1. The smallest positive integer n for which

$$\left(\frac{1-i}{1+i}\right)^{n^2} = 1$$

where $i = \sqrt{-1}$, is

(a) 2

(b) 4

(c) 6

(d) 8

2. The value of x, satisfying the equation $\log_{\cos x} \sin x = 1$, where $0 < x < \frac{\pi}{2}$, is

(a) $\frac{\pi}{12}$

(b) $\frac{\pi}{3}$

(c) $\frac{\pi}{4}$

(d) $\frac{\pi}{6}$

3. If Δ is the value of the determinant

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$$

then what is the value of the following determinant?

$$\begin{vmatrix} pa_1 & b_1 & qc_1 \\ pa_2 & b_2 & qc_2 \\ pa_3 & b_3 & qc_3 \end{vmatrix}$$

($p \neq 0$ or 1, $q \neq 0$ or 1)

(a) $p\Delta$

(b) $q\Delta$

(c) $(p+q)\Delta$

(d) $pq\Delta$

4. If $C_0, C_1, C_2, \cdots, C_n$ are the coefficients in the expansion of $(1+x)^n$, then what is the value of $C_1 + C_2 + C_3 + \cdots + C_n$?

(a) 2^n

(b) $2^n - 1$

(c) 2^{n-1}

(d) $2^n - 2$

5. If $a+b+c = 4$ and $ab+bc+ca = 0$, then what is the value of the following determinant?

$$\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$$

(a) 32

(b) −64

(c) −128

(d) 64

6. The number of integer values of k, for which the equation $2\sin x = 2k+1$ has a solution, is

(a) zero

(b) one

(c) two

(d) four

7. If $a_1, a_2, a_3, \cdots, a_9$ are in GP, then what is the value of the following determinant?

$$\begin{vmatrix} \ln a_1 & \ln a_2 & \ln a_3 \\ \ln a_4 & \ln a_5 & \ln a_6 \\ \ln a_7 & \ln a_8 & \ln a_9 \end{vmatrix}$$

(a) 0

(b) 1

(c) 2

(d) 4

8. If the roots of the quadratic equation $x^2 + 2x + k = 0$ are real, then

(a) $k < 0$

(b) $k \leq 0$

(c) $k < 1$

(d) $k \leq 1$

9. If $n = 100!$, then what is the value of the following?

$$\frac{1}{\log_2 n} + \frac{1}{\log_3 n} + \frac{1}{\log_4 n} + \cdots + \frac{1}{\log_{100} n}$$

(a) 0

(b) 1

(c) 2

(d) 3

10. If $Z = 1 + i$, where $i = \sqrt{-1}$, then what is the modulus of $Z + \frac{2}{Z}$?

(a) 1

(b) 2

(c) 3

(d) 4

11. If A and B are two matrices such that AB is of order $n \times n$, then which one of the following is correct?

(a) A and B should be square matrices of same order.

(b) Either A or B should be a square matrix.

(c) Both A and B should be of same order.

(d) Orders of A and B need not be the same.

12. How many matrices of different orders are possible with elements comprising all prime numbers less than 30?

(a) 2

(b) 3

(c) 4

(d) 6

13. Let

$$A = \begin{vmatrix} p & q \\ r & s \end{vmatrix}$$

where p, q, r and s are any four different prime numbers less than 20. What is the maximum value of the determinant?

(a) 215

(b) 311

(c) 317

(d) 323

14. If A and B are square matrices of order 2 such that $\det(AB) = \det(BA)$, then which one of the following is correct?

(a) A must be a unit matrix.

(b) B must be a unit matrix.

(c) Both A and B must be unit matrices.

(d) A and B need not be unit matrices.

15. What is

$$\cot 2x \cot 4x - \cot 4x \cot 6x - \cot 6x \cot 2x$$

equal to?

