N can be resolved in two factors is $\frac{(\alpha_1+1)(\alpha_2+1)\cdots(\alpha_n+1)+1}{2}$ or $\frac{(\alpha_1+1)(\alpha_2+1)\cdots(\alpha_n+1)}{2}$ as N is a perfect square or not. Number of ways of resolving N in two coprime factors is 2^{n-1}.

114. The number of ways in which 420 can be factorised in two non coprime factors is

(A) 24 (B) 8 (C) 12 (D) 4

115. The number of positive integral solution of $x_1x_2x_3x_4 = 420$ is

(A) 420 (B) 240 (C) 640 (D) none of these

116. The sum of all the even divisors of 420 is

(A) 860 (B) 192 (C) 1344 (D) 1152

COMPREHENSION-5

Paragraph for Questions Nos. 117 to 119

If z_1, z_2 be the complex numbers representing two points A and B, then we define the complex slope of the line AB as $\mu = \frac{z_1 - z_2}{\bar{z}_1 - \bar{z}_2}$, it can be noted that $|\mu| = 1$ and μ remains same for any two points on the line AB, since if z_3 . z_4 be complex numbers representing some other points on the same line, then

$$\mu' = \frac{z_3 - z_4}{\bar{z}_3 - \bar{z}_4} = \frac{\lambda(z_1 - z_2)}{\lambda(\bar{z}_1 - \bar{z}_2)} \quad (\because z_3 - z_4 = \lambda(z_1 - z_2)\ \lambda \text{ real}) = \frac{z_1 - z_2}{\bar{z}_1 - \bar{z}_2} = \mu$$

117. The complex slope of the line $\bar{a}z + a\bar{z} + b = 0$ where a is complex and b is real is

(A) $\frac{a}{a}$ (B) $-\frac{a}{a}$ (C) $\frac{\bar{a}}{a}$ (D) $-\frac{\bar{a}}{a}$

118. If the complex slope of a line which is not parallel to y-axis is $\cos\phi + i\sin\phi$, then the line makes an angle θ with x-axis, θ must be

(A) 2ϕ (B) $90° - \phi$

(C) $\frac{\phi}{2}$ (D) ϕ

119. If μ and μ' be complex slopes of two perpendicular lines, then

(A) $\mu\mu' = 1$ (B) $\mu\mu' = -1$

(C) $\mu + \mu' = 0$ (D) none of these

COMPREHENSION-6

Paragraph for Questions Nos. 120 to 122

Let z be a complex number lying on a circle $|z| = \sqrt{2}\,a$ and $b = b_1 + ib_2$ (any complex number), then

120. The equation of tangent at the point 'b' is

(A) $z\bar{b} + \bar{z}b = a^2$ (B) $z\bar{b} + \bar{z}b = 2a^2$ (C) $z\bar{b} + \bar{z}b = 3a^2$ (D) $z\bar{b} + \bar{z}b = 4a^2$

121. The equation of straight line parallel to the tangent at the point b and passing through centre of circle is

(A) $z\bar{b} + \bar{z}b = 0$ (B) $2z\bar{b} + \bar{z}b = \lambda$ (C) $2z\bar{b} + 3\bar{z}b = 0$ (D) $z\bar{b} + \bar{z}b = \lambda$

122. The equation of lines passing through the centre of the circle and making an angle $\frac{\pi}{4}$ with the normal at 'b' are

(A) $z = \pm\frac{ib^2}{2a^2}\bar{z}$ (B) $z = \pm\frac{ib^2}{a^2}\bar{z}$ (C) $z = \pm\frac{ib^2}{3a^2}\bar{z}$ (D) $z = \pm\frac{ib^2}{4a^2}\bar{z}$

COMPREHENSION-7

Paragraph for Questions Nos. 123 to 125

Suppose $f(x) = 3x^3 - 13x^2 + 14x - 2$. It is assumed that $f(x) = 0$ have three real roots say α, β and γ where $\alpha < \beta < \gamma$.

123. $[\alpha]$, $[\beta]$, $[\gamma]$ (where [.] denotes the greatest integer function) are in

(A) A.P (B) G.P (C) H.P (D) none of these

124. $\lim\limits_{n\to\infty} \alpha^{n!} \cdot \beta^{1/n!}$ will be equal to

(A) 1 (B) e (C) 0 (D) none of these

125. The value of $\tan^{-1}\alpha + \tan^{-1}\beta + \tan^{-1}\gamma$ is

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

COMPREHENSION-8

Paragraph for Questions Nos. 126 to 128

The quantities $1 + x$, $1 + x + x^2$, $1 + x + x^2 + x^3$, …, $1 + x + x^2 + \ldots + x^n$ are multiplied and terms of the product are arranged in increasing powers of x in the form $a_0 + a_1 x + a_2 x^2 + \ldots$, then

