ALGEBRA

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ALGEBRA

Set

1. Write the set builder form of A = {–1, 1)
a. A = {x : x is an integer}
b. A = {x : x is a root of the equation $x^2 + 1 = 0$}
c. A = {x : x is a real number}
d. A = {x : x is a root of the equation $x^2 = 1$}

2. Which of the following set is an empty set?
a. {x|x is a real number and $x^2 - 1 = 0$}
b. {x|x is a real number and $x^2 + 3 = 0$}
c. {x|x is a real number and $x^2 - 9 = 0$}
d. {x|x is a real number and $x^2 = x + 2$}

3. Which of the following set is empty?
a. $\{x \in R | x^2 + x + 1 = 0\}$
b. $\{x \in R | x^2 = 9 \text{ and } 2x = 6\}$
c. $\{x \in R | x + 4 = 4\}$ d. $\{x \in R | 2x + 1 = 3\}$

4. The set A = {x|x is a real number and $x^2 = 16$ and 2x = 6} is equal to
a. {4} b. {3}
c. ϕ d. None of these

5. The set A = {x : |2x + 3| < 7} is equal to the set
a. D = {x : 0 < x + 5 < 7} b. B = {x : –3 < x < 7}
c. E = {x : –7 < x < 7} d. C = {x : –13 < 2x < 4}

6. If $X = \{4^n - 3n - 1 | n \in N\}$ and $Y = \{9(n - 1) | n \in N\}$, then
a. $X \subset Y$ b. $Y \subset X$
c. X = Y d. None of these

7. If $A = \{5^n - 4n - 1 : n \in N\}$ and $B = \{16(n - 1) : n \in N\}$, then
a. A = B b. $A \cap B = \phi$
c. $A \subseteq B$ d. $B \subseteq A$

8. If a set A has 4 elements, then the total number of proper subset of set A, is
a. 16 b. 14 c. 15 d. 17

9. The number of proper subsets of a set having n + 1 elements is
a. 2^{n+1} b. $2^{n+1} - 1$
c. $2^{n+1} - 2$ d. 2^{n-2}

10. Let A = {1, 2, {a, b}, 3, 4} which among the following statements is incorrect?
a. $\{a, b\} \subset A$ b. $\{a, b\} \in A$
c. $\{\{a, b\}\} \subset A$ d. $\{1, 2\} \subset A$

11. The number of subsets of A = {2, 4, 6, 8} without empty set is ....
a. 14 b. 16 c. 15 d. 12

12. Let A = {1, 2}, B = {{1}, {2}}, C = {{1}}, {1, 2}. Then which of the following relation is true?
a. A = B b. $B \subseteq C$ c. $A \in C$ d. $A \subset C$

13. Two finite sets A and B have m and n elements respectively. If the total number of subsets of A is 112 more than the total number of subsets of B, then the value of m is
a. 7 b. 9 c. 10 d. 12

14. If the set A contains 5 elements, then the number of elements in the power set P(A) is equal to
a. 32 b. 25 c. 16 d. 8

15. A set contains n elements. The power set contains
a. n elements b. 2^n elements
c. n^2 elements d. None of these

16. If n(P) = 8, n(Q) = 10 and n(R) = 5 (‘n’ denotes carinality) for three disjoint sets P, Q, R then $n(P \cup Q \cup R)$ =
a. 23 b. 20 c. 18 d. 15

17. If A and B are finite sets and $A \subset B$, then
a. $n(A \cup B) = n(B)$ b. $n(A \cap B) = n(B)$
c. $n(A \cap B) = \phi$ d. $n(A \cup B) = n(A)$

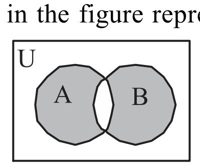
18. If X = {–2, –1, 0, 1, 2, 3, 4, 5, 6, 7, 8} and A{x:|x – 2| ≤ 3, x is an integer}, then X – A =
a. {–2, 6, 7, 8}
b. {–2, –1, 1, 2, 3, 4, 5, 6}
c. {–1, 0, 1, 2, 3, 4, 5, 7, 8}
d. {–2, –1, 2, 3, 6, 7, 8}

19. The set $(A | B) \cup (B | A)$ is equal to
a. $[A | (A \cap B)] \cap [B | (A \cap B)]$
b. $(A \cup B) | (A \cap B)$
c. $A | (A \cap B)$ d. $\overline{(A \cap B)} | (A \cup B)$

20. Set A and B have 2 and 6 elements respectively. What can be the minimum number of elements in $A \cup B$?
a. 18 b. 9 c. 6 d. 3

21. Let X = {1, 2, 3, ..., 10} and A = {1, 2, 3, 4, 5}. Then the number of subsets B of X such that A – B = {4} is
a. 2^5 b. 2^4 c. 2^{5-1} d. 1

22. The shaded region in the figure represents



a. $A \cap B$ b. $A \cup B$
c. B – A d. None of these

23. If sets A and B are defined as
$A = \{(x, y) : y = 1/x, x \neq 0, x \in R\}$
$B = \{(x, y) : y = -x, x \in R\}$, then
a. $A \cap B = A$ b. $A \cap B = B$
c. $A \cap B = \phi$ d. None of these

24. Let Z denote the set of all integers and
$A = \{(a, b) : a^2 + 3b^2 = 28, a, b \in Z\}$ and
$B = \{(a, b) : a > b, a, b \in Z\}$. Then the number of elements in $A \cap B$ is
a. 2 b. 3 c. 4 d. 6

25. For any two sets A and B, A – (A – B) equals
a. B b. A – B c. $A \cap B$ d. $A^c \cap B^c$

26. In a certain town, 25% of the families own a phone and 15% own a car, 65% families own neither a phone nor a car and 2000 families own both a car and a phone. Consider the following three statements:
1. 5% families own both a car and a phone
2. 35% families own either a car or a phone
3. 40,000 families live in the town
Then
a. only 1 and 2 are correct b. only 1 and 3 are correct
c. only 2 and 3 are correct d. all 1, 2 and 3 are correct

27. In a class of 80 students numbered 1 to 80, all odd numbered students opt for Cricket, students whose numbers are divisible by 5 opt for Football and those whose numbers are divisible by 7 opt for Hockey. The number of students who do not opt any of the three games, is
a. 13 b. 24 c. 28 d. 52

28. There is a group of 265 persons who like either singing or dancing or painting. In this group 200 like singing, 110 like dancing and 55 like painting. if 60 persons like both singing and dancing, 30 like both singing and painting and 10 like all three activities, then the number of persons who like only dancing and painting is
a. 10 b. 20 c. 30 d. 40

29. A survey shoes that 63% of the Americans like cheese whereas 76% like apples. If x% of the Americans like both cheese and apples, then the value of x is
a. $39 \leq x \leq 63$ b. 63 c. 39 d. $139 \geq x$

30. There are 100 students in a class. In an examination, 50 of them failed in Mathematics, 45 failed in Physics, 40 failed in Biology and 32 failed in exactly two of three subjects. Only one student passed in all the subjects. Then the sumber of students failing in all the three subjects
a. is 12 b. is 4
c. is 2
d. cannot determined from the given information

31. If $n(A) = 8$ and $n(A \cap B) = 2$ then $n((A \cap B)' \cap A)$ is equal to
a. 2 b. 4 c. 6 d. 8

32. 25 people for programme A, 50 people for programme B, 10 people for both. So number of employee employed for only A is
a. 15 b. 20 c. 35 d. 40

33. A and B are subsets of universal set U such that n(U) = 800, n(A) = 300, n(B) = 400 & $n(A \cap B) = 100$. The number of elements in the set $A^c \cap B^c$ is
a. 100 b. 200 c. 300 d. 400

34. If $aN = \{ax : x \in N\}$ and $bN \cap cN = dN$, where $b, c \in N$ are relatively prime, then
a. b = cd b. c = bd
c. d = bc d. None of these

35. If S is a set with 10 elements and
$A = \{(x, y) : x, y \in S, x \neq y\}$, then the number of elements in A is
a. 100 b. 90 c. 50 d. 45

Relation

36. The caretsian product A × A has 9 elements among which two elements are found (–1, 0) and (0, 1), then set A?
a. {1, 0} b. {1, –1, 0} c. {0, –1} d. {1, –1}

37. For non-empty sets A and B, if $A \subset B$, then $(A \times B) \cap (B \times A)$ equals
a. $A \cap B$ b. A × A
c. B × B d. None of these

38. If A and B have n elements in common, then the number of elements common to A × B and B × A is
a. 0 b. n c. 2n d. n^2

39. If n(A) denotes the number of elements to set A and if n(A) = 4, n(B) = 5 and $n(A \cap B) = 3$, then $n\{(A \times B) \cap (B \times A)\} =$
a. 8 b. 9 c. 10 d. 11

40. Let A and B be finite sets such that n(A) = 3. If the total number of relations that can be defined from A to B is 4096, then n(B) =
a. 5 b. 4 c. 6 d. 8

41. If R is a relation on a finite set having n elements, then the number of relations on A is
a. 2^n b. 2^{n^2} c. n^2 d. n^n

42. Let A = {1, 2, 3, 4) and R be the relation on A defined by {(a, b) : a, b ∈ A, a × b is an even number}, then find the range of R
a. {1, 2, 3, 4} b. {2, 4} c. {2, 3, 4} d. {1, 2, 4}

43. Let the number of elements of the sets A and B be p and q respectively. Then the number of relations from the set A to the set B is
a. 2^{p+q} b. 2^{pq} c. p + q d. pq

44. Let S = {(a, b) : b = |a – 1|, a ∈ Z and |a| < 3} where Z denotes the set of integers. Then the range of S is
a. {1, 2, 3} b. {–1, 2, 3, 1}
c. {0, 1, 2, 3} d. {–1, –2, –3, –4}

45. The relation R defined on set A = {x : |x| < 3, x ∈ I} by R = {(x, y) : y = |x|} is
a. {(–2, 2), (–1, 1), (0, 0), (1, 1), (2, 2)}
b. {(–2, –2), (–2, 2), (–1, 1), (0, 0), (1, –1), (1, 2), (2, –1), (2, –2)}
c. {(0, 0), (1, 1), (2, 2)} d. None of these

46. If n(A) = 5 and n(B) = 7, then the number of relations on A × B is
a. 2^{35} b. 2^{49} c. 2^{25} d. 2^{70}

47. Let A = {x, y, z} and B = {a, b, c, d}. Which one of the following is not a relation from A to B?
a. {(x, a), (x, c)} b. {(y, c), (y, d)}
c. {(z, a), (z, d)} d. {(z, b), (y, b), (a, d)}

48. R is a relation on N given by R = {(x, y)(4x + 3y) = 20}. Which of the following belongs to R?
a. (3, 4) b. (2, 4) c. (–4, 12) d. (5, 0)

49. A set A has 5 elements. Then the maximum number of relations on A (inclusing empty relation) is
a. 5 b. 2^5 c. 2^{25} d. 25

50. On the set R of real numbers we define xRy if and only if xy ≥ 0. Then the relation P is
a. reflexive but not symmetric
b. symmetric but not reflexive
c. transitive but not reflexive
d. reflexive and symmetric but not transitive

51. On R, the relation ρ be defined by 'xρy holds if and only if x – y is zero or irrational'. Then
a. ρ is reflexive and transitive but not symmetric
b. ρ is reflexive and symmetric but not transitive
c. ρ is symmetric and transitive but not reflexive
d. ρ is equivalence relation

52. On set A = {1, 2, 3}, relations R and S are given by
R = {(1, 1), (2, 2), (3, 3), (1, 2), (2, 1)}
S = {(1, 1), (2, 2), (3, 3), (1, 3), (3, 1)}. Then
a. $R \cup S$ is an equivalence relation
b. $R \cup S$ is reflexive and transitive but not symmetric
c. $R \cup S$ is reflexive and symmetric but not transitive
d. $R \cup S$ is symmetric and transitive but not reflexive

53. On R, the set of real numbers, a relation ρ is defined as 'aρb if and only if 1 + ab > 0. Then
a. ρ is an equivalence relation
b. ρ is reflexive and transitive but not symmetric
c. ρ is reflexive and symmetric but not transitive
d. ρ is symmetric

54. Let R be a reflexive relation on a finite set A having n elements and let there be m ordered pairs in R then
a. m ≥ n b. m ≤ n
c. m = n d. None of these

55. Let R be a relation defined on the set Z of all integers and xRy when x + 2y is divisible by 3. Then
a. R is not transitive b. R is symmetric only
c. R is an equivalence relation
d. R is not an equivalence relation

56. The number of equivalence relations on the set {1, 2, 3} containing (1, 2) and (2, 1) is
a. 3 b. 1
c. 2 d. None of these

57.

58. Let X = {a, b, c, d, e} and R = {(a, a), (b, b), (c, c), (a, b), (b, a)}. Then the relation R on X is
a. reflexive and symmetric
b. not reflexive but symmetric only
c. symmetric and transitive, but not reflexive
d. reflexive but not transitive

59. Let r be a relation over the set N × N and it is defined by (a, b)r (c, d) ⇒ a + d = b + c. Then r is
a. reflexive only b. symmetric only
c. transitive only d. an equivalence relation

60. A relation ρ on the set of real number R is defined as follows: "x ρ y if and only if xy > 0". Then which os the following is/are true?
a. ρ is reflexive and symmetric
b. ρ is symmetric but not reflexive
c. ρ is symmetric and transitive
d. ρ is an equivalence relation

61. Let R be the relation on the set R of all real numbers defined by aRb iff |a – b| ≤ 1. Then R is
a. reflexive b. transitive
c. anti-symmetric d. None of these

62. If A = {1, 2, 3, 4}, then which one of the following is reflexive?
a. {(1, 1), (2, 3), (3, 3)} b. {(1, 1), (2, 2), (3, 3)(4, 4)}
c. {(1, 2), (2, 1), (3, 2)(2, 3)} d. {(1, 2), (1, 3), (1, 4)}

63. Let S be the set of all real numbers. A relation R has been defined on S by aRb ⇔ |a – b| ≤ 1, then R is
a. symmetric and transitive but not reflexive
b. reflexive and transitive but not symmetric

c. reflexive and symmetric but not transitive
d. an equivalence relation

64. For any real numbers θ and ϕ, we define $\theta R\phi$ if and only if $\sec^2\theta - \tan^2\phi = 1$. The relation R is
a. reflexive but not transitive
b. symmetric but not reflexive
c. both reflexive and symmetric but not transitive
d. an equivalence relation

65. Let Z be the set of integers. Then the relation R = {(a, b) : 1 + ab > 0} defined on Z is
a. reflexive and transitive but not symmetric
b. symmetric and transitive but not reflexive
c. reflexive and symmetric but not transitive
d. an equivalence relation

66. Let L denote the set of all straight lines in a plane. Let a relation R be defined on L by L_1RL_2 if and only if the straight line L_1 is perpendicular to the straight line L_2. Then R is
a. symmetric b. reflexive
c. transitive d. None of these

67. If N denote the set of all natural numbers and R be the relation on N × N defined by
(a, b)R(c, d), if ad(b + c) = bc(a + d), then R is
a. symmetric only b. reflexive only
c. transitive only d. an equivalence relation

68. For any two real numbers a and b, we define aRb if and only if $\sin^2 a + \cos^2 b = 1$. The relation R is
a. reflexive but not symmetric
b. symmetric but not transitive
c. transitive but not reflexive
d. an equivalence relation

69. Let R be a relation on the set N, defined by {(x, y) : 2x – y = 10}, then R is
a. reflexive b. symmetric
c. transitive d. None of these

70. A relation R is defined on the set R of all real numbers such that for non-zero x, y ∈ R, $xRy \Rightarrow |x - y| < 1$ then this relation is
a. Reflexive, symmetric but not transitive
b. Reflexive, transitive but not symmetric
c. Symmetric, transitive but not reflexive
d. An equivalence relation

71. $aRb \Leftrightarrow |a| \le b$. Then R is ....
a. reflexive b. symmetric
c. transitive d. equivalence

72. A relation defined on two natural numbers a and b is given by aRb : a is divisible by b. The the condition which holds true is
a. symmetric and transitive relation
b. reflexive, but not transitive relation
c. transitive but not symmetric relation
d. symmetric, reflexive and transitive relation

73. Let R be the set of real numbers:
Statement-1 : A = {(x, y) ∈ R × R : y – x is an integer} is an equivalence relation on R.
Statement-2 : B = {(x, y) ∈ R × R : x = αy for some rational number α} is an equivalence relation on R.
a. Statement-1 is true, Statement-2 is false
b. Statement-1 is false, Statement-2 is true
c. Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1
d. Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1

74. Define a relation R on A = {1, 2, 3, 4) as xRy is x divides y. R is
a. reflexive and transitive b. reflexive and symmetric
c. symmetric and transitive d. equivalence

75. If A and B are two equivalence relations defined on set C, then
a. $A \cap B$ is an equivalence relation
b. $A \cap B$ is not an equivalence relation
c. $A \cup B$ is an equivalence relation
d. $A \cup B$ is not an equivalence relation

76. Consider the following relations:
R = {(x, y)|x, y are real numbers and x = wy for some rational number w};
$S = \left\{\left(\frac{m}{n}, \frac{p}{q}\right)\middle|\right.$ m, n, p and q are integers such that n, q ≠ 0 and qm = pn}. Then
a. R is an equivalence relation but S is not an equivalence relation
b. neither R nor S is an equivalence relation
c. S is an equivalence relation but R is not an equivalence relation
d. R and S both are equivalence relations

77. Let R be an equivalence relation defined on a set containing 6 elements. The minimum number of ordered pairs that R should contain is
a. 6 b. 12 c. 36 d. 64

78. $R \subseteq A \times A$ (where $A \neq 0$) is an equivalence relation is R is
a. Reflexive, symmetric but not transitive
b. Reflexive neither symmetric nor transitive
c. Reflexive, symmetric and transitive
d. None of the above

79. The realtion R defined on the set N of natural number by $xRy \Leftrightarrow 2x^2 - 3xy + y^2 = 0$ is
a. symmetric but not reflexive
b. only symmetric

c. not symmetric but reflexive
d. None of the above

80. Let a relation R in the set N of natural numbers is defined as (x, y) $\Leftrightarrow$ $x^2 - 4xy + 3y^2 = 0$ $\forall$ x, y $\in$ N. The realtion R is
a. reflexive   b. symmetric
c. transitive   d. an equivalence relation

81. Let r be a relation from R (set of real numbers) to R defined by r = {(a, b)|a, b $\in$ R and $a - b + \sqrt{3}$ is an irrational number}. The relation r is
a. an equivalence relation   b. reflexive only
c. symmetric only   d. transitive only

82.

83. Given the realtion R = {(1, 2), (2, 3)} on the set A = {1, 2, 3}, the number of ordered pairs which when added to R make it an equivalence relation is
a. 5   b. 6
c. 7   d. None of these

84. Let R be the real line. Consider the following subsets of the plane R × R :
S = {(x, y) : y = x + 1 and 0 < x < 2}
T = {(x, y) : x – y is an integer}.
Which one of the following is true?
a. T is an equivalence relation on R but S is not
b. Neither S not T is an equivalence relation on R
c. Both S and T are equivalence relations on R
d. S is an equivalence relation on R but T is not

85. If R be a relation defined aRb iff |a – b| > 0, then the relation is
a. reflexive   b. symmetric
c. transitive
d. both symmetric and transitive

86. On the set N of natutal numbers define the relation R by aRb if and only if the G.C.D. of a and b is 2 then R is
a. reflexive but not symmetric
b. symmetric only
c. reflexive and transitive
d. reflexive, symmetric and transitive

Complex Numbers

87. One of the square roots of $6+4\sqrt{3}$ is
a. $\sqrt{3}(\sqrt{3}+1)$ b. $-\sqrt{3}(\sqrt{3}-1)$
c. $\sqrt{3}(-\sqrt{3}+1)$ d. None of these

88. If $\left(\frac{1+i}{1-i}\right)^m = 1$, then the least positive integral value of m is
a. 4   b. 1   c. 2   d. 3

89. If $z = i^9 + i^{19}$, then z is equal to
a. 0 + 0i   b. 1 + 0i   c. 0 + i   d. 1 + 2i

90. The expression $\frac{(1+i)^n}{(1-i)^{n-2}}$ equals
a. $-i^{n+1}$ b. i^{n+1} c. $-2i^{n+1}$ d. 1

91. $\frac{(1+i)^{2016}}{(1-i)^{2014}} =$
a. –2i   b. 2i   c. 2   d. –2

92. $\frac{\sin 60° + i\cos 60°}{\cos 15° - i\sin 15°} =$
a. $\frac{1}{\sqrt{2}}+i\frac{1}{\sqrt{2}}$ b. $\frac{1}{\sqrt{2}}-i\frac{1}{\sqrt{2}}$
c. $-\frac{1}{\sqrt{2}}+i\frac{1}{\sqrt{2}}$ d. $\frac{1}{2}+i\frac{\sqrt{3}}{2}$

93. The value of $\left(\frac{1+i}{1-i}\right)^{1000} + \left(\frac{1-i}{1+i}\right)^{2000}$ is equal to
a. 1 + i   b. 2   c. – i   d. 1

94. If $z = \frac{2-i}{i}$, then $\text{Re}(z^2) + \text{Im}(z^2)$ is equal to
a. 1   b. –1   c. 2   d. –2

95. Let $i^2 = -1$. Then $\left(i^{10} - \frac{1}{i^{11}}\right) + \left(i^{11} - \frac{1}{i^{12}}\right) + \left(i^{12} - \frac{1}{i^{13}}\right)$
$\left(i^{13} - \frac{1}{i^{14}}\right) + \left(i^{14} + \frac{1}{i^{15}}\right) =$
a. –1 + i   b. –1 – i   c. 1 + i   d. – i

96. If $z_1 = 2\sqrt{2}(1+i)$ and $z_2 = 1 + i\sqrt{3}$, then $z_1^2 z_2^3$ is equal to
a. 128i   b. 64i   c. – 64i   d. –128i

97. The value of $\frac{1}{i} + \frac{1}{i^2} + \frac{1}{i^3} + ... \frac{1}{i^{102}}$ is equal to
a. –1 – i   b. –1 + i   c. 1 – i   d. 1 + i

98. If the imaginary part of $\frac{2+i}{ai-1}$ is zero, where a is a real number, then the value of a is equal to
a. $\frac{1}{2}$ b. 2   c. $-\frac{1}{2}$ d. –2

99. The value of $i - i^2 + i^3 - i^4 + ... -i^{100}$ is equal to
a. i   b. – i   c. 1 – i   d. 0

100. If $\frac{i^4 + i^9 + i^{16}}{2 - i^8 + i^{10} + i^3} = a + ib$, then (a, b) is
a. (1, 2)   b. (–1, 2)   c. (2, 1)   d. (–2, –1)

101. What should be the positive value of p so that the

magnitude of (2 + pi) where $i = \sqrt{(-1)}$ is twice that of $\left(\frac{3}{4}\right)+pi$?
a. 1 b. 0 c. $\frac{3}{2}$ d. 3

102. If $\left|z-\frac{3}{z}\right|=2$, then the greatest value of |z| is
a. 1 b. 2 c. 3 d. 4

103. If z = x + iy is a complex number such that |z| = Re(iz) + 1, then the locus of z is
a. $x^2 + y^2 = 1$ b. $x^2 = 2y - 1$
c. $y^2 = 2x - 1$ d. $x^2 = 1 - 2y$

104. If a complex number lies in the III quadrant. Find the quadrant in which its conjugate lies
a. I quadrant b. II quadrant
c. III quadrant d. IV quadrant

105. The number of solutions for $z^3+\bar{z}=0$ is
a. 1 b. 2 c. 3 d. 5

106. If z is a complex number such that z + |z| = 8 + 12i, then the value of $|z^2|$ is equal to
a. 228 b. 144 c. 121 d. 169

107. Let x_1 and y_1 be real numbers. If z_1 and z_2 are complex numbers such that $|z_1| = |z_2| = 4$, then $|x_1z_1 - y_1z_2|^2 + |y_1z_1 + x_1z_2|^2 =$
a. $32(x_1^2+y_1^2)$ b. $16(x_1^2+y_1^2)$
c. $4(x_1^2+y_1^2)$ d. 32

108. The number of solutions of equation $z^2+\bar{z}=0$, where $z \in C$ are
a. 6 b. 1 c. 4 d. 5

109. The locus of z such that $\left|\frac{1+iz}{z+i}\right|=1$ is
a. y – x = 0 b. y + x = 0 c. y = 0 d. xy = 1

110. If $iz^3 + z^2 - z + 1 = 0$, then |z| is equal to
a. 0 b. 1
c. 2 d. None of these

111. If $\frac{2z_1}{3z_2}$ is purely imaginary number then, $\left|\frac{z_1-z_2}{z_1+z_2}\right|$ is equal to
a. 3/2 b. 1 c. 2/3 d. 4/9

112. The modulus of $\frac{1-i}{3+i}+\frac{4i}{5}$ is
a. $\sqrt{5}$ unit b. $\frac{\sqrt{11}}{5}$ unit
c. $\frac{\sqrt{5}}{5}$ unit d. $\frac{\sqrt{12}}{5}$ unit

113. If z is a complex number such that $z = -\bar{z}$, then
a. z is any complex number
b. Real part of z is the same as its imaginary part
c. z is purely real
d. z is purely imaginary

114. If $(\sqrt{5}+\sqrt{3}i)^{33}=2^{49}z$, then modulus of the complex number z is equal to
a. 1 b. $\sqrt{2}$ c. $2\sqrt{2}$ d. 4

115. The point represented by 2 + i in the Argand plane moves 1 unit eastwards, then 2 units northwards and finally from there $2\sqrt{2}$ units in the south-westwards direction. Then its new position in the Argand plane is at the point represented by
a. 1 + i b. 2 + 2i c. –2 – 2i d. –1 – i

116. Amplitude of the complex number $i\sin\left(\frac{\pi}{19}\right)$ is
a. $\frac{\pi}{19}$ b. $-\frac{\pi}{19}$ c. $\frac{\pi}{2}$ d. $\frac{\pi}{2}-\frac{\pi}{19}$

117. If $Z_r=\cos\left(\frac{\pi}{2^r}\right)+i\sin\left(\frac{\pi}{2^r}\right)$ for r = 1, 2, 3, ... then $Z_1Z_2Z_3 \ldots \infty =$
a. 1 b. 2 c. –1 d. –2

118. If z = r(cosθ + isinθ), then the value of $\frac{z}{\bar{z}}+\frac{\bar{z}}{z}$ is
a. cos2θ b. 2cos2θ c. 2cosθ d. 2sinθ

119. If $-\pi < \arg(z) < -\frac{\pi}{2}$, then $\arg\bar{z}-\arg(-\bar{z})$ is
a. π b. –π c. $\frac{\pi}{2}$ d. $-\frac{\pi}{2}$

120. If a = cosθ + isinθ then $\frac{1+a}{1-a}=$
a. tanθ b. cotθ
c. i tanθ/2 d. i cotθ/2

121. Let α and β be the roots of $x^2 + x + 1 = 0$. If n be positive integer, then $\alpha^n + \beta^n$ is
a. $2\cos\frac{2n\pi}{3}$ b. $2\sin\frac{2n\pi}{3}$
c. $2\cos\frac{n\pi}{3}$ d. $2\sin\frac{n\pi}{3}$

122. The square roots of $-7-24\sqrt{-1}$ are
a. $\pm(4+3\sqrt{-1})$ b. $\pm(3+4\sqrt{-1})$
c. $\pm(3-4\sqrt{-1})$ d. $\pm(4-3\sqrt{-1})$

123 If $z=\cos\left(\frac{\pi}{3}\right)-i\sin\left(\frac{\pi}{3}\right)$, then $z^2 - z + 1$ is equal to
a. 0 b. 1 c. –1 d. $\frac{\pi}{2}$

124. $\left(\frac{1+\cos\left(\frac{\pi}{12}\right)+i\sin\left(\frac{\pi}{12}\right)}{1+\cos\left(\frac{\pi}{12}\right)-i\sin\left(\frac{\pi}{12}\right)}\right)^{72}$ is equal to
a. 0 b. –1 c. 1 d. $\frac{1}{2}$

125. If 'ω' is a complex cube root of unity, then

$\omega^{\left(\frac{1}{3}+\frac{2}{9}+\frac{4}{27}+...\infty\right)}+\omega^{\left(\frac{1}{2}+\frac{3}{8}+\frac{9}{32}+...\infty\right)}=$

a. 1 b. –1 c. ω d. i

126. The common roots of the equations $z^3+2z^2+2z+1=0$, $z^{2014}+z^{2015}+1=0$ are

a. ω, ω^2 b. $1, \omega, \omega^2$ c. $-1, \omega, \omega^2$ d. $-\omega, -\omega^2$

127. If $1, \omega, \omega^2$ are three cube roots of unity, then $(1-\omega+\omega^2)(1+\omega-\omega^2)$ is

a. 2 b. 4 c. 1 d. 3

128. If $z = 1 + i$, then the argument of z^2e^{x-1} is

a. $\frac{\pi}{2}$ b. $\frac{\pi}{6}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{3}$