(a) -1

(b) 0

(c) 1

(d) 2

16. If $\tan x = -\frac{3}{4}$ and x is in the second quadrant, then what is the value of $\sin x \cdot \cos x$?

(a) $\frac{6}{25}$

(b) $\frac{12}{25}$

(c) $-\frac{6}{25}$

(d) $-\frac{12}{25}$

17. What is the value of the following?

$$\operatorname{cosec}\left(\frac{7\pi}{6}\right)\sec\left(\frac{5\pi}{3}\right)$$

(a) $\frac{4}{3}$

(b) 4

(c) -4

(d) $-\frac{4}{\sqrt{3}}$

18. If the determinant

$$\begin{vmatrix} x & 1 & 3 \\ 0 & 0 & 1 \\ 1 & x & 4 \end{vmatrix} = 0$$

then what is x equal to?

(a) -2 or 2

(b) -3 or 3

(c) -1 or 1

(d) 3 or 4

19. What is the value of the following?

$\tan 31^\circ \tan 33^\circ \tan 35^\circ \cdots \tan 57^\circ \tan 59^\circ$

(a) -1

(b) 0

(c) 1

(d) 2

20. If

$$f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & x(x+1) \\ 3x(x-1) & 2(x-1)(x-2) & x(x+1)(x-1) \end{vmatrix}$$

then what is $f(-1) + f(0) + f(1)$ equal to?

(a) 0

(b) 1

(c) 100

(d) -100

21. The equation $\sin^{-1} x - \cos^{-1} x = \frac{\pi}{6}$ has

(a) no solution

(b) unique solution

(c) two solutions

(d) infinite number of solutions

22. What is the value of the following?

$(\sin 24^\circ + \cos 66^\circ)(\sin 24^\circ - \cos 66^\circ)$

(a) -1

(b) 0

(c) 1

(d) 2

23. A chord subtends an angle 120° at the centre of a unit circle. What is the length of the chord?

(a) $\sqrt{2} - 1$ units

(b) $\sqrt{3} - 1$ units

(c) $\sqrt{2}$ units

(d) $\sqrt{3}$ units

24. What is

$(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \tan\theta + \sec\theta)$

equal to?

(a) 1

(b) 2

(c) 3

(d) 4

25. What is

$$\frac{1+\tan^2\theta}{1+\cot^2\theta}-\left(\frac{1-\tan\theta}{1-\cot\theta}\right)^2$$

equal to?

(a) 0

(b) 1

(c) $2\tan\theta$

(d) $2\cot\theta$

26. What is the interior angle of a regular octagon of side length 2 cm?

(a) $\frac{\pi}{2}$

(b) $\frac{3\pi}{4}$

(c) $\frac{3\pi}{5}$

(d) $\frac{3\pi}{8}$

27. If $7\sin\theta+24\cos\theta=25$, then what is the value of $(\sin\theta+\cos\theta)$?

(a) 1

(b) $\frac{26}{25}$

(c) $\frac{6}{5}$

(d) $\frac{31}{25}$

28. A ladder 6 m long reaches a point 6 m below the top of a vertical flagstaff. From the foot of the ladder, the elevation of the top of the flagstaff is 75°. What is the height of the flagstaff?

(a) 12 m

(b) 9 m

(c) $(6+\sqrt{3})$ m

(d) $(6+3\sqrt{3})$ m

29. The shadow of a tower is found to be x metre longer, when the angle of elevation of the sun changes from 60° to 45°. If the height of the tower is $5(3+\sqrt{3})$ m, then what is x equal to?

(a) 8 m

(b) 10 m

(c) 12 m

(d) 15 m

30. If $3\cos\theta=4\sin\theta$, then what is the value of $\tan(45°+\theta)$?

(a) 10

(b) 7

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

(d) $\frac{7}{4}$

31. $\tan^{-1} x + \cot^{-1} x = \frac{\pi}{2}$ holds, when

(a) $x \in R$

(b) $x \in R - (-1, 1)$ only

(c) $x \in R - \{0\}$ only

(d) $x \in R - [-1, 1]$ only

32. If $\tan A = \frac{1}{7}$, then what is $\cos 2A$ equal to?

(a) $\frac{24}{25}$

(b) $\frac{18}{25}$

(c) $\frac{12}{25}$

(d) $\frac{6}{25}$

33. The sides of a triangle are m, n and $\sqrt{m^2 + n^2 + mn}$. What is the sum of the acute angles of the triangle?

(a) 45°

(b) 60°

(c) 75°

(d) 90°

34. What is the area of the triangle ABC with sides $a = 10$ cm, $c = 4$ cm and angle $B = 30°$?

(a) 16 cm^2

(b) 12 cm^2

(c) 10 cm^2

(d) 8 cm^2

35. Consider the following statements :

1. $A = \{1, 3, 5\}$ and $B = \{2, 4, 7\}$ are equivalent sets.

