1. If $A \subseteq B$, then $B \cup A$ is equal to :
   (a) $B \cap A$ (b) A
   (c) B (d) none of these

2. The real value of α for which the expression $\frac{1 - i \sin \alpha}{1 + 2i \sin \alpha}$ is purely real, is :
   (a) $(2n + 1)\frac{\pi}{2}$ (b) $(n + 1)\frac{\pi}{2}$
   (c) $n\pi$ (d) none of these

3. The medians AD and BE of the triangle with vertices $A(0, b), B(0, 0)$ and $C(a, 0)$ are mutually perpendicular, if :
   (a) $b = a$ (b) $b = -2\sqrt{a}$
   (c) $a = \pm \sqrt{2}b$ (d) $b = \sqrt{2}a$

4. The equation of line parallel to the tangent to the circle $x^2 + y^2 = r^2$ at the point (x_1, y_1) and passing through origin , is :
   (a) $xy_1 + x_1y = 0$ (b) $x x_1 - y y_1 = 0$
   (c) $x x_1 + y y_1 = 0$ (d) $x y - x_1y = 0$

5. $\sin 200° + \cos 200°$ is :
   (a) positive (b) negative
   (c) zero (d) zero or positive

6. The principal value of $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ is :
   (a) $\frac{4\pi}{3}$ (b) $\frac{5\pi}{3}$
   (c) $-\frac{2\pi}{3}$ (d) $-\frac{\pi}{3}$

7. If $xy + yz + zx = 1$, then $\sum \frac{x + y}{1 - xy}$ is equal to :
   (a) $\frac{4}{xyz}$ (b) $\frac{1}{xyz}$
   (c) xyz (d) none of these

8. A vertical pole (more than 100 m high) consists of two portions, the lower being one-third of the whole. If the upper portion subtends an angle $\tan^{-1}\frac{1}{2}$ at a point in a horizontal plane through the foot of the pole and distance 40 ft from it, then the height of the pole is :
   (a) 100 ft (b) 120 ft
   (c) 150 ft (d) none of these

9. When the three coins are tossed simultaneously, then the probability of getting one head will be :
   (a) $\frac{3}{7}$ (b) $\frac{1}{7}$
   (c) $\frac{3}{8}$ (d) $\frac{7}{8}$

10. The cosine of the angle between any two diagonals of a cube is :
   (a) $\frac{1}{3}$ (b) $\frac{1}{2}$
   (c) $\frac{2}{3}$ (d) $\frac{1}{\sqrt{3}}$

11. If f is any function, then $\frac{1}{2}[f(x) + f(-x)]$ is always :

(a) odd
(b) even
(c) neither even nor odd
(d) one-one

12. If $f(x) = \log\left(\frac{1+x}{1-x}\right)$ and $g(x) = \frac{3x + x^3}{1 + 3x^2}$, then $f(g(x))$ is equal to :
(a) $f(3x)$ (b) $(f(x))^3$
(c) $3f(x)$ (d) $-f(x)$

13. $\lim_{x \to 0} [\cos x]$ is equal to :
(a) -1 (b) 1
(c) 0 (d) none of these

14. $\frac{d}{dx}(\sin^{-1} 2x\sqrt{1-x^2})$ is equal to :
(a) $-\frac{2}{\sqrt{1-x^2}}$ (b) $\frac{2}{\sqrt{1-x^2}}$
(c) $\cos 2x$ (d) none of these

15. $\int_0^{\pi/2} |\sin x - \cos x| \, dx$ is equal to :
(a) $2(\sqrt{2}+1)$ (b) $\sqrt{2}-1$
(c) $2(\sqrt{2}-1)$ (d) 0

16. If p and q are the roots of the equation $x^2 + pq = (p+1)x$, then q is equal to :
(a) -1 (b) 2
(c) 1 (d) -2

17. If a line lies in the octant $OXYZ$ and it makes equal angle with the axes, then :
(a) $l = m = n = \frac{1}{\sqrt{3}}$ (b) $l = m = n = \pm\frac{1}{\sqrt{3}}$
(c) $l = m = n = -\frac{1}{\sqrt{3}}$ (d) $l = m = n = \pm\frac{1}{\sqrt{2}}$

18. If a, b, c are in AP, a, mb, c are in GP, then a, m^2b, c are in :
(a) HP (b) GP
(c) AP (d) none of these

19. If $p \Rightarrow (q \vee r)$ is false, then the truth values of p, q, r are respectively :
(a) T, F, F (b) F, F, F
(c) F, T, T (d) T, T, F

20. In the expansion of $(3x + 2)^4$ the coefficient of middle term is :
(a) 36 (b) 216
(c) 54 (d) 81

21. For any 2×2 matrix A, if $A\,(\text{adj } A) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$, then $|A|$ i.e., det A is equal to :
(a) 20 (b) 100
(c) 10 (d) 0