129. The non-zero solutions of the equation $z^2+|z|=0$, where z is a complex number are

a. ±1 b. ±i c. 1 ± i d. ±1 ∓ i

130. If $2x=-1+\sqrt{3}i$ then the value of $(1-x^2+x)^6-(1-x+x^2)^6=$

a. 32 b. 64 c. – 64 d. 0

131. Let $z_1 = 2 + 3i$ and $z_2 = 3 + 4i$ be two points on the complex plane. Then the set of complex numbers z satisfying $|z-z_1|^2+|z-z_2|^2=|z_1-z_2|^2$ represents

a. a straight line b. a point
c. a circle d. a pair of straight lines

132. Suppose $z = x + iy$ where x and y are real numbers and $i=\sqrt{-1}$. The point (x, y) for which $\frac{z-1}{z-i}$ is real, lies on

a. an ellipse b. a circle
c. a parabola d. a straight line

133. If α and β are the roots of $x^2-x+1=0$, then the value of $\alpha^{2013}+\beta^{2013}$ is equal to

a. 2 b. –2 c. –1 d. 1

134. If $1, \omega, \omega^2$ are the sube roots of unity, then $(3+3\omega^2+5\omega)^6-(2+6\omega^2+2\omega)^3$ is equal to

a. 32 b. 64 c. 0 d. –1

135. i^i (when $i=\sqrt{-1}$) is

a. a purely real number b. a purely complex number
c. a complex number whose real part is always a negative real number
d. a complex number whose real part is always a positive integer

136. If α is a complex number such that $\alpha^2-\alpha+1=0$, then α^{2011} is

a. 1 b. – α c. α^2 d. α

137. If $\left(\frac{3}{2}+i\frac{\sqrt{3}}{2}\right)^{50}=3^{25}(x+iy)$, where x and y are real, then the ordered pair (x, y) is

a. (–3, 0) b. (0, 3)
c. (0, –3) d. $\left(\frac{1}{2},\frac{\sqrt{3}}{2}\right)$

138. If $z_r=\cos\left(\frac{\pi}{3^r}\right)+i\sin\left(\frac{\pi}{3^r}\right)$, then $z_1 . z_2 . z_3$ .... to ∞ is equal to

a. –1 b. 0 c. – i d. i

139. If ω denotes the imaginary cube roots of unity. Then the roots of the equation $(x+1)^3+8=0$ are

a. $-3, 1+2\omega, 1+2\omega^2$ b. $-3, 1-2\omega, 1-2\omega^2$
c. $-3, -1+2\omega, -1+2\omega^2$ d. $-3, 1-2\omega, -1-2\omega^2$

140. If ω is an imaginary cube root of unity, then the value of $(1-\omega+\omega^2).(1-\omega^2+\omega^4).(1-\omega^4+\omega^8)+...$ (2n factors) is

a. 2^{2n} b. 2n c. 1 d. 0

141. If $x+iy=(1-i\sqrt{3})^{100}$, then find (x, y)

a. $(2^{99}, 2^{99}\sqrt{3})$ b. $(2^{99}, -2^{99}\sqrt{3})$
c. $(-2^{99}, 2^{99}\sqrt{3})$ d. None of these

142. If $x+\frac{1}{2}=2\cos\theta$, then for any integer n, $x^n+\frac{1}{x^n}=$

a. 2 cos nθ b. 2 sin nθ
c. 2i cos nθ d. 2i sin nθ

143. The number of solutions of the system of equations $Re(z^2)=0, |z|=2$ is

a. 4 b. 3 c. 2 d. 1

144. The real part of log log i is

a. $\frac{\pi}{2}$ b. $\log\frac{\pi}{2}$
c. 0 d. None of these

145. The number of complex numbers z such that $|z-1|=|z+1|=|z-i|$ is

a. 0 b. 1 c. 2 d. ∞

146. If ω is a complex cube root of unity, then $\frac{a+b\omega+c\omega^2}{a\omega^2+b+c\omega}+\frac{a\omega^2+b\omega+c}{a+b\omega^2+c\omega}$ is equal to

a. 1 b. 2ω c. $2\omega^2$ d. –1

147. If $x+iy=(-1+i\sqrt{3})^{2010}$, then x =

a. 2^{2010} b. -2^{2010} c. –1 d. 1

148. If z satisfies the equation $|z|-z=1+2i$, then z is equal to

a. $\frac{3}{2}+2i$ b. $\frac{3}{2}-2i$ c. $2-\frac{3}{2}i$ d. $2+\frac{3}{2}i$

149. The value of $(-1+\sqrt{-3})^{62}+(-1-\sqrt{-3})^{62}$ is

a. 2^{62} b. 2^{64} c. -2^{62} d. 0

150. $4+5\left(\frac{-1+i\sqrt{3}}{2}\right)^{2008}+3\left(\frac{-1+i\sqrt{3}}{2}\right)^{2009}$ is
a. $-i\sqrt{3}$ b. $i\sqrt{3}$ c. $1-i\sqrt{3}$ d. $-1+i\sqrt{3}$

151. If α and β are the roots of $x^2 + x + 1 = 0$, then $\alpha^{16} + \beta^{16} =$
a. 2 b. 0 c. 1 d. –1

152. The locus of z such that $\arg[(1 - 2i)z - 2 + 5i] = \frac{\pi}{4}$ is a
a. line not passing through the origin
b. circle not passing through the origin
c. line passing through the origin
d. circle passing through the origin

153. If the area of the triangle formed by the points z, z + iz and iz is 50 square units, then |z| is equal to
a. 5 b. 8 c. 10 d. 12

154. The points 0, 2 + 3i, i, –2 – 2i in the argand plane are the vertices of a
a. rectangle b. rhombus
c. trapezium d. parallelogram

155. One of the values of $\left(\frac{1+i}{\sqrt{2}}\right)^{2/3}$ is
a. $\sqrt{3}+i$ b. $-i$ c. i d. $-\sqrt{3}+i$

156. For any complex number z, the minimum value of |z| + |z – 1| is
a. 0 b. 1 c. 2 d. –1

157. If ω is a non-real cube root of unity then $1 + \omega + \omega^2 + ... + \omega^{101} =$
a. 1 b. ω c. ω^2 d. 0

158. If α, β are the roots of the equation $x^2 + x + 1 = 0$, then the equation whose roots are α^{22} and β^{19}, is
a. $x^2 - x + 1 = 0$ b. $x^2 + x + 1 = 0$
c. $2x^2 + x + 1 = 0$ d. $x^2 - x - 1 = 0$

159. If $2\alpha = -1 - i\sqrt{3}$ and $2\beta = -1 + i\sqrt{3}$, then $5\alpha^4 + 5\beta^4 + 7\alpha^{-1}\beta^{-1}$ is equal to
a. –1 b. –2 c. 1 d. 2

160. Let $a_n = i^{(n+1)^2}$, where $i = \sqrt{-1}$ and n = 1, 2, 3, ... Then the value of $a_1 + a_3 + a_5 + ... + a_{25}$ is
a. 13 b. 13 + i c. 13 – i d. 12

161. If ω is an imaginary cube root of unity, then $(1 - \omega + \omega^2)(1 - \omega^2 + \omega^4)(1 - \omega^4 + \omega^8)(1 - \omega^8 + \omega^{16})$ is
a. 4 b. 8 c. 12 d. 16

162. Find the value of $\left(\frac{-1}{2}+\frac{\sqrt{3}i}{2}\right)^{1000}$
a. ω b. 1 c. ω^2 d. 0

163. The value of $(1 - \omega + \omega^2)^5 + (1 + \omega - \omega^2)^5$ where ω and ω^2 are the complex cube roots of unity is
a. 0 b. 32ω c. –32 b. 32

164. If |z| = 1 and $z \neq \pm 1$, then all the values of $\frac{z}{1-z^2}$ lie on
a. a line not passing through the origin
b. $|z| = \sqrt{2}$
c. the x-axis d. the y-axis

165. If 1, ω, ω^2 are the cube roots of unity then $(1 + \omega)(1+ \omega^2)(1+ \omega^4)(1 + \omega^8)$ is equal to
a. 1 b. 0 c. ω^2 d. ω

166. The amplitude of $(1 + i)^5$ is
a. $\frac{3\pi}{4}$ b. $\frac{-3\pi}{4}$ c. $\frac{-5\pi}{4}$ d. $\frac{5\pi}{4}$

167. If ω is a complex cube root of unity then the value of $\sin\left\{(\omega^{10}+\omega^{23})\pi-\frac{\pi}{6}\right\}$ is
a. $\frac{1}{\sqrt{2}}$ b. $\frac{\sqrt{3}}{2}$ c. $-\frac{1}{\sqrt{2}}$ d. $\frac{1}{2}$

168. Let arg z < 0 then arg(–z) – arg z =
a. π b. $\pi/2$
c. $\pi/3$ d. None of these

Quadratic Equations

169. The sum of all the real values of x satisfying the equation $2^{(x-1)(x^2+5x-50)} = 1$ is
a. –5 b. 14 c. – 4 d. 16

170. The values of x for which $4^x + 4^{1-x} - 5 < 0$, is given by
a. x = 1 b. x = 0, 1
c. x = 0 d. 0 < x < 1

171. The value of $|\sqrt{4+2\sqrt{3}}|-|\sqrt{4-2\sqrt{3}}|$ is
a. 1 b. 2 c. 4 d. 3

172. Let x_1 and x_2 be the roots of the equation $x^2 + px - 3 = 0$. If $x_1^2 + x_2^2 = 10$, then the value of p is equal to
a. – 4 or 4 b. –3 or 3 c. –2 or 2 d. –1 or 1

173. The product and sum of the roots of the equation $|x^2| - 5|x| - 24 = 0$ are respectively
a. – 64, 0 b. –24, 5 c. 5, –24 d. 0, 72

174. If the equations $x^2 + bx - 1 = 0$ and $x^2 + x + b = 0$ have a common root different from –1, then |b| is equal to
a. 2 b. 3 c. $\sqrt{3}$ d. $\sqrt{2}$

175. If the roots of the quadratic equation $mx^2 - nx + k = 0$ are tan 33° and tan12°, then the value of $\frac{2m+n+k}{m}$ is equal to
a. 0 b. 1 c. 2 d. 3

176. If α and β are the roots of $4x^2 + 2x - 1 = 0$, then $\beta =$

a. $-\frac{1}{4\alpha}$ b. $-\frac{1}{2\alpha}$ c. $-\frac{1}{\alpha}$ d. $-\frac{1}{3\alpha}$

177. If α and α^2 are the roots of the equation $x^2 - 6x + c = 0$, then the positive value of c is

a. 2 b. 3 c. 4 d. 8

178. If one of the roots of the quadratic equation $ax^2 - bx + a = 0$ is 6 then the value of $\frac{b}{a}$ is equal to

a. $\frac{1}{6}$ b. $\frac{11}{6}$ c. $\frac{37}{6}$ d. $\frac{6}{11}$

179. If the equation $2x^2 + (a + 3)x + 8 = 0$ has equal roots, then one of the values of a is

a. –9 b. –5 c. –11 d. 11

180. If p, q are the roots of the equation $x^2 + px + 1 = 0$, then

a. $p = 1, q = -2$ b. $p = 0, q = 1$
c. $p = -2, q = 0$ d. $p = -2, q = 1$

181. The number of integer values(s) of k for which the expression $x^2 - 2(4k - 1)x + 15k^2 - 2k - 7 > 0$ for every real number x is/are

a. none b. one
c. finitely many greater than 1
d. infinitely many

182. If α and β are the roots of $x^2 - \alpha x + b^2 = 0$, then $\alpha^2 + \beta^2$ is equal to

a. $2a^2 - b^2$ b. $a^2 + b^2$ c. $a^2 - 2b^2$ d. $a^2 - b^2$

183. Sum of the roots of the equation $|x - 3|^2 + |x - 3| - 2 = 0$ is equal to

a. 2 b. 4 c. 6 d. 16

184. The quadratic equation whose roots are three times the roots of the equation $2x^2 + 3x + 5 = 0$, is

a. $2x^2 + 9x + 45 = 0$ b. $2x^2 + 9x - 45 = 0$
c. $5x^2 + 9x + 45 = 0$ d. $2x^2 - 9x + 45 = 0$

185. If x is real number, then $\frac{x}{x^2 - 5x + 9}$ must lie between

a. $\frac{1}{11}$ and 1 b. -1 and $\frac{1}{11}$
c. –11 and 1 d. $-\frac{1}{11}$ and 1

186. If the roots of the equation $(x - a)(x - b) + (x - b)(x - c) + (x - c)(x - a) = 0$ are equal then $a^2 + b^2 + c^2 =$

a. $a + b + c$ b. $2a + b + c$
c. 3abc d. $ab + bc + ca$

187. If one root of a quadratic equation is $\frac{1}{1+\sqrt{3}}$, then the quadratic equation is

a. $2x^2 + x - 1 = 0$ b. $2x^2 - 2x - 1 = 0$
c. $2x^2 + 2x + 1 = 0$ d. $2x^2 + 2x - 1 = 0$

188. Given that x is a real number satisfying $\frac{5x^2 - 26x + 5}{3x^2 - 10x + 3} < 0$, then

a. $x < \frac{1}{5}$ b. $\frac{1}{5} < x < 3$
c. $x > 5$ d. $\frac{1}{5} < x < \frac{1}{3}$ or $3 < x < 5$

189. Which of the following is/are always false?

a. A quadratic equation with rational coefficients has zero or two irrational roots
b. A quadratic equation with real coefficients has zero or two non-real roots
c. A quadratic equation with irrational coefficients has zero or two rational roots
d. A quadratic equation with integer coefficients has zero or two irrational roots

190. The equation whose roots are the squares of the roots of the equation $2x^2 + 3x + 1 = 0$ is

a. $4x^2 + 5x + 1 = 0$ b. $4x^2 - x + 1 = 0$
c. $4x^2 - 5x - 1 = 0$ d. $4x^2 - 5x + 1 = 0$

191. The value of x such that $3^{2x} - 2(3^{x+2}) + 8a = 0$ is

a. 1 b. 2 c. 3 d. 4

192. If α and β are the roots of the equation $x^2 + 3x - 4 = 0$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ is equal to

a. $\frac{-3}{4}$ b. $\frac{3}{4}$ c. $\frac{-4}{3}$ d. $\frac{4}{3}$

193. If the equations $x^2 + 2x + 3 = 0$ and $ax^2 + bx + c = 0$, a, b, $c \in R$ have a common root, then a : b : c is

a. 3 : 2 : 1 b. 1 : 3 : 2 c. 3 : 1 : 2 d. 1 : 2 : 3

194. Let a and b be the roots of the equation $px^2 + qx + r = 0$. If p, q, r are in A.P. and $\alpha + \beta = 4$, then $\alpha\beta$ is equal to

a. –9 b. 9 c. –5 d. 5

195. The quadratic equation $(x - a)(x - b) + (x - b)(x - c) + (x - c)(x - a) = 0$ has equal roots if

a. $a \neq b, b = c$ b. $a = b, b \neq c$
c. $a \neq b, b \neq c$ d. $a = b = c$

196. If $|x^2 - x - 6| = x + 2$, then the values of x are

a. –2, 2, –4 b. –2, 2, 4 c. 3, 2, –2 d. 4, 4, 3

197. If α, β are the roots of the quadratic equation $x^2 + ax + b = 0$, $(b \neq 0)$, then the quadratic equation whose roots are $\alpha - \frac{1}{\beta}, \beta - \frac{1}{\alpha}$ is

a. $ax^2 + a(b - 1)x + (a - 1)^2 = 0$
b. $bx^2 + a(b - 1)x + (b - 1)^2 = 0$
c. $x^2 + ax + b = 0$ d. $abx^2 + bx + a = 0$

198. Let α and β be the roots of equation $x^2 - (a - 2)x - a - 1 = 0$, then $\alpha^2 + \beta^2$ assumes the least value if

a. $a = 0$ b. $a = 1$ c. $a = -1$ d. $a = 2$

199. One root of $mx^2 - 14x + 8 = 0$ is 6 times the other root.

Then m is
a. 2 b. 1
c. 3 d. None of these

200. The number of real values of x which satisfy the equation $\left|\frac{x}{x-1}\right|+|x|=\frac{x}{|x-1|}$ is
a. 2 b. 1 c. infinite d. zero

201. If sinθ and cosθ are the roots of the equation $ax^2 + bx + c = 0$, $a \neq 0$, then the relation between the coefficients of the equation is
a. $a^2 - b^2 + 2ac = 0$ b. $a^2 + b^2 + 2ac = 0$
c. $a^2 - b^2 - 2ac = 0$ d. $a^2 + b^2 - 2ac = 0$

202. Let a, b, c be positive real numbers. If $\frac{x^2 - bx}{ax - c} = \frac{m-1}{m+1}$ has two roots which are numerically equal but opposite in sign, then the value of m is
a. c b. 1/c c. $\frac{a+b}{a-b}$ d. 1

203. The number of real roots of the equation $|x|^2 - 3|x| + 2 = 0$ is
a. 1 b. 2 c. 3 d. 4

204. If (1 + i) is a root of the equation $x^2 - x + (1 - i) = 0$, then the other root is
a. 1 – i b. i c. – i d. 2i

205. The value of a for which the equation $2x^2 + 2\sqrt{6}x + a = 0$ has equal roots is
a. 3 b. 4 c. 2 d. $\sqrt{3}$

206. The quadratic equation $x^2 + 15|x| + 14 = 0$ has
a. only positive solutions b. only negative solutions
c. no solution
d. both positive and negative solution

207. If the equation $(a + 1)x^2 - (a + 2)x + (a + 3) = 0$ has roots equal in magnitude, but opposite in signs, then the roots of the equation are
a. ±a b. $\pm\frac{1}{2}a$ c. $\pm\frac{3}{2}a$ d. ±2a

208. If $x^2 + 4ax + 2 > 0$ for all values of x, then a lies in the interval
a. (–2, 4) b. (1, 2)
c. $(-\sqrt{2}, \sqrt{2})$ d. $\left(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$

209. If 2 – i is a root of the equation $ax^2 + 12x + b = 0$ (where a and b are real), then the value of ab is equal to
a. 45 b. 15 c. –15 d. –45

210. If the roots of the equation $\frac{1}{x+p}+\frac{1}{x+q}=\frac{1}{r}$, $(x \neq -p, x \neq -q, r \neq 0)$ are equal in magnitude but oppostite in sign, then p + q is equal to
a. r b. 2r c. r^2 d. 1/r

211. If one root of equation $x^2 + ax + 12 = 0$ is 4 while the equation $x^2 + ax + b = 0$ has equal roots, then the value of b is
a. $\frac{4}{49}$ b. $\frac{49}{4}$ c. $\frac{7}{4}$ d. $\frac{4}{7}$

212. The quadratic equation whose roots are three times the roots of $3ax^2 + 2bx + c = 0$ is
a. $ax^2 + 3bx + 3c = 0$ b. $ax^2 + 3bx + c = 0$
c. $9ax^2 + 9bx + c = 0$ d. $ax^2 + bx + 3c = 0$

213. If $x^2 + 2x + n > 0$ for all real number x, then which of the following conditions is true?
a. n < 11 b. n = 10 c. n = 11 d. n > 11

214. If a is positive and if A and G are the arithmetic mean and the geometric mean of the roots of $x^2 - 2ax + a^2 = 0$ respectively, then
a. A = G b. A = 2G c. 2A = G d. $A^2 = G$

215. If the difference between the roots of the equation $x^2 + ax + 1 = 0$ is less than $\sqrt{5}$, then the set of possible values of a is
a. (3, ∞) b. (–∞, –3) c. (–3, 3) d. (–3, ∞)

216. If secα and cosecα are the roots of the equation $x^2 - px + q = 0$, then
a. $p^2 = p + 2q$ b. $q^2 = p + 2q$
c. $p^2 = q(q + 2)$ d. $q^2 = p(p + 2)$

217. The number of roots of the equation $|x| = x^2 + x - 4$ is
a. 4 b. 3 c. 1 d. 2

218. For real roots, the solution of the equation $2^{x^2} : 2^{2x} = 8:1$ is
a. 1, 2 b. 2, 3
c. 3, –1 d. None of these

219. The equation |x + 2| = –2 has
a. only one solution
b. infinite number of solutions
c. no solution d. None of these

220. If roots of the equation $x^2 + \alpha^2 = 8x + 6\alpha$ are real, then which one is correct?
a. $-2 \le \alpha \le 8$ b. $2 \le \alpha \le 8$
c. $-2 < \alpha \le 8$ d. $-2 \le \alpha < 8$

221. If x and 'a' are real, then the value of 'a' for which $x^2 - \frac{3ax}{2} + 1 - a^2$ is positive is
a. $-\frac{4}{25}$ b. $\frac{4}{25}$ c. $|a| > \frac{4}{5}$ d. $|a| < \frac{4}{5}$

222. One of the roots of the equation $2x^3 - 9x^2 + kx - 13 = 0$ is 2 + 3i. What will be the real root of the equation?
a. 1 b. $\frac{1}{4}$ c. $-\frac{1}{2}$ d. $\frac{1}{2}$

223. The sum of all real values of x satisfying the equation $(x^2 - 5x + 5)^{x^2 + 4x - 60} = 1$ is
a. 3 b. – 4 c. 6 d. 5

224. If x is real, then the maximum value of $x^2 - 8x + 17$ is
a. 2 b. 4 c. 1 d. 3

225. The solution set of the inequation $\frac{x^2 + 6x - 7}{|x + 4|} < 0$ is
a. (–7, – 4) b. (–7, – 4) ∪ (4, 1)
c. (–7, 1) d. (–7, – 4) ∪ (– 4, 1)

226. If $(1 + x + x^2)^n = a_0 + a_1x + a_2x^2 + ... a_{2n}x^{2n}$, then $a_0 + a_3 + a_6 + ... =$
a. 3^{n+1} b. 3n
c. 3^{n-1} d. None of these

227. The number of points of intersection of the two curves y = 2sinx and $y = 5x^2 + 2x + 3$ is
a. 0 b. 1 c. 2 d. ∞

228. If α, β, γ are the roots of the equation $x^3 - 3x^2 + 2x - 1 = 0$ then the value of [(1 – α)(1 – β)(1 – γ)] is
a. 1 b. 2 c. –1 d. –2

229. If α, β, γ are the roots of the equation $x^3 + 4x + 2 = 0$, then $\alpha^3 + \beta^3 + \gamma^3 =$
a. – 6 b. 2 c. 6 d. –2

230. The value of b for which the equations $x^2 + bx - 1 = 0$, $x^2 + x + b = 0$, have one root in common is
a. $-\sqrt{2}$ b. $-i\sqrt{3}$ c. $i\sqrt{5}$ d. $\sqrt{2}$

231. The sum of all real roots of the equation $|x - 2|^2 + |x - 2| - 2 = 0$ is
a. 7 b. 4 c. 1 d. 5

232. The number of real roots of the equation $x^4 + \sqrt{x^4 + 20} = 22$ is
a. 4 b. 2 c. 0 d. 1

Permutation

233. The total number of 7 digit positive integral numbers with distinct digits that can be formed using the digits 4, 3, 7, 2, 1, 0, 5 is
a. 4320 b. 4340 c. 4310 d. 4230

234. The number of four digit numbers formed by using the digits 0, 2, 4, 5 and which are not divisible by 5, is
a. 10 b. 8 c. 6 d. 4

235. The number of points, having both co-ordinates as integers, that lie in the interior of the triangle with vertices (0, 0), (0, 41) and (41, 0), is
a. 820 b. 780 c. 901 d. 861

236. The number of 5-digit numbers (no digit is repeated) that can be formed by using the digits 0, 1, 2, ..., 7 is
a. 1340 b. 1860 c. 2340 d. 5880

237. A five digit number divisible by 3 is to be formed using the numerals 0, 1, 2, 3, 4 and 5, without repetition. The total number of ways, this can be done, is
a. 216 b. 240 c. 600 d. 720

238. How many four digit numbers abcd exist such that a is odd, b is divisible by 3, c is even and d is prime?
a. 380 b. 360 c. 400 d. 520

239. How many four digit numbers are there with distinct digits?
a. 5040 b. 4536 c. 30240 d. 5274

240. The number of 3-digit numbers of which at least one digit is 2, is
a. 251 b. 252 c. 270 d. 271

241. Sum of digits in the unit place formed by the digits 1, 2, 3, 4 taken all at a time is
a. 40 b. 84 c. 60 d. 10

242. There are 300 students in a college. Every student reads daily 5 newspapers and every newspaper is read by 60 students. The number of newspapers is
a. atleast 30 b. atmost 20
c. exactly 25 d. None of these

243. The number of even numbers of three digits which can be formed with digits 0, 1, 2, 3, 4 and 5 (no digit being used more than once) is
a. 60 b. 92 c. 52 d. 48

244. In how many ways 6 letters be posted in 5 different letter boxes?
a. 5^6 b. 6^5 c. 5! d. 6!

245. The number of positive integers less than 40,000 that can be formed by using all the digits 1, 2, 3, 4 and 5 is equal to
a. 24 b. 78 c. 32 d. 72

246. In an examination, there are three multiple choice questions an each question has 4 choices. Number of ways in which a student can fail to get all answers correct is
a. 11 b. 12 c. 27 d. 63

247. How many 10-digit numbers can be written by using the digits 1 and 2?
a. ${}^{10}C_1 + {}^9C_2$ b. 2^{10} c. ${}^{10}C_2$ d. 10!

248. In all the words, (with or without meaning), are written using the letters of the word QUEEN and are arranged as in English dictionary, then the position of the word QUEEN is
a. 47^{th} b. 44^{th} c. 45^{th} d. 46^{th}

249. The number of words that can be formed by using all the letters of the word PROBLEM only once is
a. 5! b. 6! c. 7! d. 8!

250. The number of all numbers having 5 digits, with distinct digits is
a. 99999 b. $9 \times {}^9P_4$ c. ${}^{10}P_5$ d. ${}^9P_4$

251. In all the words (with or without meaning) having five letters, formed using the letters of the word SMALL and arranged as in a dictionary, then the position of the word SMALL is
a. 46th b. 59th c. 52nd d. 58th

252. If ${}^nP_4 = 5({}^nP_3)$, then the value of n is equal to
a. 5 b. 6 c. 7 d. 8

253. The number of ways in which the letters of the wrod ARRANGE can be permuted such that the R's occur together is
a. $\frac{\lfloor 7}{\lfloor 2 \lfloor 2}$ b. $\frac{\lfloor 7}{\lfloor 2}$ c. $\frac{\lfloor 6}{\lfloor 2}$ d. $\lfloor 5 \times \lfloor 2$

254. The letters of the word COCHIN are permuted and all permutations are arranged in an alphabetical order as in an English dictionary. The number of words that appear before the word COCHIN is
a. 96 b. 48 c. 183 d. 267

255. Find the number of ways in which 52 cards can be divided into 4 sets, three of them having 17 cards each and the fourth one having just one card.
a. $\frac{\lfloor 52}{(\lfloor 17)^3}$ b. $\frac{\lfloor 52}{(\lfloor 17)^3 \lfloor 3}$ c. $\frac{\lfloor 51}{(\lfloor 17)^3}$ d. $\frac{\lfloor 51}{(\lfloor 17)^3 \lfloor 3}$

256. How many numbers greater than 10,00,000 be formed from 2, 3, 0, 3, 4, 2, 3?
a. 420 b. 360 c. 400 d. 300

257. The number of integers greater than 6,000 that can be formed, using the digits 3, 5, 6, 7 and 8 without repetition, is
a. 120 b. 72 c. 216 d. 192

258. The number of ways in which the letters of the word ARTICLE can be rearrange so that the even places are always occupied by consonants is
a. 576 b. ${}^4C_3 \times (4!)$
c. 2(4!) d. None of these

259. If m_1 and m_2 satisfy the relation
${}^{m+5}P_{m+1} = \frac{11}{2}(m-1)({}^{m+3}P_m)$, then $m_1 + m_2$ is equal to
a. 10 b. 9 c. 13 d. 17

260. If ${}^{56}P_{r+6} : {}^{54}P_{r+3} = 30800 : 1$, then
a. r = 41 b. r = 51
c. r = 31 d. None of these

261. If $8!\left[\frac{1}{3!}+\frac{5}{4!}\right] = {}^9P_r$, then the value of r is equal to
a. 4 b. 5 c. 3 d. 2

262. If ${}^{12}P_r = {}^{11}P_6 + 6 \cdot {}^{11}P_5$, then r =
a. 7 b. 5 c. 6 d. 4

263. If ${}^{m+n}P_2 = 90$ and ${}^{m-n}P_2 = 30$, then (m, n) is given by (m and n are positive integers)
a. (8, 2) b. (5, 6) c. (3, 7) d. (8, 3)

264. Six identical coins are arranged in a row. The total number of ways in which the number of heads is equal to the number of tails is
a. 9 b. 15 c. 20 d. 40

265. If n is any positive integer, then $\frac{1}{2^n}({}^{2n}P_n) =$
a. 2.4.6. .....(2n) b. 1.2.3. ... n
c. 1. 3.5. .... (2n – 1) d. 1. 2. 3. ....(3n)

266. There are 5 letters and 5 different envelopes. The number of ways in which all the letters can be put in wrong envelope, is
a. 119 b. 44 c. 59 d. 40

267. The number of words that can be written using all the letters of the word 'IRRATIONAL' is
a. $\frac{10!}{(2!)^3}$ b. $\frac{10!}{(2!)^2}$ c. $\frac{10!}{2!}$ d. 10!

268. Four speakers will address a meeting where speaker Q will always speak after speaker P. Then the number of ways in which the order of speakers can be prepared is
a. 256 b. 128 c. 24 d. 12

269. If $(n + 2)! = 2550 \times n!$, then the value of n is equal to
a. 48 b. 49 d. 50 d. 51

270. Number of ways in which 7 distinct objects can distributed among 4 children
a. P(7, 4) b. 7!
c. 4! d. None of these

271. The number of permutations by taking all letters and keeping the vowels of the word COMBINE in the odd places is
a. 96 b. 144 c. 512 d. 576

272. If P_m stands for ${}^mP_m$, then $1 + 1.P_1 + 2.P_2 + 3.P_3 + ...+ n.P_n$ is equal to
a. n! b. (n + 3)! c. (n + 2)! d. (n + 1)!