2. $A = \{1, 5, 9\}$ and $B = \{1, 5, 5, 9, 9\}$ are equal sets.

Which of the above statements is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

36. Consider the following statements :

1. The null set is a subset of every set.
2. Every set is a subset of itself.
3. If a set has 10 elements, then its power set will have 1024 elements.

Which of the above statements are correct?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

37. Let R be a relation defined as xRy if and only if $2x+3y=20$, where $x, y \in N$. How many elements of the form (x, y) are there in R?

(a) 2

(b) 3

(c) 4

(d) 6

38. Consider the following statements :

1. A function $f: \mathbb{Z} \to \mathbb{Z}$, defined by $f(x) = x+1$, is one-one as well as onto.
2. A function $f: \mathbb{N} \to \mathbb{N}$, defined by $f(x) = x+1$, is one-one but not onto.

Which of the above statements is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

39. Consider the following in respect of a complex number Z :

1. $\overline{(Z^{-1})} = (\bar{Z})^{-1}$
2. $ZZ^{-1} = |Z|^2$

Which of the above is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

40. Consider the following statements in respect of an arbitrary complex number Z :

1. The difference of Z and its conjugate is an imaginary number.
2. The sum of Z and its conjugate is a real number.

Which of the above statements is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

41. What is the modulus of the complex number $i^{2n+1}(-i)^{2n-1}$, where $n \in N$ and $i = \sqrt{-1}$?

(a) -1

(b) 1

(c) $\sqrt{2}$

(d) 2

42. If α and β are the roots of the equation $4x^2 + 2x - 1 = 0$, then which one of the following is correct?

(a) $\beta = -2\alpha^2 - 2\alpha$

(b) $\beta = 4\alpha^2 - 3\alpha$

(c) $\beta = \alpha^2 - 3\alpha$

(d) $\beta = -2\alpha^2 + 2\alpha$

43. If one root of $5x^2 + 26x + k = 0$ is reciprocal of the other, then what is the value of k?

(a) 2

(b) 3

(c) 5

(d) 8

44. In how many ways can a team of 5 players be selected from 8 players so as not to include a particular player?

(a) 42

(b) 35

(c) 21

(d) 20

45. What is the coefficient of the middle term in the expansion of $(1 + 4x + 4x^2)^5$?

(a) 8064

(b) 4032

(c) 2016

(d) 1008

46. What is $C(n, 1) + C(n, 2) + \cdots + C(n, n)$ equal to?

(a) $2 + 2^2 + 2^3 + \cdots + 2^5$

(b) $1 + 2 + 2^2 + 2^3 + \cdots + 2^n$

(c) $1 + 2 + 2^2 + 2^3 + \cdots + 2^{n-1}$

(d) $2 + 2^2 + 2^3 + \cdots + 2^{n-1}$

47. What is the sum of the coefficients of first and last terms in the expansion of $(1 + x)^{2n}$, where n is a natural number?

(a) 1

(b) 2

(c) n

(d) $2n$

48. If the first term of an AP is 2 and the sum of the first five terms is equal to one-fourth of the sum of the next five terms, then what is the sum of the first ten terms?

(a) –500

(b) –250

(c) 500

(d) 250

49. Consider the following statements :

1. If each term of a GP is multiplied by same non-zero number, then the resulting sequence is also a GP.
2. If each term of a GP is divided by same non-zero number, then the resulting sequence is also a GP.

Which of the above statements is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

50. How many 5-digit prime numbers can be formed using the digits 1, 2, 3, 4, 5 if the repetition of digits is not allowed?