126. The number of terms in the product is

(A) n^2 (B) $n(n + 1)$ (C) $\frac{n(n+1)}{2}$ (D) $\frac{n^2+n+2}{2}$

127. The coefficients of equidistant terms from beginning and end are

(A) always equal (B) never equal
(C) sometimes equal (D) can't be said

128. The sum of odd coefficients = sum of even coefficients = ?

(A) n ! (B) (n + 1) !
(C) $\frac{(n+1)!}{2}$ (D) none of these

COMPREHENSION-9

Paragraph for Questions Nos. 129 to 131

Consider the quadratic equation $az^2 + bz + c = 0$ where a , b , c and z are complex numbers

129. The condition that the equation has both real roots is

(A) $\frac{a}{\bar{a}} = -\frac{b}{\bar{b}} = \frac{c}{\bar{c}}$ (B) $\frac{a}{\bar{a}} = \frac{b}{\bar{b}} = \frac{c}{\bar{c}}$ (C) $\frac{a}{\bar{a}} = \frac{b}{\bar{b}} = -\frac{c}{\bar{c}}$ (D) none of these

130. The condition that equation has both roots purely imaginary

(A) $\frac{a}{\bar{a}} = -\frac{b}{\bar{b}} = -\frac{c}{\bar{c}}$ (B) $\frac{a}{\bar{a}} = -\frac{b}{\bar{b}} = \frac{c}{\bar{c}}$ (C) $\frac{a}{\bar{a}} = \frac{b}{\bar{b}} = -\frac{c}{\bar{c}}$ (D) none of these

131. Condition that equation has one complex root m such that |m| = 1

(A) $\frac{\bar{b}c - b\bar{a}}{a\bar{a} - c\bar{c}} = \frac{a\bar{a} + c\bar{c}}{\bar{c}b + a\bar{b}}$ (B) $\frac{\bar{b}c + b\bar{a}}{a\bar{a} + c\bar{c}} = \frac{a\bar{a} + c\bar{c}}{\bar{c}b + a\bar{b}}$

(C) $(\bar{b}c - b\bar{a})(\bar{c}b - a\bar{b}) = (a\bar{a} - c\bar{c})^2$ (D) none of these

COMPREHENSION-10

Paragraph for Questions Nos. 132 to 134

8 players compete in a tournament, everyone plays everyone else just once. The winner of a game gets 1, the loser 0 or each gets $\frac{1}{2}$ if the game is drawn. The final result is that everyone gets a different score and the player playing placing second gets the same score as the total of four bottom players.

Now answer the following questions:

132. The total of the player placing II was

(A) 6 (B) $6\frac{1}{2}$ (C) $5\frac{1}{2}$ (D) can't say

133. The result of the game between player placing III and player placing VII was

(A) player III was the winner (B) player VII was the winner

(C) the game ended in a drawn (D) can't say

134. The total score of the top four players was

(A) 22 (B) 21 (C) 20 (D) 19

COMPREHENSION-11

Paragraph for Questions Nos. 135 to 137

Let z_1, z_2, z_3 be the complex number associated with vertices A, B, C of a triangle ABC which is circumscribed by the circle |z| = 1. Altitude through A meets the side BC and D and circum-circle at E. Let P be the image of E about BC and F be the image of E about origin.

Now answer the following questions:

135. The complex number of point P is

(A) $\frac{z_1 + z_2 + z_3}{3}$ (B) $\frac{2(z_1 + z_2 + z_3)}{3}$

(C) $z_1 + z_2 + z_3$ (D) none of these

136. The complex number of point E is

(A) $\frac{z_1z_2}{z_3}$ (B) $\frac{z_2z_3}{z_1}$

(C) $-\frac{z_2z_3}{z_1}$ (D) $-\frac{z_1z_2}{z_3}$

137. The distance of point C from F i.e. CF is equal to

(A) $|z_1 - z_2|$ (B) $|z_1 + z_2|$

(C) $\frac{|z_1 - z_3|}{2}$ (D) $\frac{|z_1 + z_3|}{2}$

COMPREHENSION-12

Paragraph for Questions Nos. 138 to 140

A complex number z = x + iy satisfies $\arg\left(\frac{z-1}{z+1}\right) = \frac{\pi}{3}$. Then-

138. Locus of z is

(A) major arc of the circle (B) minor arc of the circle

(C) circle having centre at origin (D) none of these

139. Radius of the circle given by above equation is

(A) $\frac{1}{\sqrt{3}}$ (B) $\frac{2}{\sqrt{3}}$

(C) $\sqrt{3}$ (D) 1

140. Maximum value of |z| satisfying the given equation is

(A) $\frac{2}{\sqrt{3}} + 1$ (B) $\frac{1}{\sqrt{3}} + 1$

(C) $\sqrt{3}$ (D) $\frac{4}{\sqrt{3}}$

SECTION-4: (MATRIX MATCH TYPE)