273. The range of the function $f(x) = {}^{7-x}P_{x-3}$ is

a. {1, 2, 3, 4} b. {3, 4, 5, 6}
c. {0, 1, 2, 3, 4, 5} d. {1, 2, 3}

274. The number of seven digit integers, with sum of the digits equal to 10 and formed by using the digits 1, 2, and 3 only, is
a. 55 b. 66 c. 77 d. 88

275. If one person handshakes with the other only once and number of handshakes is 66, then number of persons will be
a. 10 b. 33 c. 24 d. 12

276. In how many number of ways can 10 students be divided into three teams, one containing four students and the other three?
a. 400 b. 700 c. 1050 d. 2100

277. How many odd numbers of six significant digits can be formed with the digits 0, 1, 2, 5, 6, 7 when no digit is repeated?
a. 120 b. 96 c. 360 d. 288

278. The number of ways five boys can be seated around a round-table in five chairs of different colours is
a. 24 b. 12 c. 23 d. 64

279. The number of permutations of the letters of the word 'CONSEQUENCE' in which all the three E's are together is
a. 9! 3! b. $\frac{9!}{2!}$ c. $\frac{9!}{2!2!3!}$ d. $\frac{9!}{2!2!}$

280. The letters of the word 'TRIANGLE' are arranged in all possible ways. How many of them begin with A and end with N?
a. 120 b. 720 c. 1680 d. 60

281. A man X has 7 friends, 4 of them are ladies and 3 are men. His wife Y also has 7 friends, 3 of them are ladies and 4 are men. Assume X and Y have no common friends. Then the total number of ways in which X and Y together can throw a party inviting 3 ladies and 3 men, so that 3 friends of each of X and Y are in this party, is
a. 468 b. 469 c. 484 d. 485

282. The number of ways in which 5 boys and 3 girls can be seated on a round table if a particular boy B1 and a particular girl G3 never sit adjacent to each other, is
a. 7! b. 5 × 6! c. 6 × 6! d. 5 × 7!

Combination

283. The number of diagonals in a hexagon is
a. 8 b. 9 c. 10 d. 11

284. If ${}^nC_{r-1} = 36$, ${}^nC_r = 84$ and ${}^nC_{r+1} = 126$, then the value of r is
a. 9 b. 3 c. 4 d. 5

285. If ${}^xC_{15} = {}^xC_{14}$, Then the value of ${}^xC_{29}$ is equal to
a. 6 b. 1 c. 8 d. 9

286. If ${}^nC_2 + {}^nC_3 = {}^6C_3$ and ${}^nC_2 = {}^nC_3$, $x \neq 3$, then the value of x is equal to
a. 5 b. 4 c. 2 d. 6

287. If $\sum_{k=0}^{18} \frac{k}{{}^{18}C_k} = a\sum_{k=0}^{18} \frac{1}{{}^{18}C_k}$, then the value of a is equal to
a. 3 b. 9 c. 6 d. 18

288. If $\frac{1}{{}^5C_r} + \frac{1}{{}^6C_r} = \frac{1}{{}^4C_r}$, then the value of r equals to
a. 4 b. 2 c. 5 d. 3

289. If ${}^nC_{r-1} = 36$, ${}^nC_r = 84$ and ${}^nC_{r+1} = 126$, then the value of ${}^nC_8$ is
a. 10 b. 7 c. 9 d. 8

290. Given 5 line segments of lengths 2, 3, 4, 5, 6 units. Then, the no. of triangles that can be formed by joining these segments is
a. ${}^5C_3 - 3$ b. ${}^5C_3$ c. ${}^5C_3 - 1$ d. ${}^5C_3 - 2$

291. T_m denotes the number of triangles that can be formed with the vertices of a regular polygon of m sides. If $T_{m+1} - T_m = 15$, then m =
a. 3 b. 6 c. 9 d. 12

292. The number of ways of selecting 15 teams from 15 men and 15 women, such that each team consists of a man and a woman, is
a. 1120 b. 1240 c. 1880 d. 1960

293. Let $A = \{x_1, x_2, ..., x_7\}$ and $B = \{y_1, y_2, y_3\}$ be two sets containing seven and three distinct elements respectively. Then the total number of functions $f : A \rightarrow B$ that are onto, if there exist exactly three elements x in A such that $f(x) = y_2$, is equal to
a. $14.{}^7C_2$ b. $16.{}^7C_3$ c. $12.{}^7C_2$ d. $14.{}^7C_3$

294. If in a regular polygon, the number of diagonals is 54, then the number of sides of the polygon is
a. 10 b. 12 c. 9 d. 6

295. If ${}^{32}P_6 = k({}^{32}C_6)$, then k is equal to
a. 6 b. 24 c. 120 d. 720

296. The value of x satisfying the relation $11({}^xC_3) = 24({}^{(x+1)}C_2)$ is
a. 8 b. 9 c. 11 d. 10

297. ${}^{m}C_{r+1} + \sum_{k=m}^{n} {}^{k}C_r =$

a. ${}^{n}C_{r+1}$ b. ${}^{n+1}C_{r+1}$
c. ${}^{n}C_r$ d. None of these

298. $\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + 3\frac{C_3}{C_2} + ... + n\frac{C_n}{C_{n-1}} =$

a. $\frac{n(n-1)}{2}$ b. $\frac{n(n+1)}{2}$
c. $\frac{n(n+1)(n+2)}{2}$ d. None of these

299. Out of thrity points in a plane, eight of them are collinear. The number of straight lines that can be formed by joining these points is

a. 540 b. 408 c. 348 d. 296

300. Six cards and six envelopes are numbered 1, 2, 3, 4, 5, 6 and cards are to be placed in envelopes so that each envelope contains exactly one card and no card is placed in the envelope bearing the same number and moreover the card numbered 1 is always placed in envelope numbered 2. Then the number of ways it can be done is

a. 264 b. 265 c. 53 d. 67

301. Find ${}^{n}C_{21}$ if ${}^{n}C_{10} = {}^{n}C_{11}$.

a. 1 b. 0 c. 11 d. 10

302. Determine n if ${}^{2n}C_2 : {}^{n}C_2 = 9 : 2$

a. 5 b. 4 c. 3 d. 2

303. The value of ${}^{10}C_1 - {}^{10}C_2 + {}^{10}C_3 - {}^{10}C_4 + {}^{10}C_5 - {}^{10}C_6 + {}^{10}C_7 - {}^{10}C_8 + {}^{10}C_9$ is

a. 0 b. 2 c. 10 d. 252

304. Let T_n denote the number of triangles which can be formed by using the vertices of a regular polygon of n sides. If $T_{n+1} - T_n = 36$, then n is equal to

a. 2 b. 5 c. 6 d. 9

305. Total number of ways in which five '+' and three '–' signs can be arranged in a line such that no two '–' signs occur together is

a. 10 b. 20
c. 15 d. None of these

306. A box contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the box, if at least one black ball is to be included in the draw?

a. 64 b. 24 c. 3 d. 12

307. Let T_n be the number of all possible triangles formed by joining vertices of an n-sided regular polygon. If $T_{n+1} - T_n = 10$, then the value of n is

a. 5 b. 10 c. 8 d. 7

308. If ${}^{n}C_r + {}^{n}C_{r+1} = {}^{n+1}C_x$, then x = ?

a. r b. r – 1 c. n d. r + 1

309. There are 12 points in a plane. The number of straight lines joining any two of them, when 3 of them are collinear, is

a. 60 b. 63 c. 64 d. 65

310. The value of $C_0 + 3C_1 + 5C_2 + 7C_3 + ... + (2n + 1)C_n$ is

a. 2^n b. $(n + 1)2^n$
c. $(n + 2)2^{n-2}$ d. None of these

311. Choose 3, 4, 5 points other than vertices respectively on the sides AB, BC and CA of a triangle ABC. tHE number of triangles than can be formed using only these points as vertices is

a. 220 b. 217 c. 215 d. 205

312. If ${}^{n}C_{r-1} = 36$ and ${}^{n}C_r = 84$, then

a. $13r - 3n - 3 = 0$ b. $10r - 3n - 30 = 0$
c. $10r + 3n - 3 = 0$ d. $10r - 3n - 3 = 0$

313. The total number of ways in which 30 books can be distributed among 5 students is

a. ${}^{30}C_5$ b. ${}^{34}C_5$ c. ${}^{30}C_4$ d. ${}^{34}C_4$

314. The value of ${}^{10}C_1 + {}^{10}C_2 + {}^{10}C_3 + ... + {}^{10}C_9$ is

a. $2^{10} - 1$ b. 2^{10} c. 2^{11} d. $2^{10} - 2$

315. There are 10 persons including 3 ladies. A committee of 4 persons including at least one lady is to be formed. The number of ways of forming such a committee is

a. 160 b. 170 c. 180 d. 155

316. The number of diagonals in a regular polygon of 100 sides is

a. 4950 b. 4850 c. 4750 d. 4650

317. The expression ${}^{n}C_0 + 2\,{}^{n}C_1 + 3\,{}^{n}C_2 + ... + (n + 1)\,{}^{n}C_n$ is equal to

a. $(n + 1)2^n$ b. $2^n(n + 2)$
c. $(n + 2)2^{n-1}$ d. $(n + 2)2^{n+1}$

318. **Statement - 1** : The number of ways of distributing 10 identical balls in 4 distinct boxes such that no box is empty is ${}^{9}C_3$.
Statement - 2 : The number of ways of choosing any 3 places from 9 different places is ${}^{9}C_3$.

a. Statement -1 is true, Statement - 2 is false.
b. Statement - 1 is false, Statement - 2 is true.
c. Statement - 1 is true, Statement - 2 is true; Statement - 2 is a correct explanation for statement - 1.
d. Statement- 1 is true, Statement - 2 is true; Staement -2 is not a correct explanation for statement -1

319. A student is allowed to select at most n books from a collection of (2n + 1) books. If the total number of ways in which he can select a book is 255, then the value of n equal to

a. 6 b. 5 c. 4 d. 3

320. If ${}^nC_3 + {}^nC_4 > {}^{n+1}C_3$, then
a. $n > 6$ b. $n > 7$
c. $n < 6$ d. None of these

321. If ${}^nC_{r-1} = 28$, ${}^nC_r = 56$ and ${}^nC_{r+1} = 70$, then the value of r is equal to
a. 1 b. 2 c. 3 d. 4

322. A man has 6 friends. No. of different ways he can invite 2 or more for a dinner is
a. 56 b. 72 c. 28 d. 57

323. The number of diagonals in a polygon is 20. The number of sides of the polygon is
a. 5 b. 6 c. 8 d. 10

324. ${}^{15}C_3 + {}^{15}C_5 + ... + {}^{15}C_{15} =$
a. 2^{14} b. $2^{14} - 15$ c. $2^{14} + 15$ d. $2^{14} - 1$

325. If ${}^nC_1 + 2\,{}^nC_2 + ... + n\,{}^nC_n = 2n^2$, then n =
a. 4 b. 2 c. 1 d. 8

326. Let $S_1 = \sum_{j=1}^{10} j(j-1)\,{}^{10}C_j$, $S_2 = \sum_{j=1}^{10} j\,{}^{10}C_j$ and

$$S_3 = \sum_{j=1}^{10} j^2\,{}^{10}C_j$$

Statement-1 : $S_3 = 55 \times 2^9$.
Statement-2 : $S_1 = 90 \times 2^8$ and $S_2 = 10 \times 2^8$.
a. Statement - 1 is true, Statement - 2 is true; Statement - 2 is a correct explanation for statement - 1.
b. Statement- 1 is true, Statement - 2 is true; Staement -2 is not a correct explanation for statement -1
c. Statement -1 is true, Statement - 2 is false.
d. Statement - 1 is false, Statement - 2 is true.

327. There are two urns. Urn A has 3 distinct red balls and urn B has 9 distinct blue balls. From each urn two balls are taken out at random and then transferred to the other. The number of ways in which this can be done is
a. 3 b. 36 c. 66 d. 108

328. The number of ways of selecting a boy and a girl from a class consisting of 20 boys and 30 girls is
a. 50 b. 10 c. 600 d. 1300

329. The number of positive integers satisfying the inequality ${}^{n+1}C_{n-2} - {}^{n+1}C_{n-1} \le 50$ is
a. 9 b. 8 c. 7 d. 6

330. The straight lines L_1, L_2, L_3 are parallel and lie in the same plane. A total of m points are taken on L_1, n points on L_2, k points on L_3. The maximum number of triangles formed with vertices at these points are
a. ${}^{m+n+k}C_3$ b. ${}^{m+n+k}C_3 - {}^mC_3 - {}^nC_3$
c. ${}^{m+n+k}C_3 + {}^mC_3 + {}^nC_3$ d. None of these

331. The number of triangles in a complete graph with 10 non-collinear vertices is
a. 360 b. 240 c. 120 d. 60

332. The number of diagonals of a polygon of 20 sides is
a. 210 b. 190 c. 180 d. 170

333. Let T_n denote the number of triangles which can be formed by using the vertices of a regular polygon of n sides. If $T_{n+1} - T_n = 28$, then n equals
a. 4 b. 5 c. 6 d. 8

334. ${}^{15}C_8 + {}^{15}C_9 - {}^{15}C_6 - {}^{15}C_7 =$
a. 1 b. 2
c. 0 d. None of these

335. In a shop there are five types of ice-creams available. A child buys six ice-creams.
Statement-1 : The number of different ways the child can buy the six ice-creams is ${}^{10}C_5$.
Statement-2 : The number of different ways the child can buy the six ice-creams is equal to the number of different ways of arranging 6 A's and 4 B's in a row.
a. Statement -1 is true, Statement - 2 is false.
b. Statement - 1 is false, Statement - 2 is true.
c. Statement - 1 is true, Statement - 2 is true; Statement - 2 is a correct explanation for statement - 1.
d. Statement- 1 is true, Statement - 2 is true; Staement -2 is not a correct explanation for statement -1

336. How many different words can be formed by jumbling the letters in the word MISSISSIPPI in which no two S are adjacent?
a. $7 \,.\, {}^6C_4 \,.\, {}^8C_4$ b. $8 \,.\, {}^6C_4 \,.\, {}^7C_4$
c. $6 \,.\, 7 \,.\, {}^8C_4$ d. $6 \,.\, 8 \,.\, {}^7C_4$

337. The number of ways in which n ties can be selected from a rack displaying 3n different ties is
a. $3 \times n!$ b. $\frac{3n!}{n!2n!}$ c. $\frac{3n!}{2n!}$ d. 3n!

338. Out of 8 given points, 3 are collinear. How many different straight lines can be drawn by joining any two points from those 8 points?
a. 26 b. 28 c. 27 d. 25

339. If ${}^{16}C_r = {}^{16}C_{r+2}$ then the value of ${}^rP_{r-3}$ is
a. 31 b. 120 c. 210 d. 840

340. ${}^{2n}P_n$ is equal to
a. $(n + 1)! \times ({}^{2n}C_n)$ b. $n! \times ({}^{2n}C_n)$
c. $n! \times ({}^{2n+1}C_n)$ d. $n! \times ({}^{2n+1}C_{n+1})$

Binomial Theorem

341. The value of $({}^{21}C_1 - {}^{10}C_1) + ({}^{21}C_2 - {}^{10}C_2) + {}^{21}C_3 - {}^{10}C_3) + ({}^{21}C_4 - {}^{10}C_4) + .. + ({}^{21}C_{10} - {}^{10}C_{10})$ is
a. $2^{21} - 2^{10}$ b. $2^{20} - 2^9$
c. $2^{20} - 2^{10}$ d. $2^{21} - 2^{11}$

342. If ${}^nC_r$ denotes the binomial coefficient then which of the following formula is correct?
a. ${}^{n+1}C_r - {}^nC_{r-1} = {}^nC_r$ b. ${}^{n+1}C_r - {}^{n-1}C_r = {}^nC_r$
c. ${}^nC_{r+1} - {}^nC_{r-1} = {}^nC_r$ d. ${}^{n-1}C_r + {}^nC_r = {}^{n-1}C_r$

343. If n is a positive integer, then $(3^{4n} - 4^{3n})$ is always divisible by
a. 7 b. 12 c. 17 d. 45

344. The sum of the coefficients in the binomial expansion of $\left(\frac{1}{x} + 2x\right)^6$ is equal to
a. 1024 b. 729 c. 243 d. 512

345. If A = {4n – 3n – 1 : n ∈ N} and B = {9(n – 1) : n ∈ N}, then
a. $B \subset A$ b. $A \cup B = N$
c. $A \subset B$ d. None of these

346. If n is a positive integer, then $(\sqrt{3}+1)^{2n} - (\sqrt{3}-1)^{2n}$ is
a. an even positive integer.
b. a rational number other than positive integer.
c. an irrational number.
d. an odd positive integer.

347. If n is an even integer, then the value of ${}^nC_0 + {}^nC_2 + {}^nC_4 + ... + {}^nC_n$ equals to
a. 2^n b. 2^{n+1} c. 2^{n-1} d. 2^{2n}

348. If $(1 + ax)^n = 1 + 6x + \frac{27}{2}x^2 + ... + a^n x^n$, then the values of a and n are respectively
a. 2, 3 b. 3, 2 c. $\frac{3}{2}$, 4 d. 1, 6

349. The product of r consecutive integers is divisible by
a. r! b. (r – 1)!
c. (r + 1)! d. None of these

350. The value of $({}^7C_0 + {}^7C_1) + ({}^7C_1 + {}^7C_2) + ... + ({}^7C_6 + {}^7C_7)$ is
a. $2^8 - 1$ b. $2^8 + 1$ c. 2^8 d. $2^8 - 2$

351. If n = 5, then $({}^nC_0)^2 + ({}^nC_1)^2 + ({}^nC_2)^2 + ... + ({}^nC_5)^2$ is equal to
a. 250 b. 254 c. 245 d. 252

352. The total number of terms in the expansion of $(x + a)^{47} - (x - a)^{47}$ after simplification is
a. 24 b. 96 c. 47 d. 48

353. The coefficient of x^5 in the expansion of $(1 + x^2)^5(1 + x)^4$ is
a. 30 b. 60 c. 40 d. 10

354. The coefficient of x^4 in the expansion of $(1 - 2x)^5$ is equal to
a. 40 b. 320 c. –320 d. 80

355. If the 7^{th} and 8^{th} term of the binomial expansion $(2a - 3b)^n$ are equal, then $\frac{2a+3b}{2a-3b}$ is equal to
a. $\frac{n-13}{n+1}$ b. $\frac{n+1}{13-n}$ c. $\frac{6-n}{13-n}$ d. $\frac{n-1}{13-n}$

356. The greatest value of the term independent of x, as α varies over R, in the expansion of $\left(x\cos\alpha + \frac{\sin\alpha}{x}\right)^{10}$ is
a. ${}^{10}C_5$ b. $\left(\frac{1}{2}\right)^5 {}^{10}C_5$
c. $\left(\frac{1}{2}\right)^4 {}^{10}C_5$ d. $\left(\frac{1}{2}\right)^3 {}^{10}C_5$

357. The coefficient of x^4 in the expansion of $(1 - x + x^2 - x^3)^4$ is
a. 31 b. 30 c. 25 d. –14

358. If the number of terms in the expansion of $\left(1 - \frac{2}{x} + \frac{4}{x^2}\right)^n$, $x \neq 0$ is 28, then the sum of the coefficients of all the terms in this expansion is
a. 64 b. 2187 c. 243 d. 729

359. The coefficient of x^2 in the expansion of $(1 + x + x^2 + x^3)^{10}$ is
a. 42 b. 43 c. 44 d. 55

360. The 11^{th} term in the expansion of $\left(x + \frac{1}{\sqrt{x}}\right)^{14}$ is
a. $\frac{999}{x}$ b. $\frac{1001}{x}$ c. i d. $\frac{x}{1001}$

361. In the expansion of (x – 1)(x – 2) .... (x – 18), the coefficient of x^{17} is
a. 684 b. –171 c. 171 d. –342

362. If in the expansion of $(1 + px)^n$, n ∈ N, the coefficient of x and x^2 are 8 and 24, then
a. n = 3, p = 2 b. n = 5, p = 3
c. n = 4, p = 3 d. n = 4, p = 2

363. The middle term of expansion $\left(\frac{10}{x} + \frac{x}{10}\right)^{10}$ is
a. ${}^8C_5$ b. ${}^{10}C_5$ c. ${}^7C_5$ d. ${}^9C_5$

364. If the coefficients of x^5 and x^6 in $\left(2+\frac{x}{3}\right)^n$ are equal, then n is
a. 51 b. 31
c. 41 d. None of these

365. The term independent of x in the expansion of $\left(\sqrt{x}-\frac{2}{\sqrt{x}}\right)^{18}$ is
a. $\binom{18}{9}2^{12}$ b. $\binom{18}{6}2^{6}$
c. $\binom{18}{6}2^{8}$ d. $-\binom{18}{9}2^{9}$

366. If the coefficients of x^3 and x^4 in the expansion of $(1 + ax + bx^2)(1 - 2x)^{18}$ in powers of x are both zero, then (a, b) is equal to
a. $\left(14,\frac{251}{3}\right)$ b. $\left(14,\frac{272}{3}\right)$
c. $\left(16,\frac{272}{3}\right)$ d. $\left(16,\frac{251}{3}\right)$

367. If 21^{st} and 22^{nd} terms in the expansion of $(1 + x)^{44}$ are equal, then x is equal to
a. $\frac{8}{7}$ b. $\frac{21}{22}$ c. $\frac{7}{8}$ d. $\frac{23}{24}$

368. If the coefficient of x^8 in $\left(ax^2+\frac{1}{bx}\right)^{13}$ is equal to the coefficient of x^{-8} in $\left(ax-\frac{1}{bx^2}\right)^{13}$, then a and b will satisfy the relation
a. $ab + 1 = 0$ b. $ab = 1$
c. $a = 1 - b$ d. $a + b = -1$

369. The value of the sum $({}^nC_1)^2 + ({}^nC_2)^2 + ({}^nC_3)^2 + \ldots + ({}^nC_n)^2$ is
a. $({}^{2n}C_n)^2$ b. ${}^{2n}C_n$ c. ${}^{2n}C_n + 1$ d. ${}^{2n}C_n - 1$

370. Let t_n denote the n^{th} term in a binomial expansion. If $\frac{t_6}{t_5}$ in the expansion of $(a + b)^{n+4}$ and $\frac{t_5}{t_4}$ in the expansion of $(a + b)^n$ are equal, then n is
a. 9 b. 11 c. 13 d. 15

371. If the $(3r)^{th}$ and $(r + 2)^{th}$ terms in the binomial expansion of $(1 + x)^{2n}$ are equal, then
a. $n = r$ b. $n = r + 1$ c. $n = 2r$ d. $n = 2r + 1$

372. The total number of terms in the expansion of $(1 + x)^{2n} - (1 - x)^{2n}$ after simplification is
a. $n + 1$ b. $n - 1$ c. n d. 4n

373. If $(2r + 3)^{th}$ and $(r - 1)^{th}$ terms in the expansion of $(1 + x)^{15}$ have equal coefficients, then r equals
a. 3 b. 4 c. 5 d. 6

374. The coefficient of x^{10} in the expansion of $1 + (1 + x) + \ldots + (1 + x)^{20}$ is
a. ${}^{19}C_9$ b. ${}^{20}C_{10}$ c. ${}^{21}C_{11}$ d. ${}^{22}C_{12}$

375. Let the coefficients of powers of x in the 2^{nd}, 3^{rd} and 4^{th} terms in the expansion of $(1 + x)^n$, where n is a positive integer, be in arithmetic progression. Then the sum of the coefficients of odd powers of x in the expansion is
a. 32 b. 64 c. 128 d. 256

376. If A and B are coefficients of x^n in the expansions of $(1 + x)^{2n}$ and $(1 + x)^{2n-1}$ respectively, then B/A is equal to
a. $\frac{1}{2}$ b. 2 c. 1 d. $\frac{1}{n}$

377. The coefficient of x^7 in the expansion of $(1 - x - x^2 + x^3)^6$ is
a. –144 b. 132 c. 144 d. –132

378. The value of r for which the coefficients of $(r - 5)^{th}$ and $(3r + 1)^{th}$ terms in the expansion of $(1 + x)^{12}$ are equal, is
a. 4 b. 9
c. 12 d. None of these

379. If A and B are coefficients of x^n in the expansions of $(1 + x)^{2n}$ and $(1 + x)^{2n-1}$ respectively, then A/B is equal to
a. 4 b. 2 c. 9 d. 6

380. In the binomial expansion of $(1 + x)^{15}$, the coefficients of x^r and x^{r+3} are equal. Then r is
a. 7 b. 8 c. 6 d. 4

381. If in the expansion $(a - 2b)^n$, the sum of the 5^{th} and 6^{th} term is zero, then the value of $\frac{a}{b}$ is
a. $\frac{n-4}{5}$ b. $\frac{2(n-4)}{5}$
c. $\frac{5}{n-4}$ d. $\frac{5}{2(n-4)}$

382. The total number of terms in the expansion of $(x + y)^{100} + (x - y)^{100}$ after simplification is
a. 100 b. 50 c. 51 d. 202

383. If $|x| < 1$, then the coefficient of x^6 in the expansion of $(1 + x + x^2)^{-3}$ is
a. 3 b. 6 c. 9 d. 12

384. If T_2/T_3 in the expansion of $(a + b)^n$ and T_3/T_4 in the expansion of $(a + b)^{n+3}$ are equal, then n =
a. 3 b. 4 c. 5 d. 6

385. In the expansion of $(2 - 3x^3)^{20}$, if the ratio of 10^{th} term to 11^{th} term is 45/22, then x =
a. 2/3 b. 3/2 c. –2/3 d. –3/2

386. If $(27)^{999}$ is divided by 7, then the remainder is
a. 6 b. 1 c. 2 d. 3

387. Let $(1 + x + x^2)^9 = a_0 + a_1x + a_2x^2 + ... + a_{18}x^{18}$. Then
a. $a_0 + a_2 + ... + a_{18} = a_1 + a_3 + ... + a_{17}$
b. $a_0 + a_2 + ... + a_{18}$ is even
c. $a_0 + a_2 + ... + a_{18}$ is divisible by 9
d. $a_0 + a_2 + ... + a_{18}$ is divisible by 3 but not by 9

388. The remainder when 2^{2016} is divided by 63, is
a. 1 b. 8 c. 17 d. 32

389. The last digit in the integer $3^{101} + 1$ is
a. 1 b. 2 c. 3 d. 4

390. The sum of the coefficients of the polynomial $(1 + x + x^2 - 4x^3)^{2149}$ is
a. 1 b. –1 c. 2143 d. 2156

391. The last digit of number 7^{886} is
a. 1 b. 9 c. 7 d. 3

392. The sum of coefficients in the expansion of $(1 + 3x - 3x^2)^{1143}$ is equal to
a. –1 b. 0 c. 1 d. 2^{1143}

393. When 2^{1505} is divided by 9, the remainder is
a. 8 b. 7 c. 5 d. 6

394. If $(1 - x + x^2)^n = a_0 + a_1x + ... + a_{2n}x^{2n}$, then $a_0 + a_2 + a_4 + ... + a_{2n} =$
a. $\frac{3^n - 1}{2}$ b. $\frac{3^n + 1}{2}$ c. $\frac{2.3^n - 1}{2}$ d. $\frac{2.3^n + 1}{2}$

395. The coefficient of x^4 in the expansion of $(1 + x)^{-2}$, where $|x| < 1$, is
a. –5 b. 5 c. 4 d. –3

396. If the sum of the coefficients in the expansion of $(a^2x^2 - 6ax + 11)^{10}$, where a is constant, is 1024, then the value of a is
a. 5 b. 1 c. 2 d. 3

397. The sum of all positive divisors of 450 is
a. 1209 b. 1299 c. 1199 d. 1099

398. When 5^{99} is divided by 13 then the remainder is
a. 8 b. 7 c. 9 d. 6

399. The coefficient of x^4 in the expansion of e^{2x-3} is
a. $\frac{3}{2e^3}$ b. $\frac{2}{3e^3}$ c. $\frac{2}{3}e^3$ d. $\frac{3}{2}e^3$

400. The digit in the unit's place of 5^{834} is
a. 3 b. 5 c. 0 d. 1

401. The remainder when $3^{100} \times 2^{50}$ is divided by 5 is
a. 3 b. 4 c. 1 d. 2

402. The coefficient of x^k in the expansion of $A = 1 + (1 + x) + (1 + x)^2 + ... + (1 + x)^n$ is
a. ${}^nC_k$ b. ${}^{n-1}C_k$
c. ${}^{n-1}C_{k+1}$ d. None of these

403. The sum of the coefficients in the expansion of $(1 + x - 3x^2)^{3148}$ is
a. 8 b. 7 c. 1 d. –1

404. The remainder obtained when 5^{124} is divided by 124 is
a. 5 b. 0 c. 2 d. 1

405. If $(1 + x - 3x^2)^{10} = 1 + a_1x + a_2x^2 + ... + a_{20}x^{20}$, then $a_2 + a_4 + a_6 + ... + a_{20}$ is equal to
a. $\frac{3^{10} + 1}{2}$ b. $\frac{3^9 + 1}{2}$ c. $\frac{3^{10} - 1}{2}$ d. $\frac{3^9 - 1}{2}$

Sequence & Series

406. Which term of the sequence {9 – 8i, 8 – 6i, 7 – 4i, ...} is a real number?
a. 4^{th} term b. 5^{th} term c. 6^{th} term d. 7^{th} term

407. If $a_1 = 1$ and $an = na_{n-1}$, for all positive integer $n \geq 2$, then a_5 is equal to
a. 125 b. 120 c. 100 d. 24

408. For any three positive real numbers a, b and c, $9(25a^2 + b^2) + 25(c^2 - 3ac) = 15b(3a + c)$. Then
a. b, c and a are in A.P. b. a, b and c are in A.P.
c. a, b and c are in G.P. d. b, c and a are in G.P.