(a) 5

(b) 4

(c) 3

(d) 0

51. If $f(x+1) = x^2 - 3x + 2$, then what is $f(x)$ equal to?

(a) $x^2 - 5x + 4$

(b) $x^2 - 5x + 6$

(c) $x^2 + 3x + 3$

(d) $x^2 - 3x + 1$

52. If x^2, x, -8 are in AP, then which one of the following is correct?

(a) $x \in \{-2\}$

(b) $x \in \{4\}$

(c) $x \in \{-2, 4\}$

(d) $x \in \{-4, 2\}$

53. The third term of a GP is 3. What is the product of its first five terms?

(a) 81

(b) 243

(c) 729

(d) Cannot be determined due to insufficient data

54. The element in the ith row and the jth column of a determinant of third order is equal to $2(i + j)$. What is the value of the determinant?

(a) 0

(b) 2

(c) 4

(d) 6

55. With the numbers 2, 4, 6, 8, all the possible determinants with these four different elements are constructed. What is the sum of the values of all such determinants?

(a) 128

(b) 64

(c) 32

(d) 0

56. What is the radius of the circle $4x^2 + 4y^2 - 20x + 12y - 15 = 0$?

(a) 14 units

(b) 10·5 units

(c) 7 units

(d) 3·5 units

57. A parallelogram has three consecutive vertices (–3, 4), (0, –4) and (5, 2). The fourth vertex is

(a) (2, 10)

(b) (2, 9)

(c) (3, 9)

(d) (4, 10)

58. If the lines $y + px = 1$ and $y - qx = 2$ are perpendicular, then which one of the following is correct?

(a) $pq + 1 = 0$

(b) $p + q + 1 = 0$

(c) $pq - 1 = 0$

(d) $p - q + 1 = 0$

59. If A, B and C are in AP, then the straight line $Ax + 2By + C = 0$ will always pass through a fixed point. The fixed point is

(a) (0, 0)

(b) (−1, 1)

(c) (1, −2)

(d) (1, −1)

60. If the image of the point (−4, 2) by a line mirror is (4, −2), then what is the equation of the line mirror?

(a) $y = x$

(b) $y = 2x$

(c) $4y = x$

(d) $y = 4x$

61. Consider the following statements in respect of the points $(p, p-3)$, $(q+3, q)$ and (6, 3) :

1. The points lie on a straight line.
2. The points always lie in the first quadrant only for any value of p and q.

Which of the above statements is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

62. What is the acute angle between the lines $x - 2 = 0$ and $\sqrt{3}x - y - 2 = 0$?

(a) 0°

(b) 30°

(c) 45°

(d) 60°

63. The point of intersection of diagonals of a square $ABCD$ is at the origin and one of its vertices is at $A(4, 2)$. What is the equation of the diagonal BD?

(a) $2x + y = 0$

(b) $2x + y = 0$

(c) $x + 2y = 0$

(d) $x - 2y = 0$

64. If any point on a hyperbola is $(3\tan\theta, 2\sec\theta)$, then what is the eccentricity of the hyperbola?

(a) $\frac{3}{2}$

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

(c) $\frac{\sqrt{11}}{2}$

(d) $\frac{\sqrt{13}}{2}$

65. Consider the following with regard to eccentricity (e) of a conic section :

1. $e = 0$ for circle
2. $e = 1$ for parabola
3. $e < 1$ for ellipse

Which of the above are correct?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

66. What is the angle between the two lines having direction ratios $\langle 6, 3, 6\rangle$ and $\langle 3, 3, 0\rangle$?

(a) $\frac{\pi}{6}$

(b) $\frac{\pi}{4}$

(c) $\frac{\pi}{3}$

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

67. If l, m, n are the direction cosines of the line $x-1 = 2(y+3) = 1-z$, then what is $l^4 + m^4 + n^4$ equal to?

(a) 1

(b) $\frac{11}{27}$

(c) $\frac{13}{27}$

(d) 4

68. What is the projection of the line segment joining $A(1, 7, -5)$ and $B(-3, 4, -2)$ on y-axis?

(a) 5

(b) 4

(c) 3

(d) 2

69. What is the number of possible values of k for which the line joining the points $(k, 1, 3)$ and $(1, -2, k+1)$ also passes through the point $(15, 2, -4)$?

(a) Zero

(b) One

(c) Two

(d) Infinite

70. The foot of the perpendicular drawn from the origin to the plane $x+y+z=3$ is

(a) $(0, 1, 2)$

(b) $(0, 0, 3)$

(c) $(1, 1, 1)$

(d) $(-1, 1, 3)$

71. A vector $\vec{r} = a\hat{i} + b\hat{j}$ is equally inclined to both x and y axes. If the magnitude of the vector is 2 units, then what are the values of a and b respectively?