141. Match the following

	Column I		***Column II***
(A)	The number of integral solutions of the equation x + 2y = 2xy is	(p)	1
(B)	The number of real solutions of the system of equations $x = \frac{2z^2}{1+z^2},\ y = \frac{2x^2}{1+x^2},\ z = \frac{2y^2}{1+y^2}$	(q)	2
(C)	If a(y + z) = x, b(z + x) = y, c(x + y) = z, where $a \neq -1$, $b \neq -1$, $c \neq -1$ admit non-trivial solutions, then $\frac{1}{1+a} + \frac{1}{1+b} + \frac{1}{1+c}$ is	(r)	0
(D)	The number of solutions of the equation $\sqrt{3x^2+6x+7} + \sqrt{5x^2+10x+14} \leq 4 - 2x - x^2$ is	(s)	Infinite

142. Match the following

List – I	List – II
(A) $\arg\left(\frac{z+1}{z-1}\right) = \frac{\pi}{4}$	(i) parabola
(B) $z = \frac{3i-t}{2+it}$ $(t \in R)$	(ii) part of a circle
(C) $\arg z = \frac{\pi}{4}$	(iii) full circle
(D) $z = t + it^2$ $(t \in R)$	(iv) line

143. Match the following:

List – I	List – II
(A) If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real and less than 3, then a is	(i) $(0, 1]$
(B) Let $f(x) = (1 + b^2)x^2 + 2bx + 1$ and let m(b) be the minimum value of f(x). As b varies, then m(b) is	(ii) $\left[\frac{2+\sqrt{3}}{2}, \infty\right)$
(C) If a, b, c $\in$ R and equation $px^2 + qx + r = 0$ has two real roots α and β such that $\alpha < -1$ and $\beta > 1$, then $x^2 + \left\|\frac{q}{p}\right\|x + \frac{r}{p}$ is	(iii) < 2
(D) The set of values of a for which both the roots of the equation $x^2 + (2a - 1)x + a = 0$ are positive is	(iv) < 0

144. Match the following:

List – I	List – I
(A) If $\|x^2 - x\| \geq x^2 + x$, then x	(i) $[0, \infty)$
(B) $\|x + y\| > x - y$, where $x > 0$, then y =	(ii) $(-\infty, 0]$
(C) If $\log_2 x \geq \log_3^{(x^2)}$, then x =	(iii) $[-1, \infty)$
(D) $[x] + 2 \geq \|x\|$ (where [.] denotes the greatest integer function)	(iv) $(0, 1]$

145. Match the following:

List – I	List – II
(A) If inequation $ax^2 - ax + 1 < 0$ $\forall$ x $\in$ R, then a belongs to	(i) $[0, 4)$
(B) If $x^3 - 3x + \frac{a}{2} = 0$ has three real and distinct root, then |a| belongs to	(ii) $[0, 3]$
(C) If $x^3 + ax^2 + x + 1 = 0$ has exactly one real root, then a^2 may belongs to	(iii) $(0, 4)$
(D) If quadratic equation $x^2 - 3ax + a^2 - 9 = 0$ has roots of opposite sign then a belongs to	(iv) $(-3, 3)$

146. Match the following:

List – I	List – II
(A) $\underbrace{1\ 1\ 1 \ldots 1}_{91\ \text{times}}$	(i) is a prime
(B) 1.2.3. … n(n + 1) (n …3.2.1)	(ii) is not a prime
(C) $10^{4n} + 10^{4(n-1)} \ldots + 10^8 + 10^4 + 1, n \in N$	(iii) is a perfect square integer
(D) $\underbrace{4\ 4\ 4 \ldots 4}_{n\ \text{times}}\ \underbrace{8\ 8\ 8 \ldots 9}_{(n-1)\ \text{times}}$	(iv) is a perfect square of odd integer.

147. Match the following:

List – I	List – II
(A) The least value of $2\log_{100}^{a} - \log_{a}^{0.0001}, a > 1$ is	(i) 0
(B) If α, β are the roots of $6x^2 - 2x + 1 = 0$ and $S_n = \alpha^n + \beta^n$, the $\lim\limits_{n\to\infty} \sum\limits_{r=1}^{n} S_r$ is	(ii) 1
(C) If $x^2 - x + 1 = 0$, then the value of x^{3n} where n is even	(iii) 2
(D) The number of roots of the equation $x - \frac{10^2}{x-1} = 1 - \frac{10^2}{x-1}$ is	(iv) 3
	(v) 4

148. Match the following:

List –I	List-II
(A) $(x-1)(x-3) + k(x-2)(x-4) = 0$ $(k \in R)$ has real roots for $k \in$	(i) $(-5, -1)$
(B) Range of the function $\frac{x-1}{x^2 - k + 1}$ does not contain any value in the interval $[-1, 1]$ for $k \in$	(ii) ϕ
(C) The equation $x \in \left(0, \frac{\pi}{2}\right)$, secx + cosecx = k has real roots if $k \in$	(iii) $(-\infty, \infty)$
(D) The equation $x^2 + 2(k-1)x + k + 5 = 0$ has roots positive and distinct if $k \in$	(iv) $[2\sqrt{2}, \infty)$

