



SAINIK SCHOOL CHANDRAPUR

HOLIDAY HOMEWORK

MATHEMATICS

1. The number 383, in binary notation is written as
 - a. $(11010111)_2$
 - b. $(10111111)_2$
 - c. $(10111110)_2$
 - d. $(11111110)_2$
2. The decimal number corresponding to the binary number $(0.1011)_2$ is
 - a. $(0.6875)_{10}$
 - b. $(0.6075)_{10}$
 - c. $(0.3785)_{10}$
 - d. $(0.4875)_{10}$
3. The value of $(\log_b a^2 \cdot \log_c b^2 \cdot \log_a c^2)$ is equal to
 - a. 4
 - b. 6
 - c. abc
 - d. 8
4. If $\log_{10}(x - 15) + \log_{10}10 = 4$, then the value of x is
 - a. 485
 - b. 1015
 - c. 1025
 - d. 1225
5. If $\log_{10}x = a$, $\log_{10}y = b$ and $\log_{10}z = c$, then antilog $(pa + qb - rc) = ?$
 - a. $\frac{pxay}{rz}$
 - b. $\frac{x^p y^p}{z^r}$
 - c. $x^p y^q z^r$
 - d. None of these
6. If $p^x = q^w = l$ and $q^y = p^z = m$, then
 - a. $\frac{x}{y} = \frac{w}{z}$
 - b. $xy = wz$
 - c. $x + y = w + z$
 - d. $x - y = w - z$
7. Let $A = \{3, \pi, \sqrt{2}, \frac{2}{7}, -5, 3 + \sqrt{7}\}$. The subset of A containing all the elements from it which are irrational number is
 - a. $\left\{3, \frac{2}{7}, -5\right\}$
 - b. $\{\pi, \sqrt{2}, 3 + \sqrt{7}\}$
 - c. $\{3, -5\}$
 - d. $\{3, \pi, 3 + \sqrt{7}\}$
8. If X is the set of all integers and f is defined on X by $f(n) = n^2$, then the image of the set $\{-2, -1, 0, 1, 2\}$ is
 - a. $\{-2, 1, 0\}$
 - b. $\{0, 1, 2\}$
 - c. $\{-2, -1, 4\}$
 - d. $\{0, 1, 4\}$
9. Which of the following is a true statement ?
 - a. $(A \cup B)^C = A \cap B^C$
 - b. $(A \cup B)^C = A^C \cap B^C$
 - c. $(A \cup B)^C = A^C \cap B$
 - d. $(A \cup B)^C = (A^C \cap B^C)$
10. If $f: \mathbb{R} \rightarrow \mathbb{R}$ satisfies the condition $f(x + y) = f(x) + f(y)$ for all x, y in \mathbb{R} , then $f(x)$ is
 - a. an even function
 - b. zero everywhere
 - c. defined at $x = 0$
 - d. an odd function
11. If $\sin\theta + \cos\theta = 1$, then the value of $\sin\theta \cdot \cos\theta$ is
 - a. $\frac{1}{2}$
 - b. 1
 - c. 2
 - d. zero
12. The value of $2 \cos\left(x + \frac{\pi}{3}\right)$ is
 - a. $\sqrt{3} \cos x - 2 \sin x$
 - b. $\cos x - \sqrt{3} \sin x$
 - c. $\cos x + \sqrt{3} \sin x$
 - d. $\sqrt{3} \cos x + 2 \sin x$
13. If $\sin\theta = \frac{1}{2}$ and $\cos\theta = \frac{-\sqrt{3}}{2}$, then the general value of θ is
 - a. $2n\pi + \frac{\pi}{6}$
 - b. $2n\pi + \frac{\pi}{4}$
 - c. $2n\pi + \frac{5\pi}{6}$
 - d. $2n\pi + \frac{7\pi}{6}$
14. If the shadow of a pillar is $\sqrt{3}$ times its height, then the angle of elevation of the sun will be
 - a. 30°
 - b. 45°
 - c. 60°
 - d. 90°
15. $\sin\theta + \cos\theta$ is maximum when θ is equal to
 - a. 30°
 - b. 45°
 - c. 60°
 - d. 90°
16. The horizontal distance between two towers is 60 m. The angular elevation of the top of the taller tower as seen from the top of the shorter one is 30° . If the height of the taller tower is 150 m, find the height of the shorter one.
 - a. 175 m
 - b. $150\sqrt{3}$ m
 - c. $150 - 20\sqrt{3}$ m
 - d. 135 m
17. In a triangle ABC , $a = 6$, $b = 3$ and $\cos(A - B) = \frac{4}{5}$, then find its area.
 - a. 4 sq. units
 - b. 9 sq. units
 - c. 15 sq. units
 - d. 24 sq. units
18. If $\frac{2 \sin \alpha}{1 + \cos \alpha + \sin \alpha} = x$, then $\frac{1 - \cos \alpha + \sin \alpha}{1 + \sin \alpha} = ?$
 - a. $1 - x$
 - b. $1 + x$
 - c. $1/x$
 - d. x
19. The angle A, B and C of a triangle ABC are in arithmetic progression. If $2b^2 = 3c^2$, then value of angle $\angle A$ is equal to
 - a. 45°
 - b. 60°
 - c. 75°
 - d. 90°
20. If $f(x) = \sin^2 x + \sin^2\left(x + \frac{\pi}{3}\right) + \cos x \cdot \left(x + \frac{\pi}{3}\right)$ and $g\left(\frac{5}{4}\right) = 1$ then $gof(x) = ?$
 - a. 1/2
 - b. 1
 - c. 2
 - d. 1/4
21. The minimum value of the expression $\sin\alpha + \sin\beta = \sin\gamma$, where α, β and γ are real numbers satisfying $\alpha + \beta + \gamma = \pi$ is
 - a. zero
 - b. positive
 - c. negative
 - d. -3

22. The number $\log_2 7$ is
 a. an irrational number b. a rational number
 c. a prime number d. an integer
23. Which one of the following graph represents the function $y = 1 + |x|$ for all $x \in \mathbb{R}$? ?
- a. A Cartesian coordinate system showing a V-shaped graph opening upwards along the x-axis. The vertex is at (0, 1). The left branch passes through (-1, 0) and continues downwards. The right branch passes through (1, 0) and continues upwards.
- b. A Cartesian coordinate system showing a V-shaped graph opening downwards along the x-axis. The vertex is at (0, 1). The left branch passes through (-1, 0) and continues downwards. The right branch passes through (1, 0) and continues downwards.
- c. A Cartesian coordinate system showing a V-shaped graph opening upwards along the x-axis. The vertex is at (0, -1). The left branch passes through (-1, 0) and continues upwards. The right branch passes through (1, 0) and continues upwards.
- d. A Cartesian coordinate system showing a V-shaped graph opening upwards along the x-axis. The vertex is at (0, 1). The left branch passes through (-1, 0) and continues upwards. The right branch passes through (1, 0) and continues upwards.
24. Consider the following statements regarding continuous functions defined on a closed interval:
 I. Every continuous function is differentiable
 II. Every continuous function is bounded
 III. Every continuous function attains its bounds
 IV. Every continuous function is integrable.
 Which of these statement(s) is/are correct?
 a. II and III b. II, III and IV
 c. IV only d. I and III
25. $f(x) = \sqrt{1 + \sqrt{x}}$ for all $x > 0$, where $\sqrt{\cdot}$ stands for positive square root, then $f'(x)$ equals
 a. $\frac{1}{2f(x)}$ b. $\frac{1}{2\sqrt{x}f(x)}$
 c. $\frac{1}{4\sqrt{x}f(x)}$ d. $\frac{2\sqrt{x}+1}{4\sqrt{x}f(x)}$
26. The value of integral $\int a^{3x+3} dx$ ($a \neq -1$) is equal to
 a. $\frac{a^{3x+3}}{\log a} + c$ b. $\frac{a^{3x+3}}{3\log a} + c$
 c. $\frac{a^{3x+4}}{\log a} + c$ d. $\frac{a^{3x+1}}{3(x+1)} + c$
27. $\int \log_{10} x dx$ is equal to
 a. $\frac{1}{x} + c$ b. $(x-1) \log_e x + c$
 c. $\log_{10} e \cdot \log e \left(\frac{x}{e} + c \right)$ d. $\log_e 10 - x \log e \left(\frac{x}{e} \right) + c$
28. The integral $\int_{-a}^a \frac{\sin^2 x}{1-x^2} dx$, $0 < a < 1$ is equal to
 a. $\int_{-a}^a \frac{\sin^2 x}{1-x^2} dx$ b. $\int_0^a \frac{\sin^2 x}{1-x^2} dx$
 c. zero d. $2 \int_0^a \frac{\sin^2 x}{1-x^2} dx$
29. In the given diagram
- A parallelogram ABCD is shown in a Cartesian coordinate system. The vertices are labeled: A is at (-u, 0), B is at (u, 0), C is at (0, v), and D is at (0, -v). The base AE is horizontal and labeled 'u'. The height CV is vertical and labeled 'v'.
- the vector $u - v$ is represented by the directed segment.
 a. \vec{AD} b. \vec{BC} c. \vec{CB} d. \vec{DA}
30. A force $\vec{F} = 3\hat{i} + 4\hat{j} - 2\hat{k}$ acts on a particle and the displacement of the point of application if given by $\vec{d} = 2\hat{i} + 5\hat{j} + 3\hat{k}$. The work done by the force is
 a. 25 units b. 20 units c. 15 units d. 10 units
31. If θ be the angle between $(\vec{a} + \vec{b})$ and $(\vec{a} + 2\vec{b})$ where $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$, then $\cos\theta = ?$
 a. $\frac{9}{40}$ b. $\frac{41}{50}$ c. $\frac{31}{50}$ d. $\frac{81}{90}$
32. The value of ' m ' for which the vectors $(m\hat{i} - 10\hat{j} - 5\hat{k})$, $(-7\hat{i} - 5\hat{j})$ and $(\hat{i} - 4\hat{j} - 3\hat{k})$ are coplanar, is
 a. -3 b. 3 c. -2 d. 1
33. The work done by the force $\vec{F} = 5\hat{i} - 3\hat{j} + 2\hat{k}$ in moving a particle from X(2, 1, 3) to Y(4, -1, 5) is
 a. 20 units b. 15 units c. 12 units d. 10 units
34. Find the value of λ if $a \perp b$, where $\vec{a} = 3\hat{i} + 4\hat{j} + \lambda\hat{k}$ and $\vec{b} = \lambda\hat{i} - \hat{j} + 4\hat{k}$.
 a. $\frac{-10}{3}$ b. $\frac{3}{7}$ c. $\frac{4}{7}$ d. $\frac{5}{8}$