409. If 60 times the 60^{th} term of an A.P. with non-zero common difference is equal to 40 times the 40^{th} term, then the 100^{th} term of this A.P. is
a. 0 b. 1 c. –1 d. 2

410. 3 + 5 + 7 + ... to n terms is
a. n^2 b. $n(n - 2)$ c. $n(n + 2)$ d. $(n + 1)^2$

411. Three numbers are in arithmetic progression. Their sum is 21 and the product of the first number and the third number is 45. Then the product of these three numbers is
a. 315 b. 90 c. 180 d. 270

412. If a + 1, 2a + 1, 4a – 1 are in arithmetic progression, then the value of a is
a. 1 b. 2 c. 3 d. 4

413. If 25^{th} term of an A.P. is 15 and if its 15^{th} term is 25, then the 40^{th} term of the A.P. is
a. –1 b. –10 c. –5 d. 0

414. If a_1, a_2, a_3, a_4 are in A.P., then $\frac{1}{\sqrt{a_1}+\sqrt{a_2}}+\frac{1}{\sqrt{a_2}+\sqrt{a_3}}+\frac{1}{\sqrt{a_3}+\sqrt{a_4}}=$

a. $\frac{\sqrt{a_4}-\sqrt{a_1}}{a_3-a_2}$ b. $\frac{a_4-a_1}{a_3-a_2}$

c. $\frac{a_3-a_2}{\sqrt{a_4}-\sqrt{a_1}}$ d. $\frac{a_1-a_4}{a_3-a_1}$

415. If $a_1, a_2, a_3, ..., a_{20}$ are in A.P. and $a_1 + a_{20} = 45$, then $a_1 + a_2 + a_3 + ... + a_{20}$ is equal to

a. 90 b. 900 c. 350 d. 450

416. If x is a positive real number different from 1 such that $\log_a x, \log_b x, \log_c x$ are in A.P., then

a. $b=\frac{a+c}{2}$ b. $b=\sqrt{ac}$

c. $c^2=(ac)^{\log_a b}$

d. none of a, b, c are correct

417. If a, b, c are distinct and the roots of $(b - c)x^2 + (c - a)x + (a - b) = 0$ are equal, then a, b, c are in

a. Arithmetic progression b. Geometric progression

c. Harmonic progression

d. Arithmetico-Geometric progression

418. $\sum_{k=1}^{2n+1}(-1)^{k-1}.k^2=$

a. $(n + 1)(2n + 1)$ b. $(n + 1)(2n – 1)$

c. $(n – 1)(2n + 1)$ d. $(n – 1)(2n – 1)$

419. Let $x_1, x_2, ..., x_n$ be in an A.P. If $x_1 + x_4 + x_9 + x_{11} + x_{20} + x_{22} + x_{27} + x_{30} = 272$, then $x_1 + x_2 + x_3 + ... + x_{30}$ is equal to

a. 1020 b. 1200 c. 716 d. 2720

420. In a triangle the lengths of the largest and the smallest sides are 10 and 9 respectively. If the angles are in A.P., then the length of the third side is

a. $\sqrt{91}$ b. 8 c. $\sqrt[3]{3}$ d. 5

421. Which of the following is a purely imaginary term of the sequence 8 – 6i, 7 – 4i, 6 – 2i, ...?

a. 9th term b. 2nd term c. 4th term d. 8th term

422. If S_n denotes the sum of first n terms of A.P. $< a_n >$, such that $\frac{S_m}{S_n}=\frac{m^2}{n^2}$ then $\frac{a_m}{a_n}$ = ?

a. $\frac{2m+1}{2n+1}$ b. $\frac{2m-1}{2n-1}$ c. $\frac{m-1}{n-1}$ d. $\frac{m+1}{n+1}$

423. If the roots of the equation $x^3 + ax^2 + bx + c = 0$ are in A.P., then $2a^3 – 9ab =$

a. 9c b. 18c c. 27c d. –27c

424. An A.P. has the propery that the sum of first ten terms is half the sum of next ten terms. If the second term is 13, then the common difference is

a. 3 b. 2 c. 5 d. 4

425. Let a_1, a_2, a_3, a_4 be in A.P. If $a_1 + a_4 = 10$ and $a_2a_3 = 24$, then the least term of them is

a. 1 b. 2 c. 3 d. 4

426. If $\log_e 5$, $\log_e(5^x – 1)$ and $\log_e\left(5^x-\frac{11}{5}\right)$ are in A.P., then the values of x are

a. $\log_5 4$ and $\log_5 3$ b. $\log_3 4$ and $\log_4 3$

c. $\log_3 4$ and $\log_3 5$ d. $\log_5 6$ and $\log_5 7$

427. The A.M. of 1, 3, 3^2, ..., 3^{n-1} is ....

a. $\frac{3^{n-1}-1}{2n}$ b. $\frac{3^n-1}{2n}$ c. $\frac{3^{n+1}-1}{2n}$ d. $\frac{3^n-3}{2n}$

428. 1 + 3 + 5 + 7 + ... + 29 + 30 + 31 + 32 + ... + 60 =

a. 1611 b. 1620 c. 1609 d. 1600

429. A man saves Rs. 200 in each of the first three months of his service. In each of the subsequent months his saving increases by Rs. 40 more than the saving of immediately previous month. His total saving from the start of service will be Rs 11040 after

a. 20 months b. 21 months

c. 18 months d. 19 months

430. If S_1, S_2, S_3 are the sum of n, 2n, 3n terms respectively of an arithmetic progression, then

a. $S_3 = 2(S_1 + S_2)$ b. $S_3 = S_1 + S_2$

c. $S_3 = 3(S_2 – S_1)$ d. $S_3 = 3(S_2 + S_1)$

431. If $4^x = 16^y = 64^z$, then

a. x, y, z are in G.P. b. x, y, z are in A.P.

c. $\frac{1}{x},\frac{1}{y},\frac{1}{z}$ are in G.P. d. $\frac{1}{x},\frac{1}{y},\frac{1}{z}$ are in A.P.

432. A man saves Rs. 135 in the first year, Rs. 150 in the second year and in this way he increases his savings by Rs 15 every year. In what time will his total saving be Rs. 5550?

a. 20 yr b. 25 yr c. 30 yr d. 35 yr

433. The first four terms of an A.P. are a, 9, 3a – b, 3a + b. The 2011th term of the A.P. is

a. 2015 b. 4025 c. 5030 d. 8045

434. Let S_n denotes the sum of first n terms of an A.P. and $S_{2n} = 3S_n$. If $S_{3n} = kS_n$, then the value of k is equal to

a. 4 b. 5 c. 6 d. 7

435. Let $S_1, S_2, ..., S_{101}$ be consecutive terms of an A.P. If $\frac{1}{S_1S_2}+\frac{1}{S_2S_3}+....+\frac{1}{S_{100}S_{101}}=\frac{1}{6}$ and $S_1 + S_{101} = 50$ then $|S_1 – S_{101}|$ is equal to

a. 10 b. 20 c. 30 d. 40

436. A person is to count 4500 currency notes. Let a denote the number of notes he counts in the nth minute. If $a_1 = a_2 = ... = a_{10} = 150$ and $a_{10}, a_{11}, ...$ are in an A.P. with common difference –2, then the time taken by him to count all notes is

a. 24 minutes b. 34 minutes
c. 125 minutes d. 135 minutes

437. Four arithmetic means between –10 and 25 are inserted. Then the 5^{th} term in the series is

a. 11 b. 19 c. 17 d. 18

438. If 19 times 12^{th} term of an A.P. and 18 times 11^{th} term of an A.P. are equal then the 30^{th} term of the A.P. is

a. 0 b. 2 c. 11 d. 29

439. The n^{th} term of the series 1 + 3 + 7 + 13 + 21 + ... is 9901. The value of n is

a. 90 b. 100 c. 99 d. 900

440. If the sum to 2n terms of the A.P. 2, 5, 8, 11, ... is equal to the sum to n terms of 57, 59, 61, 63, ..., then n =

a. 10 b. 11 c. 12 d. 13

441. If $a_1, a_2, ..., a_n$ are in A.P. with common difference $d \neq 0$, then $(\sin d)[\sec a_1 \sec a_2 + \sec a_2 \sec a_3 + ... + \sec a_{n-1} \sec a_n]$ is equal to

a. $\cot a_n - \cot a_1$ b. $\cot a_1 - \cot a_n$
c. $\tan a_n - \tan a_1$ d. $\tan a_n - \tan a_{n-1}$

442. A student read common difference of an A.P. as –3 instead of 3 and obtained the sum of first 10 terms as –30. Then the actual sum of first 10 terms is equal to

a. 240 b. 120 c. 300 d. 180

443. If sum of n terms of two A.P.'s are in the ratio 2n + 3 : 6n + 5, then the ratio of their 13^{th} term is

a. $\frac{29}{83}$ b. $\frac{27}{77}$ c. $\frac{31}{89}$ d. $\frac{53}{155}$

444. If p^{th} term of an arithmetic progression is q and q^{th} term is p, then 10^{th} term is

a. p – q + 10 b. p + q + 11
c. p + q – 9 d. p + q – 10

445. If $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in A.P. then

a. a, b, c are in A.P. b. c, a, b are in A.P.
c. a^2, b^2, c^2 are in A.P. d. a, b, c are in G.P.

446. In a G.P. series consisting of positive terms, each term is equal to the sum of next two terms. Then the common ratio of this G.P. series is

a. $\sqrt{5}$ b. $\frac{\sqrt{5}-1}{2}$ c. $\frac{\sqrt{5}}{2}$ d. $\frac{\sqrt{5}+1}{2}$

447. If $\frac{1}{6}\sin\theta, \cos\theta$ and $\tan\theta$ are in geometric progression, then the solution set of θ is

a. $2n\pi \pm \left(\frac{\pi}{6}\right)$ b. $2n\pi \pm \left(\frac{\pi}{3}\right)$
c. $n\pi + (-1)^n \left(\frac{\pi}{3}\right)$ d. $n\pi + \left(\frac{\pi}{3}\right)$

448. If a, b, c are in G.P. x is the arithmetic mean between a and b and y is the arithmetic mean between b and c, then $\frac{1}{2x} + \frac{1}{2y} =$

a. $\frac{1}{b}$ b. $\frac{1}{a}$ c. $\frac{1}{2}$ d. $\frac{1}{a+b}$

449. If 6th term of a G.P. is 2, then the product of the 11 terms of the G.P. is equal to

a. 512 b. 1024 c. 2048 d. 256

450. If a, b, c, d and p are distinct real numbers such that $(a^2 + b^2 + c^2)p^2 - 2(ab + bc + cd)p + (b^2 + c^2 + d^2) \leq 0$ then a, b, c, d are in

a. A.P. b. H.P. c. ab = cd d. G.P.

451. If the roots of $x^3 - kx^2 + 14x - 8 = 0$ are in geometric progression, then k is

a. –3 b. 7 c. 4 d. 0

452. If m is A.M. of two distinct real numbers l and n (l, n > l) and G_1, G_2 and G_3 are three geometric mean between l and n, then $G_1^4 + 2G_2^4 + G_3^4$ equals

a. $4\,lmn^2$ b. $4\,l^2m^2n^2$ c. $4\,l^2mn$ d. $4\,lm^2n$

453. Let S_1 be a square of side 5 cm. Another square S_2 is drawn by joining the midpoints of the sides of S_1. Square S_3 is drawn by joining the midpoints of the sides of S_2 and so on. Then (area of S_1 + area of S_2 + area of S_3 + ... + area of S_{10}) =

a. $25\left(1-\frac{1}{2^{10}}\right)$ b. $50\left(1-\frac{1}{2^{10}}\right)$
c. $2\left(1-\frac{1}{2^{10}}\right)$ d. $1-\frac{1}{2^{10}}$

454. Three positive numbers form an increasing G.P. If the middle term of this G.P. is doubled, the new numbers are in A.P. Then the common ratio of the G.P. is

a. $3+\sqrt{2}$ b. $2-\sqrt{3}$ c. $2+\sqrt{3}$ d. $\sqrt{2}+\sqrt{3}$

455. If two positive numbers are in the ratio $3+2\sqrt{2} : 3-2\sqrt{2}$, then the ratio between their A.M. and G.M. is

a. 6 : 1 b. 3 : 2 c. 2 : 1 d. 3 : 1

456. If a, b and c are positive numbers in a G.P., then the roots of the quadratic equation $(\log_e a)x^2 - (2\log_e b)x + (\log_e c) = 0$ are

a. –1 and $\frac{\log_e c}{\log_e a}$ b. 1 and $-\frac{\log_e c}{\log_e a}$
c. 1 and $\log_a c$ d. –1 and $\log_c a$

457. The sum of first 20 terms of the sequence 0.7, 0.77, 0.777, ..., is

a. $\frac{7}{9}(99-10^{-20})$ b. $\frac{7}{81}(179+10^{-20})$
c. $\frac{7}{9}(99+10^{-20})$ d. $\frac{7}{81}(179-10^{-20})$

458. Five numbers are in A.P. with common difference $\neq 0$. If the 1^{st}, 3^{rd} and 4^{th} terms are in A.P., then
a. the 5^{th} term is always 0 b. the 1^{st} term is always 0
c. the middle term is always 0
d. the middle term is always –2

459. If 64, 27, 36 are the P^{th}, Q^{th} and Rth terms of a G.P., then P + 2Q is equal to
a. R b. 2R c. 3R d. 4R

460. Let a be a positive number such that the arithmetic mean of a and 2 exceeds their geometric mean by 1. Then the value of a is
a. 3 b. 5 c. 9 d. 8

461. If sinθ, cosθ and tanθ are in G.P., then $\cot^6\theta - \cot^2\theta$ is
a. 1 b. 1/2 c. 2 d. 3

462. The arithmetic mean of two numbers x and y is 3 and geometric mean is 1. Then $x^2 + y^2$ is equal to
a. 30 b. 31 c. 32 d. 34

463. Two numbers x and y have arithemtic mean 9 and geometric mean 4. Then x and y are the roots of
a. $x^2 - 18x - 16 = 0$ b. $x^2 - 18x + 16 = 0$
c. $x^2 + 18x - 16 = 0$ d. $x^2 + 18x + 16 = 0$

464. If A > 0, B > 0 and $A + B = \frac{\pi}{6}$, then the minimum value of tanA + tanB is
a. $\sqrt{3}-\sqrt{2}$ b. $4-2\sqrt{3}$ c. $\frac{2}{\sqrt{3}}$ d. $2-\sqrt{3}$

465. $11^3 + 12^3 + 13^3 + ... + 20^3$ is
a. an even integer
b. an odd integer divisible by 5
c. multiple of 10
d. an odd integer but not a multiple of 5

466. If the sum of first n natural numbers is 1/5 times the sum of their squares, then n =
a. 7 b. 8 c. 6 d. 5

467. The value of $1^2 - 2^2 + 3^2 - 4^2 + ... + 11^2$ is equal to
a. 55 b. 66 c. 77 d. 88

468. The sum of all two digit natutal numbers which leave a remainder 5 when they are divided by 7 is equal to
a. 715 b. 702 c. 615 d. 602

469. If the sum of first n terms of an A.P. is cn^2, then the sum of squares of these n terms is
a. $\frac{n(4n^2-1)c^2}{6}$ b. $\frac{n(4n^2+1)c^2}{3}$
c. $\frac{n(4n^2-1)c^2}{3}$ d. $\frac{n(4n^2+1)c^2}{6}$

470. If $1 + \sin\theta + \sin^2\theta + ...$ upto $\infty = 2\sqrt{3}+4$, then θ = __
a. $\frac{\pi}{6}$ b. $\frac{\pi}{4}$ c. $\frac{\pi}{3}$ d. $\frac{3\pi}{4}$

471. Let S_k be the sum of an infinite G.P. series whose first term is k and common ratio is $\frac{k}{k+1}$ (k > 0). Then the value of $\sum_{k=1}^{\infty}\frac{(-1)^k}{S_k}$ is equal to
a. $\log_e 4$ b. $\log_e 2 - 1$
c. $1 - \log_e 2$ d. $1 - \log_e 4$

472. If sum of an infinite geometric series is $\frac{4}{3}$ and its 1st term is $\frac{3}{4}$, then its common ratio is
a. $\frac{7}{16}$ b. $\frac{9}{16}$ c. $\frac{1}{9}$ d. $\frac{7}{9}$

473. The value of $\left[(0.16)^{\log_{2.5}\left(\frac{1}{3}+\frac{1}{3^2}+\frac{1}{3^3}+.....\infty\right)}\right]^{1/2}$ is
a. 1 b. –1
c. 0 d. None of these

474. The harmonic mean of two numbers is 4 and their arithmetic mean A and geometric mean G satisfy the relation $2A + G^2 = 27$, then the numbers are
a. –3 and 1 b. 5 and –25 c. 5 and 4 d. 3 and 6

475. Let a, b and c be in A.P. and |a| < 1, |b| < 1, |c| < 1. If $x = 1 + a + a^2 + ... \infty$, $y = 1 + b + b^2 + ... \infty$, $z = 1 + c + c^2 + ... \infty$, then x, y and z are in
a. A.P. b GP.
c. H.P. d. None of these

476. If a, b, c are in H.P., then $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ will be in
a. A.P. b GP.
c. H.P. d. None of these

477. If H is harmonic mean between P and Q. Then the value of $\frac{H}{P}+\frac{H}{Q}$ is
a. 2 b. $\frac{PQ}{P+Q}$
c. $\frac{P+Q}{PQ}$ d. None of these

478. Let $a_1, a_2, ..., a_{10}$ be in A.P. and $h_1, h_2, ..., h_{10}$ be in A.P. If $a_1 = h_1 = 2$ and $a_{10} = h_{10} = 3$. Then a_4h_7 is
a. 2 b. 3 c. 5 d. 6

479. G.M. and H.M. of two numbers are 10 and 8 respectively. The numbers are
a. 5, 20 b. 4, 25 c. 2, 50 d. 1, 100

480. If log(x + z) + log(x – 2y + z) = 2log(x – z), then x, y, z are in
a. A.P. b H.P.
c. GP. d. None of these

481. If the first two terms of a H.P. are $\frac{2}{5}$ and $\frac{12}{13}$ respectively, then the largest term is

a. 2^{nd} term b. 3^{rd} term c. 4^{th} term d. 6^{th} term

482. The harmonic mean between two numbers is $14\frac{2}{5}$ and the geometric mean 24. The greater number between them is

a. 54 b. 36
c. 72 d. None of these

483. Let $t_n = n \cdot (n!)$. Then $\sum_{n=1}^{15} t_n$ is equal to

a. 15! – 1 b. 15! + 1
c. 16! – 1 d. None of these

484. The coefficient of x^3 in the infinite series expansion of $\frac{2}{(1-x)(2-x)}$, for $|x| < 1$, is

a. –1/16 b. 15/8 c. –1/8 d. 15/16

485. The value of $1000\left[\frac{1}{1\times 2}+\frac{1}{2\times 3}+\frac{1}{3\times 4}+\ldots+\frac{1}{999\times 1000}\right]$ is equal to

a. 1000 b. 999 c. 1001 d. 1/999

486. In a triangle ABC, if $\tan\frac{A}{2}=\frac{5}{6}$, and $\tan\frac{B}{2}=\frac{20}{37}$, the sides a, b, c of the triangle are in

a. GP. b H.P.
c. A.P. d. None of the above

487. The value of
$$\frac{1}{\sqrt{10}-\sqrt{9}}-\frac{1}{\sqrt{11}-\sqrt{10}}+\frac{1}{\sqrt{12}-\sqrt{11}}-\ldots-\frac{1}{\sqrt{121}-\sqrt{120}}$$
is equal to

a. –10 b. 11 c. 14 d. –8

488. The sum of the first n terms of the series
$$\frac{1}{\sqrt{2}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{11}}+\ldots \text{ is}$$

a. $\frac{1}{3}(\sqrt{3n+2}-\sqrt{2})$ b. $\sqrt{3n+2}-\sqrt{2}$

c. $\sqrt{3n+2}+\sqrt{2}$ d. $\frac{1}{3}(\sqrt{2}-\sqrt{3n+2})$

489. If $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\ldots \text{ to } \infty=\frac{\pi^2}{6}$, then $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots$ equals

a. $\frac{\pi^2}{8}$ b. $\frac{\pi^2}{12}$ c. $\frac{\pi^2}{3}$ d. $\frac{\pi^2}{2}$

490. The number of 3 × 3 matrices with entries –1 or +1 is

a. 2^4 b. 2^5 c. 2^6 d. 2^9

Matrices

491. Let P be the set of all non-singular matrices of order 3 over R and Q be the set of all orthogonal matrices of order 3 over R. Then

a. P is proper subset of Q
b. Q is proper subset of P
c. Neither P is proper subset of Q nor Q is proper subset of P
d. $P \cap Q = \phi$, the void set

492. Let P and Q are matrices such that PQ = Q and QP = P, then $P^2 + Q^2 =$

a. P b. Q c. P + Q d. P – Q

493. If $A=\frac{1}{\pi}\begin{bmatrix}\sin^{-1}(\pi x) & \tan^{-1}\left(\frac{x}{\pi}\right)\\ \sin^{-1}\left(\frac{x}{\pi}\right) & \cot^{-1}(\pi x)\end{bmatrix}$

$B=\frac{1}{\pi}\begin{bmatrix}-\cos^{-1}(\pi x) & \tan^{-1}\left(\frac{x}{\pi}\right)\\ \sin^{-1}\left(\frac{x}{\pi}\right) & -\tan^{-1}(\pi x)\end{bmatrix}$ then A – B is equal to

a. $\frac{1}{2}I$ b. I c. O d. 2I

494. $\begin{pmatrix}7 & 1 & 5\\ 8 & 0 & 0\end{pmatrix}\begin{pmatrix}2\\3\\1\end{pmatrix}+5\begin{pmatrix}1\\0\end{pmatrix}$ is equal to

a. $\begin{pmatrix}16\\27\end{pmatrix}$ b. $\begin{pmatrix}27\\16\end{pmatrix}$ c. $\begin{pmatrix}15\\16\end{pmatrix}$ d. $\begin{pmatrix}16\\15\end{pmatrix}$

495. If $\begin{pmatrix}2x+y & x+y\\ p-q & p+q\end{pmatrix}=\begin{pmatrix}1 & 1\\ 0 & 0\end{pmatrix}$, then (x, y, p, q) equals

a. 0, 1, 0, 0 b. 0, –1, 0, 0 c. 1, 0, 1, 0 d. 0, 1, 0, 1

496. If $A=\begin{pmatrix}1 & 1\\ 1 & 1\end{pmatrix}$, then A^{2017} is equal to

a. $2^{2015}A$ b. $2^{2016}A$ c. $2^{2014}A$ d. $2^{2017}A$

497. If A and B are two square matrices such that AB = A and BA = B, then

a. A and B are idempotent b. only A is idempotent
c. only B is idempotent d. None of these

498. If $\begin{bmatrix}\alpha & \beta\\ \gamma & -\alpha\end{bmatrix}$ is to be square root of the two rowed unit matrix, then α, β and γ should satisfy the relation

a. $1+\alpha^2+\beta\gamma=0$ b. $1-\alpha^2-\beta\gamma=0$
c. $1-\alpha^2+\beta\gamma=0$ d. $1+\alpha^2-\beta\gamma=0$

499. Let $\begin{bmatrix}1 & 0 & 0\\ 4 & 1 & 0\\ 16 & 4 & 1\end{bmatrix}$ and I be the identity matrix of order 3. If $Q=[q_{ij}]$ is a matrix such that $P^{50}-Q=1$, then $\frac{q_{31}+q_{32}}{q_{21}}$ equals

a. 52 b. 103 c. 201 d. 205

500. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ then $A^2 - 5A$ is equal to

a. I b. –I c. 7I d. –7I

501. The number of non-zero diagonal matrices of order 4 satisfying $A^2 = A$ is

a. 2 b. 4 c. 16 d. 15

502. If $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $A8 = aA + bI$, then (a, b) =

a. (8, 7) b. (–7, 8) c. (8, –7) d. (–8, –7)

503. If $\begin{bmatrix} -2 & 5 \\ 3 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 3 \\ -1 \end{bmatrix}$, then (x, y) is

a. (1, 2) b. (–1, 2) c. (1, –2) d. (2, 1)

504. If A and B are square matrices of order 'n' such that $A^2 - B^2 = (A - B)(A + B)$, then which of the following will be true?

a. Either of A or B is zero matrix
b. A = B
c. AB = BA
d. Either of A or B is an identity matrix

505. Let $I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $P = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -2 \end{bmatrix}$. Then the matrix $P^3 + 2P^2$ is equal to

a. P b. I – P c. 2I + P d. 2I – P

506. If $P = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$, then P^5 equals

a. P b. 2P c. –P d. –2P

507. If $e\begin{bmatrix} e^x & e^y \\ e^y & e^x \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, then the values of x and y are respectively

a. –1, –1 b. 1, 1 c. 0, 1 d. 1, 0

508. If $A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$ and A^2 is the unit matrix, then the value of $x^3 + x - 2$ is equal to

a. – 8 b. – 2 c. 0 d. 1

509. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{bmatrix}$ and I is the unit matrix of order 3, then $A^2 + 2A^4 + 4A^6$ is equal to

a. $7A^8$ b. $7A^7$ c. 8I d. 6I

510. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then A^{10} is equal to

a. $\begin{bmatrix} \cos^{10}\alpha & \sin^{10}\alpha \\ -\sin^{10}\alpha & \cos^{10}\alpha \end{bmatrix}$ b. $\begin{bmatrix} \cos^{10}\alpha & -\sin^{10}\alpha \\ \sin^{10}\alpha & \cos^{10}\alpha \end{bmatrix}$

c. $\begin{bmatrix} \cos^{10}\alpha & \sin^{10}\alpha \\ -\sin^{10}\alpha & -\cos^{10}\alpha \end{bmatrix}$ d. $\begin{bmatrix} \cos 10\alpha & \sin 10\alpha \\ -\sin 10\alpha & \cos 10\alpha \end{bmatrix}$

511. If A and B are two matrices such that A + B and AB are both defined, then

a. A and B can be any matrices
b. A, B are square matrices not necessarily of the same order
c. A, B are square matrices of the same order
d. number of columns of A = number of rows of B

512. If A is a square matrix such that $A^2 = A$, then $(I - A^3) + A$ is equal to

a. A b. I – A c. I d. 3A

513. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$, then $A^2 + xA + yI = 0$ for (x, y) =

a. (–1, 3) b. (–4, 1) c. (1, 3) d. (4, 1)

514. If $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$, then A^n is

a. $\begin{bmatrix} 1 & 2^n - 2 \\ 0 & 1 \end{bmatrix}$ b. $\begin{bmatrix} 1 & n^2 \\ 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 2n \\ 0 & 1 \end{bmatrix}$ d. $\begin{bmatrix} 1 & n^2 \\ 1 & 1 \end{bmatrix}$

515. If X and Y are 2 × 2 matrices such that 2X + 3Y = O and X + 2Y = I, where O and I denotes the 2 × 2 zero matrix and 2 × 2 identity matrix, then X =

a. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ b. $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ c. $\begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix}$ d. $\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$

516. If 1, ω, ω^2 are cube roots of unity and if $\begin{bmatrix} 1+\omega & 2\omega \\ -2\omega & -b \end{bmatrix} + \begin{bmatrix} a & -\omega \\ 3\omega & 2 \end{bmatrix} = \begin{bmatrix} 0 & \omega \\ \omega & 1 \end{bmatrix}$, then $a^2 + b^2$ is

a. $1 + \omega^2$ b. $\omega^2 - 1$ c. $1 + \omega$ d. $(1 + \omega)^2$

517. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, then A^{100} is equal to

a. 100A b. $2^{99}A$ c. $2^{100}A$ d. 99A

518. If n is a non-negative integer and $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$, then A^n =

a. $\begin{bmatrix} 1 & 0 \\ n-1 & 1 \end{bmatrix}$ b. $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 \\ n & 1 \end{bmatrix}$ d. $\begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$

519. If $f(x) = x^2 - 5x$, $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, then f(A) =

a. $\begin{bmatrix} -7 & 0 \\ 0 & -7 \end{bmatrix}$ b. $\begin{bmatrix} 0 & -7 \\ -7 & 0 \end{bmatrix}$ c. $\begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$ d. $\begin{bmatrix} 0 & 7 \\ 7 & 0 \end{bmatrix}$

520. Which one of the following is not true?

a. Matrix addition is commutative
b. Matrix addition is associative
c. Matrix multiplication is commutative
d. Matrix multiplication is not commutative

521. If ω be the complex cube root of unity and matrix $H = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}$, then H^{70} is equal to
a. 0 b. –H c. H d. H^2

522. If A and B are two square matrices of same order such that AB = B, BA = A and if matrices A is called idempotent if $A^2 = A$, then
a. A is idempotent but not B
b. B is idempotent but not A
c. neither A nor B is idempotent
d. both A and B are idempotent

523. If $A = \begin{bmatrix} 0 & 3 \\ 4 & 5 \end{bmatrix}$ and $kA = \begin{bmatrix} 0 & 4a \\ 3b & 60 \end{bmatrix}$ then value of k, a and b are respectively
a. 12, 19, 16 b. 9, 12, 16 c. 12, 9, 16 d. 16, 9, 12