149. Match the following:

List – I	List – II
(A) Given positive rational numbers a, b, c such that $a + b + c = 1$, then $a^a b^b c^c + a^b b^c c^a + a^c b^a c^b$	(i) is equal to $-\frac{1}{2}(n-1)$
(B) If n is a positive integer ≥ 1, then $\frac{3^n}{2^n + n \cdot 6^{\frac{n-1}{2}}}$	(ii) is equal to $\frac{2}{n}$
(C) If $n \in N > 1$, then sum of real part of roots of $z^n = (z+1)^n$	(iii) ≤ 1
(D) If the quadratic equations $2x^2 + bx + 1 = 0$ and $4x^2 + ax + 1 = 0$ have a common root, then the value of $\frac{a^2 + 2b^2 - 3ab + 4}{n}$, when $n \in N$	(iv) ≥ 1

150. Match the following:

List – I	List – II
(A) If $a - b$, $ax - by$, $ax^2 - by^2$ $(a, b \neq 0)$ are in G.P., then $x, y, \frac{ax - by}{a - b}$ are in	(i) A.P.
(B) If the slope of one of the lines represented by $a^3x^2 - 2hxy + b^3y^2 = 0$ be the square of the other, then ab^2, h, a^2b are in	(ii) G.P.
(C) a, b, c, d are distinct positive numbers, then $\frac{a^n}{b^n} > \frac{c^n}{d^n}$ for	(iii) H.P.
(D) If $a_1, a_2, a_3, \ldots$ are in H.P. and $f(k) = \sum_{r=1}^{n} a_r - a_k$, then $\frac{a_1}{f(1)}, \frac{a_2}{f(2)}, \frac{a_3}{f(3)} \ldots \frac{a_n}{f(n)}$ are in	

151. Match the following:

List – I		List – II	
(A)	If $x, y, z \in N$ then number of ordered triplet (x, y, z) satisfying $xyz = 243$ is	(i)	19
(B)	The number of terms in the expansion of $(x + y + z)^6$ is	(ii)	28
(C)	If $x \in N$, then number of solutions of $x^2 + x - 400 \leq 0$ is	(iii)	21
(D)	If $x, y, z \in N$, then number of solution of $x + y + z = 10$	(iv)	36

152. If $f(x) = x^3 + ax^2 + bx + c = 0$ has three distinct integral roots and $(x^2 + 2x + 2)^3 + a(x^2 + 2x + 2)^2 + b(x^2 + 2x + 2) + c = 0$ has no real roots then

(A) a =	(1) 0
(B) b =	(2) 2
(C) c =	(3) 3
(D) If the roots of $f'(x) = k$ are equal then k =	(4) –1

153. Match the following:

(A) The coefficient of x^{-15} in $\left(3x^2 + \frac{3^{-4/7}}{x^3}\right)^{10}$ is	(i)	41
(B) If $(1 - x + x^2)^4 = a_0 + a_1x + a_2x^2 + \ldots + a_8x^8$, then $a_0 + a_2 + a_4 + a_6 + a_8$ is equal to	(ii)	34
(C) $\left(\sqrt{2}+1\right)^4 + \left(\sqrt{2}-1\right)^4$ is equal to	(iii)	40
(D) Coefficient of x^{11} in the expansion of $\frac{1}{6}(2x^2 + x - 3)^6$ is equal to	(iv)	32

154. Match the following:

(A)	Locus of $\left|2z - \left(\sqrt{3}i + 1\right)\right| + \left|2z - \left(\sqrt{3}i - 1\right)\right| = 2$	(i) two infinite line segments
(B)	Locus of $|z + i| + |z - i| = 4$	(ii) ellipse
(C)	Locus of $||z - i| - |z + i|| = 4$	(iii) line segment
(D)	Locus of $||z + i| - |z - i|| = 2$	(iv) nothing on the plane

155. **Match the following :**

	Column – I	**Column – II**
(a)	$\frac{5x+1}{(x+1)^2} < 1$	(P) $x \in (-\infty, 0) \cup (0, 2) \cup (2, \infty)$
(b)	$\lvert x\rvert + \lvert x-3\rvert > 3$	(Q) $x \in (-\infty, -5) \cup (-3, 3) \cup (5, \infty)$
(c)	$\frac{1}{\lvert x\rvert - 3} < \frac{1}{2}$	(R) $x \in (-\infty, -1) \cup (-1, 0) \cup (3, \infty)$
(d)	$\frac{x^4}{(x-2)^2} > 0$	(S) $x \in (-\infty, 0) \cup (3, \infty)$

156. **Match the following :**

	Column - I	**Column - II**	
(a)	If $\frac{x(y+z-x)}{\log x} = \frac{y(z+x-y)}{\log y} = \frac{z(x+y-z)}{\log z}$ and $a.\ x^y \ .\ y^x = b.y^z .\ z^y = cz^x .\ x^z$, then $\frac{a+b}{c}$ equals	(P)	1
(b)	$y = 10^{\frac{1}{1-\log_{10} x}}$, $z = 10^{\frac{1}{1-\log_{10} y}}$ implies $x = 10^{\frac{1}{a+b\log_{10} z}}$, than a – b equals	(Q)	2
(c)	If $a^2 + b^2 = c^2 \Rightarrow \log_{c+b} a + \log_{c-b} a = k \log_{c+b} a \log_{c-b} a$, then k equals	(R)	3
(d)	If $b = \sqrt{ac}$ where $a > 0$, $c > 0$ & $b \neq 1$ and if $\frac{\log_a N - \log_b N}{\log_b N - \log_c N} = k.\ \log_a c$, then k equals	(S)	0