35. Find the angle between \vec{a} and \vec{b} , where $\vec{a} = 3\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + 5\hat{k}$.
- a. $\cos^{-1} \frac{2}{\sqrt{21}}$ b. $\cos^{-1} \frac{3}{\sqrt{21}}$
c. $\cos^{-1} \frac{2}{\sqrt{45}}$ d. $\cos^{-1} \frac{3}{\sqrt{45}}$
36. If a , b and c are coplanar, then $\begin{vmatrix} a & b & c \\ a.a & a.b & a.c \\ b.a & b.b & b.c \end{vmatrix}$ is equal to
- a. $a + b + c$ b. $\frac{4}{abc}$ c. zero d. 1
37. If $|a| = 2$, $|b| = 7$ and $a \times b = 3\hat{i} + 2\hat{j} + 6\hat{k}$, what is the angle between a and b is equal to ?
- a. 30° b. 45° c. 60° d. 90°
38. $\lim_{x \rightarrow 0} \frac{\log(1+x)}{x}$
- a. zero b. infinity c. $1/2$ d. 1
39. $\lim_{n \rightarrow \infty} \left(\frac{1}{n^2} + \frac{2}{n^2} + \dots + \frac{n}{n^2} \right)$
- a. 1 b. $1/2$ c. zero d. 2
40. $\lim_{x \rightarrow 0} \frac{\cos Ax - \cos Bx}{x^2}$ is equal to
- a. $\frac{B^2}{A^2}$ b. $\frac{A^2 - B^2}{2}$
c. $\frac{B^2 - A^2}{2}$ d. $\frac{B^2 - A^2}{4}$
41. $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$
- a. $1/2$ b. 1 c. 2 d. zero
42. If $y = \sin^{-1}(2x\sqrt{1-x^2})$, then $\frac{dy}{dx} = ?$
- a. $\frac{1}{\sqrt{1-x^2}}$ b. $\frac{2}{\sqrt{1-x^2}}$
c. $\frac{1}{\sqrt{1+x^2}}$ d. $\frac{1}{\sqrt{1-x^2}}$
43. If $y = x^2 e^{\sqrt{x}}$, then $\frac{dy}{dx} = ?$
- a. $x e^{\sqrt{x}} \left(2 + \frac{\sqrt{x}}{2} \right)$ b. $e^{\sqrt{x}} \left(1 + \frac{\sqrt{x}}{2} \right)$
c. $\left(2 + \frac{\sqrt{x}}{2} \right) x$ d. $x e^x \left(2 + \frac{1}{\sqrt{x}} \right)$
44. If $y = e^{x+e^x+e^{x+\dots}}$, then $\frac{dy}{dx} = ?$
- a. $\frac{y}{2(y+2)}$ b. $\frac{y}{1-y}$
c. $\frac{1}{(1-y)^2}$ d. $\frac{1}{(y-1)^2}$
45. If $y = \log \sqrt{\frac{1+\tan x}{1-\tan x}}$, then $\frac{dy}{dx} = ?$
- a. $\cos 2x$ b. $\sin 2x$ c. $\sec 2x$ d. $\tan 2x$
46. If $x = a \frac{(1-t^2)}{1+t^2}$, $y = \frac{2bt}{1+t^2}$, then $\frac{dy}{dx}$ is equal to
- a. a/b b. $-b/a$ c. b/a d. $-ab$
47. What is the solution of differential equation $x \frac{d^2y}{dx^2} = 1$ given that $y = 1$, $\frac{dy}{dx} = 0$, where $x = 1$.
- a. $y = x \log x + c$ b. $y = x \log x + x + x + 2$
c. $y = x \log x - x + 2$ d. $y = x \log x + x - 2$
48. The general solution of differential equation $(x + \log y)dy + ydx = 0$ is
- a. $x + y \log y - y = c$ b. $xy + y \log y - y = c$
c. $xy + x \log x + x = c$ d. None of these
49. Match the List-I with List-II and select the correct answer, using the codes given below the lists :
- | List – I
(Differential Equation) | List-II
(Order, degree) |
|--|----------------------------|
| A. $\left(\frac{d^3y}{dx} \right)^2 - x \left(\frac{dy}{dx} \right)^3 = 0$ | I. (2, 2) |
| B. $y = x \frac{dy}{dx} + \sqrt{1 + \left(\frac{dy}{dx} \right)^2}$ | II. (3, 2) |
| C. $\frac{d^2y}{dx^2} + 4x = 0$ | III. (2, 3) |
| D. $\frac{d^2y}{dx^2} = 3 \sqrt{1 + \left(\frac{dy}{dx} \right)^4}$ | IV. (2, 1) |
| a. A-III, B-I, C-II, D-IV | b. A-IV, B-III, C-II, D-I |
| c. A-II, B-I, C-IV, D-III | d. A-II, B-III, C-IV, D-I |
50. The area bounded by the curve $y = a \sin x$ and x -axis
- a. a b. $2a$ c. $4a$ d. $6a$
51. The value of $\int_0^{2\pi} |\sin^3 \theta| d\theta$ is
- a. $\frac{3}{8}$ b. $\frac{\pi}{2}$ c. $\frac{8}{3}$ d. 0