(a) $\frac{1}{2}, \frac{1}{2}$

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

(c) $\sqrt{2}, \sqrt{2}$

(d) 2, 2

72. Consider the following statements in respect of a vector $\vec{c} = \vec{a} + \vec{b}$, where $|\vec{a}| = |\vec{b}| \neq 0$:

1. $\vec{c}$ is perpendicular to $(\vec{a} - \vec{b})$.

2. $\vec{c}$ is perpendicular to $(\vec{a} \times \vec{b})$.

Which of the above statements is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

73. If $\vec{a}$ and $\vec{b}$ are two vectors such that $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}| = 4$, then which one of the following is correct?

(a) $\vec{a}$ and $\vec{b}$ must be unit vectors.

(b) $\vec{a}$ must be parallel to $\vec{b}$.

(c) $\vec{a}$ must be perpendicular to $\vec{b}$.

(d) $\vec{a}$ must be equal to $\vec{b}$.

74. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are coplanar, then what is $(2\vec{a}\times 3\vec{b})\cdot 4\vec{c} + (5\vec{b}\times 3\vec{c})\cdot 6\vec{a}$ equal to?

(a) 114

(b) 66

(c) 0

(d) −66

75. Consider the following statements :

1. The cross product of two unit vectors is always a unit vector.
2. The dot product of two unit vectors is always unity.
3. The magnitude of sum of two unit vectors is always greater than the magnitude of their difference.

Which of the above statements are **not** correct?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

76. If

$$\lim_{x\to a}\frac{a^x - x^a}{x^a - a^a} = -1$$

then what is the value of a?

(a) −1

(b) 0

(c) 1

(d) 2

77. A particle starts from origin with a velocity (in m/s) given by the equation $\frac{dx}{dt} = x + 1$. The time (in second) taken by the particle to traverse a distance of 24 m is

(a) ln 24

(b) ln 5

(c) 2 ln 5

(d) 2 ln 4

78. What is

$$\int_0^a \frac{f(a-x)}{f(x)+f(a-x)}\,dx$$

equal to?

(a) a

(b) $2a$

(c) 0

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

79. What is

$$\lim_{x \to -1} \frac{x^3 + x^2}{x^2 + 3x + 2}$$

equal to?

(a) 0

(b) 1

(c) 2

(d) 3

80. If

$$\int_0^a [f(x) + f(-x)]\,dx = \int_{-a}^{a} g(x)\,dx$$

then what is $g(x)$ equal to?

(a) $f(x)$

(b) $f(-x) + f(x)$

(c) $-f(x)$

(d) None of the above

81. What is the area bounded by $y = \sqrt{16 - x^2}$, $y \geq 0$ and the x-axis?

(a) 16π square units

(b) 8π square units

(c) 4π square units

(d) 2π square units

82. The curve $y = -x^3 + 3x^2 + 2x - 27$ has the maximum slope at

(a) $x = -1$

(b) $x = 0$

(c) $x = 1$

(d) $x = 2$

83. A 24 cm long wire is bent to form a triangle with one of the angles as 60°. What is the altitude of the triangle having the greatest possible area?

(a) $4\sqrt{3}$ cm

(b) $2\sqrt{3}$ cm

(c) 6 cm

(d) 3 cm

84. If $f(x) = e^{|x|}$, then which one of the following is correct?

(a) $f'(0) = 1$

(b) $f'(0) = -1$

(c) $f'(0) = 0$

(d) $f'(0)$ does not exist

85. What is

$$\int \frac{dx}{\sec x + \tan x}$$

equal to?

(a) $\ln(\sec x) + \ln|\sec x + \tan x| + c$

(b) $\ln(\sec x) - \ln|\sec x + \tan x| + c$

(c) $\sec x \tan x - \ln|\sec x - \tan x| + c$

(d) $\ln|\sec x + \tan x| - \ln|\sec x| + c$

86. What is

$$\int \frac{dx}{\sec^2(\tan^{-1} x)}$$

equal to?