157. Match the following

	Column – I		**Column – II**
(A)	If $\log_{\sin x} \log_3 \log_{0.2} x < 0$, then	(p)	$x \in [-1, 1]$
(B)	If $\frac{(e^x-1)(2x-3)(x^2+x+2)}{(\sin x - 2)\, x(x+1)} \le 0$, then	(q)	$x \in [-3, 6)$
(C)	If $\lvert 2 - \lvert [x] - 1\rvert \rvert \le 2$, then [.] represents greatest integer function.	(r)	$x \in \left(0, \frac{1}{125}\right)$
(D)	If $\lvert \sin^{-1}(3x - 4x^3)\rvert \le \frac{\pi}{2}$, then	(s)	$x \in (-\infty, -1) \cup \left[\frac{3}{2}, \infty\right)$

158 Match the column

Column – I		**Column – II**	
(A)	$x\,|x| =$	(p)	$\begin{cases} -2x & : \quad x < -1 \\ 2 & : \quad -1 \le x \le 1 \\ 2x & : \quad x \ge 1 \end{cases}$
(B)	$|x - 1| + |x + 1| =$	(q)	$\begin{cases} -x^2 & : \quad x \le 0 \\ x^2 & : \quad x > 0 \end{cases}$
(C)	If $-1 \le x \le 2$, then $2x - \{x\} =$	(q)	$\begin{cases} -x & : \quad -1 \le x < 0 \\ 0 & : \quad 0 \le x < 1 \\ x & : \quad 1 \le x < 2 \end{cases}$
(D)	If $-1 \le x \le 2$, then $x[x] =$	(s)	$\begin{cases} x - 1 & : \quad -1 \le x < 0 \\ x & : \quad 0 \le x < 1 \\ x + 1 & : \quad 1 \le x < 2 \end{cases}$

159 Match The column

Column – I		**Column – II**	
(A)	Number of real solution of $a^2 + b^2 + c^2 = x^2$ is	(p)	2
(B)	The number of non-negative real roots of $2^x - x - 1 = 0$, equals	(q)	∞
(C)	Let p and q be the roots of the quadratic equation $x^2 - (\alpha - 2)x - \alpha - 1 = 0$. What is the minimum possible value of $p^2 + q^2$?	(r)	6
(D)	The value of 'c' for which $|\alpha^2 - \beta^2| = \frac{7}{4}$, where α and β are the roots of $2x^2 + 7x + c = 0$, is	(s)	5

160. Match the column

Column – I		**Column – II**	
(A)	Find all possible values of k for which every solution of the inequation $x^2 - (3k - 1)x + 2k^2 - 3k - 2 \ge 0$ is also a solution of the inequation $x^2 - 1 \ge 0$.	(p)	16
(B)	If a, b, c and d are four positive real numbers such that abcd = 1, the minimum value of $(1 + a)(1 + b)(1 + c)(1 + d)$ is	(q)	[0, 1]
(C)	Solution set of the inequality $5^{x+2} > \left(\frac{1}{25}\right)^{1/x}$ is	(r)	$\frac{1}{6}$
(D)	Let $f(x) = x^3 + 3x + 1$ if g(x) is the inverse function of f(x). Then $g'(5)$ equal to	(s)	$(0, \infty)$

161 Match the column

Column – I		Column – II	
(A)	Suppose that $F(n + 1) = \frac{2F(n)+1}{2}$ for n = 1, 2, 3,... and F(1) = 2. Then F(101) equals	(p)	42
(B)	If $a_1, a_2, a_3, ...a_{21}$ are in A.P. and $a_3 + a_5 + a_{11} + a_{17} + a_{19} = 10$ then the value of $\sum_{i=1}^{21} a_i$ is	(q)	1620
(C)	10^{th} term of the sequence S = 1 + 5 + 13 + 29 + ..., is	(r)	52
(D)	The sum of all two digit numbers which are not divisible by 2 or 3 is	(s)	2045

162. Match the column

Column – I		Column – II	
(A)	The arithmetic mean of two numbers is 6 and their geometric mean G and harmonic mean H satisfy the relation $G^2 + 3H = 48$. Find the two numbers.	(p)	$\frac{240}{77}$
(B)	The sum of the series $\frac{5}{1^2.4^2} + \frac{11}{4^2.7^2} + \frac{17}{7^2.10^2} + ...$ is.	(q)	(4,8)
(C)	If the first two terms of a Harmonic Progression be $\frac{1}{2}$ and $\frac{1}{3}$, then the Harmonic Mean of the first four terms is	(r)	$\frac{1}{3}$