52. What is the integrating factor of $\frac{dy}{dx} + y \sec x = \tan x$
- $e^{\sec x}$
 - $\frac{dy}{dx} + y \sec x = \tan x$
 - $\sec x \log(\sec x + \tan x)$
 - None of these
53. $\int_0^1 \frac{dx}{(x^2+1)^{3/2}}$ equals which of the following?
- $\frac{1}{\sqrt{2}}$
 - 1
 - $\sqrt{2}$
 - 1
54. $\int_0^1 \log(\sqrt{1+x} + \sqrt{1-x}) dx$ is equal to
- $\frac{1}{2} \left(\log 2 - \frac{1}{2} + \frac{\pi}{4} \right)$
 - $\frac{1}{3} \left(\log 4 - 1 + \frac{\pi}{8} \right)$
 - $\frac{1}{2} \left(\log 2 - 1 + \frac{\pi}{2} \right)$
 - $\frac{1}{4} \left(\log 3 - 1 + \frac{\pi}{2} \right)$
55. $\int_{1/\pi}^{2/\pi} \frac{\sin\left(\frac{1}{x}\right)}{x^2} dx = ?$
- $\frac{1}{2}$
 - $\frac{2}{3}$
 - 1
 - $\frac{2}{\pi}$
56. $\int_0^{\pi/4} \frac{e^{\tan x}}{\cos^2 x} dx = ?$
- $\frac{1}{e}$
 - $e - 1$
 - $\frac{1}{e+1}$
 - $\frac{1}{e-1}$
57. $\int_3^5 \frac{x^2}{x^2 - 4} dx$ is equal to
- $2 + 4 \log 3 - 4 \log 5 + 4 \log 2$
 - $4 - 2 \log 3 - 2 \log 5 + 3 \log 2$
 - $2 - \sin^{-1} \frac{5}{7}$
 - $2 + \log 15 - \log 7$
58. $\int_0^{\pi/2} x^2 \cos x dx$ is equal to
- $\frac{\pi}{2}$
 - $\frac{\pi^2}{4}$
 - $\frac{\pi^2}{4} - 2$
 - $2 - \frac{\pi^2}{4}$
59. If $\sin^{-1} x + \sin^{-1} y = \frac{2\pi}{3}$, then $\cos^{-1} x + \cos^{-1} y = ?$
- $\frac{\pi}{2}$
 - π
 - $\frac{\pi}{3}$
 - $\frac{\pi}{6}$
60. The value of $\sin 7\frac{1}{2}^\circ \cdot \cos 37\frac{1}{2}^\circ$ is equal to
- $\frac{\sqrt{3}-1}{4}$
 - $\frac{\sqrt{2}-1}{4}$
 - $\frac{\sqrt{2}+1}{4}$
 - $\frac{1-\sqrt{2}}{4}$
61. In an office there are 15 officers whose mean income is Rs. 1300 and there are 25 clerks in the office. If the mean income of the employees is Rs. 850, the mean income of the clerks is
- 580 Rs.
 - 570 Rs.
 - 560 Rs.
 - 550 Rs.
62. Arithmetic mean of unclassified data is
- $A = \frac{\sum_{i=1}^n x_i}{n}$
 - $A = \frac{\sum_{i=2}^n x_i}{n}$
 - $A = \frac{\sum_{i=3}^n x_i}{n}$
 - None of these
63. The mode from the following data is
- | Variable | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 50-60 | 60-70 |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|
| Frequency | 8 | 15 | 6 | 20 | 10 | 10 | 7 | 3 |
- 25.83
 - 35.83
 - 45.83
 - 55.83
64. The root mean square deviation is the least when measured from the
- arithmetic mean
 - geometrical mean
 - H.M.
 - None of these
65. In a family there are 8 men, 7 women and 5 children whose mean ages are 24, 20 and 6 years respectively. The mean age of the family is
- 17.1
 - 18.1
 - 18.2
 - 18.3
66. If $x = 1 + a + a^2 + \dots + \infty$ and $y = 1 + b + b^2 + \dots + \infty$ then $1 + ab + a^2b^2 + \dots + \infty$ is
- $\frac{xy}{x+y+1}$
 - $\frac{xy}{x-y+1}$
 - $\frac{xy}{x+y-1}$
 - $\frac{xy}{x-y-1}$
67. How many terms of the series $1 + 3 + 3^2 + 3^3 + \dots$ must be taken to make 3280?
- 8
 - 7
 - 6
 - 5
68. Find the sum of n terms of the series $(a+b) + (a^2 + 2b) + (a^3 + 3b) + \dots$
- $\frac{a(1+a^n)}{1-a} + b \frac{n(n+1)}{2}$
 - $\frac{a(1-a^n)}{1-a} + b \frac{n(n+1)}{2}$
 - $\frac{a(1+a^n)}{1+a} + b \frac{n(n+1)}{2}$
 - $\frac{a(1-a^n)}{1-a} - b \frac{n(n+1)}{2}$
69. When $b^2 - 4ac = 0$, roots will be
- real and equal
 - real and irrational
 - real and rational
 - None of these

70. If the total number of combinations of some given things taken any number of them at a time is 63, the number of things present is
 a. 4 b. 5 c. 6 d. 7
71. ${}^{10}c_3 + {}^{10}c_4$ is equal to
 a. ${}^{10}c_5$ b. ${}^{10}c_4$ c. ${}^{11}c_4$ d. ${}^{10}c_5$
72. The minimum distance from the origin of the co-ordinates to the point z which satisfies the equation $\left|z + \frac{1}{z}\right| = 2$ is
 a. $\sqrt{2} + 1$ b. $\sqrt{2} + 3$ c. $\sqrt{2} - 1$ d. 0
73. The $\arg\left(\frac{3i}{-1-i}\right)$ is
 a. $\frac{-3\pi}{4}$ b. $\frac{-5\pi}{4}$ c. $\frac{-7\pi}{4}$ d. $\frac{-9\pi}{4}$
74. $\begin{vmatrix} {}^x c_1 & {}^x c_2 & {}^x c_3 \\ {}^y c_1 & {}^y c_2 & {}^y c_3 \\ {}^z c_1 & {}^z c_2 & {}^z c_3 \end{vmatrix}$ is
 a. $\frac{xyz}{12}(x-y)(y-z)(z-x)$
 b. $\frac{xyz}{12}(x+y)(y+z)(z-x)$
 c. $(x-y)(y-z)(z-x)$
 d. $xyz(x-y)(y-z)(z-x)$
75. The value of the determinant equal to

$$\begin{vmatrix} 1 & 1 & 1 \\ {}^m c_1 & {}^{m+1} c_1 & {}^{m+2} c_1 \\ {}^m c_2 & {}^{m+1} c_2 & {}^{m+2} c_2 \end{vmatrix}$$

 a. $m(m+1)$ b. $m(m-1)$ c. 1 d. 0
76. If $(1+x+x^2)^n = a_0 + a_1x + a_2x^2 + \dots + a_{2n}x^{2n}$ then $a_0 + a_1 + a_2 + \dots + a_{2n}$ is
 a. 2^n b. 3^n c. 5^n d. 7^n
77. In how many ways can the letters of the word "civilization" be arranged?
 a. 19958392 b. 19958391 c. 19958390 d. 19958389
78. In how many ways 4 boys and 3 girls can be seated in a row so that they are alternate
 a. 142 b. 143 c. 144 d. 151
79. The real values of x the expression $x^2 - 2x - 3 > 0$ is
 a. $x < -1$ or $x > 3$ b. $x > -1$ or $x > 3$
 c. $x > -1$ or $x < 3$ d. None of these
80. If A be the A.M. and H the H.M. between two quantities a and b , then $\frac{a-A}{a-H} \cdot \frac{b-A}{b-H} = \frac{A}{H}$ is
 a. true b. false
 c. undefined d. None of these
81. If a, b, c, d are in H.P. then $ab + bc + cd$ is
 a. $2ad$ b. $3ad$ c. $4ad$ d. $5ad$
82. If $p^{\text{th}}, q^{\text{th}}$ and r^{th} terms of an H.P be respectively a, b and c then $(q-r)bc + (r-p)ca + (p-q)ab$ is
 a. 0 b. pqr
 c. $2abc$ d. None of these
83. $18^{\frac{8-4x}{2}} = (54\sqrt{2})^{\frac{3x-2}{2}}$ then $x = ?$
 a. $\frac{21}{17}$ b. $\frac{22}{17}$ c. $\frac{23}{17}$ d. 1
84. The linear factors of $2x^2 - y^2 - x + xy + 2y - 1$ is
 a. $(x + y - 1)$ and $(2x - y + 1)$
 b. $(x - y + 1)$ and $(2x - y + 1)$
 c. $(x + y - 1)$ and $(2x + y + 1)$
 d. $(x - y + 1)$ and $(2x + y + 1)$
85. $\frac{x^2 - 2x + 9}{x^2 + 2x + 9}$ lies between
 a. $-\frac{1}{2}$ and $\frac{1}{2}$ b. $\frac{1}{2}$ and 2
 c. $\frac{1}{2}$ and -2 d. $-\frac{1}{2}$ and 2
86. 5 men, 6 boys and 7 women can be seated in a row so that men, women and boys may not be separated in
 a. 567 ways b. 3567 ways
 c. $\frac{18}{5|6|7}$ d. None of these
87. If the complex numbers z_1, z_2, z_3 represent the vertices of an equilateral triangle such that $|z_1| = |z_2| = |z_3|$ then $z_1 + z_2 + z_3 \neq 0$
 a. may be true b. may be false
 c. may not be true nor be false
 d. None of these
88. If w is a complex cube root of unity, then the value of $\frac{a + bw + cw^2}{c + aw + bw^2} + \frac{a + bw + cw^2}{b + cw + aw^2}$ is
 a. 1 b. 0 c. 2 d. -1
89. Which of the following is correct?
 a. $3 - 4i > 4 - 5i$ b. $6 + 2i > 5 + 6i$
 c. $8 - 3i < 2 - 2i$ d. None of these