(a) $\sin^{-1} x + c$

(b) $\tan^{-1} x + c$

(c) $\sec^{-1} x + c$

(d) $\cos^{-1} x + c$

87. If $x + y = 20$ and $P = xy$, then what is the maximum value of P?

(a) 100

(b) 96

(c) 84

(d) 50

88. What is the derivative of

$$\sin(\ln x) + \cos(\ln x)$$

with respect to x at $x = e$?

(a) $\frac{\cos 1 - \sin 1}{e}$

(b) $\frac{\sin 1 - \cos 1}{e}$

(c) $\frac{\cos 1 + \sin 1}{e}$

(d) 0

89. If $x = e^t \cos t$ and $y = e^t \sin t$, then what is $\frac{dx}{dy}$ at $t = 0$ equal to?

(a) 0

(b) 1

(c) 2e

(d) −1

90. What is the maximum value of $\sin 2x \cdot \cos 2x$?

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

(b) 1

(c) 2

(d) 4

91. What is the derivative of e^x with respect to x^e?

(a) $\frac{xe^x}{ex^e}$

(b) $\frac{e^x}{x^e}$

(c) $\frac{xe^x}{x^e}$

(d) $\frac{e^x}{ex^e}$

92. If a differentiable function $f(x)$ satisfies

$$\lim_{x \to -1} \frac{f(x)+1}{x^2-1} = -\frac{3}{2}$$

then what is $\lim_{x \to -1} f(x)$ equal to?

(a) $-\frac{3}{2}$

(b) -1

(c) 0

(d) 1

93. If the function

$$f(x) = \begin{cases} a+bx, & x<1 \\ 5, & x=1 \\ b-ax, & x>1 \end{cases}$$

is continuous, then what is the value of $(a+b)$?

(a) 5

(b) 10

(c) 15

(d) 20

94. Consider the following statements in respect of the function $f(x) = \sin x$:

1. $f(x)$ increases in the interval $(0, \pi)$.
2. $f(x)$ decreases in the interval $\left(\frac{5\pi}{2}, 3\pi\right)$.

Which of the above statements is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

95. What is the domain of the function $f(x) = 3^x$?

(a) $(-\infty, \infty)$

(b) $[0, \infty)$

(c) $[0, \infty)$

(d) $(-\infty, \infty) - \{0\}$

96. If the general solution of a differential equation is $y^2 + 2cy - cx + c^2 = 0$, where c is an arbitrary constant, then what is the order of the differential equation?

(a) 1

(b) 2

(c) 3

(d) 4

97. What is the degree of the following differential equation?

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

(a) 1

(b) 2

(c) 3

(d) Degree is not defined

98. Which one of the following differential equations has the general solution $y = ae^x + be^{-x}$?

(a) $\frac{d^2y}{dx^2} + y = 0$

(b) $\frac{d^2y}{dx^2} - y = 0$

(c) $\frac{d^2y}{dx^2} + y = 1$

(d) $\frac{dy}{dx} - y = 0$

99. What is the solution of the following differential equation?

$$\ln\left(\frac{dy}{dx}\right) + y = x$$

(a) $e^x + e^y = c$

(b) $e^{x+y} = c$

(c) $e^x - e^y = c$

(d) $e^{x-y} = c$

100. What is $\int e^{(2\ln x + \ln x^2)} dx$ equal to?

(a) $\frac{x^4}{4} + c$

(b) $\frac{x^3}{3} + c$

(c) $\frac{2x^5}{5} + c$

(d) $\frac{x^5}{5} + c$

101. Consider the following measures of central tendency for a set of N numbers :

1. Arithmetic mean
2. Geometric mean

Which of the above uses/use all the data?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

102. The numbers of Science, Arts and Commerce graduates working in a company are 30, 70 and 50 respectively. If these figures are represented by a pie chart, then what is the angle corresponding to Science graduates?