163. Match the column

Column – I		Column – II	
(A)	${}^mC_1\,{}^nC_m - {}^mC_2\,{}^{2n}C_m + {}^mC_3\,{}^{3n}C_m$	(p)	coefficient of x^m in the expansion of $((1+)^n - 1)^m$
(B)	${}^nC_m + {}^{n-1}C_m + {}^{n-2}C_m + ... + {}^mC_m$	(q)	coefficient of x^m in $\frac{(1+x)^{n+1}}{x}$
(C)	$C_0 C_n + C_1 C_{n-1} + ... + C_n C_0$	(r)	coefficient of x^n in $(1 + x)^{2n}$
(D)	$2^k\,{}^nC_0 - 2^{k-1}\,{}^nC_1\,{}^{n-1}C_{k-1}$ .... $(-1)^k\,{}^nC_k\,{}^{n-k}C_0$	(s)	coefficient of x^k in the exp. of $(1 + x)^n$

164. Match the column

Column – I		**Column – II**	
(A)	The number of distinct terms in the expansion of $(x_1 + x_2 + x_3 + ... + x_n)^3$ is	(p)	${}^{n+3}C_n$
(B)	The number of Integral terms in ther expansion of $[5^{1/2} + 7^{1/8}]^{1024}$	(q)	${}^{n+2}C_3$
(C)	Degree of polynomial $[x + (x^3 - 1)^{1/2}]^5 + [x - (x^3 - 1)^{1/2}]^5$ is	(r)	129
(D)	Coefficients of the second, third and fourth terms in the expansion of $(1 + x)^n$ are in A.P. the n is equal to	(s)	7

165.

Column – I		**Column – II**	
(A)	If (r + 1) th term is the first negative term in the expansion of $(1 + x)^{7/2}$, then the value of r (where $\|x\| < 1$) is	(p)	divisible by 2
(B)	The coefficient of y in the expansion of $(y^2 + 1/y)^5$ is	(q)	divisible by 5
(C)	If the second term in the expansion $\left(a^{\frac{1}{13}} + \frac{a}{\sqrt{a^{-1}}}\right)^n$ is $14a^{5/2}$, then the value of n is	(r)	divisible by 10
(D)	The coefficient of x^4 in the expression $(1 + 2x + 3x^2 + 4x^3 + ...\text{up to } \infty)^{1/2}$ is c, $(c \in N)$, then c + 1 (where $\|x\| < 1$) is	(s)	a prime number

166. Match the following :

	Column - I		**Column - II**
(a)	The number of cubes with the six faces numbered 1 to 6 can be made, if the sum of the number in each pair of opposite faces is 7, is equal to	(P)	2
(b)	A citizen is expected to vote for atleast one of three positions mayor, secretary and attorney. The number of ways he/she can vote if there are 3 candidates each for three position, is 9 k where k is	(Q)	4
(c)	The number of ways in which 4 married couples can be seated at a round table if no husband and wife as well as no two men are to seat together is 3 k where k is	(R)	3
(d)	The sum of all numbers of the form $\frac{12!}{a!b!c!}$ where a, b, c $\in$ W, satisfy a + b + c = 12, is 3^{3k} where k is	(S)	7

167. **Match the following :**

	Column - I		Column - II
(a)	The number of five - digit numbers having the product of digits 20 is	(P)	77
(b)	A man took 5 space plays out of an engine to clean them. The number of ways in which he can place atleast two plays in the engine from where they came out is	(Q)	31
(c)	The number of integer between 1 & 1000 inclusive in which atleast two consecutive digits are equal is	(R)	50
(d)	The value of $\frac{1}{15}\sum_{1\le i\le j\le 9}\sum i\cdot j$	(S)	181

168. **Match the following :**

	Column - I		Column - II
(A)	The number of arrangements that can be made taking 4 letters, at a time, out of the letters of the word "PASSPORT" is :	(p)	2454
(B)	The numberof ways of forming a 4 letter word using the letters of the word MATHEMATICS, is	(q)	606
(C)	The number of selections of four letters from the letters of the word ASSASSINATION is	(r)	72
(D)	The total number of ways of selecting five letters from the letter of the words INDEPENDENT is	(s)	2424

169.

	Column – I		Column – II
(A)	The total number of selections of fruits which can be made from, 3 bananas, 4 apples and 2 oranges is	(p)	Greater than 50
(B)	If 7 points out of 12 are in the same straight line, then the number of triangles formed is	(q)	Greater than 100
(C)	The number of ways of selecting 10 balls from unlimited number of red, black, white and green balls is	(r)	Greater than 150
(D)	The total number of proper divisors of 38808 is	(s)	Greater than 200

170. **Column – I** **Column – II**

	Column – I		Column – II
(A)	Number of 4 letter words that can be formed using the letter of the words 'RESONANCE' is	(p)	$\frac{11!}{3!}$
(B)	Number of ways of selecting 3 persons out of 12 sitting in a row, if no two selected persons were sitting together, is	(q)	1206
(C)	Number of solutions of the equation $x + y + z = 20$, where $1 \le x < y < z$ and $x, y, z \in I$, is	(r)	24
(D)	Number of ways in which indian team can bat, if Yuvraj wants to bat before Dhoni and Pathan wants to bat after Dhoni is (assume all the batsman bat)	(s)	120