90. Value of $c_1 - \frac{1}{2}c_2 + \frac{1}{3}c_3 - \dots = \frac{(-1)^{n-1}c_2}{n}$ is
- $1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n}$
 - $1 - \frac{1}{2} + \frac{1}{3} - \dots + \frac{1}{n}$
 - $\frac{1+2+3+\dots+n}{2}$
 - None of these

91. The value of $\Delta = \begin{vmatrix} 4 & 9 & 7 \\ 1 & 3 & 9 \\ 1 & 4 & 6 \end{vmatrix}$ is
- 76
 - 75
 - 77
 - 74

92. Evaluate $\begin{vmatrix} 1 & 2 & 4 \\ 1 & 3 & 9 \\ 1 & 4 & 6 \end{vmatrix}$
- 2
 - 3
 - 4
 - 5

93. Find the value of the determinant
- $$\begin{vmatrix} x & 0 & 0 & 0 \\ 0 & y & 0 & 0 \\ 0 & 0 & z & 0 \\ 0 & 0 & 0 & w \end{vmatrix}$$
- $xyzw$
 - xyz
 - 0
 - 1

94. Evaluate $\begin{vmatrix} b+c & a+b & a \\ c+a & b+c & b \\ a+b & c+a & c \end{vmatrix}$
- $a^3 + b^3 + c^3 + 3abc$
 - $a^3 + b^3 + c^3 - 3abc$
 - $a^3 + b^3 + c^3$
 - $3(a^3 + b^3 + c^3)$

95. $\begin{vmatrix} a-b+c & a+b-c & a-b-c \\ b-c+a & b+c-a & b-c-a \\ c-a+b & c+a-b & c-a-b \end{vmatrix}$ is
- $4(a^3 + b^3 + c^3 - 3abc)$
 - $2(a^3 + b^3 + c^3 - 3abc)$
 - $6(a^3 + b^3 + c^3 - 3abc)$
 - $5(a^3 + b^3 + c^3 - 3abc)$

96. Let a, b, c be positive and not all equal the determinants $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is
- negative
 - positive
 - non-negative non-positive
 - None of these

97. Evaluate $\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix}$
- 0
 - 1
 - abc
 - None of these

98. Evaluate $\begin{vmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{vmatrix}$

- $-2(a^3 + b^3 + c^3 - 3abc)$
- $2(a^3 + b^3 + c^3 - 3abc)$
- $-2(a^3 + b^3 + c^3 + 3abc)$
- None of these

99. $\begin{vmatrix} x+a & x+b & x+c \\ y+a & y+b & y+c \\ z+a & z+b & z+c \end{vmatrix}$

- 1
- 0
- $abc(x + y + z)$
- None of these

100. Find the rank of the matrix $A = \begin{vmatrix} 1 & 2 & 3 \\ 2 & 4 & 7 \\ 3 & 6 & 10 \end{vmatrix}$

- rank $A = 2$
- rank = 3
- rank = 4
- None of these

101. Two consecutive sides of a parallelogram are $4x + 5y = 0$ and $7x + 2y = 0$. If the equation to one diagonal is $11x + 7y = 9$ find the equation of the other diagonal,
- $y - x = 0$
 - $x - y = 0$
 - $y + x = 0$
 - None of these

102. If the lines $3x - 4y + 7 = 0$ and $ax + 6y + 1 = 0$ are perpendicular then a is equal
- 4
 - 5
 - 10
 - 8

103. The equation of the line passing through (1, 2) and perpendicular to the line $x + y + 4 = 0$ is
- $y - x + 1 = 0$
 - $y - x - 1 = 0$
 - $y - x + 2 = 0$
 - $y - x - 2 = 0$

104. The nearest point on the line $(3x - 4y) = 25$ from the origin is
- $(-4, 5)$
 - $(3, -4)$
 - $(3, 4)$
 - $(3, 5)$

105. The angle between the lines represented by $x^2 - y^2 = 0$
- 0
 - 45°
 - 90°
 - 180°

106. The centre of the circle $(x - a)(x - c) + (y - b)(y - d) = 0$ is
- (a, a)
 - (c, d)
 - $\left(\frac{a+c}{2}, \frac{b+d}{2}\right)$
 - None of these

- 107.** The centre of the circle passing through the points $(0, 0)$, $(a, 0)$ and $(0, b)$ is

- a. (a, b)
- b. $\left(\frac{a}{2}, \frac{b}{2}\right)$
- c. $\left(-\frac{a}{2}, \frac{-b}{2}\right)$
- d. $(-a, -b)$

- 108.** The shortest distance from the point $(2, -7)$ to the circle $x^2 + y^2 - 14x - 10y - 151 = 0$ is equal to
 a. 4 b. 3 c. 5 d. 6

- 109.** The straight line $y = mx + c$ cuts the circle $x^2 + y^2 = a^2$ in real points if
 a. $\sqrt{a^2(1+m^2)} < c$ b. $\sqrt{a^2(1-m^2)} > c$
 c. $\sqrt{a^2(1+m^2)} > c$ d. None of these

- 110.** The straight line $px + qy + r = 0$ is tangent to the circle $x^2 + y^2 = a^2$ if
 a. $p^2 + q^2 = r^2 + a^2$ b. $p^2 + q^2 = a^2r^2$
 c. $r^2 = a^2(p^2 + q^2)$ d. None of these

- 111.** The angle between two tangents from the origin to the circle $(x - 7)^2 + (y + 1)^2 = 25$ is
 a. $\frac{\pi}{3}$ b. $\frac{\pi}{6}$ c. $\frac{\pi}{2}$ d. 0

- 112.** Two distinct tangents can be drawn from the point $(8, 6)$ to the circle $x^2 + y^2 - 100 = 0$
 a. true b. false

- 113.** The distance of a point on the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ from the centre is 2. The eccentric angle of the point is
 a. $\frac{\pi}{4}$ b. $\frac{\pi}{2}$ c. $\frac{3\pi}{4}$ d. π

- 114.** Given from lines whose equations are $x + 2y - 3 = 0$, $2x + 3y - 4 = 0$, $3x + 4y - 7 = 0$ and $4x + 5y - 6 = 0$ then
 a. they all are concurrent
 b. they are sides of a quadrilateral

- c. None of these

- 115.** The equation $7x^2 - 12xy + 5y^2 = 0$ represents
 a. two parallel lines b. a circle
 c. two perpendicular lines d. two lines through the origin

- 116.** The equation $\sqrt{(x-2)^2 + y^2} + \sqrt{(x+2)^2 + y^2} = 4$ represents
 a. circle b. a pair of lines
 c. a parabola d. an ellipse

- 117.** The area of a parallelogram is 12 square units. Two of its vertices are the points $A(-1, 3)$ and $B(-2, 4)$. Find the other two vertices of the parallelogram if the point of intersection of its diagonals lies on the x-axis
 a. $(17, -13), (18, -4)$ b. $(17, -3), (18, -4)$
 c. $(17, 3), (18, -4)$ d. $(17, 3), (18, 4)$

- 118.** Find the equation of the normal to the circle $x^2 + y^2 - 2x - 4y + 3 = 0$ at the point $(2, 3)$
 a. $x - y + 1 = 0$ b. $x + y + 1 = 0$
 c. $x + y - 1 = 0$ d. $x - y = 0$