524. For two 3 × 3 matrices A and B, let $A + B = 2B'$ and $3A + 2B = I_3$, where B′ is the transpose of B and I_3 is 3 × 3 identity matrix. Then
a. $10A + 5B = 3I_3$ b. $5A + 10B = 2I_3$
c. $3A + 6B = 2I_3$ d. $B + 2A = I_3$

525. If $A = \begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$ and $A + A^T = I$, where I is the transpose of A, then the value of θ is equal to
a. $\frac{\pi}{6}$ b. $\frac{\pi}{3}$ c. π d. $\frac{3\pi}{2}$

526. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a matrix satisfying the equation $AA^T = 9I$, where I is a 3 × 3 identity matrix, then the ordered pair (a, b) is equal to
a. (2, 1) b. (–2, –1) c. (2, –1) d. (–2, 1)

527. If A and B are square matrices of the same order and if $A = A^T$, $B = B^T$, then $(ABA)^T =$
a. BAB b. ABA c. ABAB d. AB^T

528. If P is a 3 × 3 matrix such that $P^T = 2P + I$, where P^T is the transpose of P and I is the 3 × 3 identity matrix, then there exists a column matrix $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix} \neq \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ such that
a. $PX = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ b. PX = X
c. PX = 2X d. PX = –X

529. The matrix product satisfies $[5\ 6\ 2]\,.\,A^T = [4\ 8\ 1\ 7\ 8]$, where A^T denotes the transpose of the matrix A. Then, the order of the matrix A equals to
a. 1 × 2 b. 5 × 1 c. 3 × 5 d. 5 × 3

530. If a matrix A is both symmetric and skew symmetric, then
a. A is diagonal matrix b. A is a zero matrix
c. A is scalar matrix d. A is square matrix

531. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, then (A – A′) is (where A′ is transpose of matrix A)
a. Null matrix b. Identity matrix
c. Symmetric d. Skew-symmetric

532. If the matrix $\begin{bmatrix} 2 & 3 \\ 5 & -1 \end{bmatrix} = A + B$, where A is symmetric and B is skew symmetric, then B =
a. $\begin{bmatrix} 2 & 4 \\ 4 & -1 \end{bmatrix}$ b. $\begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix}$ c. $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ d. $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$

533. Let A and B be two syymetric matrices of order 3.
Statement-1: A(BA) and (AB)A are symmetric matrices
Statement-2: AB is symmetric matrix if matrix multiplication of A awith B is commutative.
a. Statement-1 is true, Statement-2 is false
b. Statement-1 is false, Statement-2 is true
c. Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1
d. Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1

534. Let A and B be 3 × 3 matrices. Then $(AB)^T = BA$ is
a. A is skew-symmetric and B is symmetric
b. B is skew-symmetric and A is symmetric
c. A and B are skew-symmetric
d. None of these

535. If A is a skew-symmetric matrix and n is odd positive integer, then A^n is
a. a skew-symmetric matrix b. a symmetric matrix
c. a diagonal matrix d. None of the above

536. If A and B are symmetric matrices of the same order, then which one of the following is not true?
a. A + B is symmetric b. A – B is symmetric
c. AB + BA is symmetric d. AB – BA is symmetric

537. If $A = \begin{bmatrix} 3 & x-1 \\ 2x+3 & x+2 \end{bmatrix}$ is a symmetric matrix, then the value of x is
a. 4 b. 3 c. – 4 d. – 3

538. If A is a square matrix. Then
a. $A + A^T$ is symmetric b. AA^T is skew-symmetric
c. $A^T + A$ is skew-symmetric d. A^TA is skew-symmetric

539. If A is a square matrix, A′ its transpose then $\frac{1}{2}(A - A')$ is
a. a symmetric matrix b. a skew-symmetric
c. a unit matrix d. an elementry matrix

540. Let A be a square matrix and A^T is its transpose, then $A + A^T$ is
a. a diagonal matrix
b. a symmetric matrix
c. the identity matrix
d. a skew-symmetric matrix

541. Let A be a 3×3 matrix such that $A^2 - 5A + 7I = 0$
Statement-I: $A^{-1} = \frac{1}{7}(5I - A)$
Statement-II: The polynomial $A^3 - 2A^2 - 3A + I$ can be reduced to $5(A - 4I)$.
a. Both the statements are true
b. Both the statements are false
c. Statement-I is true, but Statement-II is false
d. Statement-I is false, but Statement-II is true

542. If $A = \begin{bmatrix} 2 & 1 \\ 0 & x \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1/2 & 1/6 \\ 0 & 1/x \end{bmatrix}$, then the value of x is equal to
a. –3 b. 3 c. –2 d. 6

543. If X is any matrix of order $n \times p$ (n and p are integers) and I is an identity matrix of order $n \times n$, then the matrix $M = I - X(X'X)^{-1} X'$ is
(i) idempotent matrix
(ii) MX = O
Choose the correct answer
a. only (i) is correct
b. (i) is incorrect
c. Both (i) & (ii) are correct
d. None of these

544. If A and B are square matrices of the same order such that $(A + B)(A - B) = A^2 - B^2$, then $(ABA^{-1})^2 =$
a. A^2B^2 b. A^2 c. B^2 d. I

545. If $A^2 - A + I = O$, then the inverse of the matrix A is
a. A – I b. I – A c. A + I d. A

546. If A and B are square matrices of the same order and AB = 3I, then A^{-1} is equal to
a. 3B b. $\frac{1}{3}B$ c. $3B^{-1}$ d. $\frac{1}{3}B^{-1}$

Determinants

547. Let ω be a complex number such that 2ω + 1 = z where z $= \sqrt{3}$. If $\begin{vmatrix} 1 & 1 & 1 \\ 1 & -\omega^2 - 1 & \omega^2 \\ 1 & \omega^2 & \omega^7 \end{vmatrix} = 3k$, thn k is equal to
a. z b. –1 c. 1 d. –z

548. If $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$ then x is equal to
a. 8 b. 4 c. $\pm 2\sqrt{2}$ d. 2

549. If $\begin{pmatrix} 1 & 2 & 4 \\ 1 & 3 & 5 \\ 1 & 4 & a \end{pmatrix}$ is singular, then the value of a is
a. a = – 6 b. a = 5 c. a = –5 d. a = 6

550. If $\begin{vmatrix} 3i & -9i & 1 \\ 2 & 9i & -1 \\ 10 & 9 & i \end{vmatrix} = x + iy$, then
a. x = 1, y = 1
b. x = 0, y = 1
c. x = 1, y = 0
d. x = 0, y = 0

551. If $A = \begin{vmatrix} 4 & k & k \\ 0 & k & k \\ 0 & 0 & k \end{vmatrix}$ and det(A) = 256, then |k| equals
a. 4 b. 5 c. 6 d. 8

552. If $f(x) = \begin{vmatrix} x & x^2 & x^3 \\ 1 & 2x & 3x^2 \\ 0 & 2 & 6x \end{vmatrix}$, then $f'(x)$ is equal to
a. $x^3 + 6x^2$ b. $6x^3$ c. 3x d. $6x^2$

553. The roots of the equation $\begin{vmatrix} x-1 & 1 & 1 \\ 1 & x-1 & 1 \\ 1 & 1 & x-1 \end{vmatrix} = 0$ are
a. 1, 2 b. –1, 2 c. –1, –2 d. 1, –2

554. The value of $A = \begin{vmatrix} 1 & \cos\theta & 0 \\ -\cos\theta & 1 & \cos\theta \\ -1 & -\cos\theta & 1 \end{vmatrix}$ lies
a. in the closed interval [1, 2]
b. in the closed interval [0, 1]
c. in the open interval (0, 1)
d. in the open interval (1, 2)

555. If a, b, c are distinct positive real numbers, then the value of the determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is
a. < 0 b. > 0 c. 0 d. ≥ 0

556. If x, y, z are all different and not equal to zero and $\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix} = 0$ then the value of $x^{-1} + y^{-1} + z^{-1}$ is equal to
a. xyz
b. $x^{-1}y^{-1}z^{-1}$
c. – x – y – z
d. –1

557. If $A = \begin{vmatrix} 8 & 27 & 125 \\ 2 & 3 & 5 \\ 1 & 1 & 1 \end{vmatrix}$, then the value of A^2 is equal to
a. 3 b. 36 d. 64 d. 3600

558. If $\begin{vmatrix} x^2 + x & x+1 & x-2 \\ 2x^2 + 3x - 1 & 3x & 3x-3 \\ x^2 + 2x + 3 & 2x-1 & 2x-1 \end{vmatrix} = ax - 12$, then 'a' is equal to

a. 12 b. 24 d. –12 d. –24

559. Let $M = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$. Then $\frac{1}{3}\det(3(M + M^T))$ is equal to

a. –18 b. 54 c. –72 d. 72

560. If α, β are non-real numbers satisfying $x^3 - 1 = 0$ then the value of $\begin{vmatrix} \lambda+1 & \alpha & \beta \\ \alpha & \lambda+\beta & 1 \\ \beta & 1 & \lambda+\alpha \end{vmatrix}$ is equal to

a. 0 b. λ^3
c. $\lambda^3 + 1$ d. None of these

561. Evaluate : $\begin{vmatrix} \cos 15° & \sin 15° \\ \sin 75° & \cos 75° \end{vmatrix}$

a. 0 b. 3 c. 1 d. 2

562. If $P = \begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$ and $Q = \begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$, then $\frac{dQ}{dx}$ = ______.

a. 1 – 3P b. 3P c. 3P + 1 d. –3P

563. If α, β, γ are the roots of $x^3 + a^2x + b = 0$ then the value of $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}$ is

a. $-a^3$ b. $a^3 - 3b$ c. a^3 d. 0

564. The value of $\begin{vmatrix} a^2 & 2ab & b^2 \\ b^2 & a^2 & 2ab \\ 2ab & b^2 & a^2 \end{vmatrix} = ?$

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

565. If $A = \begin{bmatrix} 1 & \log_b a \\ \log_a b & a \end{bmatrix}$ then |A| is equal to

a. 0 b. $\log_a b$ c. –1 d. $\log_b a$

566. If the entries in a 3 × 3 determinant are either 0 or 1, then the greatest value of this determinant is

a. 1 b. 2 c. 3 d. 9

567. If $f(x) = \begin{vmatrix} x & \lambda \\ 2\lambda & x \end{vmatrix}$, then $f(\lambda x) - f(x)$ is equal to

a. $x(\lambda^2 - 1)$ b. $2\lambda(x^2 - 1)$ c. $\lambda^2(x^2 - 1)$ d. $x^2(\lambda^2 - 1)$

568. If $A = \begin{vmatrix} a & x \\ y & a \end{vmatrix}$ and if xy = 1, then $\det(AA^T)$ is equal to

a. $a^2 - 1$ b. $(a^2 + 1)^2$ c. $1 - a^2$ d. $(a^2 - 1)^2$

569. If $A = \begin{bmatrix} \log x & -1 \\ -\log x & 2 \end{bmatrix}$ and if det(A) = 2, then the value of x is equal to

a. 2 b. e^2 c. –2 d. e

570. If $f(x) = \begin{vmatrix} a & -1 & 0 \\ ax & a & -1 \\ ax^2 & ax & a \end{vmatrix}$ then $f(2x) - f(x)$ is not divisible by

a. x b. a
c. 2a + 3x d. None of these

571. Minimum value of $\begin{vmatrix} 0 & 0 & 1 \\ \sin x & \cos x & 0 \\ -\cos x & 1+\tan x & 0 \end{vmatrix}$

a. 0 b. 1 c. –1 d. 2

572. Which of the following is correct?

a. Determinant is a square matrix
b. Determinant is a number associated to a matrix
c. Determinant is a number associated to a square
d. All of the above

573. If $z = \begin{vmatrix} 1 & 1+2i & -5i \\ 1-2i & -3 & 5+3i \\ 5i & 5-3i & 7 \end{vmatrix}$, then

a. z is purely real b. z is purely imaginary
c. $z + \bar{z} = 0$
d. $(z - \bar{z})i$ is purely imaginary

574. Let $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$. If $|A^2| = 25$, then |α| equals

a. 1/5 b. 5 c. 5^2 d. 1

575. The coefficient of x in $f(x) = \begin{vmatrix} x & 1+\sin x & \cos x \\ 1 & \log(1+x) & 2 \\ x^2 & 1+x^2 & 0 \end{vmatrix}$, $-1 < x \le 1$, is

a. 1 b. –2 c. –1 d. 0

576. Let [x] represent the greatest integer less than or equal to x, then the value of the determinant $\begin{vmatrix} [e] & [\pi] & [\pi^2 - 6] \\ [\pi] & [\pi^2 - 6] & [e] \\ [\pi^2 - 6] & [e] & [\pi] \end{vmatrix}$ is

a. 8 b. 1/8
c. –8 d. None of these

577. Let $a\mu^3 + b\mu^2 + c\mu + d = \begin{vmatrix} 3\mu & \mu+1 & \mu-1 \\ \mu-3 & -2\mu & \mu+2 \\ \mu+3 & \mu-4 & 5\mu \end{vmatrix}$ be an identity in μ, where a, b, c, d are constants, then the value of d is

a. 5 b. –6 c. 9 d. 0

578. The determinant $\begin{vmatrix} xp+y & x & y \\ yp+z & y & z \\ 0 & xp+y & yp+z \end{vmatrix} = 0$ is

a. x, y, z are in A.P. b. x, y, z are in G.P.
c. x, y, z are in H.P. d. xy, yz, zx are in A.P.

579. Let $X = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then $|X^{100}| =$

a. 1024 b. 100 c. 1 d. –1

580. If A is any square matrix of order 3 × 3 then |3A| is equal to

a. 3|A| b. $\frac{1}{3}|A|$ c. 27|A| d. 9|A|

581. If a, y and z be greater than 1, then the value of $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix}$

a. logx . loy . logz b. logx + logy + logz
c. 0
d. 1 – {(logx) . (logy) . (logz)}

582. If a, b, c are in A.P., then the value of the determinant $\begin{vmatrix} x+2 & x+3 & x+2a \\ x+3 & x+4 & x+2b \\ x+4 & x+5 & x+2c \end{vmatrix}$ is

a. 0 b. 1 c. x d. 2x

583. If M is a 3 × 3 skew symmetric matrix, then det(M) is

a. –1 b. 0 c. 1 d. i

584. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $|A^3| = 27$, then α = ________.

a. ±2 b. $\pm\sqrt{5}$ c. ±1 d. $\pm\sqrt{7}$

585. The value of the determinant $\begin{vmatrix} \cos^2 54° & \cos^2 36° & \cot^2 135° \\ \sin^2 53° & \cot 135° & \sin^2 37° \\ \cot 135° & \cos^2 25° & \cos^2 65° \end{vmatrix}$ is equal to

a. –2 b. –1 c. 0 d. 1

586. If f : [0, π/2) → R is defined as

$$f(\theta) = \begin{vmatrix} 1 & \tan\theta & 1 \\ -\tan\theta & 1 & \tan\theta \\ -1 & -\tan\theta & 1 \end{vmatrix}$$. Then the range of f is

a. (2, ∞) b. (–∞, –2] c. [2, ∞) d. (–∞, 2]

587. The value of $\begin{vmatrix} 4 & 4 & 4 \\ (a+a^{-1})^2 & (b+b^{-1})^2 & (c+c^{-1})^2 \\ (a-a^{-1})^2 & (b-b^{-1})^2 & (c-c^{-1})^2 \end{vmatrix}$ is

a. 0 b. 4abc
c. $4(abc)^{-1}$ d. $4[abc + (abc)^{-1}]$

588. If k > 1 and the determinant of the matrix A^2, where $A = \begin{vmatrix} k & k\alpha & \alpha \\ 0 & \alpha & k\alpha \\ 0 & 0 & k \end{vmatrix}$ is k^2, then |α| =

a. k b. k^2 c. $\frac{1}{k}$ d. $\frac{1}{k^2}$

589. Consider the following statements:

i. If any two rows or columns of a determinant are identical, then the value of the determinant is zero.
ii. If the corresponding rows and columns of a determinant are interchanged, then the value of the determinant does not change.
iii. If any two rows (or columns) of a determinant are interchanged, then the value of the determinant changes in sign.

Which of these are correct?

a. i and iii b. i and ii c. i, ii and iii d. ii and iii

590. If a, b and c are in A.P., then the value of $\begin{vmatrix} x+2 & x+3 & x+a \\ x+4 & x+5 & x+b \\ x+6 & x+7 & x+c \end{vmatrix}$ is

a. 0 b. x – (a + b + c)
c. a + b + c d. $9x^2 + a + b + c$

591. If $\Delta_r = \begin{vmatrix} 2r-1 & {}^mC_r & 1 \\ m^2-1 & 2^m & m+1 \\ \sin^2(m^2) & \sin^2(m) & \sin^2(m+1) \end{vmatrix}$, then the value of $\sum_{r=0}^{m} \Delta_r$ is

a. 1 b 0
c. 2 d. None of these

592. The value of $\begin{vmatrix} \sin\alpha & \cos\alpha & \sin(\alpha+\gamma) \\ \sin\beta & \cos\beta & \sin(\beta+\gamma) \\ \sin\delta & \cos\delta & \sin(\gamma+\delta) \end{vmatrix}$ is

a. sinα sinβ sinδ b. sinα cosβ cosδ
c. 1 d. 0

593. If $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix} = x + iy$, then x and y are given by

a. x = 0, y = 1 b. x = 1, y = 0
c. x = 1, y = 1 d. x = 0, y = 0

594. The value of $\begin{vmatrix} 1988 & 1989 & 1990 \\ 1991 & 1992 & 1993 \\ 1994 & 1995 & 1996 \end{vmatrix}$ is

a. 0 b. 1
c. –1 d. None of these

595. If $A = \begin{bmatrix} 3 & 7 \\ 1 & 2 \end{bmatrix}$, then the value of the determinant $|A^{2013} - 3A^{2012}|$ is equal to

a. 8　b. –8　c. 9　d. –7

596. If t_5, t_{10} and t_{25} are 5^{th}, 10^{th} and 25^{th} terms of an A.P. respectively, then the value of $\begin{vmatrix} t_5 & t_{10} & t_{25} \\ 5 & 10 & 25 \\ 1 & 1 & 1 \end{vmatrix}$ is equal to

a. – 40　b. 1　c. –1　d. 0

597. If $f(x) = \begin{vmatrix} x+1 & x & 1 \\ x(x+1) & x(x-1) & 2x \\ x(x+1)(x-1) & x(x-1)(x-2) & 3x(x-1) \end{vmatrix}$, then f(1000) =

a. 1　b. 1000　c. –1000　d. 0

598. If $\begin{vmatrix} (x+a) & b & c \\ a & (x+b) & c \\ a & b & (x+c) \end{vmatrix} = 0$, then x =

a. 0, – (a + b + c)　b. 0
c. – (a + b + c)　d. a + b + c

599. If ω is a cube root of unity, then the value of determinant $\begin{vmatrix} 1+\omega & \omega^2 & \omega \\ \omega^2+\omega & -\omega & \omega^2 \\ 1+\omega^2 & \omega & \omega^2 \end{vmatrix}$ is

a. 1 + ω　b. ω – 1　c. 0　d. ω^2

600. If A is a matrix of order n, then determinant |–A| is equal to

a. |A|　b. –|A|　c. $(-1)^n|A|$　d. n|A|

601. If $ax^4 + bx^3 + cx^2 + dx + e = \begin{vmatrix} x^3+3x & x-1 & x+3 \\ x+1 & -2x & x-4 \\ x-3 & x+4 & 3x \end{vmatrix}$, then e =

a. –1　b. 1　c. 0　d. 2

602. If $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$, then the number of distinct real roots of this equation in the interval $-\pi/2 < x < \pi/2$ is

a. 2　b. 0　c. 1　d. 3

603. Let m be the positive integer and 0 ≤ r ≤ m. The value of $\sum_{r=0}^{m} \begin{vmatrix} 2r-1 & {}^mC_r & 1 \\ m^2-1 & 2^m & m+1 \\ \sin^2 m & \cos^2 m & \tan^2 m \end{vmatrix}$ will be

a. 2^m　b. m + 1　c. $m^2 - 1$　d. 0

604. If A is a square matrix of order 3 and α is a real number, then determinant |αA| is equal to

a. $\alpha^2|A|$　b. α|A|
c. $\alpha^3|A|$　d. None of these

605. If ω is an imaginary cube root of unity, then the value of $\begin{vmatrix} 1 & \omega^2 & 1-\omega^4 \\ \omega & 1 & 1+\omega^5 \\ 1 & \omega & \omega^2 \end{vmatrix}$ is

a. – 4　b. $\omega^2 - 4$　c. ω^2　d. 4

606. $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix} =$

a. 0　b. –1　c. 1　d. 2

607. The value of the determinant $\begin{vmatrix} 15! & 16! & 17! \\ 16! & 17! & 18! \\ 17! & 18! & 19! \end{vmatrix}$ is equal to

a. 15! + 16!　b. 2(15!) (16!) (17!)
c. 15! + 16! + 17!　d. 16! + 17!

608. If ω is a cube root of unity, then $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$ is equal to

a. 1　b. ω　c. ω^2　d. 0

609. The value of $\begin{vmatrix} \log_5 729 & \log_3 5 \\ \log_5 27 & \log_9 25 \end{vmatrix} \cdot \begin{vmatrix} \log_3 5 & \log_{27} 5 \\ \log_5 9 & \log_5 9 \end{vmatrix}$ is

a. 1　b. 6
c. $\log_5 9$　d. $\log_3 5 \cdot \log_5 81$

610. If a, b, c are all distinct and if $\begin{vmatrix} 1-a^3 & a^2 & a \\ 1-b^3 & b^2 & b \\ 1-c^3 & c^2 & c \end{vmatrix} = 0$, then

a. abc = 1　b. abc = –1
c. a + b + c = 0　d. a + b + c = ±1

611. If $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} = 0$, then a, b, c are

a. equal　b. in A.P.　c. in G.P.　d. in H.P

612. If $\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 2\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 2\theta \\ \sin^2\theta & \cos^2\theta & 4\sin 2\theta - 1 \end{vmatrix} = 0$ and $0 < \theta < \frac{\pi}{2}$, then cos4θ =

a. $\frac{-1}{2}$　b. $\frac{1}{2}$　c. $\frac{\sqrt{3}}{2}$　d. 0

613. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 5 \end{pmatrix}$, then the value of the determinant $|A^{2009} - 5A^{2008}|$ is

a. – 6 b. –5 c. – 4 d. 4

614. If x, y, z are all positive and are the p^{th}, q^{th} and r^{th} terms of a geometric progression respectively, then the value of the determinant $\begin{vmatrix} \log x & p & 1 \\ \log y & q & 1 \\ \log z & r & 1 \end{vmatrix}$ equals

a. log xyz b. (p – 1)(q – 1)(r –1)
c. pqr d. 0

615. $\begin{vmatrix} 101 & 103 & 105 \\ 104 & 105 & 106 \\ 107 & 108 & 109 \end{vmatrix} =$

a. 0 b. 1 c. 2 d. 3

616. $\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & bc & c^2+1 \end{vmatrix} =$

a. 1 + a + b + c b. 1 + ab + bc + ca
c. $1 + a^2 + b^2 + c^2$ d. abc

617. If x ≠ 0, $\begin{vmatrix} x+1 & 2x+1 & 3x+1 \\ 2x & 4x+3 & 6x+3 \\ 4x+1 & 6x+4 & 8x+4 \end{vmatrix} = 0$, then 2x + 1 =

a. x b. 0 c. 2x d. 3x

618. $\begin{vmatrix} 1 & x & y+z \\ 1 & y & z+x \\ 1 & z & x+y \end{vmatrix} =$

a. 0 b. x c. y d. xyz

619. Let $A = \begin{pmatrix} \alpha^2 & 5 \\ 5 & -\alpha \end{pmatrix}$ and $|A^{10}| = 1024$, then α =

a. 2 b. –2 c. 3 d. –3

620. If $\alpha^3 \neq 1$ and $\alpha^9 = 1$, then the value of $\begin{vmatrix} \alpha & \alpha^3 & \alpha^5 \\ \alpha^3 & \alpha^5 & \alpha \\ \alpha^5 & \alpha & \alpha^3 \end{vmatrix}$ is equal to

a. $3\alpha^3$ b. $3(\alpha^3 + \alpha^6 + \alpha^9)$
c. $3(\alpha + \alpha^2 + \alpha^3)$ d. 3

621. If ω ≠ 1 is a cube root of unity, then the value of $\begin{vmatrix} 1+2\omega^{100}+\omega^{200} & \omega^2 & 1 \\ \omega & 1+\omega^{100}+2\omega^{200} & \omega \\ \omega & \omega^2 & 2+\omega^{100}+\omega^{200} \end{vmatrix}$ is equal to

a. 0 b. 1 c. ω d. ω^2

622. $\begin{vmatrix} a & b & a-b \\ b & c & b-c \\ 2 & 1 & 0 \end{vmatrix} = 0$ if a, b, c are in

a. A.P. b. GP.
c. H.P. d. None of these

623. If $f(x) = \begin{vmatrix} 1 & 2(x-1) & 3(x-1)(x-2) \\ (x-1) & (x-1)(x-2) & (x-1)(x-2)(x-3) \\ x & x(x-1) & x(x-1)(x-2) \end{vmatrix}$ then f(49) =

a. 49 b. – 49
c. 0 d. None of these

624. The value of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ {}^mC_1 & {}^{m+1}C_1 & {}^{m+2}C_1 \\ {}^mC_2 & {}^{m+1}C_2 & {}^{m+2}C_2 \end{vmatrix}$ is

a. 1 b. –1
c. 0 d. None of these

625. If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for x ≠ 0, y ≠ 0 then D is

a. divisible by x but not y b. divisible by y but not x
c. divisible by neither x nor y
d. divisible by both x and y

626. If $\begin{vmatrix} x & y & z \\ -x & y & z \\ x & -y & z \end{vmatrix} = kxyz$, then k =

a. 1 b. 3 c. 4 d. 2

627. $\begin{vmatrix} a-b+c & -a-b+c & 1 \\ a+b+2c & -a+b+2c & 2 \\ 3c & 3c & 3 \end{vmatrix}$ is

a. 12ab b. –12ab c. ab d. 1/12ab

628. $\begin{vmatrix} \log_z x & \log_z y & 1 \\ 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \end{vmatrix}$ is equal to

a. 3 b. 1
c. logx + logy + logz d. 0

629. The area of triangle with vertices (K, 0), (4, 0), (0, 2) is 4 square units, then the value of K is

a. 8 b. 0 or –8 c. 0 d. 0 or 8

630. Let A(a, 0), B(0, b) and C(1, 1) be three points. If $\frac{1}{a} + \frac{1}{b} = 1$, then the three points are

a. vertices of an equilateral traingle
b. vertices of a right angled traingle
c. collinear
d. vertices of an isosceles traingle

631. $x + 8y - 22 = 0$, $5x + 2y - 34 = 0$, $2x - 3y + 13 = 0$ are the three sides of a traingle. The area of the triangle is
a. 36 square units　b. 19 square units
c. 42 square units　d. 72 square units

632. The points (a, 0), (0, b) and (1, –1) are collinear ($a \neq 0$, $b \neq 0$) if
a. $b - a = ab$　b. $a + b = ab$
c. $a - b = ab$　d. $a + b = -ab$

633. The three distinct points $A(at_1^2, 2at_1)$, $B(at_2^2, 2at_2)$ and C (0, a) (where a is a real number) are collinear if
a. $t_1t_2 = -1$　b. $t_1t_2 = 1$
c. $2t_1t_2 = t_1 + t_2$　d. $t_1 + t_2 = a$

634. If $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ are the vertices of an equilateral triangle whose each side is equal to a, then $\begin{vmatrix} x_1 & y_1 & 2 \\ x_2 & y_2 & 2 \\ x_3 & y_3 & 2 \end{vmatrix}^2$ is equal to
a. $3a^4$　b. $3a^2$
c. $3a^6$　d. None of these

635. Value of a 3×3 determinant is 3, value of determinant formed by its co-factor is
a. 27　b. 9　c. 6　d. 3

636. If $A = \begin{bmatrix} 2 & -3 \\ -4 & 1 \end{bmatrix}$, then adj $(3A^2 + 12A)$ is equal to
a. $\begin{bmatrix} 51 & 63 \\ 84 & 72 \end{bmatrix}$　b. $\begin{bmatrix} 51 & 84 \\ 63 & 72 \end{bmatrix}$
c. $\begin{bmatrix} 72 & -63 \\ -84 & 51 \end{bmatrix}$　d. $\begin{bmatrix} 72 & -84 \\ -63 & 51 \end{bmatrix}$

637. For an invertible matrix A if A(adj A) = $\begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$ then |A| is
a. 100　b. –100　c. 10　d. –10

638. If $A = \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}$ and A adj A = AA^T, then 5a + b is equal to
a. –1　b. 5　c. 4　d. 13

639. Let A be a square matrix of order 3 such that |A| = 5. Then det[adj (A)A] =
a. 625　b. 5　c. 25　d. 125

640. If $A = \begin{bmatrix} 2 & 2 \\ -3 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$, then $(B^{-1}, A^{-1})^{-1}$ = _____
a. $\begin{bmatrix} 2 & -2 \\ 2 & 3 \end{bmatrix}$　b. $\begin{bmatrix} 2 & 2 \\ -2 & 3 \end{bmatrix}$
c. $\begin{bmatrix} 2 & -3 \\ 2 & 2 \end{bmatrix}$　d. $\begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$

641. If A is square matrix of order 3, then $|\text{adj}(\text{adj } A^2)|$ =
a. $|A|^2$　b. $|A|^4$　c. $|A|^8$　d. $|A|^{16}$

642. If A is 3×3 matrix such that |5 . adjA| = 5, then |A| is equal to
a. $\pm\frac{1}{5}$　b. ±5　c. ±1　d. $\pm\frac{1}{25}$

643. Let $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$. The determinant of $\frac{1}{3}A(\text{adj}(\text{adj}A))$ is
a. 1　b. –1　c. 1/3　d. 3

644. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ be such that $A^{-1} = kA$, then k is equal to
a. 19　b. $\frac{1}{19}$　c. –19　d. $-\frac{1}{19}$

645. If A is a square matrix of order $n \times n$ then adj (adj A) is equal to
a. $|A|^nA$　b. $|A|^{n-1}A$　c. $|A|^{n-2}A$　d. $|A|^{n-3}A$

646. If ω is a complex cube root of unity and
$A = \begin{bmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{bmatrix}$, then the maxtrix A is
a. skew-symmetric　b. Non-singular
c. Singular　d. None of these

647. If A is a non-singular matrix of order 3 and |A| indicates the determinant of A, then $|A^{-1}(\text{adj } A)|$ is equal to
a. $\frac{1}{|A|}$　b. |A|　c. $|A|^2$　d. $|A|^3$

648. If $A = \begin{bmatrix} 2-k & 2 \\ 1 & 3-k \end{bmatrix}$ is a singular matrix, then the value of $5k - k^2$ is equal to
a. 0　b. 6　c. –6　d. 4

649. If $P = \begin{bmatrix} 1 & \alpha & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 4 \end{bmatrix}$ is the adjoint of a 3×3 matrix A and |A| = 4, then α is equal to
a. 11　b. 5　c. 0　d. 4

650. For 3×3 matrices M and N, which of the following statement(s) is (are) not correct?
a. N^TMN is symmetric or skew symmetric according as M is symmetric or skew symmetric.
b. MN – NM is skew symmetric for all symmetric matrices M and N
c. MN is symmetric for all symmetric matrices M and N.
d. (adj M) (adj N) = adj(MN) for all invertible matrices M and N.