(a) 36°

(b) 72°

(c) 120°

(d) 168°

103. For a histogram based on a frequency distribution with unequal class intervals, the frequency of a class should be proportional to

(a) the height of the rectangle

(b) the area of the rectangle

(c) the width of the rectangle

(d) the perimeter of the rectangle

104. The coefficient of correlation is independent of

(a) change of scale only

(b) change of origin only

(c) both change of scale and change of origin

(d) neither change of scale nor change of origin

105. The following table gives the frequency distribution of number of peas per pea pod of 198 pods :

Number of peas	1	2	3	4	5	6	7
Frequency	4	33	76	50	26	8	1

What is the median of this distribution?

(a) 3

(b) 4

(c) 5

(d) 6

106. If M is the mean of n observations $x_1 - k, x_2 - k, x_3 - k, \cdots, x_n - k$, where k is any real number, then what is the mean of $x_1, x_2, x_3, \cdots, x_n$?

(a) M

(b) $M + k$

(c) $M - k$

(d) kM

107. What is the sum of deviations of the variate values 73, 85, 92, 105, 120 from their mean?

(a) –2

(b) –1

(c) 0

(d) 5

108. Let x be the HM and y be the GM of tw positive numbers m and n. If $5x = 4$ then which one of the following correct?

(a) $5m = 4n$

(b) $2m = n$

(c) $4m = 5n$

(d) $m = 4n$

109. If the mean of a frequency distribution is 100 and the coefficient of variation is 45%, then what is the value of the variance?

(a) 2025

(b) 450

(c) 45

(d) 4·5

110. Let two events A and B be such that $P(A) = L$ and $P(B) = M$. Which one of the following is correct?

(a) $P(A|B) < \dfrac{L+M-1}{M}$

(b) $P(A|B) > \dfrac{L+M-1}{M}$

(c) $P(A|B) \geq \dfrac{L+M-1}{M}$

(d) $P(A|B) = \dfrac{L+M-1}{M}$

111. For which of the following sets of numbers do the mean, median and mode have the same value?

(a) 12, 12, 12, 12, 24

(b) 6, 18, 18, 18, 30

(c) 6, 6, 12, 30, 36

(d) 6, 6, 6, 12, 30

112. The mean of 12 observations is 75. If two observations are discarded, then the mean of the remaining observations is 65. What is the mean of the discarded observations?

(a) 250

(b) 125

(c) 120

(d) Cannot be determined due to insufficient data

113. If k is one of the roots of the equation $x(x+1)+1 = 0$, then what is its other root?

(a) 1

(b) $-k$

(c) k^2

(d) $-k^2$

114. The geometric mean of a set of observations is computed as 10. The geometric mean obtained when each observation x_i is replaced by $3x_i^4$ is

(a) 810

(b) 900

(c) 30000

(d) 81000

115. If $P(A \cup B) = \frac{5}{6}$, $P(A \cap B) = \frac{1}{3}$ and $P(\bar{A}) = \frac{1}{2}$, then which of the following is/are correct?

1. A and B are independent events.
2. A and B are mutually exclusive events.

Select the correct answer using the code given below.

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

116. The average of a set of 15 observations is recorded, but later it is found that for one observation, the digit in the tens place was wrongly recorded as 8 instead of 3. After correcting the observation, the average is

(a) reduced by $\frac{1}{3}$

(b) increased by $\frac{10}{3}$

(c) reduced by $\frac{10}{3}$

(d) reduced by 50

117. A coin is tossed twice. If E and F denote occurrence of head on first toss and second toss respectively, then what is $P(E \cup F)$ equal to?

(a) $\frac{1}{4}$

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

(c) $\frac{3}{4}$

(d) $\frac{1}{3}$

118. In a binomial distribution, the mean is $\frac{2}{3}$ and variance is $\frac{5}{9}$. What is the probability that random variable $X = 2$?

(a) $\frac{5}{36}$

(b) $\frac{25}{36}$

(c) $\frac{25}{54}$

(d) $\frac{25}{216}$

119. If the mode of the scores 10, 12, 13, 15, 15, 13, 12, 10, x is 15, then what is the value of x?

(a) 10

(b) 12

(c) 13

(d) 15

120. If A and B are two events such that $P(A) = \frac{3}{4}$ and $P(B) = \frac{5}{8}$, then consider the following statements :

1. The minimum value of $P(A \cup B)$ is $\frac{3}{4}$.
2. The maximum value of $P(A \cap B)$ is $\frac{5}{8}$.

Which of the above statements is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2