- 119.** The equation $x^2 + y^2 + 2(3 + p)x + 2(3 - p)y + 4 = 0$ represents a circle for all values of p ; passing through
 a. two fixed points b. one fixed points
 c. three fixed points d. None of these

- 120.** The length of the common chord of the two circles $x^2 + y^2 + 2hx + a^2 = 0$ and $x^2 + y^2 + 2ky - a^2 = 0$ is
 a. $2\sqrt{\frac{(h^2 + a^2)(k^2 + a^2)}{h^2 + k^2}}$ b. $2\sqrt{\frac{(h^2 - a^2)(k^2 + a^2)}{h^2 + k^2}}$
 c. $2\sqrt{\frac{(h^2 - a^2)(k^2 - a^2)}{h^2 + k^2}}$ d. None of these

1. Find the equation of sphere centered at (2, 3, 4) and having radius 5
 a. $x^2 + y^2 + z^2 - 4x - 6y - 8z + 4 = 0$
 b. $x^2 + y^2 + z^2 + 4x - 6y - 8z + 4 = 0$
 c. $x^2 + y^2 + z^2 + 4x + 6y - 8z + 4 = 0$
 d. None of these
2. Find the cartesian equation of the plane $\vec{r} \cdot (\hat{i} + \hat{j} - \hat{k}) = 2$
 a. $x + y + z = 2$ b. $x - y + z = 2$
 c. $x + y - z = 2$ d. None of these
3. Find the angle between the planes $r + 2y + 3z = 4$ and $2x + y - z = 5$
 a. $\cos^{-1} \frac{1}{\sqrt{74}}$ b. $\cos^{-1} \frac{1}{\sqrt{84}}$
 c. $\cos^{-1} \frac{1}{\sqrt{97}}$ d. None of these
4. Determine the angle between the following pair of line
 $r = \hat{i} + \hat{j} + 3\hat{k} + 2\lambda(2\hat{i} - \hat{j} + 6\hat{k})$ and
 $r = 3\hat{i} - \hat{j} + 2\hat{k} + \mu(\hat{i} + 5\hat{k})$
 a. $\theta = \cos^{-1} \frac{32}{\sqrt{41}\sqrt{26}}$ b. $\theta = \cos^{-1} \frac{29}{\sqrt{41}\sqrt{26}}$
 c. $\theta = \cos^{-1} \frac{27}{\sqrt{41}\sqrt{26}}$ d. None of these
5. The octal system has a base of
 a. 8 b. 7 c. 6 d. 5
6. Each octal digit is replaced with the appropriate ‘triple’ of
 a. binary digits b. arithmetical digits
 c. algebraic digits d. None of these
7. The binary equivalent of the octal number 65 is
 a. 101111 b. 110101 c. 100101 d. 011100
8. The binary equivalent of the octal number 43 is
 a. 100011 b. 110101 c. 100101 d. 011100
9. The conversion from hexadecimal to binary consists of writing off the binary equivalent of each hexadecimal digit in groups of
 a. three b. two c. four d. six
10. If $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ is the G.M. between a and b , then the value of n is
 a. 1 b. $\frac{1}{2}$
 c. $-\frac{1}{2}$ d. None of these
11. $3 + 7 + 13 + 21 + 31 + \dots + n$ terms =
 a. $\frac{n(n^2 + 3n + 5)}{5}$ b. $\frac{n(n^2 + 3n + 5)}{4}$
 c. $\frac{n(n^2 + 3n + 5)}{3}$ d. None of these
12. $\frac{1}{x^2}, \frac{1}{x^4}, \frac{1}{x^8}, \frac{1}{x^{16}}, \dots$ to ∞ is equal to
 a. zero b. Infinite c. one d. x
13. The cotangents of $\frac{\pi}{3}, \frac{\pi}{4}, \frac{\pi}{6}$ are in
 a. A.P. b. G.P.
 c. H.P. d. None of these
14. The 1st terms of a G.P. is 1 its common ratio is 3 and n th term is 243 then n is equal to
 a. 6 b. 4 c. 5 d. 8
15. The 7th term of a G.P. whose first term is 3 and common ratio 2 is
 a. 128 b. 192 c. 48 d. 36
16. The first term of a G.P. whose second term is 2 and sum of infinite term is 8 is
 a. 8 b. 3 c. 4 d. 1
17. If $3x^2 - 2x + c = 0$ and $6x^2 + 17x + 12 = 0$ have a common root. The value of c is
 a. -7 b. -8 c. -9 d. -10
18. The equation that one root of the equation $ax^2 + bx + c = 0$ may be the square of other is
 a. $a^2c + ac^2 + b^2 = 3abc$ b. $a^2b + a^2c + d^2 = 0$
 c. $a^2c - a^2c - b^2 = 3abc$ d. None of these
19. The larger of $99^{50}, 100^{50}, 101^{50}$ is
 a. 101^{50} b. 100^{50}
 c. 99^{50} d. None of these
20. Between two numbers whose sum is $\frac{23}{6}$ an even number of A.M’s are inserted. If the sum of means exceeds their number by unity find the number of means.
 a. $n = 6$ b. $n = 5$ c. $n = 4$ d. $n = 3$
21. Find the sum of the series.
 $1 \cdot n + 2(n-1) + 3(n-2) + \dots + n \cdot 1$
 a. $\frac{n(n+1)(n+2)}{6}$ b. $\frac{n(n+1)}{2}$
 c. $\frac{n(n+1)(n+1)}{3}$ d. None of these

22. $1 + 3 + 5 + \dots$ up to n terms is
 a. $\frac{n}{2}[2 \cdot 1 + (n-1)2]$
 b. n
 c. n^5
 d. None of these
23. $1^3 + 2^3 + 3^3 + \dots + n^3$ is?
 a. $\frac{n(n+1)}{2}$
 b. $\left\{ \frac{n(n+1)}{2} \right\}^2$
 c. $\frac{n(n+1)(n+2)}{6}$
 d. None of these
24. Find the sum of n terms of the series $1 + (1 + 2) + (1 + 2 + 3) + \dots$ is?
 a. $\frac{n(n+1)(n+2)}{6}$
 b. $\frac{n(n+1)}{2}$
 c. $\left\{ \frac{n(n+1)}{2} \right\}^2$
 d. None of these
25. $1 + (2 + 3) + (4 + 5 + 6) + \dots$
 a. $\frac{n(n+1)(n^2 + n + 2)}{8}$
 b. $\frac{n(n+1)(n+2)}{6}$
 c. $\frac{n(n+1)}{2}$
 d. None of these
26. How many terms are there in the G.P. 5, 20, 80, ..., 5120 ?
 a. $n = 6$
 b. $n = 5$
 c. $n = 4$
 d. $n = 3$
27. 0.54 as a rational number is
 a. $\frac{5}{11}$
 b. $\frac{6}{11}$
 c. $\frac{7}{11}$
 d. $\frac{8}{11}$
28. Find the conjugate of $3 - 5i$
 a. $3 + 5i$
 b. $13 - 15i$
 c. $5 - 7i$
 d. $5 + 7i$
29. Find the modulus of $3 - 4i$
 a. 5
 b. 4
 c. 6
 d. 3
30. Find the determine of $\begin{vmatrix} 7 & 4 \\ 4 & 8 \end{vmatrix}$ is
 a. 30
 b. 40
 c. 50
 d. 60
31. Find $A + B$ if $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}$
 a. $\begin{bmatrix} 4 & 4 \\ 6 & 6 \end{bmatrix}$
 b. $\begin{bmatrix} 6 & 5 \\ 7 & 3 \end{bmatrix}$
 c. $\begin{bmatrix} 4 & 3 \\ 5 & 2 \end{bmatrix}$
 d. $\begin{bmatrix} 5 & 5 \\ 4 & 4 \end{bmatrix}$
32. Find the value of $\begin{vmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{vmatrix}$ is
 a. 2
 b. 3
 c. 4
 d. 5
33. A square matrix A is said to be non-singular as
 a. $|A| \neq 0$
 b. $|A| = 0$
 c. $|A| = 1$
 d. None of these
34. A square matrix A is said to be singular as
 a. $|A| \neq 0$
 b. $|A| = 0$
 c. $|A| = 1$
 d. None of these
35. Since $|A^\Theta| = |\bar{A}| \neq 0$, therefore the matrix A^Θ is also
 a. singular
 b. non-singular
 c. singular and non-singular
 d. singular or non-singular
36. If A be an $m \times n$ non-singular matrix then $(A^{-1})^0$
 a. $(A^0)^{-1}$
 b. A^0
 c. A^{-1}
 d. None of these
37. Since $|A'| = |A| \neq 0$, therefore the matrix A' is also
 a. singular
 b. non-singular
 c. singular or non-singular
 d. singular & non-singular
38. The transpose of the matrix where
 $B = \begin{bmatrix} 7 & 8 & 6 \\ -11 & -14 & -13 \\ -5 & 05 & -5 \end{bmatrix}$ then $\text{adj. } A = \dots$
 a. $\begin{bmatrix} 7 & -11 & -5 \\ 8 & -14 & -5 \\ 6 & -13 & -5 \end{bmatrix}$
 b. $\begin{bmatrix} 7 & -14 & -5 \\ -11 & -14 & -13 \\ -5 & -5 & -5 \end{bmatrix}$
 c. $\begin{bmatrix} 6 & -14 & -5 \\ 7 & -14 & -5 \\ -5 & -5 & -5 \end{bmatrix}$
 d. None of these
39. Find the rank of the matrix $A = \begin{bmatrix} 4 & 2 & 1 & 3 \\ 6 & 3 & 4 & 7 \\ 2 & 1 & 0 & 1 \end{bmatrix}$
 a. rank $A = 1$
 b. rank $A = 2$
 c. rank $A = 3$
 d. rank $A = 4$
40. In a correlation study the following values are obtained