SECTION5: (INTEGER TYPE)

171. In a class tournament where the participants were to play one game with another, two class players fell ill, having played 3 games each. If the total number of games played is 84, then the number of participants at the beginning is _______________

172. If $|z|^2 + (3 - 4i)z + (3 + 4i)\bar{z} + 75 = 0$ and $(1 - i)z + (1 + i)\bar{z} - 16 = 0$ intersect at z_1 and z_2, then the integral part of the sum of the areas of the quadrilaterals having $(z_1 + z_2)$ and $(z_1 - z_2)$ as diagonals passing through origin is ____________ (Two vertices of 1st quadrilateral are z_1 and z_2 and of 2nd quadrilateral are z_1 and $-z_2$).

173. If $x = 1.2\,(2^2 - 1^2) + 2.3\,(3^2 - 2^2) + 3.4\,(4^2 - 3^2) + \ldots$ upto 50 terms, then the value of $\frac{x}{51^3}$ is ________

174. If α is the absolute maximum value of the expression $\frac{3x^2+2x-1}{x^2+x+1}$ $\forall$ x $\in$ R, then $[\alpha]$is _______, (where [.] denotes the greatest integer function)

175. The number of solutions of the equation $e^{|x|} = |x| + 1$ is __________

176. The value of x satisfying the equations $\log_3(\log_2 x) + \log_{1/3}(\log_{1/2} y) = 1$; $xy^2 = 9$is________

177. If there are six letters $L_1, L_2, L_3, L_4, L_5, L_6$ and their corresponding six envelopes $E_1, E_2, E_3, E_4, E_5, E_6$. Letters having odd value can be put into odd value envelopes and even value letter can be put into even value envelopes, so that no letter go into the right envelopes, the number of arrangement will be equal to ________

178. The number of integral values of a ; a $\in$ (6, 100) for which the equation $[\tan x]^2 + \tan x - a = 0$ has real roots; where [.] denotes greatest integer function is _________

179. If the co-efficient of rth, (r+1)th and (r + 2)th terms in the expansion of $(1 + x)^{14}$ are in A.P. then the greatest possible value of r is ___________

180. The remainder when $(3m + (-1)^n)^{18}$ is divided by 9 is __________ (m, n are natural numbers).

181. The numbers of five digits that can be made with the digits 1, 2, 3 each of which can be used at most thrice in a number, is ______________

182. The number of TIMES the digit 0 will be written when listing of the integers from 1 to 100 is _____________

183. If 6-digit number abcdef is multiplied with 6 and the resulting number is defabc. The number is ____________.

184. If $f:\{a,b,c,d,e\} \to \{a,b,c,d,e\}$ f is onto and $f(x) + x$ for each x $\in \{a,b,c,d,e\}$ is equal to ____.

185. The number of real solutions of the equation $x^6 - x^5 + x^4 - x^3 + x^2 - x + \frac{3}{4} = 0$ is ________

186. The number of ordered triplets (a, b, c) such that L.C.M (a, b) = 1000, L.C.M (b, c) = 2000 and L.C.M (c, a) = 2000 is _______________

187. If the number of ordered pairs of (x, y) satisfying the system of equations $5x\left(1+\frac{1}{x^2+y^2}\right)=12$ and $5y\left(1-\frac{1}{x^2+y^2}\right)=4$ is n, then n is ———————

188. Consider the sequence a_n given by $a_1 = \frac{1}{3}$, $a_{n+1} = a_n^2 + a_n$. Let $S = \frac{1}{a_2} + \frac{1}{a_3} + \cdots + \frac{1}{a_{2008}}$, then $[S]$ is equal to ___________ (where [ ] represents greatest integer function)

189. Let (x_i, y_i) where i = 1, 2, 3, 4 are the integral solutions of equation $2x^2y^2 + y^2 - 6x^2 - 12 = 0$. The area of quadrilateral whose vertices are (x_i, y_i), i = 1, 2, 3, 4 is _______

190. In the expansion of $(a^{1/3} + b^{1/9})^{6561}$, where a, b are distinct prime numbers, then the number of irrational terms are ________

191. If $(1 + 2x + 3x^2)^{10} = a_0 + a_1x + a_2x^2 + ... + a_{20}x^{20}$, then calculate $a_1 + a_2 + a_4$

192. Given that a, g are roots of the equation, $A x^2 - 4 x + 1 = 0$ and b, d the roots of the equation, $B x^2 - 6 x + 1 = 0$, find values of A *B, such that a, b, g & d are in H.P.

193. In maths paper there is a question on "Match the column" in which column A contains 6 entries & each entry of column A corresponds to exactly one of the 6 entries given in column B written randomly. 2 marks are awarded for each correct matching & 1 mark is deducted from each incorrect matching. A student having no subjective knowledge decides to match all the 6 entries randomly. Find the number of ways in which he can answer, to get atleast 25 % marks in this question.