651. If the determinant of the adjoint of a (real) matrix of order 3 is 25, then the determinant of the inverse of the matrix is

a. 0.3 b ±5 c. $\frac{1}{\sqrt[5]{625}}$ d. ±0.2

652. The value of x, for which the matrix $A = \begin{bmatrix} e^{x-2} & e^{7+x} \\ e^{2+x} & e^{2x+3} \end{bmatrix}$ is singular, is equal to

a. 9 b. 8 c. 7 d. 6

653. In the set of all 3 × 3 real matrices a relation is defined as follows. A matrix A is related to a matrix B if and only if there is a non-singular 3 × 3 matrix P such that $B = P^{-1}AP$. This relation is

a. reflexive, symmetric but not transitive
b. reflexive, trasitive but not symmetric
c. symmetric, transitive but not reflexive
d. an equivalence relation

654. The inverse of a symmetric matrix is

a. skew symmetric b. symmetric
c. diagonal matrix d. None of these

655. If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, B = (adj A) and C = 5A, then $\frac{|C|}{|\text{adj } B|}$ is equal to

a. 125 b. –1 c. 5 d. –5

656. If the adjoint of a 3 × 3 matrix P is $\begin{bmatrix} 1 & 4 & 4 \\ 2 & 1 & 7 \\ 1 & 1 & 3 \end{bmatrix}$, then the possible value(s) of the determinant of P is (are)

a. –2 b. –1 c. 1 d. 2

657. For any square matrix A, A^{-1} exists if and only if

a. A = I b. A ≠ O c. |A| = 0 d. |A| ≠ 0

658. Inverse of a diagonal non-singular matrix is

a. diagonal matrix b. scalar matrix
c. skew symmetric matrix d. zero matrix

659. If $P = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ then, det (adj P) =

a. P^{27} b. P^{17}
c. P^{6} d. None of these

660. A is a singular matrix, then A(adj A) is ....

a. null matrix b. –1
c. 1 d. 2

661. If A is a 2 × 2 matrix and |A| = 2, then the matrix represented by A(adj A) is equal to

a. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ b. $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$

c. $\begin{bmatrix} 1/2 & 0 \\ 0 & 1/2 \end{bmatrix}$ d. $\begin{bmatrix} 0 & 2 \\ 2 & 0 \end{bmatrix}$

662. If A(adjA) = 5I, where I is identity matrix of order 3, then |adjA| =

a. 125 b. 25 c. 10 d. 5

663. If A is a square matrix of order 3 and if det(A) = 3, then det {adj[adj(adj(adjA)]} is equal to

a. 81^2 b. 81 c. 729 d. 27

664. If A is a 3 × 3 nonsingular matrix and if |A| = 3, then $|(2A)^{-1}|$ =

a. 3 b. 24 c. $\frac{1}{24}$ d. $\frac{1}{3}$

665. Which one of the following is true always for any two non-singular matrices A and B of same order?

a. AB = BA b. $(AB)^1 = A^1B^1$
c. $(A + B)(A - B) = A^2 - B^2$ d. $(AB)^{-1} = B^{-1}A^{-1}$

666. If A is a non-singular matrix of order 3, then adj(adjA) is equal to

a. A b. A^{-1} c. $\frac{1}{|A|}A$ d. |A|A

667. If B is a non-singular matrix and A is a square matrix, then $\det(B^{-1}AB)$ be equal to

a. $\det(A^{-1})$ b. $\det(B^{-1})$ c. det(A) d. det(B)

668. Let A be a 2 × 2 matrix

Statement-1 : adj(adjA) = A

Statement-2 : |adjA| = |A|

a. Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1
b. Statement-1 is true, Statement-2 is false
c. Statement-1 is false, Statement-2 is true
d. Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1

669. For 0 < θ < π, if $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, then

a. $A^T = A$ b. $A^T = -A$ c. $A^2 = I$ d. $A^T = A^{-1}$

670. The matrix $\begin{bmatrix} \lambda & 1 & 0 \\ 0 & 2 & 3 \\ 0 & 0 & \lambda \end{bmatrix}$ is non-singular

a. for all real values of λ b. only when $\lambda = \pm\frac{1}{\sqrt{2}}$
c. only when λ ≠ 0 d. only when λ = 0

671. If B is an non-singular matrix and A is a square matrix such that $B^{-1}AB$ exists, then $\det(B^{-1}AB)$ is equal to

a. $\det(A^{-1})$ b. $\det(B^{-1})$ c. det(B) d. det(A)

672. From the matrix equation AB = AC, it can be concluded that B = C provided

a. A is singular b. A is non-singular
c. A is symmetric d. A is square

673. Let A be a square matrix all of whose entries are integers. Then which one of the following is true?
a. If det A = ±1, then A^{-1} need not exist
b. If det A = ±1, then A^{-1} exists but all its entries are not necessarily integers
c. If det A ≠ ±1, then A^{-1} exists all its entries are non-integers
d. If det A = ±1, then A^{-1} exists and all its entries are integers

674. The inverse of a skew-symmetric matrix of odd order is
a. a symmetric marix b. a skew-symmetric matrix
c. diagonal matrix d. does not exist

675. If A is a square matrix of order 3 and |A| = 8, then |adjA| =
a. 8 b. 8^2 c. $1/8^2$ d. 1/8

676. If $A(\theta)=\begin{bmatrix}1 & \tan\theta \\ -\tan\theta & 1\end{bmatrix}$ and AB = I, then $(\sec^2\theta)B$ is equal to
a. $A(\theta)$ b. $A\left(\frac{\theta}{2}\right)$ c. $A(-\theta)$ d. $A\left(\frac{-\theta}{2}\right)$

System of Equations

677. The number of real values of λ for which the system of linear equations $2x + 4y - \lambda z = 0$, $4x + \lambda y + 2z = 0$, $\lambda x + 2y + 2z = 0$ has infinitely many solutions, is
a. 0 b. 1 c. 2 d. 3

678. The equations $\lambda x - y = 2$, $2x - 3y = -\lambda$ and $3x - 2y = -1$ are consistent for
a. λ = – 4 b. λ = 1, 4 c. λ = 1, – 4 d. λ = –1, 4

679.. The linear system of equations $\left.\begin{array}{l}8x-3y-5z=0\\5x-8y+3z=0\\3x+5y-8z=0\end{array}\right\}$ has
a. only zero solution
b. only finite number of non-zero solutions
c. n non-zero solution
d. infinitely many non-zero solutions

680. The system of linear equations $x + \lambda y - z = 0$, $\lambda x - y - z = 0$, $x + y - \lambda z = 0$ has a non-trival solution for
a. infinitely many values of λ
b. exactly one value of λ
c. exactly two values of λ
d. exactly three values of λ

681. The system of equations $x + 4y - 3z = 3$, $x - y + 7z = 11$, $2x + 8y - 6z = 7$ have
a. unique solution
b. infinitely many solutions
c. no solutions
d. only finite number of solutions

682. The system of linear equations $x + y + z = 6$, $x + 2y + 3z = 10$ and $x + 2y + az = b$ has a no solution when
a. a = 3, b ≠ 10 b. b = 3, a ≠ 10
c. a = 2, b ≠ 3 d. b = 2, a = 3

683. The existence of the unique solution of the system of equations $x + y + z = \beta$, $5x - y + \alpha z = 10$ and $2x + 3y - z = 6$ depends on
a. α only b. β only
c. α and β both d. neither β nor α

684. The system of linear equations $3x + y - z = 2$, $x - z = 1$ and $2x + 2y + az = 5$ has unique solution when
a. a ≠ 3 b. a ≠ 4 c. a ≠ 5 d. a ≠ 2

685. If the system of equations $x + ky - z = 0$, $3x - ky - z = 0$ and $x - 3y + z = 0$ has non-zero solution, then k is equal to
a. –1 b. 0 c. 1 d. 2

686. The number of values of k, for which the system of equations $(k+1)x + 8y = 4k$, $kx + (k + 3)y = 3k - 1$, has no solution, is
a. 1 b. 2 c. 3 d. infinite

687. Consider the system of equatuons:
$x + y + z = 0$
$\alpha x + \beta y + \gamma z = 0$
$\alpha^2 x + \beta^2 y + \gamma^2 z = 0$
Then the system of equations has
a. a unique solution for all values of α, β, γ
b. infinite number of solutions if any two of α, β, γ are equal
c. a unique solution if α, β, γ are distinct
d. more than one, but finite number of solutions depending on values of α, β, γ

688. The system of homogeneous equations $tx + (t + 1)y + (t - 1)z = 0$, $(t + 1)x + ty + (t + 2)z = 0$, $(t - 1)x + (t + 2)y + tz = 0$ has non-trival solutions for
a. exactly three real values of t
b. exactly two real values of t
c. exactly one real value of t
d. infinite number of values of t

689. The number of real values of α for which the system of equations $x + 3y + 5z = \alpha x$, $5x + y + 3z = \alpha y$, $3x + 5y + z = \alpha z$ has infinite number of solution is
a. 1 b. 2 c. 4 d. 6

690. The system of linear equations
$\lambda x + y + z = 3$, $x - y - 2z = 6$, $-x + y + z = \mu$ has
a. infinite number of solutions for λ ≠ –1 and all μ
b. infinite number of solutions for λ = –1 and μ = 3
c. no solution for λ ≠ –1
d. unique solution for λ = –1 and μ = 3

691. If the system of linear equations $x + 2y - 3z = 1$, $(p + 2)z = 3$, $(2p + 1)y + z = 2$ has no solution, then
a. $p = 2$ b. $p = -2$ c. $p = \frac{1}{2}$ d. $p = 3$

692. If $x + y + z = 0$, $4x + 3y - z = 0$ and $3x + 5y + 3z = 0$ is system of equation then which of the following is correct?
a. it is inconsistent
b. it has only single solution $x = 0, y = 0, z = 0$
c. determinant of coefficient of matrix is zero
d. it has infinitely many solutions

693. The value of λ and μ for which the simultaneous equation $x + y + z = 6$, $x + 2y + 3z = 10$ and $x + 2y + \lambda z = \mu$ have a unique solution are
a. $\lambda = 3$ only b. $\mu = 3$ only
c. $\lambda = 3$ and $\mu = 3$
d. $\lambda \neq 3$ and μ can take any value

694. The system of equations $2x + y - 5 = 0$, $x - 2y + 1 = 0$, $2x - 14y - a = 0$, is consistsent. Then, a is equal to
a. 1 b. 2
c. 5 d. None of these

695. Consider the system of linear equations $x_1 + 2x_2 + x_3 = 3$, $2x_1 + 3x_2 + x_3 = 3$, $3x_1 + 5x_2 + 2x_3 = 1$. The system has
a. infinite number of solutions
b. exactly 3 solutions
c. a unique solution
d. no solution

696. If the system of equations $ax + ay - z = 0$, $bx - y + bz = 0$, $-x + cy + cz = 0$ has a non-trival solution, then the value of $\frac{1}{1+a} + \frac{1}{1+b} + \frac{1}{1+c}$ is
a. 0 b. 1 c. 2 d. 3

697. If the three linear equations $x + 4ay + az = 0$, $x + 3by + bz = 0$, $x + 2cy + cz = 0$ have a non-trival solution, where $a \neq 0$, $b \neq 0$, $c \neq 0$, then $ab + bc$ is equal to
a. 2ac b. –ac c. ac d. –2ac

698. The real value of k for which the system of equations $2kx - 2y + 3z = 0$, $x + ky + 2z = 0$, $2x + kz = 0$, has non-trival solution is
a. 2 b. –2 c. 3 d. –3

699. The system of linear equations $x + ky + 3z = 0$, $3x + ky - 2z = 0$, $2x + 3y - 4z = 0$ possess a non-trival solution if
a. $k = 33/2$ b. $k = 1$
c. $k = 0$ d. None of these

700. The number of solutions of the system of equations $x - y + z = 2$, $2x + y - z = 5$, $4x - y + z = 10$ is
a. ∞ b. 1 c. 2 d. 0

701. The value of a for which the system of equations $ax + y + z = 0$, $x + ay + z = 0$, $x + y + z = 0$, possess non-zero solutions are given by
a. 1, 2 b. 1, –1
c. 1 d. None of these

702. The simultaneous equations $Kx + 2y - z = 1$, $(K - 1)y - 2z = 2$ and $(K + 2)z = 3$ have only one solution when
a. $K = -2$ b. $K = -1$ c. $K = 0$ d. $K = 1$

703. The system of equation $ax + y + z = 0$, $-x + ay + z = 0$ & $-x - y + az = 0$ has a non-zero solution if the real value of 'a' is
a. 1 b. –1 c. 3 d. 0

Probability

704. Three unbiased coins are tossed. The probability of getting at least 2 tails is
a. $\frac{3}{4}$ b. $\frac{1}{4}$ c. $\frac{1}{2}$ d. $\frac{1}{3}$

705. A single letter is selected from the word TRICKS. The probability that it is either T or R is
a. $\frac{1}{36}$ b. $\frac{1}{4}$ c. $\frac{1}{2}$ d. $\frac{1}{3}$

706. Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?
a. $\frac{3}{4}$ b. $\frac{1}{4}$ c. $\frac{1}{2}$ d. $\frac{2}{3}$

707. The probability that a non leap year selected at random will have 53 Sundays, is
a. 0 b. 1/7 c. 2/7 d. 3/7

708. Two fair dice are rolled. The the probability of getting a composite number as the sum of face values is equal to
a. $\frac{7}{12}$ b. $\frac{5}{12}$ c. $\frac{1}{12}$ d. $\frac{3}{4}$

709. Three dice are rolled once. The chance of getting a total score of 5 is
a. $\frac{5}{216}$ b. $\frac{1}{6}$ c. $\frac{1}{36}$ d. $\frac{1}{7^2}$

710. Probability of product of a perfect square when two dice are thrown together is ......
a. $\frac{1}{9}$ b. $\frac{2}{13}$ c. $\frac{2}{9}$ d. $\frac{4}{9}$

711. Tweleve tickets are numbered from 1 to 12. One ticket is drawn at random, then the probability of the number to be divisible by 2 or 3 is
a. 2/3 b. 7/12 c. 5/6 d. 3/4

712. For three events A, B and C, P(Exactly one of A or B occurs) = P(Exactly one of B or C occurs) = P(Exactly one of C or A occurs) $= \frac{1}{4}$ and P(All the three events occur simultaneously) $= \frac{1}{16}$. Then the probability that at least one of the events occurs, is

a. $\frac{7}{16}$ b. $\frac{7}{64}$ c. $\frac{3}{16}$ d. $\frac{7}{32}$

713. If x is one of the first fifty numbers chosen at random, then the probability that $x + \frac{3}{x}$ is greater than 20 is

a. $\frac{11}{50}$ b. $\frac{21}{50}$ c. $\frac{31}{50}$ d. $\frac{41}{50}$

714. Two distinct numbers x and y are chosen from 1, 2, 3, 4, 5. The probability that the arithmetic mean of x and y is an integer is

a. 0 b. $\frac{1}{5}$ c. $\frac{3}{5}$ d. $\frac{2}{5}$

715. In a class of 15 students, 5 of them are boys and 10 students are girls. A team of 11 members has to be formed at random. The probability that the team has at least 4 boys, is

a. $\frac{57}{91}$ b. $\frac{54}{95}$ c. $\frac{54}{91}$ d. $\frac{51}{91}$

716. Two cards are drawn at random from a pack of 52 cards. The probability of these two being "Aces" is

a. $\frac{1}{26}$ b. $\frac{1}{221}$ c. $\frac{1}{2}$ d. $\frac{1}{13}$

717. A bag contains 3 red, 4 white and 5 blue balls. If two balls are drawn at random, then the probability that they are of different colours is

a. $\frac{47}{66}$ b. $\frac{23}{33}$ c. $\frac{47}{132}$ d. $\frac{47}{33}$

718. There are 5 positive numbers and 6 negative numbers. Three numbers are chosen at random and multiplied. The probability that the product being a negative number is

a. $\frac{11}{34}$ b. $\frac{17}{33}$ c. $\frac{16}{35}$ d. $\frac{16}{33}$

719. An urn contains 9 balls, 2 of which are white, 3 blue and 4 black are drawn at random from the urn. The chance that 2 balls will be of the same colour and the third of a different colour is

a. $\frac{45}{84}$ b. $\frac{55}{84}$ c. $\frac{35}{84}$ d. $\frac{25}{84}$

720. 6 boys & 6 girls sit in a row at random. The probability that all the girls sit together is

a. $\frac{1}{432}$ b. $\frac{12}{431}$

c. $\frac{1}{132}$ d. None of these

721. A bag contains 3 white, 4 black, 2 red balls. If 2 balls are drawn at random, then the probability that both the balls are white, is

a. $\frac{1}{18}$ b. $\frac{1}{36}$ c. $\frac{1}{12}$ d. $\frac{1}{24}$

722. Two persons A and B are throwing an unbiased six faced die alternatively, with the condition that the person who throws 3 first wins the game. If A starts the game, the probabilities of A and B to win the same are respectively

a. $\frac{6}{11}, \frac{5}{11}$ b. $\frac{5}{11}, \frac{6}{11}$ c. $\frac{8}{11}, \frac{3}{11}$ d. $\frac{3}{11}, \frac{8}{11}$

723. The letters of the word "Question" are arranged in a row at random. The probability that there are exactly two letters between Q and S is

a. $\frac{1}{14}$ b. $\frac{5}{7}$ c. $\frac{1}{7}$ d. $\frac{5}{28}$

724. $x_1, x_2, x_3, ... x_{50}$ are fifty real numbers such that $x_r < x_{r+1}$ for r = 1, 2, 3, ..., 49. Five numbers out of these are picked up at random. The probability that the five numbers have x_{20} as the middle number is

a. $\frac{^{20}C_2 \times {}^{30}C_2}{^{50}C_5}$ b. $\frac{^{30}C_2 \times {}^{19}C_2}{^{50}C_5}$

c. $\frac{^{19}C_2 \times {}^{31}C_2}{^{50}C_5}$ d. None of these

725. Let A and B be two events. Then $1 + P(A \cap B) - P(B) - P(A)$ is equal to

a. $P(\bar{A} \cup \bar{B})$ b. $P(A \cap \bar{B})$

c. $P(\bar{A} \cap B)$ d. $P(\bar{A} \cap \bar{B})$

726. If the occurrence of an event A implies the occurrence of an event B, then $P(A^C \cap B^C)$ is equal to

a. $P(B^C)$ b. $P(A^C)P(B^C)$

c. $P(A^C)$ d. $1 - P(A \cap B)$

727. Consider an experiment E in which a box contains 10 identical tickets numbered 1 to 10 and 2 tickets are drawn at random from the box. What is the probability that both the tickets have even numbers on them?

a. $\frac{4}{9}$ b. $\frac{1}{3}$ c. $\frac{2}{9}$ d. $\frac{1}{9}$

728. If A, B and C are mutually exclusive and exhaustive events of a random experiment such that $P(B) = \frac{3}{2}P(A)$ and $P(C) = \frac{1}{2}(P(B)$, then $P(A \cup C) =$

a. $\frac{3}{13}$ b. $\frac{6}{13}$ c. $\frac{7}{13}$ d. $\frac{10}{13}$

729. There are 7 horses in a race. Mr. X selected 2 horses at random and bet on them. The probability that Mr. X selected the winning horse, is

a. $\frac{1}{7}$ b. $\frac{4}{7}$ c. $\frac{3}{7}$ d. $\frac{2}{7}$

730. The probability that A speaks the truth is $\frac{3}{5}$ and probability that B speaks the truth is $\frac{3}{4}$. Find the probability that they contradict each other when asked to speak a fact.

a. $\frac{3}{20}$ b. $\frac{4}{5}$ c. $\frac{9}{20}$ d. $\frac{7}{20}$

731. For any two events A, B if $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{2}$, $P(A \cap B) = \frac{1}{6}$, then the probabilty that exactly one of them occurs is

a. $\frac{1}{3}$ b. $\frac{1}{2}$ c. $\frac{2}{3}$ d. $\frac{5}{6}$

732. A four-digit number is formed by the digits 1, 2, 3, 4 with no repetition. The probability that the number is odd, is

a. zero b. $\frac{1}{3}$

c. $\frac{1}{4}$ d. None of these

733. A poker hand consists of 5 cards drawn at random from a well-shuffled pack of 52 cards. Then the probability that the pocket hand consists of a pair and a triple of equal face values (for example, 2 sevens and 3 kings or 2 aces and 3 queens, etc.) is

a. $\frac{6}{4165}$ b. $\frac{23}{4165}$ c. $\frac{1797}{4165}$ d. $\frac{1}{4165}$

734. For the two events A and B, let P(A) = 0.7 and P(B) = 0.6. The necessarily false statement(s) is/are

a. $P(A \cap B) = 0.35$ b. $P(A \cap B) = 0.45$

c. $P(A \cap B) = 0.65$ d. $P(A \cap B) = 0.28$

735. For any two events A and B, which of the following result does not hold true in general:

a. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

b. $P(A) = P(A \cap B) + P(A \cap \bar{B})$

c. $P(B) = P(A \cap B) + P(\bar{A} \cap B)$

d. $P(A \cup B) = P(A) + P(B)$

736. Four persons independently solve a certain problem correctly with probabilities $\frac{1}{2}, \frac{3}{4}, \frac{1}{4}, \frac{1}{8}$. Then the probability that the problem is solved correctly by at least one of them is

a. $\frac{235}{256}$ b. $\frac{21}{256}$ c. $\frac{3}{256}$ d. $\frac{256}{256}$

737. A bag contains 50 tickets numbered 1, 2, 3, ..., 50 of which five are drawn at random and arranged in ascending order of magnitude ($x_1 < x_2 < x_3 < x_4 < x_5$) then the probability that $x_3 = 30$ is

a. $\frac{^{29}C_2 \times {}^{20}C_2}{^{50}C_5}$ b. $\frac{^{30}C_1 \times {}^{20}C_1}{^{50}C_5}$

c. $\frac{^{5}C_1 \times {}^{50}C_2}{^{50}C_5}$ d. $\frac{^{50}C_2 \times {}^{20}C_1}{^{50}C_5}$

738. If S is the sample space and $P(A) = \frac{1}{3}P(B)$ and $S = A \cup B$ where A and B are two mutually exclusive events, then P(A) = ?

a. 1/4 b. 1/2 c. 3/4 d. 3/8

739. Five persons entered the lift cabin on the ground floor of an eight floor house. Suppose that each of them independently and with equal probability can leave the cabin at any floor beginning with the first, then the probability of all 5 persons leaving at different floors is

a. $\frac{^7P_5}{7^5}$ b. $\frac{7^5}{^7P_5}$ c. $\frac{6}{^6P_5}$ d. $\frac{^5P_5}{5^5}$

740. Five dice are tossed. What is the probability that the five numbers shown will be different?

a. $\frac{5}{54}$ b. $\frac{5}{18}$ c. $\frac{5}{27}$ d. $\frac{5}{81}$

741. An objective type test paper has 5 questions. Out of these 5 questions, 3 questions have four options each (A, B, C, D) with one option being the correct answer. The other 2 questions have two options each, namely true and false. A candidate randomly ticks the options. Then the probability that he/she will tick the correct option in atleast four questions is

a. $\frac{5}{32}$ b. $\frac{3}{128}$ c. $\frac{3}{256}$ d. $\frac{3}{64}$

742. Each of a and b can take values of 1 or 2 with equal probability. The probability that the equation $ax^2 + bx + 1 = 0$ has real roots, is equal to

a. $\frac{1}{2}$ b. $\frac{1}{4}$ c. $\frac{1}{8}$ d. $\frac{1}{16}$

743. The probability that atleast one of the events A and B occurs is 0.5. If A and B occur simultaneously with probability 0.2, then $P(A^C) + P(B^C)$ is equal to

a. 1.0 b. 1.1 c. 0.7 d. 1.3

744. Let A and B two mutually exclusive events such that $P(A \cap B^C) = 0.25$ and $P(A^C \cap B) = 0.5$. Then $P((A \cup B)^C)$ is equal to

a. 0.25 b. 0.50 c. 0.75 d. 0.40

745. The probability that atleast one of the events A and B occurs is 0.6. If A and B occur simultaneously with probability 0.2, then $P(\bar{A}) + P(\bar{B})$ is

a. 0.4 b. 0.8 c. 1.2 d. 1.4

746. An urn contains 8 red and 5 white balls. Three balls are drawn at random. Then the probability that balls of both colours are drawn is

a. $\frac{40}{143}$ b. $\frac{70}{143}$ c. $\frac{3}{13}$ d. $\frac{10}{13}$

747. Let A and B abe any two events, then P(A $\cap$ B) is equal to

a. $P(A \cup B) - P(A^C)$ b. $P(A) + P(B^C)$

c. $P(B) + P(A^C)$ d. None of the above

748. If A and B are mutually exclusively events such that P(A) = 0.25, P(B) = 0.4, then $P(A^C \cap B^C)$ is equal to

a. 0.45 b. 0.55 c. 0.9 d. 0.35

749. A bag contains 12 pairs of socks, 4 socks are picked up at random. Then, the probability that there is at least one pair, is

a. $\frac{41}{161}$ b. $\frac{120}{161}$

c. $\frac{21}{161}$ d. None of these

750. 4 boys and 2 girls occupy seats in a row at random. Then the probability that the two girls occupy seats side by side is

a. $\frac{1}{2}$ b. $\frac{1}{4}$ c. $\frac{1}{3}$ d. $\frac{1}{6}$

751. Three cards are drawn successuviely without replacement from a pack of 52 well shuffled cards. The probability that first two cards are queens and the third car is a king is

a. $\frac{4}{52}\times\frac{4}{51}\times\frac{4}{50}$ b. $\frac{4}{52}\times\frac{2}{51}\times\frac{1}{50}$

c. $\frac{4}{52}\times\frac{3}{51}\times\frac{3}{50}$ d. $\frac{4}{52}\times\frac{3}{51}\times\frac{4}{50}$