X	50
Mean	50
Standard deviation	3.5

 The co-efficient of correlation is 0.5. Find the lines of regression.
 a. $x = 0.38y + 31, y = 0.64x + 18$
 b. $x = 0.21y + 21$
 c. $x = 0.37y + 37, y = 0.64x + 17$
 d. None of these
41. Find the regression co-efficient of x on y from the following data $\Sigma x = 20, \Sigma y = 40, \Sigma xy = 300, \Sigma x^2 = 150, \Sigma y^2 = 345; n = 5$. Find the value of x and $y - 5$
 a. -7.2
 b. 7.1
 c. 7.0
 d. -8.2
42. If θ is the acute angle between two regression lines the find out the value of θ .
 a. $\frac{1+b_{xy} b_{yx}}{b_{xy} + b_{yx}}$
 b. $\frac{1-b_{xy} b_{yx}}{b_{xy} + b_{yx}}$
 c. $\frac{1-b_{xy} \cdot b_{yx}}{b_{xy} - b_{yx}}$
 d. None of these

43. The centre of the circle passing through the points $(0, 0)$ $(a, 0)$ and $(0, b)$ is
- $\left(\frac{a}{2}, \frac{b}{2}\right)$
 - (a, b)
 - $\left(\frac{a}{3}, \frac{b}{3}\right)$
 - None of these
44. Find the projection of the line segment joining the points $A(-1, 0, 3)$ and $B(2, 5, 1)$ on the line whose direction radius are $6, 2$ and 3 .
- $\frac{20}{7}$
 - $\frac{18}{7}$
 - $\frac{22}{7}$
 - None of these
45. Find the co-ordinates of the centroid of triangle with vertices $A(x_1, y_1, z_1)$, $B(x_2, y_2, z_2)$, $C(x_3, y_3, z_3)$, are
- $\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}, \frac{z_1 + z_2 + z_3}{3}\right)$
 - $\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 - y_2 + y_3}{3}, \frac{z_1 + z_2 - z_3}{3}\right)$
 - $\left(\frac{x_1 - x_2 - x_3}{3}, \frac{y_1 + y_2 + y_3}{3}, \frac{z_1 + z_2 + z_3}{3}\right)$
 - None of these
46. Find the ratio in which the line joining the points $A(1, 4, 6)$ and $B(-4, -3, 5)$ is divided by the yz plane.
- $1 : 3$
 - $1 : 2$
 - $1 : 4$
 - $1 : 6$
47. Find the equation of the planes passing through the points $(2, 3, 4)$, $(5, 6, 7)$ and $(1, 0, 0)$
- $x - 3y + 2z = 1$
 - $x + 3y + 2z = 1$
 - $x + 3y - 2z = 1$
 - None of these
48. Find the equation of the plane passing through the points $P(1, 2, 4)$ and $Q(4, 0, 6)$ ad perpendicular to the plane $x + 2y + z = 5$.
- $6x + y - 8z = 0$
 - $6x + y + 8z = 0$
 - $6x + y = 0$
 - None of these
49. The distance of point $(1, 2, 4)$ from the plane $3x + 4y + 12z = 20$ is
- 8 units
 - 5 units
 - 3 units
 - 1 unit
50. The equation of sphere is $x^2 + y^2 + z^2 - 2x - 4y - 6z - 2 = 0$ and one end of the diameter is $(2, 3, 3 + \sqrt{4})$. Locate the co-ordinates of the other end.
- $(0, 1, 2 - \sqrt{4})$
 - $(0, 1, 3 - \sqrt{4})$
 - $0, 1, 3 - \sqrt{4}$
 - None of these
51. Find the equation of line through $(2, 3)$ and parallel the line $y = 3x + 5$
- $3x - y - 5 = 0$
 - $3x - y - 4 = 0$
 - $3x - y - 3 = 0$
 - None of these
52. Find the equation of the straight line through $(1, 2)$ and perpendicular to the line $4x - 3y = 10$
- $3x + 4y - 8 = 0$
 - $3x + 4y - 11 = 0$
 - $3x + 4y - 17 = 0$
 - None of these
53. Find the equation of the straight line which has y -intercept equal to $2/3$ and its perpendicular to the line $3x + 4y + 11 = 0$
- $4x + 3y - 2 = 0$
 - $4x + 3y - 5 = 0$
 - $4x + 3y - 3 = 0$
 - None of these
54. Find the equation for the straight line which passes through the point of intersection of lines, $3x - 4y - 7 = 0$ and $12x - 5y - 13 = 0$ and is perpendicular to the line $2x - 3y + 5 = 0$
- $33x + 22y + 13 = 0$
 - $33x + 22y + 44 = 0$
 - $22x + 11y + 13 = 0$
 - None of these
55. Find the position of the points $(1, 1)$ and $(2, -1)$ with respect to the line $3x + 4y - 6 = 0$
- points A and B lie on the opposite sides of line $3x + 4y - 6 = 0$
 - points A and B doesn't lie on the opposite sides of line $3x + 4y - 6 = 0$
 - both 'a' and 'b' are correct
 - None of these
56. If the line $ax + by + c = 0$ cut the line segment joining points $P(x_1, y_1)$ and $Q(x_2, y_2)$ internally in the ratio $m : n$ at R, then $m/n = \dots\dots\dots$
- $\frac{ax_1 - by_1 - c}{ax_2 - by_2 - c} \frac{ax_1 + by_1 - c}{ax_2 + by_2 + c}$
 - $\frac{ax_1 + by_1 - c}{ax_2 + by_2 + c}$
 - $\frac{ax_1 - by_1 - c}{ax_2 - by_2 - c}$
 - None of these
57. A straight road passes through two towns, one 5 km east and other $2\frac{1}{2}$ km , north from a tower, where should a rest house be constructed by the side of the road, so that it may be nearest to be tower.
- $c \equiv (1, 3)$
 - $c \equiv (1, 2)$
 - $c \equiv (1, 4)$
 - None of these
58. For the straight lines $4x + 3y - 6 = 0$ and $5x + 12y + 9 = 0$, find the equation of the bisector of the acute angle between them. When $9x - 7y - 41 = 0$ is the bisector of obtuse angle between the given lines above is given
- $7x + 9y - 3 = 0$
 - $7x - 9y - 3 = 0$
 - $7x + 9y + 3 = 0$
 - None of these
59. Find the standard deviation of the following frequency distribution
- | variable | 5 | 10 | 15 | 20 | 25 |
|-----------|---|----|----|----|----|
| frequency | 5 | 6 | 12 | 16 | 11 |
- 6.11
 - 6.17
 - 6.28
 - 6.39