194. Find the number of positive integral solutions of, $x^2 - y^2 = 352706$

195. Find the nonzero value of ' x ' for which the fourth term in the expansion $\left(5^{\frac{2}{5}\log_5\sqrt{4^x + 44}} + \frac{1}{5^{\log_5 \sqrt[3]{2^{x-1} + 7}}}\right)^8$, is 336.

196. In the binomial expansion of $\left(\sqrt[3]{2} + \frac{1}{\sqrt[3]{3}}\right)^n$, the ratio of the 7th term from the beginning to the 7th term from the end is 1 : 6 ; find n.

197. Find the coefficient of $a^5 b^4 c^7$ in the expansion of $(bc + ca + ab)^8$.

198. Find the number of positive integral solutions of xyz = 21600

199. Find the value of 8k for which the expression $3x^2 + 2xy + y^2 + 4x + y + k$ can be resolved into two linear factors.

200. How many five digits numbers divisible by 3 can be formed using the digits 0, 1, 2, 3, 4, 7 and 8 if, each digit is to be used atmost one.

END OF EXERCISE # 01

Answer Key

Qs.	Ans.	Qs.	Ans.	Qs.	Ans.	Qs.	Ans.
1	A	51	AB	101	AD	151	A-(iii), B-(ii), C-(i), D-(iv)
2	C	52	AC	102	CD	152	A-(3), B-(2), C-(1), D-(4)
3	C	53	BD	103	ACD	153	A-(iii), B-(i), C-(ii), D-(iv)
4		54	ABCD	104	AB	154	A-(iii), B-(ii), C-(iv), D-(i)
5	C	55	BD	105	C	155	A-(R), B-(S), C-(Q), D-(P)
6	C	56	AC	106	C	156	A-(Q), B-(Q), C-(Q), D-(P)
7	C	57	ABC	107	B	157	A-(r), B-(s), C-(q), D-(p)
8	C	58	AB	108	C	158	A-(q), B-(p), C-(s), D-(r)
9	D	59	ABCD	109	B	159	A-(q), B-(p), C-(s), D-(r)
10	A	60	AB	110	A	160	A-(q), B-(p), C-(s), D-(r)
11	C	61	BD	111	C	161	A-(r), B-(p), C-(s), D-(q)
12	A	62	ABCD	112	D	162	A-(q), B-(r), C-(p)
13	C	63	CD	113	A	163	A-(p), B-(q), C-(r), D-(s)
14	A	64	ABCD	114	D	164	A-(q), B-(r), C-(s), D-(s)
15	D	65	AC	115	C	165	A-(q,s), B-(p,q,r), C-(p), D-(p,s)
16	B	66	ABC	116	D	166	A-(P), B-(S), C-(Q), D-(Q)
17	A	67	ABCD	117	B	167	A-(R), B-(Q), C-(S), D-(P)
18	B	68	ABC	118	C	168	A-(q), B-(p), C-(r), D-(r)
19	B	69	BC	119	C	169	A-(p), B-(p,q,r), C-(p,q,r,s), D-(p)
20	A	70	AC	120	D	170	A-(q), B-(s), C-(r), D-(p)
21	D	71	ABCD	121	A	171	15
22	C	72	AC	122	A	172	52
23	B	73	BC	123	A	173	50
24	D	74	BCD	124	C	174	3
25	C	75	ABD	125	D	175	1
26	B	76	ABC	126	D	176	729
27	A	77	ABC	127	A	177	4
28	B	78	ABC	128	C	178	7
29	C	79	BD	129	B	179	9
30	B	80		130	B	180	1
31	B	81	CD	131	C	181	210
32	A	82	ABCD	132	A	182	192
33	A	83	AB	133	A	183	142857
34	B	84	ACD	134	A	184	44
35	C	85	AC	135	C	185	0
36	B	86	AD	136	C	186	70
37	A	87	ABCD	137	A	187	(2, 1) or (2/5, -1/5)
38	A	88	ABCD	138	A	188	4
39	D	89	BC	139	B	189	16
40	B	90	AB	140	C	190	730
41	B	91	ABCD	141	A-(q), B-(q), C-(q), D-(p)	191	8315
42	C	92	ABCD	142	A-(ii), B-(iii), C-(iv), D-(i)	192	24
43	B	93	BC	143	A-(iii), B-(i), C-(iv), D-(ii)	193	40
44	D	94	AD	144	A-(ii), B-(i), C-(iv), D-(iii)	194	0
45	C	95	AD	145	A-(iii), B-(i), C-(ii), D-(iv)	195	1
46	D	96	AC	146	A-(ii), B-(iv), C-(ii), D-(iv)	196	n=9
47	C	97	BD	147	A-(v), B-(i), C-(ii), D-(i)	197	280
48		98	BCD	148	A-(iii), B-(ii), C-(iv), D-(i)	198	1260
49	C	99	CD	149	A-(iii), B-(iv), C-(i), D-(ii)	199	11
50	D	100	ABC	150	A-(I),(ii), B-(i), C-(iii), D-(iii)	200	744