752. An urn contains nine balls of which three are red, four are blue and two are green. Three balls are drawn at random without replacement from the urn. The probability that the three balls have different colours is

a. 1/3 b. 2/7 c. 1/21 d. 2/23

753. Two events A and B have probabilities 0.3 and 0.4 respectively. The probability that both A and B occur simultanesously is 0.1. The probability that neither A nor B occur is

a. 0.2 b. 0.3 c. 0.4 d. 0.1

754. If A and B are mutually exclusive events and if $P(B) = \frac{1}{3}$, $P(A \cup B) = \frac{13}{21}$, then P(A) is equal to

a. 1/7 b. 4/7 c. 2/7 d. 5/7

755. 7 persons to be seated in a row. Probability that 2 particular persons to sit next to each other is

a. 3/7 b. 2/7 c. 4/7 d. 5/7

756. In a non-leap year, the probability of having 53 Friday or Saturday is

a. 3/7 b. 4/7 c. 2/7 d. 1/7

757. If $\frac{1+3p}{3}, \frac{1-p}{4}$ and $\frac{1-2p}{2}$ are mutually exclusive events. Then, range of p is

a. $\frac{1}{3} \le p \le \frac{1}{2}$ b. $\frac{1}{4} \le p \le \frac{1}{2}$

c. $\frac{1}{3} \le p \le \frac{2}{3}$ d. $\frac{1}{3} \le p \le \frac{2}{5}$

758. If A and B are two events such that $P(A) = \frac{3}{4}$ and $P(B) = \frac{5}{8}$, then

a. $P(A \cup B) \ge 3/4$ b. $P(A' \cap B) \le 1/4$

c. $\frac{3}{8} \le P(A \cap B) \le \frac{5}{8}$ d. All of the above

759. Two dice are tossed once. The probability of getting an even number at the first die or a total of 8 is

a. $\frac{1}{36}$ b. $\frac{3}{36}$

c. $\frac{11}{36}$ d. None of these

760. The probability that at least one of A and B occurs is 0.6. If A and B occur simultaneously with probability 0.3, then P(A′) + P(B′) is

a. 0.9 b. 0.15 c. 1.1 d. 1.2

761. A complete cycle of a traffic light takes 60 seconds. During each cycle the light is green for 25 seconds, yellow for 5 seconds and red for 30 seconds. At a randomly chosen time, the probability that the light will not be green is

a. $\frac{1}{3}$ b. $\frac{1}{4}$ c. $\frac{4}{12}$ d. $\frac{7}{12}$

762. A five digit number is formed by the digits 1, 2, 3, 4, 5, 6 & 8. The probability that the no. has even digits at both ends is

a. 2/7 b. 3/7 c. 4/7 d. 1/7

763. In a college 25% boys and 10% girls offer Mathematics. There are 60% girls in the college. If a Mathematice student is chosen at random, then the probability that the student is a girl, will be

a. $\frac{1}{6}$ b. $\frac{3}{8}$ c. $\frac{5}{8}$ d. $\frac{5}{6}$

764. In an assembly of 4 persons the probability that at least 2 of them have the same birthday, is

a. 0.293 b. 0.24 c. 0.0001 d. 0.016

765. A and B are two independent events such that $P(A \cup B')$ = 0.8 and P(A) = 0.3. Then P(B) is

a. 2/7 b. 2/3 c. 3/8 d. 1/8

766. Three numbers are chosen at random from 1 to 20. The probability that they are consecutive is

a. $\frac{1}{190}$ b. $\frac{1}{120}$ c. $\frac{3}{190}$ d. $\frac{5}{190}$

767. The probability that A can solve a problem is 2/3 and B can solve it is 3/4. If both attempt the problem, what is the probability that the problem gets solved?
a. $\frac{11}{12}$ b. $\frac{7}{12}$ c. $\frac{5}{12}$ d. $\frac{1}{2}$

768. If A and B are two events such that P(A) = 0.54, P(B) = 0.69 and P(A ∩ B) = 0.35, then P(A ∩ B′) is
a. 0.88 b. 0.12 c. 0.19 d. 0.34

769. Two events A and B have probabilities 0.25 and 0.50 respectively. The probability that both A and B occur is 0.14. Then the probability that neither nor B occur is
a. 0.39 b. 0.25
c. 0.11 d. None of these

770. A die is thrown. Let A be the event that the number obtained is greater than 3. Let B be the event that the number obtained is less than 5. Then P(A ∪ B) is
a. 2/5 b. 3/5 c. 0 d. 1

771. Let E_1, E_2 be two mutually exclusively events of an experiment with P(not E_2) = 0.6 = P(E_1 ∪ E_2). ThenP(E_1) =
a. 0.1 b. 0.3 c. 0.4 d. 0.2

772. A die has four blank faces and two faces marked 3. The chance of getting a total of 12 in 5 throws is
a. ${}^5C_4\left(\frac{1}{3}\right)^4\left(\frac{2}{3}\right)$ b. ${}^5C_4\left(\frac{1}{3}\right)\left(\frac{2}{3}\right)^4$
c. ${}^5C_4\left(\frac{1}{6}\right)^5$ d. ${}^5C_4\left(\frac{1}{6}\right)^4\left(\frac{5}{6}\right)$

773. If A and B are any two events, then P(A ∩ B′)
a. P(A) + P(B′) b. P(A) + P(A ∩ B)
c. P(B) – P(A ∩ B) d. P(A) – P(A ∩ B)

774. Let A = {1, 3, 5, 7, 9}, B = {2, 4, 6, 8}, if a cartesian product A × B choosen at random, the probability of a + b = 9 is
a. 3/2 b. 3/4 c. 1 d. 1/5

775. If A and B are two events such that $P(A \cup B) = \frac{3}{4}$, $P(A \cap B) = \frac{1}{4}$, $P(\bar{A}) = \frac{2}{3}$, then $P(\bar{A} \cap B)$ is equal to
a. $\frac{5}{12}$ b. $\frac{3}{8}$ b. $\frac{5}{8}$ d. $\frac{1}{4}$

776. If four dice are thrown together. Probability that the sum of the numbers appearing on them is 13, is
a. $\frac{35}{324}$ b. $\frac{5}{216}$ c. $\frac{11}{216}$ d. $\frac{11}{432}$

777. Three different integers are chosen at random from the first 20 integers. The probability that their product is even is
a. $\frac{2}{19}$ b. $\frac{3}{19}$ c. $\frac{17}{19}$ d. $\frac{4}{29}$

778. When three dice are thrown the probability of 4 or 5 on each of the dice simulataneously is
a. 1/72 b. 1/108
c. 1/24 d. None of these

779. The probability of forming a three digit number with the same digits when three digit numbers are formed out of the digits 0, 2, 4, 6, 8
a. 1/16 b. 1/12 c. 1/645 d. 1/25

780. $P(A \cup B) = \frac{1}{2}$, $P(\bar{A}) = \frac{2}{3}$, find $P(\bar{A} \cap B)$
a. 1/3 b. 1/4 c. 1/5 d. 1/6

781. If A and B are mutually exclusive events with $P(A) = \frac{1}{2}P(B)$ and A ∪ B = S, the sample space then P(A) =
a. 2/3 b. 1/3 c. 1/4 d. 3/4

782. A coin is tossed three times. The probability of getting a head once and a tail twice is
a. 1/8 b. 1/4 c. 3/8 d. 1/2

783. The probability of choosing a number divisible by 6 or 8 from among 1 to 90 is
a. 1/6 b. 1/90 c. 1/30 d. 23/90

784. Out of 15 persons, 10 can speak Hindi and 8 can speak English. If two persons are chosen at rando, then the probability that one person speaks Hindi only and the other speaks both Hindi and English is
a. 3/5 b. 7/12 c. 1/5 d. 2/5

785. An urn contains 3 red and 5 blue balls. The probability that 2nd ball drawn is blue without replacement is
a. 5/8 b. 8/5
c. 3/8 d. None of these

786. A problem is given to three persons and their chances of solving it are $\frac{1}{3}, \frac{1}{5}, \frac{1}{6}$ respectively. The probability that none will solve it is
a. $\frac{1}{3}\times\frac{1}{5}\times\frac{1}{6}$ b. $\frac{2}{3}\times\frac{4}{5}\times\frac{5}{6}$
c. $1-\frac{2}{3}\times\frac{4}{5}\times\frac{5}{6}$ d. $\frac{1}{3}+\frac{1}{3}+\frac{1}{6}$

787. One card is drawn from a pack of 52 cards. The probability that it is the card of a king or spade is
a. 1/26 b. 3/26 c. 4/13 d. 3/13

788. A box contains 9 tickets numbered 1 to 9 inclusive. If 3 tickets are drawn from the box one at a time, the probability that they are alternatively either {odd, even, odd} or {even, odd, even} is
a. $\frac{5}{17}$ b. $\frac{4}{17}$ c. $\frac{5}{16}$ d. $\frac{5}{18}$

789. Let S be the set of all 2 × 2 symmetric matrices whose entries are either zero or one. A matrix X is chosen from S. The probability that the determinant of X is not zero
a. 1/3 b. 1/2 c. 3/4 d. 1/4

790. A determinant of second order is made with the elements 0, 1. What is the probability that the determinant is non-negative?
a. $\frac{7}{12}$ b. $\frac{11}{12}$ c. $\frac{3}{16}$ d. $\frac{15}{16}$

Conditional Probability

791. If $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{5}$ and $P(AB) = \frac{1}{8}$, then $P\left(\frac{A^C}{B^C}\right) =$

a. $\frac{21}{32}$ b. $\frac{25}{32}$ c. $\frac{27}{32}$ d. $\frac{29}{32}$

792. If A and B are any two events such that $P(A) = \frac{2}{5}$ and $P(A \cap B) = \frac{3}{20}$, then the conditional probability, $(A \mid (A' \cup B'))$, where A' denotes the complement of A, is equal to

a. $\frac{11}{20}$ b. $\frac{5}{17}$ c. $\frac{8}{17}$ d. $\frac{1}{4}$

793. If $P(A \cap B) = \frac{7}{10}$ and $P(B) = \frac{17}{20}$, where P stands for probability then P(A|B) is equal to

a. $\frac{7}{8}$ b. $\frac{17}{20}$ c. $\frac{14}{17}$ d. $\frac{1}{8}$

794. A fair die is rolled. Consider the events A = {1, 3, 5}, B = {2, 3} and C = {2, 3, 4, 5}. Then the conditional probability $P((A \cup B)|C)$ is

a. $\frac{1}{4}$ b. $\frac{5}{4}$ c. $\frac{1}{2}$ d. $\frac{3}{4}$

795. Given that P(A) = 0.1, P(B|A) = 0.6 and $P(B|A^C) = 0.3$ what is P(A|B) ?

a. $\frac{2}{11}$ b. $\frac{4}{11}$ c. $\frac{7}{11}$ d. $\frac{9}{11}$

796. A card is picked at random from a pack of cards. Given that the picked card is a Queen, what is the probability that it is a spade?

a. $\frac{1}{3}$ b. $\frac{4}{13}$ c. $\frac{1}{4}$ d. $\frac{1}{2}$

797. A six-faced unbiased die is thrown twice and the sum of the numbers appearing on the upper face is observed to be 7. The probability that the number 3 has appeared at least once is

a. 1/2 b. 1/3 c. 1/4 d. 1/5

798. A and B are two events such that $P(A) \neq 0$, P(B|A) is
i. A is a subset of B ii. $A \cap B = \phi$ are respectively

a. 1, 1 b. 0 and 1 c. 0, 0 d. 1, 0

799. If A and B are any two events associated with a random experiment such that $P(A) = \frac{3}{8}$, $P(B) = \frac{5}{8}$ and P(A or B) $= \frac{3}{4}$, then P(A|B) is

a. 1/4 b. 2/3 c. 3/4 d. 2/5

800. Three numbers are chosen at random without replacement from {1, 2, 3, ..., 8}. The probability that their minimum is 3, given that their maximum is 6, is

a. 1/4 b. 2/5 c. 3/8 d. 1/5

801. For the married couple living in Jammu, the probability that a husband will vote in an election is 0.5 and the probability that his wife will vote is 0.4. The probability that the husband votes, given that his wife also votes is 0.7. Then the probability that husband and wife both will vote is

a. 0.28 b. 0.20 c. 0.35 d. 0.15

802. Let A and B be two events with $P(A^C) = 0.3$, P(B) = 0.4 and $P(A \cap B^C) = 0.5$. Then $P(B|A \cup B^C)$ is equal to

a. 1/4 b. 1/3 c. 1/2 d. 2/3

803. If C and D are two events such that $C \subset D$ and $P(D) \neq 0$, then the correct statement among the following is

a. P(C|D) < P(C) b. $P(C|D) = \frac{P(D)}{P(C)}$
c. P(C|D) = P(C) d. $P(C|D) \geq P(C)$

804. A dice is rolled twice and the sum of the numbers appearing on them is observed to be 7. What is the conditional probability that the number 2 has appeared at least once?

a. 1/2 b. 1/3 c. 2/3 d. 2/5

805. One Indian and four American men and their wives are to be seated randomly around a circular table. Then the conditional probability that the Indian man is seated adjacent to his wife given that each American man is seated adjacent to his wife is

a. 1/2 b. 1/3 c. 2/5 d. 1/5

806. If $P(A) = \frac{1}{12}$, $P(B) = \frac{5}{12}$ and $P(B|A) = \frac{1}{15}$, then $P(A \cup B)$ is equal to

a. $\frac{89}{180}$ b. $\frac{90}{180}$ c. $\frac{91}{180}$ d. $\frac{92}{180}$

807. Let X and Y be two events such that $P(X) = \frac{1}{3}$, $P(X|Y) = \frac{1}{2}$ and $P(Y|X) = \frac{2}{5}$. Then

a. $P(X \cap Y) = \frac{1}{5}$ b. $P(X'|Y) = \frac{1}{2}$
c. $P(Y) = \frac{4}{15}$ d. $P(X \cup Y) = \frac{2}{5}$

Independent Events

808. Three persons, P, Q and R independently try to hit a target. If the probabilities of their hitting the target are $\frac{3}{4}, \frac{1}{2}$ and $\frac{5}{8}$ respectively, then the probability that the target is hit by P or Q but not by R is

a. $\frac{39}{64}$ b. $\frac{21}{64}$ c. $\frac{15}{64}$ d. $\frac{9}{64}$

809. Let E and F be two independent events. The probability that both E and F happen is $\frac{1}{12}$ and the probability that neither E nor F happens is $\frac{1}{2}$, then a value of $\frac{P(E)}{P(F)}$ is
a. $\frac{1}{3}$ b. $\frac{5}{12}$ c. $\frac{3}{2}$ d. $\frac{4}{3}$

810. P speaks truth in 70% cases and Q speaks in 80% of the cases. In what percentage of cases are they likely to contradict each other in stating the same fact?
a. 25% b. 38% c. 42% d. 48%

811. Two events A and B will be independent if
a. $P(A' \cap B') = (1 - P(A))(1 - P(B))$
b. A and B are mutually exclusive
c. $P(A) + P(B) = 1$ d. $P(A) = P(B)$

812. If A and B are independent events associated to some experiment E such that $P(A^C \cap B) = 2/15$ and $P(A \cap B^C) = 1/6$, then P(B) is equal to
a. $\frac{1}{6}, \frac{1}{5}$ b. $\frac{1}{6}, \frac{4}{5}$ c. $\frac{4}{5}, \frac{1}{5}$ d. $\frac{4}{5}, \frac{5}{6}$

813. If A and B are independent events such that $P(B) = \frac{2}{7}$, $P(A \cup \overline{B}) = 0.8$, then P(A) =
a. 0.4 b. 0.3 c. 0.2 d. 0.1

814. If A and B are two independent events such that P(B) = 0.4 and $P(A \cup B) = 0.6$, then $P(A \cap B)$
a. $\frac{1}{3}$ b. $\frac{2}{3}$ c. $\frac{1}{5}$ d. $\frac{2}{15}$

815. Let A and B be two events such that $P(A \cap B) = \frac{1}{6}$, $P(A \cup B) = \frac{31}{45}$ and $P(\overline{B}) = \frac{7}{10}$, then
a. A and B are independent
b. A and B are mutually exclusive
c. $P\left(\frac{A}{B}\right) < \frac{1}{6}$ d. $P\left(\frac{B}{A}\right) < \frac{1}{6}$

816. A candidate takes three tests in succession and the probability of passing the first test is p. The probability of passing each succeeding test is p or $\frac{p}{2}$ according as he passes or fails in the preceding one. The candidate is selected if he; passes at least two tests. The probability that the candidate is selected is
a. $p(2 - p)$ b. $p + p^2 + p^3$
c. $p^2(1 - p)$ d. $p^2(2 - p)$

817. Let A and B be two events such that $P(\overline{A \cup B}) = \frac{1}{6}$, $P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{1}{4}$, where $\overline{A}$ stands for the complement of the event A. Then the events A and B are
a. equally likely but not independent
b. independent but not equally likely
c. independent and equally likely
d. mutually exclusive and independent

818. If the events A and B are independent and if $P(\overline{A}) = \frac{2}{3}$, $P(\overline{B}) = \frac{2}{7}$, then $P(A \cap B)$ is equal to
a. $\frac{4}{21}$ b. $\frac{3}{21}$ c. $\frac{5}{21}$ d. $\frac{2}{21}$

819. Let X and Y be two events such that $P(X|Y) = \frac{1}{2}$, $P(Y|X) = \frac{1}{3}$ and $P(X \cap Y) = \frac{1}{6}$. Which of the following is(are) correct?
a. $P(X \cup Y) = \frac{2}{3}$
b. X and Y are independent
c. X and Y are not independent
d. $P(X^C \cap Y) = \frac{1}{3}$

820. Let E and F be two independent events. The probability that exactly one of them occurs is $\frac{11}{25}$ and the probability of none of them occurring is $\frac{2}{25}$. If P(T) denotes the probability of ccurrence of the event T, then
a. $P(E) = \frac{4}{5}, P(F) = \frac{3}{5}$ b. $P(E) = \frac{1}{5}, P(F) = \frac{2}{5}$
c. $P(E) = \frac{2}{5}, P(F) = \frac{1}{5}$ d. $P(E) = \frac{3}{5}, P(F) = \frac{4}{5}$

821. If P(S) = 0.3, P(T) = 0.4. S and T are independent events, then P(S|T)
a. 0.2 b. 0.3 c. 0.12 d. 0.4

Baey's Theorem

822. A certain item is manufactured by machine M_1 and M_2. It is known that machine M_1 turns out twice as many items as machine M_2. It is also known that 4% of the items produced by machine M_1 and 3% of the items produced by machine M_2 are defective. All the items produced are put into one stock pile and then one item is selected at random. The probaility that the selected item is defective is equal to
a. 10/300 b. 11/300 c. 10/200 d. 11/200

823. A computer producing factory has only two plants T_1 and T_2. Plant T_1 produces 20% and plant T_2 produces 80% of the total computers produced. 7% of computers produced in the factory turn out to be defective. It is known that P(computer turns out to be defective given that it is produced in plant T_1) = 10P(computer turns out to be defective given that its is produced in plant T_2). A computer produced in the factory is randomly selected and it does not turn out to be defective. Then the probability that it is produced in plant T_2 is
a. $\frac{36}{73}$ b. $\frac{47}{79}$ c. $\frac{78}{93}$ d. $\frac{75}{83}$

824. A bag contains one marble which is either green or blue, with equal probability. A green marble is put in the bag (so there are 2 marbles now) and then a marble is picked at random from the bag. If the marble taken out is green, then the probability that the remaining marble is also green is

a. 1/2 b. 1 c. 2/3 d. 1/3

825. A crime is committed by one of the two suspects, A and B. Initially, there is equal evidence against both of them. In further investigation at the crime scene, it is found that the guilty party has a blood type found in 20% of the population. If the suspect A does match this blood type, whereas the blood type of suspect B is unknown, then the probability that A is the guilty party is

a. 3/5 b. 5/6 c. 1/3 d. 2/3

826. A person goes to office by car or scooter or bus or train, probability of which are 1/7, 3/7, 2/7 and 1/7 respectively. Probability that he reaches office late, if he takes car, scooter, bus or train is 2/9, 1/9, 4/9 and 1/9 respectively. Given that he reached office in time, the probability that he travelled by a car is

a. 1/7 b. 2/7 c. 3/7 d. 4/7

827. A certain item is manufactured by 3 factory F_1, F_2 and F_3 with 30% of item made in F_1, 20% in F_2 and 50% in F_3. It is found that 2% of the items produced by F_1, 3% of the items produced by F_2 and 4% of the items produced by F_3 are defective. Suppose that an items selected at random from the stock is found defective. What is the probability that the item came from F_1?

a. $\frac{1}{16}$ b. $\frac{1}{8}$ c. $\frac{1}{3}$ d. $\frac{3}{16}$

828. A student answers a multiple choice question with 5 alternatives of which exactly one is correct. The probability that he knows the correct answer is p, $0 < p < 1$. If he does not know the correct answer, he randomly ticks one answer. Given that he has answered the question correctly, the probability that he did not tick the answer randomly, is

a. $\frac{3p}{4p+3}$ b. $\frac{5p}{3p+2}$ c. $\frac{5p}{4p+1}$ d. $\frac{4p}{3p+1}$

829. There are two coins, one unbiased with probability $\frac{1}{2}$ of getting heads and the other one is biased with probability $\frac{3}{4}$ of getting heads. A coin is selected at random and tossed. It shows heads up. Then the probability that the unbiased coin was selected is

a. 2/3 b. 3/5 c. 1/2 d. 2/5

830. A purse contains 4 copper and 3 silver coins, and a second purse contains 6 copper and 2 silver coins. A coin is taken out from any purse, the probability that it is copper coin is

a. 3/7 b. 4/7 c. 3/4 d. 37/56

831. Two coins are available, one fair and the other two- headed. Choose a coin and toss it once; assume that the unbiased coin is chosen with probability $\frac{3}{4}$. Given that the outcome is head, the probabilty that the two-headed coin was chosen is

a. 3/5 b. 2/5 c. 1/5 d. 2/7

Directions: Questions 832 and 833 are based on the following paragraph.

Let U_1 and U_2 be two urns such that U_1 contains 3 white and 2 red balls, and U_2 contains only 1 white ball. A fair coin is tossed. If head appears then 1 ball is drawn at random from U_1 and put into U_2. However, if tail appears then 2 balls are drawn at random from U_1 and put into U_2. Now 1 ball is drawn at random from U_2.

832. The probability of the drawn ball from U_2 being white is

a. $\frac{13}{30}$ b. $\frac{23}{30}$ c. $\frac{19}{30}$ d. $\frac{11}{30}$

833. Given that the drawn ball from U_2 is white, the probability that head appeared on the coin is

a. $\frac{17}{23}$ b. $\frac{11}{23}$ c. $\frac{15}{23}$ d. $\frac{12}{23}$

834. Bag I contains 3 red and 4 black balls while another bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and it is found to be black. The probability that it was drawn from bag II is

a. $\frac{7}{43}$ b. $\frac{13}{43}$

c. $\frac{21}{43}$ d. None of these

835. A signal which can be green or red with probability $\frac{4}{5}$ and $\frac{1}{5}$ respectively, is received by station A and then transmitted to station B. The probability of each station receiving the signal correctly is $\frac{3}{4}$. If the signal received at station B is green, then the probability that the original signal was green is

a. $\frac{3}{5}$ b. $\frac{6}{7}$ c. $\frac{20}{23}$ d. $\frac{9}{20}$

836. The chances of defective screws in three boxes A, B C are $\frac{1}{5}, \frac{1}{6}, \frac{1}{7}$ respectively. A box is selected at random and a screw draw from it at random is found to be defective. Then, the probability that it came from box A, is

a. $\frac{16}{29}$ b. $\frac{1}{15}$ c. $\frac{27}{59}$ d. $\frac{42}{107}$

Probability Distribution

837. The probability distribution of X is

X	0	1	2	3
P(X)	0.3	k	2k	2k

The value of k is

a. 0.7 b. 0.3 c. 1 d. 0.14

838. For the following distribution frunction F(X) of a r.v.X

X	1	2	3	4	5	6
F(X)	0.2	0.37	0.48	0.62	0.85	1

$P(3 < X \le 5) =$

a. 0.48 b. 0.37 c. 0.27 d. 1.47

839. The probability distribution of a random variable is given below:

X = x	0	1	2	3	4	5	6	7
P(X = x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$

Then $P(0 < X < 5) =$

a. $\frac{1}{10}$ b. $\frac{3}{10}$ c. $\frac{8}{10}$ d. $\frac{7}{10}$

840. A random variable X has the probability distribution given below. Its variance is

X	1	2	3	4	5
P(X = x)	k	2k	3k	2k	k

a. $\frac{4}{3}$ b. $\frac{5}{3}$ c. $\frac{10}{3}$ d. $\frac{16}{3}$

841. Suppose $f(x) = \frac{k}{2^x}$ is a probability distribution of a random variable X that can take on the value x = 0, 1, 2, 3, 4. Then k is equal to

a. 16/15 b. 15/16
c. 31/16 d. None of these

842. A box contains 15 green and 10 yellow balls. If 10 balls are randomly drawn, one-by-one, with replacement, then the variance of the number of green balls drawn is

a. 6 b. 4 c. $\frac{6}{25}$ d. $\frac{12}{5}$

843. An unbiased coin is tossed eight times. The probability of obtaining at least one head and at least one tail is

a. $\frac{63}{64}$ b. $\frac{255}{256}$ c. $\frac{127}{128}$ d. $\frac{1}{2}$

844. A box has 100 pens of which 10 are defective. The probability that out of a sample of 5 pens drawn one by one with replacement and atmost one is defective is

a. $\frac{9}{10}$ b. $\frac{1}{2}\left(\frac{9}{10}\right)^4$
c. $\left(\frac{9}{10}\right)^5 + \frac{1}{2}\left(\frac{9}{10}\right)^4$ d. $\frac{1}{2}\left(\frac{9}{10}\right)^5$

845. Probability that a person will develop immunity after vaccination is 0.8. If 8 people are given the vaccine then probability that all develop immunity is

a. $(0.2)^8$ b. $(0.8)^8$
c. 1 d. ${}^8C_6(0.2)^6(0.8)^2$

846. If the mean and variance of a binomial distribution are 4 and 2 respectively, then the probability of 2 successes of that binomial variate X, is

a. $\frac{1}{2}$ b. $\frac{219}{256}$ c. $\frac{37}{256}$ d. $\frac{7}{64}$

847. An experiment succeeds twice as often as it fails. The probability of at least 5 successes in the six trials of this experiment is

a. $\frac{496}{729}$ b. $\frac{192}{729}$ c. $\frac{240}{729}$ d. $\frac{256}{729}$

848. India play two matches each with West Indies and Australia. In any match, the probabilities of India getting 0, 1 and 2 points are 0.45, 0.05 and 0.50 respectively. Assuming that the outcomes are independent, the probability of India getting at least 7 points is

a. 0.0875 b. $\frac{1}{16}$
c. 0.1125 d. None of these

849. The probability that an event does not happen in one trial is 0.8. The probability that the event happens atmost once in three trials is

a. 0.896 b. 0.791 c. 0.642 d. 0.592

850. If the mean and variance of a binomial variate X are 8 and 4 respectively, then $P(X < 3) =$

a. $\frac{137}{2^{16}}$ b. $\frac{697}{2^{16}}$ c. $\frac{265}{2^{16}}$ d. $\frac{265}{2^{15}}$

851. If the mean and the variance of a binomial variate X and 2 and 1 respectively, then the probability that X takes a value greater than or equal to one is

a. $\frac{1}{16}$ b. $\frac{9}{16}$ c. $\frac{3}{4}$ d. $\frac{15}{16}$

852. If getting a number greater than 4 is a success in a throw of a fair die, then the probability of at least 2 successes in six throws of a fair die is

a. 0.649 b. 0.351 c. 0.267 d. 0.667

853. A coin is tossed 2n times. The chance that the number of times one gets head is not equal to the number of times one gets tail is

a. $\frac{(2n)!}{(n!)^2} \cdot \left(\frac{1}{2}\right)^{2n}$ b. $1 - \frac{(2n)!}{(n!)^2}$
c. $1 - \frac{(2n)!}{(n!)^2} \cdot \frac{1}{4^n}$ d. None of these

854. A man takes a step forward with probability 0.4 and one step backwards with probability 0.6, then the probability that at the end of eleven steps he is one step away from the starting point, is

a. ${}^{11}C_6 \times (0.24)^5$ b. ${}^{11}C_6 \times (0.72)^6$
c. ${}^{11}C_5 \times (0.48)^5$ d. ${}^{11}C_5 \times (0.12)^5$

855. A fair coin is tossed a fixed number of times. If the probability of getting exactly 3 heads equals the probability of getting exactly 5 heads, then the probability of getting exactly one head is

a. 1/64 b. 1/32 c. 1/16 d. 1/8

856. The mean and variance of a random variable X having a binomial distribution are 4 and 2 respectively, find the value of P(X = 1).

a. $\frac{1}{4}$ b. $\frac{1}{16}$ c. $\frac{1}{8}$ d. $\frac{1}{32}$

857. A box contains 100 bulbs, out of which 10 are defective. A sample of 5 bulbs is drawn. The probability that none is defective is

a. $\frac{9}{10}$ b. $\left(\frac{1}{10}\right)^5$ c. $\left(\frac{9}{10}\right)^5$ d. $\left(\frac{1}{2}\right)^5$

858. A multiple choice examination has 5 questions. Each question has three akternative answers of which exactly one is correct. The probability that a student will get 4 or more correct answers just by guessing is

a. $\frac{10}{3^5}$ b. $\frac{17}{3^5}$ c. $\frac{13}{3^5}$ d. $\frac{11}{3^5}$

859. If mean and variance of a binomial variate X are 2 and 1 respectively, then the probability that X takes a value at least one is

a. $\frac{1}{16}$ b. $\frac{3}{16}$ c. $\frac{5}{16}$ d. $\frac{15}{16}$

860. The probability that an event A happens in one trial of an experiment is 0.4. If 3 independent trials are performed, the probability that A happens atleast once is

a. 0.936 b. 0.784
c. 0.904 d. None of these

861. A fair coin is tossed 100 times. The probability of getting tail an odd number of times is

a. $\frac{1}{2}$ b. $\frac{1}{4}$ c. 0 d. 1

862. Consider 5 independent Bernoulli's trials each with probability of success p. If the probability of at least one failure is greater than or equal to $\frac{31}{32}$, then p lies in the interval

a. $\left[0, \frac{1}{2}\right]$ b. $\left(\frac{11}{12}, 1\right]$ c. $\left(\frac{1}{2}, \frac{3}{4}\right]$ d. $\left(\frac{3}{4}, \frac{11}{12}\right]$

863. A fair coin is tossed n number of times. If the probability of having at least one head is more than 90%, then n is greater than or equal to

a. 2 b. 3 c. 4 d. 5

864. For the binomial distribution $(p + q)^n$, whose mean is 20 and variance is 16, pair (m, p) is

a. $\left(100, \frac{1}{5}\right)$ b. $\left(100, \frac{2}{5}\right)$ c. $\left(50, \frac{1}{5}\right)$ d. $\left(50, \frac{2}{5}\right)$

865. Two dice are tossed 6 times, then the probability that 7 will show in exactly four of the tosses is

a. $\frac{225}{18442}$ b. $\frac{116}{20003}$
c. $\frac{125}{15552}$ d. None of these

866. In a binomial distribution $B\left(n, p - \frac{1}{4}\right)$, if the probability of at least one success is greater than or equal to $\frac{9}{10}$, then n is gretaer than

a. $\frac{1}{\log_{10} 4 + \log_{10} 3}$ b. $\frac{9}{\log_{10} 4 - \log_{10} 3}$
c. $\frac{4}{\log_{10} 4 - \log_{10} 3}$ d. $\frac{1}{\log_{10} 4 - \log_{10} 3}$

Directions: Questions 867, 868 and 869 are based on the following paragraph.