60. The mean of 100 terms is 70 and their standard deviation is 5. Find the sum of all the terms.
- 7000
 - 8000
 - 9000
 - None of these
61. The unit vector of perpendicular to the vectors $\hat{i} - \hat{j} + \hat{k}$ and $2\hat{i} + 3\hat{j} - \hat{k}$
- $\frac{-2\hat{i} + 5\hat{j} + 6\hat{k}}{\sqrt{38}}$
 - $\frac{-2\hat{i} + 3\hat{j} + 5\hat{k}}{\sqrt{38}}$
 - $\frac{-\hat{i} + \hat{j} + \hat{k}}{\sqrt{38}}$
 - None of these
62. If \vec{a} and \vec{b} are unit vectors and θ is the angle between them, then $|\vec{a} - \vec{b}| = ?$
- $\sin \frac{\theta}{2}$
 - $2 \cos \frac{\theta}{2}$
 - $2 \sin \frac{\theta}{2}$
 - None of these
63. If $m\hat{i} + 6\hat{j} - \hat{k}$ and $7\hat{i} - 3\hat{j} + 17\hat{k}$ are perpendicular vectors, then the value of 'm' is equal to
- 7
 - 5
 - $\frac{2}{3}$
 - 4
64. If $\hat{a}, \hat{b}, \hat{c}$ are unit vectors, such that $\hat{a} + \hat{b} + \hat{c} = 0$ then value of $\hat{a} \cdot \hat{b} + \hat{b} \cdot \hat{c} + \hat{c} \cdot \hat{a}$ is equal to
- $-\frac{2}{3}$
 - $\frac{2}{3}$
 - $\frac{3}{2}$
 - $-\frac{3}{2}$
65. If A, B, C are the vertices of a triangle whose position vectors are $\vec{a}, \vec{b}, \vec{c}$ and G is the centroid of the ΔABC , then $G = \frac{\vec{A} + \vec{B} + \vec{C}}{3}$ =
- $\frac{\vec{a} + \vec{b} + \vec{c}}{3}$
 - 0
 - $\frac{\vec{a} - \vec{b} - \vec{c}}{3}$
 - $\vec{A} + \vec{B} + \vec{C}$
66. If $|\vec{a}| = |\vec{b}| = 1, \vec{a} + \vec{b} + \vec{c} = 0$ and $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a} = -\left(\frac{3}{2}\right)$, then $|\vec{c}| = ?$
- $\frac{1}{2}$
 - $\frac{1}{3}$
 - 2
 - 1
67. The points having position vectors $(2\hat{i} + 3\hat{j} + 4\hat{k}), (3\hat{i} + 4\hat{j} + 2\hat{k}), (4\hat{i} + 2\hat{j} + 3\hat{k})$ are
- vertices of a right triangle
 - collinear
 - vertices of an equilateral triangle
 - None of these
68. If $\vec{a} = \hat{i} + m\hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ are parallel vectors, then the value of 'm' is
- $\frac{3}{2}$
 - $\frac{2}{3}$
 - $\frac{1}{3}$
 - None of these
69. The unit vector perpendicular to both the vectors $\vec{a} = 3\hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + 2\hat{k}$ is
- $\frac{\hat{i} - \hat{j} - \hat{k}}{\sqrt{3}}$
 - $\frac{\hat{i} + \hat{j} - \hat{k}}{\sqrt{6}}$
 - $\frac{2(\hat{i} + \hat{j} - \hat{k})}{\sqrt{3}}$
 - None of these
70. If $f(x) = \frac{x-1}{x+1}$, then $f(2x)$ is
- $\frac{f(x+3)}{3f(x)+1}$
 - $\frac{3f(x)+1}{f(x)+3}$
 - $\frac{f(x)+1}{f(x)+3}$
 - None of these
71. If $f: R \rightarrow R$ is a function defined by, then $f(x) = 10x - 7$. If $g = f^{-1}$, then $g(x) = ?$
- $\frac{x-7}{10}$
 - $\frac{x+7}{10}$
 - $\frac{1}{10x+7}$
 - $\frac{1}{10x-7}$
72. The maximum number of $\frac{\log_e x}{x}$ in $0 < x < \infty$ is
- $\frac{1}{e}$
 - e
 - $\frac{e}{2}$
 - $\log_x e$
73. $\lim_{x \rightarrow 0} \frac{1 + \cos 3x}{1 - \cos 4x}$
- $\frac{3}{16}$
 - $\frac{9}{16}$
 - $\frac{3}{8}$
 - $\frac{1}{16}$
74. $\lim_{x \rightarrow \pi} \frac{1 + \cos x}{\tan^2 x}$
- $-\frac{1}{4}$
 - $\frac{1}{2}$
 - $-\frac{1}{2}$
 - 1
75. $\lim_{x \rightarrow 0} \frac{\log(1+x)}{3^x - 1}$
- $\log 3$
 - $(\log 3)^2$
 - $\frac{1}{(\log 3)^2}$
 - $\frac{1}{(\log 3)}$
76. $\lim_{x \rightarrow 0} \frac{a^{\sin x} - 1}{b^{\sin x} - 1}$
- $\frac{\log b}{\log a}$
 - $\frac{\log a}{\log b}$
 - $\frac{a}{b}$
 - None of these
77. If $y = x^x$, then $\frac{dy}{dx} = ?$
- $x^x(1 + \log x)$
 - $x(1 + \log x)$
 - $(1 + \log x)$
 - None of these
78. If $y = \log \frac{\sqrt{1+x^2} - x}{\sqrt{1+x^2} + x}$, then $\frac{dy}{dx} = ?$
- $\frac{1}{\sqrt{1+x^2}}$
 - $\frac{2}{\sqrt{1-x^2}}$
 - $\frac{2}{\sqrt{1+x^2}}$
 - None of these

79. If $x = \frac{a \cos t}{t}$, $y = \frac{a \sin t}{t}$ then $\frac{dy}{dx} = ?$
- $\frac{t \cos t - \sin t}{\cos t - t \sin t}$
 - $\frac{\cos t - \sin t}{\sin t - \cos t}$
 - $\frac{t \cos t + \sin t}{\cos t - t \sin t}$
 - None of these
80. If $y = \sin^{\sin x \sin x} \dots$ then $\frac{dy}{dx} = ?$
- $\frac{\cot x}{1 - y \log \sin x}$
 - $\frac{y^2 \cot x}{1 - y \log \sin x}$
 - $\frac{y \cot x}{1 - y \log \sin x}$
 - None of these
81. The derivative of $\sin^{-1} \left(\frac{2x}{1+x^2} \right)$ with respect of $\cos^{-1} \left(\frac{1-x^2}{1+x^2} \right)$ is
- 1
 - 1
 - 2
 - 3
82. The solution of $\frac{dy}{dx} = 2^{y-x}$ is
- $2^x - 2^y = c$
 - $\frac{1}{2^x} + \frac{1}{2^y} = c$
 - $2^x + 2^y = c$
 - $\frac{1}{2^x} - \frac{1}{2^y} = c$
83. The general solution of differential equation $\frac{dy}{dx} = (4x+y+1)^2$ is
- $1 + 2x + 4y = \tan^{-1}(x+c)$
 - $4x + y + 1 = \tan^{-1}(x+c)$
 - $4x + y + 1 = 2\tan(2x+2c)$
 - None of these
84. The general solution of differential equation $\frac{dy}{dx} - \frac{2xy}{1+x^2} = 0$ is
- $y = \frac{c}{1+x^2}$
 - $y = \frac{c}{\sqrt{1+x^2}}$
 - $y = c(1+x^2)^{3/2}$
 - $y = c(1+x^2)$
85. The volume of a cube increases at a rate of $0.003 \text{ m}^2/\text{min}$ at the instant when the edge is 20 cm long. What is the rate at which the length of the edge changes.
- 0.015 m/min
 - 0.025 m/m
 - 0.035 m/min
 - None of these
86. What are the two positive numbers whose sum is 16 and the sum of whose cubes is minimum?
- 9, 7
 - 12, 4
 - 8, 8
 - 3, 13
87. $\int \frac{\sin x}{(1-\cos x)(2-\cos x)} dx = ?$
- $\log|1-\cos x| - \log|2-\cos x| + c$
 - $\log|1-\cos 2x| - \log|1-\cos x| + c$
88. Integrate $\int (\log x)^2 dx$
- $x(\log x)^2 - 2x + c$
 - $(x \log x)^2 - 2x(1+\log x) + c$
 - $x(\log x)^2 - 2x \log x + 2x + c$
 - $x \log x - 2x \log x + c$
89. Integrate $\int (xe)^2 dx$
- $e^x(1-x) + c$
 - $\frac{1}{e^x(1-x)} + c$
 - $e^x(x-1) + c$
 - $\frac{e^x}{e^x + c}$
90. Evaluate $\int e^x \left(\frac{1}{x} - \frac{1}{x^2} \right) dx$
- $e^x + c$
 - $\frac{1}{e^x} + c$
 - $e^{-x} + c$
 - $\frac{e^x}{x} + c$
91. $\int \frac{\cos x}{1+\cos x + \sin x} dx = ?$
- $\frac{x}{2} - \log \sec \frac{x}{2} + c$
 - $\frac{x}{2} + \log \sec \frac{x}{2} + c$
 - $\frac{1}{x} - \log \sec \frac{x}{2} + c$
 - None of these
92. $\int \frac{\sin x}{3+4\cos^2 x} dx = ?$
- $-\frac{1}{2\sqrt{3}} \tan^{-1} \left(\frac{\cos x}{\sqrt{3}} \right) + c$
 - $-\frac{1}{2\sqrt{3}} \tan^{-1} \left(\frac{2\cos x}{\sqrt{3}} \right) + c$
 - $\log(3+4\cos^2 x) + c$
 - None of these
93. $\int_0^\infty \frac{x^2}{(x^2+1)(x^2+2)(x^2+3)} dx = ?$
- $\frac{\pi}{2}(\sqrt{2}-1)$
 - $\frac{\pi}{2}$
 - $(2\sqrt{2}-\sqrt{3}-1)\frac{\pi}{4}$
 - $(1-2\sqrt{3}-\sqrt{3})\frac{\pi}{2}$
94. $\int_0^{\pi/2} \frac{1}{5+4\sin x} dx = ?$
- $\frac{2}{3} \tan^{-1} \left(\frac{1}{5} \right)$
 - $\frac{2}{3} \tan^{-1} \left(\frac{1}{3} \right)$
 - $2 \tan^{-1} \left(\frac{1}{2} \right)$
 - None of these

95. $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx = ?$
- a. $\frac{\pi}{2}$ b. $\frac{\pi}{3}$ c. $\frac{\pi}{4}$ d. π
96. $\int_0^{2\pi} |\cos x| dx$ is equal to
- a. 2 b. 4 c. 5 d. None of these
97. $\int_0^1 \cot^{-1}(1-x-x^2) dx = ?$
- a. $\frac{\pi}{2} - \log 2$ b. $\log 2$ c. $\pi - \log 1$ d. None of these
98. $\int_0^{\pi/4} \log(1+\tan x) dx$
- a. $\frac{\pi}{4} \log 2$ b. $\frac{\pi}{2} \log 4$ c. $\frac{\pi}{8} \log 2$ d. zero
99. $\int_0^{\pi/2} \log(\tan x) dx = ?$
- a. 2 b. zero c. 4 d. $\frac{\pi}{2}$
100. $\int \frac{dx}{(x-5)^2}$ is equal to
- a. $-\frac{1}{x-5} + c$ b. $\frac{1}{x-5} + c$ c. $\frac{2}{(x-5)^2} + c$ d. None of these
101. General solution of $\tan 5\theta = \cot 2\theta$ is
- a. $\theta = \frac{n\pi}{7} + \frac{\pi}{5}$ b. $\theta = \frac{n\pi}{7} + \frac{\pi}{14}$ c. $\theta = \frac{n\pi}{7} - \frac{\pi}{3}$ d. None of these
102. If $\cos A = \cos B \cdot \cos C$ and $A + B + C = \pi$, then $\cot B \cdot \cot C$ will be equal to
- a. $\frac{5}{4}$ b. $\frac{1}{3}$ c. $\frac{1}{2}$ d. $\cos A \cdot \cos B$
103. If $2\sec 2\alpha = \tan \beta + \cot \beta$, then one value of $(\alpha + \beta)$ is
- a. $\frac{\pi}{2}$ b. $\frac{\pi}{4}$ c. 2π d. π
104. If R is the radius of circum circle of ΔABC and D is its area, then
- a. $R = \frac{a+b+c}{4\Delta}$ b. $R = \frac{abc}{\Delta}$
- c. $R = \frac{abc}{4\Delta}$ d. None of these
105. The value of $\left[\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) \right]$ is
- a. π b. $\frac{\pi}{2}$ c. $\frac{\pi}{4}$ d. $\frac{\pi}{3}$
106. What is the value of $\tan^2 \frac{A}{2}$, if $a = 13$, $b = 14$ and $c = 15$?
- a. $\frac{1}{2}$ b. $\frac{1}{4}$ c. $\frac{1}{8}$ d. $\frac{1}{16}$
107. In a ΔABC if $\cot A$, $\cot B$, $\cot C$ are in A.P., then a^2, b^2, c^2 are in
- a. A.P. b. G.P. c. H.P. d. None of these
108. $\frac{(\sin 2\alpha + \cos 2\alpha)^2 - 1}{\cot 2\alpha - \sin 2\alpha \cdot \cos 2\alpha} = ?$
- a. $\tan^2 \alpha$ b. $2\tan^2 2\alpha$ c. $2\cot^2 \alpha$ d. None of these
109. The period of $\cos(50\theta + 4)$ is
- a. $\frac{\pi}{2}$ b. π c. 2π d. $5\pi + 4$
110. In triangle ABC if $\angle A = 120^\circ$, $b = 2$ and $\angle C = 30^\circ$, then $a = ?$
- a. $\sqrt{3}$ b. $2\sqrt{3}$ c. $\frac{1}{\sqrt{3}}$ d. None of these
111. In ΔABC , $(ac \cos B - bc \cos A) = ?$
- a. $c^2 - b^2$ b. $a^2 - b^2$ c. $b^2 - a^2$ d. $a^2 - c^2$
112. Length of the shadow of a person is x when the angle of elevation of the sun is 45° . If the length of shadow increases by $(\sqrt{3}-1)x$, then the angle of elevation becomes
- a. 15° b. 45° c. 30° d. 60°
113. AB is a vertical pole. The end A is on the ground, C is the middle point of AB and P is a point on the level ground. The portion BC subtends an angle α at P . If $AP = n \cdot AB$, then $\tan \alpha$ is
- a. $\frac{n}{n^2 + 1}$ b. $\frac{n}{2n^2 + 1}$ c. $\frac{n^2 - 1}{n^2 + 1}$ d. $\frac{n}{n^2 - 1}$

114. If $\cos x + \cos y + \cos \alpha = 0$ and $\sin x + \sin y + \sin \alpha = 0$, then

$$\cot\left(\frac{x+y}{2}\right) = ?$$

a. $\cos \alpha$

b. $\cot \alpha$

c. $\sin \alpha$

d. $\sin\left(\frac{x+y}{2}\right)$

115. If $\cos \theta = -\frac{1}{2}$ and $0^\circ < \theta < 360^\circ$, then the values of θ are

a. 60° and 120°

b. 120° and 240°

c. 360° and 240°

d. None of these

116. A pair of dice is thrown a multiple of two or one dice and a multiple of three on the other.

a. $\frac{1}{6}$

b. $\frac{7}{36}$

c. $\frac{11}{36}$

d. $\frac{9}{29}$

117. Given two mutually exclusive events A and B such that

$P(A) = \frac{1}{2}$ and $P(B) = \frac{1}{3}$. Find $P(A \text{ or } B)$.

a. $\frac{2}{3}$

b. $\frac{5}{6}$

c. $\frac{3}{11}$

d. $\frac{11}{36}$

118. A pair of dice is thrown. Find the probability of getting a sum of 10 or more if 5 appears on the first dice.

a. $\frac{1}{2}$

b. $\frac{2}{3}$

c. $\frac{1}{3}$

d. None of these

119. Find the area enclosed between $y = x$ and $y = x^3$

a. 2

b. $\frac{1}{2}$

c. $\frac{1}{4}$

d. 4

120. Obtain the area bounded by $y^2 = 4ax$ and $x^2 = 4ay$

a. $\frac{5}{36}a^2$

b. $\frac{3}{16}a^2$

c. $\frac{18}{5}a^2$

d. $\frac{16}{3}a^2$