A fair die is tossed repeatedly until a six is obtained. Let X denote the number of tosses required.

867. The probability that X = 3 equals

a. $\frac{25}{216}$ b. $\frac{25}{36}$ c. $\frac{5}{36}$ d. $\frac{125}{216}$

868. The probability that $X \geq 3$ equals

a. $\frac{125}{216}$ b. $\frac{25}{36}$ c. $\frac{5}{36}$ d. $\frac{25}{216}$

869. The conditional probability that $X \geq 6$ given $X > 3$ equals

a. $\frac{125}{216}$ b. $\frac{25}{216}$ c. $\frac{5}{36}$ d. $\frac{25}{36}$

870. Two dice are thrown n times in succession. The probability of obtaining a double six at least once is

a. $\left(\frac{1}{36}\right)^n$ b. $1 - \left(\frac{35}{36}\right)^n$
c. $\left(\frac{1}{12}\right)^n$ d. None of these

871. If X is a binomial variate with the range {0, 1, 2, 3, 4, 5, 6} and P(X = 2) = 4P(X = 4), then the parameter p of X is

a. $\frac{1}{3}$ b. $\frac{1}{2}$ c. $\frac{2}{3}$ d. $\frac{3}{4}$

872. The probability that a certain knid of component will survive a given shock test is $\frac{3}{4}$. The probability that exactly 2 of the next 4 components tested survive is

a. $\frac{9}{41}$ b. $\frac{25}{128}$ c. $\frac{1}{5}$ d. $\frac{27}{128}$

873. A random variable X follows binomial distribution with mean α and variance β. Then

a. $0 < \alpha < \beta$ b. $0 < \beta < \alpha$
c. $\alpha < 0 < \beta$ d. $\beta < 0 < \alpha$

874. A pair of fair dice is thrown independently three times. The probability of getting a score of exactly 9 twice is

a. 8/729 b. 8/243 c. 1/729 d. 8/9

875. The mean and variance of a random variable X having a binomial distribution are 4 and 2 respectively. Then P(X > 6) =

a. 1/256 b. 3/256 c. 9/256 d. 7/256

876. A and B are two equally strong players. Find the probability that A beats B in exactly 3 games out of 4

a. $\frac{3}{4}$ b. $\frac{1}{2}$ c. $\frac{1}{4}$ d. $\frac{3}{7}$

877. If X follows a binomial distribution with parameters n = 100 and p = $\frac{1}{3}$, then P(X = r) is maximum when r is equal to

a. 16 b. 32
c. 33 d. None of these

Statistics

878. The mean age of 25 teachers in a school is 40years. A teacher retires at the age of 60 years and a new teacher is appornted in his place. If now the mean age of the teachers in this school is 39 years, then the age (in years) of the newly appointed teacher is

a. 25 b. 35 c. 30 d. 40

879 The mean for the data 6, 7, 10, 12, 13, 4, 8, 12 is

a. 9 b. 8 c. 7 d. 6

880. The mode of the data 8, 11, 9, 8, 11, 9, 7, 8, 7, 3, 2, 8 is

a. 11 b. 9 c. 8 d. 3

881. If the mean of six numbers is 41, then the sum of these numbers is

a. 246 b. 236 c. 226 d. 216

882. Mean of n observations $x_1, x_2, ..., x_n$ is $\bar{x}$. If an observation x_q is replaced by x'_q then the new mean is

a. $\bar{x} - x_q + x'_q$ b. $\frac{(n-1)\bar{x} + x'_q}{n}$

c. $\frac{(n-1)\bar{x} - x'_q}{n}$ d. $\frac{n\bar{x} - x_q + x'_q}{n}$

883. The mean of 100 items was 60. Later it was found that two items were misread as 69 and 96 instead of 66 and 99 respectively. The correct mean of the 100 items is

a. 60 b. 61 c. 60.5 d. 61.5

884. In a class, in an examination in Mathematics, 10 students scored 100 marks each, 2 students scored zero and the average of the remaining students is 72 marks. If the class average is 76, then the number of students in the class is

a. 44 b. 40 c. 38 d. 34

885. The mean of the data comprising of 16 observations is 16. If one of the observation valued 16 is deleted and three new observations valued 3, 4 and 5 are added to the data, then the mean of the resultant data, is

a. 15.8 b. 14.0 c. 16.8 d. 16.0

886. A factory is operating in two shifts, day and night, with 70 and 30 workers respectively. If per day mean wage of the day shift workers is ₹54 and per day mean wage of all workers is ₹60, then per day mean wage of the night shift workers (in ₹) is

a. 66 b. 69 c. 74 d. 75

887. If the combined mean of two groups is $\frac{40}{3}$ and if the mean of one group with 10 observations is 15, then the mean of the other group with 8 observations is equal to

a. $\frac{46}{3}$ b. $\frac{35}{4}$ c. $\frac{45}{4}$ d. $\frac{41}{4}$

888. Ram obtained 60 and 85 in first two unit tests. The minimum marks he should get in the third test to have an average of atleast 55 marks is

a. $x \geq 20$ b. $x \leq 20$ c. $x > 20$ d. $x < 20$

889. In a moderately asymmetrical distribution, the mean and median are 36 and 34 respectively, find out the value of empirical mode?

a. 30 b. 32 c. 42 d. 22

890. A batsman in his 16^{th} inning makes a score of 70 runs, then thereby increases his average by 2 runs. If he had never been 'not out', then his average after 16^{th} inning is

a. 36 b. 38 c. 40 d. 42

891. Mean and mode of a data are 66 and 60, median is ......

a. 64 b. 32 c. 19 d. 28

892. If the median of $\frac{x}{5}, x, \frac{x}{4}, \frac{x}{2}, \frac{x}{3}$ $(x > 0)$ is 8, then the value of x is

a. 24 b. 32 c. 8 d. 16

893. If the average of the numbers 1, 2, 3, ..., 98, 99, x is 100x, then the value of x is

a. $\frac{51}{100}$ b. $\frac{50}{99}$ c. $\frac{1}{2}$ d. $\frac{50}{101}$

894. The A.M. of 9 terms is 15. If one more term is added to this series, then the A.M. becomes 16. The value of the added term is

a. 30 b. 27 c. 25 d. 23

895. Mode of 7, 6, 10, 7, 5, 9, 3, 7, 5 is

a. 6 b. 3 c. 5 d. 7

896. The arithmetic mean of 7 consecutive integers starting with a is m. Then the arithmetic mean of 11 consecutive integers starting with a + 2 is

a. 2a b. 2m c. a + 4 d. m + 4

897. Relation between mean, median and mode of moderately skewed distribution is

a. mode = median – mean
b. mode = 3 median – 2 arithmetic mean
c. median = 3 mode + 2 mean
d. mode = 3 median + 2 arithmetic mean

898. The mean age of a combined group of men and women is 25 years. If the mean age of the group of men is 26 and that of the group of women is 21, then the percentage of men and women respectively in the group is
a. 46, 60 b. 80, 20 c. 20, 80 d. 60, 40

899. The mean of the values 0, 1, 2, 3, ..., n with the corresponding weights $^nC_0$, $^nC_1$, ..., ^nC_n respectively, is
a. $\frac{n+1}{2}$ b. $\frac{n-1}{2}$ c. $\frac{2^n-1}{2}$ d. n/2

900. The arithmetic mean of first n odd natural numbers is
a. 2n b. n(n + 1) c. n d. n/2

901. If a variable takes discrete values x + 4, $x-\frac{7}{2}, x-\frac{5}{2}$, x – 3, x – 2, $x+\frac{1}{2}, x-\frac{1}{2}$, x + 5 (x is positive), then the median is
a. $x-\frac{5}{4}$ b. $x-\frac{1}{2}$ c. $x-2$ d. $x+\frac{5}{4}$

902. The average of the four-digit numbers that can be formed using each of the digits 3, 5, 7 and 9 exactly once in each number is
a. 4444 b. 5555 c. 6666 d. 7777

903. The average marks of boys in class is 52 and that of girls is 42. The average marks of boys and girls combined is 50. The percentage of boys in the class is
a. 80 b. 60 c. 40 d. 20

904. Median of $^{2n}C_0$, $^{2n}C_1$, $^{2n}C_2$, $^{2n}C_3$, ..., $^{2n}C_n$ (where n is even) is
a. $^{2n}C_{\frac{n}{2}}$ b. $\frac{^{2n}C_{n+1}}{2}$
c. $\frac{^{2n}C_{n-1}}{2}$ d. None of these

905. The mean of three positive numbers is 9. The mean is larger than only one of these numbers. The mean deviation about mean is 2. The smallest number is
a. 5 b. 6 c. 7 d. 7.5

906. If the mean deviation of the numbers 1, 1 + d, ..., 1 + 100d from their mean is 255, then a value of d is
a. 10.1 b. 5.05 c. 20.2 d. 10

907. The mean deviation from the mean of the data 3, 10, 10, 4, 7, 10, 5 is
a. 2 b. 2.57 c. 3 d. 3.75

908. The mean deviation from the median is
a. equal to that measured from another value
b. maximum if all observations are positive
c. greater than that measured from any other value
d. less than measured from any other value

909. If the mean deviation about the median of the numbers a, 2a, ..., 50a is 50, then |a| equals
a. 4 b. 5 c. 2 d. 3

910. If the values observed are 1, 2, 3, ..., n each with frequency 1 and n is even, then the mean deviation from mean equals to
a. n b. n/2
c. n/4 d. None of these

911. If the algebraic sum of deviations of 20 observations from 30 is 20, then the mean of observations is
a. 30 b. 30.1 c. 29 d. 31

912. The mean deviation about the mean for the values 18, 20, 12, 14, 19, 22, 26, 16, 19, 24 is
a. 3.1 b. 3.4 c. 3.2 d. 3.3

913. The mean deviation from the mean of the set of observations –1, 0, 4 is
a. 2 b. 4 c. 3 d. 1

914. The sum of 100 observations and the sum of their squares are 400 and 2475, respectively. Later on, three observations, 3, 4 and 5 were found to be incorrect. If the incorrect obervations are omitted, then the variance of the remaining observations is
a. 8.00 b. 8.25 c. 9.00 d. 8.50

915. In a experiment with 15 observations on x, the following results were available $\Sigma x^2 = 2830$ and $\Sigma x = 170$. One observation that was 20, was found to be wrong and was replaced by the correct value 30. Then the corrected variance is
a. 9.3 b. 8.3 c. 188.6 d. 78

916. Standard deviation of first n odd natural numbers is
a. $\sqrt{n}$ b. $\sqrt{\frac{(n+2)(n+1)}{3}}$
c. $\sqrt{\frac{n^2-1}{3}}$ d. n

917. The variance of first 50 even natural numbers is
a. $\frac{833}{4}$ b. 833 c. 437 d. $\frac{437}{4}$

918. If the standard deviation of the numbers 2, 3, a and 11 is 3.5, then which of the following is true?
a. $3a^2 - 26a + 55 = 0$ b. $3a^2 - 32a + 84 = 0$
c. $3a^2 - 34a + 91 = 0$ d. $3a^2 - 23a + 44 = 0$

919. The standard deviation of 1, 3, 5, 7 is
a. $\sqrt{3.5}$ b. $\sqrt{5}$ c. $\sqrt{3}$ d. $\sqrt{2}$

920. If the mean of the numbers a, b, 8, 5, 10 is 6 and their variance is 6.8, then ab is equal to
a. 6 b. 7 c. 12 d. 14

921. Standard deviation of n observations $a_1, a_2, a_3, ..., a_n$ is σ. Then the standard deviation of the observations $\lambda a_1, \lambda a_2, ..., \lambda a_n$ is

a. $\lambda\sigma$ b. $-\lambda\sigma$ c. $|\lambda|\sigma$ d. $\lambda^n\sigma$

922. The mean and variance for the data, 6, 7, 10, 12, 13, 4, 8, 12 respectively are

a. $8, \sqrt{26.25}$ b. $9, \sqrt{9.25}$ c. 8, 26.25 d. 9, 9.25

923. If the median of the data 6, 7, x – 2, x, 18, 21 written in ascending order is 16, then the variance of that data is

a. $30\frac{1}{5}$ b. $31\frac{1}{3}$ c. $32\frac{1}{2}$ d. $33\frac{1}{3}$

924. The mean of five observations is 4 and their variance is 5.2. If three of these observations are 2, 4 and 6, then te other two observations are

a. 3 and 5 b. 2 and 6 c. 4 and 4 d. 1 and 7

925. The variance of first 20 natural numbers is

a. 133/4 b. 279/12 c. 133/2 d. 399/4

926. The mean of four observations is 3. If the sum of the squares of these observations is 48, then their standard deviation is

a. $\sqrt{2}$ b. $\sqrt{3}$ c. $\sqrt{5}$ d. $\sqrt{7}$

927. If $x_1, x_2, ..., x_n$ are n observations such that $\sum_{i=1}^{n} x_i^2 = 400$ and $\sum_{i=1}^{n} x_i = 80$, then the least value of n is

a. 12 b. 15 c. 16 d. 18

928. In an experiment with 15 observations on x the following results are available $\Sigma x^2 = 2830$, $\Sigma x = 170$. One observation that was 20, was found to be wrong and was replaced by correct value 30. Find the correct variance.

a. 78 b. 186 c. 158 d. 18

929. The standard deviation of 9, 16, 23, 30, 37, 44, 51 is

a. 7 b. 9 c. 12 d. 14

930. If $\sum_{i=1}^{9}(x_i - 5) = 9$ and $\sum_{i=1}^{9}(x_i - 5)^2 = 45$, then the standard deviation of the 9 items $x_1, x_2, ..., x_9$ is

a. 9 b. 4 c. 3 d. 2

931. All the students of a class performed poorly in Mathematics. The teacher decided to give grace marks of 10 to each of the students. Which of the following statistical measures will not change even after the grace marks were given?

a. median b. mode c. variance d. mean

932. If the standard deviation of a variable X is σ then the standard deviation of variable $\frac{aX+b}{c}$ is

a. $a\sigma$ b. $\frac{a}{c}\sigma$ c. $\left|\frac{a}{c}\right|\sigma$ d. $\frac{a\sigma+b}{c}$

933. Mean of 10 observations is 50 and their standard deviation is 10. If each observation is subtracted by 5 and then divided by 4, then the new mean and standard deviation are

a. 22.5, 2.5 b. 11.25, 2.5 c. 11.5, 2.5 d. 11, 2.5

934. If the variance of 1, 2, 3, 4, 5, ..., x is 10, then the value of x is

a. 9 b. 13 c. 12 d. 11

935. Let $x_1, x_2, ..., x_n$ be n observations, and let $\overline{x}$ be their arithmetic mean and σ^2 be their variance.

Statement 1 : Variance of $2x_1, 2x_2, ..., 2x_n$ is $4\sigma^2$

Statement 2 : Arithmetic mean of $2x_1, 2x_2, ..., 2x_n$ is $4\overline{x}$

a. Statement 1 is true, Statement 2 is true; Statement 2 is not a correct explanation for Statement 1

b. Statement 1 is true, Statement 2 is false

c. Statement 1 is false, Statement 2 is true

d. Statement 1 is true, Statement 2 is true; Statement 2 is a correct explanation for Statement 1

936. The mean of five numbers is 0 and their variance is 2. If three of those numbers are –1, 1 and 2, then the other two numbers are

a. –5 and 3 b. –4 and 2 c. –3 and 1 d. –2 and 0

937. Variance of 2, 4, 6, 8, 10 is .....

a. 36 b. 8 c. 9 d. 16

938. If the standard deviation of 3, 8, 6, 10, 12, 9, 11, 10, 12, 7 is 2.71, then the standard deivation of 30, 80, 60, 100, 120, 90, 110, 100, 120, 70 is

a. 2.71 b. 27.1

c. $(2.71)\sqrt{10}$ d. $(2.71)\sqrt{2}$

939. For two data sets, each of size 5, the variances are given to be 4 and 5 and the corresponding means are given to be 2 and 4, respectively. The variance of the combined data set is

a. $\frac{5}{2}$ b. $\frac{11}{2}$ c. 6 d. $\frac{13}{2}$

940. The mean and variance of n observations $x_1, x_2, x_3, ..., x_n$ are 5 and 0 respectively. If $\sum_{i=1}^{n} x_i^2 = 400$, then the value of n is equal to

a. 80 b. 25 c. 20 d. 16

941. Variance of the numbers 2, 4, 6, 8 is

a. 3 b. 8 c. 4 d. 5

942. **Statement 1 :** The variance of first n even natural numbers is $\frac{n^2-1}{4}$

Statement 2 : The sum of first n natural numbers is $\frac{n(n+1)}{2}$ and the sum of squares of first n natural numbers is $\frac{n(n+1)(2n+1)}{6}$

a. Statement 1 is true, Statement 2 is true; Statement 2 is not a correct explanation for Statement 1
b. Statement 1 is true, Statement 2 is false
c. Statement 1 is false, Statement 2 is true
d. Statement 1 is true, Statement 2 is true; Statement 2 is a correct explanation for Statement 1

943. If $x_1, x_2, ..., x_{18}$ are observations such that $\sum_{j=1}^{18}(x_j-8)=9$ and $\sum_{j=1}^{18}(x_j-8)^2=45$

a. $\sqrt{\frac{81}{34}}$ b. 5 c. $\sqrt{5}$ d. 3/2

944. If the variance of 1, 2, 3, 4, 5, ..., 10 is $\frac{99}{12}$, then the standard deviation of 3, 6, 9, 12, ..., 30 is

a. $\frac{297}{4}$ b. $\frac{3}{2}\sqrt{33}$ c. $\frac{3}{2}\sqrt{99}$ d. $\sqrt{\frac{99}{12}}$

945. The variance of 20 observations is 10. If each observation is multiplied by 3, the new variance of the resulting observations is

a. 30 b. 300 c. 90 d. 9

946. The mean of the numbers a, b, 8, 5, 10 is 6 and the variance is 6.80. Then which one of the following gives possible values of a and b?

a. a = 3, b = 4 b. a = 0, b = 7
c. a = 5, b = 2 d. a = 1, b = 6

947. The standard deviation of the first n natural numbers is

a. $\sqrt{\frac{n^2+1}{12}}$ b. $\frac{n^2-1}{12}$ c. $\sqrt{\frac{n^2-1}{12}}$ d. $\frac{n^2+1}{12}$

948. The standard deviation for the scores 1, 2, 3, 4, 5, 6 and 7 is 2. Then the standard deviation of 12, 23, 34, 45, 56, 67 and 78 is

a. 2 b. 4 c. 22 d. 11

949. Mean and standard deviation from the following observations of marks of 5 students of a rutorial group (marks out of 25)
8 12 13 15 22 are

a. 14, 4.604 b. 15, 4.604
c. 14, 5.604 d. None of these

950. The standard deviation of the numbers 31, 32, 33, ..., 46, 47 is

a. $\sqrt{\frac{17}{12}}$ b. $\sqrt{\frac{47^2-1}{12}}$ c. $2\sqrt{6}$ d. $4\sqrt{3}$

951. If coefficient of variation is 60 and standard deviation is 24, then arithmetic mean is

a. $\frac{20}{7}$ b. $\frac{7}{20}$ c. $\frac{1}{40}$ d. 40

952. If the mean of 10 observations is 50 and the sum of the squares of the deviations of the observations from the mean is 250, then the coefficient of variantaion of those observations is

a. 25 b. 50 c. 10 d. 5

953. Coefficient of variation of two distributions are 60 and 70, and their standard deviation are 21 and 16 respectively. What are their means?

a. 35, 20 b. 35, 22.85 c. 30, 22.85 d. 30, 20

954. If the coefficient of variation and standard deviation are 60 and 21 respectively, the arithmetic mean of distribution is

a. 60 b. 30 c. 35 d. 21

955. An analysis of the weekly wages paid to workers in two firms A & B, belonging to the same industry gives the following results:

	Firm A	Firm B
Number of wage earners	586	648
Average of weekly wages	Rs. 52.5	Rs. 47.5
Variance of the distribution of wages	100	121

then, which firm pays out larger amount and which shows greater variability respectively?

a. A, B b. B, A c. B, B d. A, A

956. Coefficient of variations of two distributions are 55 and 65, and their standard deviations are 22 and 39 respectively. Their arithmetic means are respectively

a. 15, 20 b. 40, 60
c. 30, 50 d. None of these

957. If the coefficient of variations of a distribution is 45% and the mean is 12, then its standard deviation is

a. 5.2 b. 5.3
c. 5.4 d. None of these

958. For a symmetrical distribution Q_1 = 20 and Q_3 = 40. The value of 50th percentile is

a. 20 b. 40
c. 30 d. None of these

Logarithm

959. For $y = \log_a x$ to be defined 'a' must be
a. Any positive real number
b. Any number
c. $\geq e$
d. Any positive real number $\neq 1$

960. Logarithm of $32\sqrt[5]{4}$ to the base $2\sqrt{2}$ is
a. 3.6 b. 5
c. 4 d. None of these

961. The number $\log_2 7$ is
a. An integer b. A rational number
c. An irrational number d. A prime number

962. If $\log_7 2 = m$, then $\log_{49} 28$ is equal to
a. $2(1+2m)$ b. $\frac{1+2m}{2}$ c. $\frac{2}{1+2m}$ d. $1 + m$

963. If $\log_e\left(\frac{a+b}{2}\right) = \frac{1}{2}(\log_e a + \log_e b)$, then relation between a and b will be
a. $a = b$ b. $a = \frac{b}{2}$ c. $2a = b$ d. $a = \frac{b}{3}$

964. Which is the correct order for a given number α in increasing order
a. $\log_2\alpha, \log_3\alpha, \log_e\alpha, \log_{10}\alpha$
b. $\log_{10}\alpha, \log_3\alpha, \log_e\alpha, \log_2\alpha$
c. $\log_{10}\alpha, \log_e\alpha, \log_2\alpha, \log_3\alpha$
d. $\log_3\alpha, \log_e\alpha, \log_2\alpha, \log_{10}\alpha$

965. $\log ab - \log|b| =$
a. $\log a$ b. $\log|a|$
c. $-\log a$ d. None of these

966. The value of $\sqrt{(\log^2_{0.5} 4)}$ is
a. -2 b. $\sqrt{(-4)}$
c. 2 d. None of these

967. The value of $\log_3 4 \log_4 5 \log_5 6 \log_6 7 \log_7 8 \log_8 9$ is
a. 1 b. 2 c. 3 d. 4

968. $\log_7 \log_7 \sqrt{7(\sqrt{7\sqrt{7}})} =$
a. $3\log_2 7$ b. $1 - 3\log_3 7$
c. $1 - 3\log_7 2$ d. None of these

969. The value of $81^{(1/\log_5 3)} + 27^{\log_9 36} + 3^{4/\log_7 9}$ is equal to
a. 49 b. 625 c. 216 d. 890

970. $7\log\left(\frac{16}{15}\right) + 5\log\left(\frac{25}{24}\right) + 3\log\left(\frac{81}{80}\right)$ is equal to
a. 0 b. 1 c. log2 d. log3

971. If $\log_4 5 = a$ and $\log_5 6 = b$, then $\log_3 2$ is equal to
a. $\frac{1}{2a+1}$ b. $\frac{1}{2b+1}$ c. $2ab+1$ d. $\frac{1}{2ab-1}$

972. If $\log_k x \cdot \log_5 k = \log_x 5, k \neq 1, k > 0$, then x is equal to
a. k b. $\frac{1}{5}$
c. 5 d. None of these

973. If $\log_5 a \cdot \log_a x = 2$, then x is equal to
a. 125 b. a^2
c. 25 d. None of these

974. If $a^2 + 4b^2 = 12ab$, then $\log(a + 2b)$ is
a. $\frac{1}{2}[\log a + \log b - \log 2]$
b. $\log\frac{a}{2} + \log\frac{b}{2} + \log 2$
c. $\frac{1}{2}[\log a + \log b + 4\log 2]$
d. $\frac{1}{2}[\log a - \log b + 4\log 2]$

975. If $A = \log_2 \log_2 \log_4 256 + 2\log_{\sqrt{2}} 2$, then A is equal to
a. 2 b. 3 c. 5 d. 7

976. If $\log_{10} x = y$, then $\log_{1000} x^2$ is equal to
a. y^2 b. $2y$ c. $\frac{3y}{2}$ d. $\frac{2y}{3}$

977. If $x = \log_a(bc)$, $y = \log_b(ca)$, $z = \log_c(ab)$, then which of the following is equal to 1
a. $x + y + z$
b. $(1 + x)^{-1} + (1 + y)^{-1} + (1 + z)^{-1}$
c. xyz d. None of these

978. If $a = \log_{24} 12$, $b = \log_{36} 24$ and $c = \log_{48} 36$, then 1+ abc is equal to
a. 2ab b. 2ac c. 2bc d. 0

979. If $a^x = b, b^y = c, c^z = a$, then value of xyz is
a. 0 b. 1 c. 2 d. 3

980. If $\log_{10} 2 = 0.30103$, $\log_{10} 3 = 0.47712$, the number of digits in $3^{12} \times 2^8$ is
a. 7 b. 8 c. 9 d. 10

981. $\sum_{n=1}^{n} \frac{1}{\log_{2^n}(a)} =$
a. $\frac{n(n+1)}{2}\log_a 2$ b. $\frac{n(n+1)}{2}\log_2 a$
c. $\frac{(n+1)^2 n^2}{4}\log_2 a$ d. None of these

982. The solution of the equation $\log_7 \log_5 (\sqrt{x^2 + 5 + x}) = 0$
a. $x = 2$ b. $x = 3$ c. $x = 4$ d. $x = -2$

983. $\log_4 18$ is
a. A rational number b. An irrational number
c. A prime number d. None of these

984. The value of $(0.05)^{\log_{\sqrt{20}}(0.1 + 0.01 + 0.001 + ...)}$ is
a. 81 b. $\frac{1}{81}$ c. 20 d. $\frac{1}{20}$

985. If a, b, c are distinct positive numbers, each different from 1, such that $[\log_b a \log_c a - \log_a a] + [\log_a b \log_c b - \log_b b] + [\log_a c \log_b c - \log_c c] = 0$, then abc =

a. 1 b. 2
c. 3 d. None of these

986. If $\log_{12}27 = a$, then $\log_6 16 =$

a. $2.\frac{3-a}{3+a}$ b. $3.\frac{3-a}{3+a}$
c. $4.\frac{3-a}{3+a}$ d. None of these

987. If $\frac{\log x}{b-c} = \frac{\log y}{c-a} = \frac{\log z}{a-b}$, then which of the following is true

a. $xyz = 1$ b. $x^a y^b z^c = 1$
c. $x^{b+c} y^{c+a} z^{a+b} = 1$ d. $xyz = x^a y^b z^c$

988. The number of real values of the parameter k for which $(\log_{16}x)^2 - \log_{16}x + \log_{16}k = 0$ with real coefficients will have exactly one solution is

a. 2 b. 1
c. 4 d. None of these

989. If $x^{\frac{4}{3}(\log_3 x)^2 + \log_3 x - \frac{5}{4}} = \sqrt{3}$ then x has

a. One positive integral value
b. One irrational value
c. Two positive rational values
d. None of these

990. If $x = \log_5(1000)$ and $y = \log_7(2058)$ then

a. $x > y$ b. $x < y$
c. $x = y$ d. None of these

991. If $\frac{1}{\log_3 \pi} + \frac{1}{\log_4 \pi} > x$, then x be

a. 2 b. 3 c. 3.5 d. π

992. If $\log_{1/\sqrt{2}} \sin x > 0,\ x \in [0, 4\pi]$, then the number of values of x which are integral multiples of $\frac{\pi}{4}$, is

a. 4 b. 12
c. 3 d. None of these

993. The set of real values of x satisfying $\log_{1/2}(x^2 - 6x + 12) \geq -2$ is

a. $(-\infty, 2]$ b. $[2, 4]$
c. $[4, +\infty)$ d. None of these

994. The set of real values of x for which $2^{\log_{\sqrt{2}}(x-1)} > x + 5$ is

a. $(-\infty, -1) \cup (4, +\infty)$ b. $(4, +\infty)$
c. $(-1, 4)$ d. None of these

995. If $\log_{0.04}(x-1) \geq \log_{0.2}(x-1)$ then x belongs to the interval

a. $(1, 2]$ b. $(-\infty, 2]$
c. $[2, +\infty)$ d. None of these

996. The set of real values of x for which is

a. $\left(-\infty, -\frac{5}{2}\right] \cup (0, +\infty)$ b. $\left[\frac{5}{2}, +\infty\right)$
c. $(-\infty, -2) \cup (0, +\infty)$ d. None of these

997. If $x = \log_b a,\ y = \log_c b,\ z = \log_a c$, then xyz is

a. 0 b. 1
c. 3 d. None of these

998. The value of $\log_2 .\log_3 ....\log_{100} 100^{99^{98^{\cdot^{\cdot^{2^1}}}}}$ is

a. 0 b. 1 c. 2 d. 100

Mathematical Induction

999. If $49n + 16n + \lambda$ is divisible by 64 for all $n \in N$, then the least negative integral value of λ is

a. –1 b. –2 c. –3 d. –4

1000. For +ve integer n, $n^3 + 2n$ is always divisible by

a. 3 b. 7 c. 5 d. 6