22. The vectors $\vec{a} = 3\hat{i} - \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j}$ are adjacent sides of a parallelogram. Its area is :
(a) $\frac{1}{2}\sqrt{7}$ (b) $\sqrt{41}$
(c) $\frac{1}{2}\sqrt{41}$ (d) $\frac{1}{2}\sqrt{17}$

23. If a, b, c are elements of a boolean algebra, then $a \cdot b + c(a' + b')$ is equal to :
(a) $a \cdot b$ (b) c
(c) $a \cdot b + c$ (d) none of these

24. $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b}) = 0$ implies that :
(a) $\vec{a} = -\vec{b}$ (b) $\vec{a} \neq \vec{b}$
(c) $|\vec{a}| = |\vec{b}|$ (d) $\vec{a} = \vec{b}$

25. 3 persons have 4 coats, 5 waist coats and 6 hats. The number of ways in which they put on the clothes are :
(a) $4^3 \times 5^3 \times 6^3$ (b) $4 \times 5 \times 6$
(c) $4!5!6!$ (d) none of these

26. If an integer p is chosen at random in the interval $0 \le p \le 5$, the probability that the roots of the equation $x^2 + px + \frac{p}{4} + \frac{1}{2} = 0$ are real, is :
(a) $\frac{4}{5}$ (b) $\frac{2}{3}$
(c) $\frac{3}{5}$ (d) none of these

27. $\int_0^1 x(1-x)^4 dx$ is equal to :
(a) 1 (b) 0
(c) $\frac{1}{30}$ (d) $\frac{1}{5}$

28. The function $f(x) = 2 - 3x$ is :
(a) increasing
(b) decreasing
(c) neither decreasing nor increasing
(d) none of the above

29. The value of $\int_0^{\pi/2} \frac{\frac{\pi}{4} - x}{\sqrt{\sin x + \cos x}} dx$ is :
(a) $\frac{\pi\sqrt{3}}{4}$ (b) $\frac{\pi}{4\sqrt{2}}$
(c) 0 (d) none of these

30. If $y = \sqrt{x + \sqrt{x + \sqrt{x + \ldots\ldots \infty}}}$, then $\frac{dy}{dx}$ is equal to :

(a) $\frac{1}{2y+1}$ (b) $\frac{1}{2y-1}$

(c) $\frac{1}{xy}$ (d) 1

31. If $f : A \to B$ is a bijection, then :

(a) $n(A) = n(B)$ (b) $n(A) \leq n(B)$

(c) $n(A) \geq n(s)$ (d) none of these

32. The equation of a straight line passing through $(-3, 2)$ and cutting an intercept equal in magnitude but opposite in sign from axis, is given by :

(a) $x - y + 5 = 0$ (b) $x + y - 5 = 0$

(c) $x - y - 5 = 0$ (d) $x + y + 5 = 0$

33. If $\frac{2z_1}{3z_2}$ is a purely imaginary number, then $\left|\frac{z_1 - z_2}{z_1 + z_2}\right|$ is equal to :

(a) $\frac{3}{2}$ (b) 1

(c) $\frac{2}{3}$ (d) $\frac{4}{9}$

34. If pth, qth, rth, sth terms of an arithmetic progression are in geometric progression, then $p - q$, $q - r$ and $r - s$ are in :

(a) HP (b) GP

(c) AP (d) no particular order

35. Two bodies are projected from the same point with the same velocity but in different directions. If the range in each case be R and times of flight be t_1 and t_2, then R is equal to :

(a) $\frac{1}{2} g t_1 t_2$ (b) $g t_1 t_2$

(c) $\frac{1}{4} g t_1 t_2$ (d) $2g t_1 t_2$

36. The reciprocal of the eccentricity of rectangular hyperbola is :

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

(c) $\frac{1}{2}$ (d) 2

37. If $y = \frac{a^{\cos^{-1}x}}{1 + a^{\cos^{-1}x}}$, $z = a^{\cos^{-1}x}$, then $\frac{dy}{dx}$ is equal to :

(a) $\frac{1}{1 + a^{\cos^{-1}x}}$ (b) $\frac{1}{(1 + a^{\cos^{-1}x})^2}$

(c) $\frac{-1}{1 + a^{\cos^{-1}x}}$ (d) none of these

38. The value of $\sin 600° \cos 330° + \cos 120° \sin 150°$ is :

(a) 1 (b) -1

(c) $\frac{\sqrt{3}}{2}$ (d) $\frac{1}{\sqrt{2}}$

39. The area of circle whose centre is (h, k) and radius a is :

(a) $\pi a^2 hk$ sq unit

(b) πa^2 sq unit

(c) $\pi (h^2 + k^2 - a^2)$ sq unit

(d) none of the above

40. If $\begin{bmatrix} 3 & 1 \\ 4 & 1 \end{bmatrix} X = \begin{bmatrix} 5 & -1 \\ 2 & 3 \end{bmatrix}$, then X is equal to :

(a) $\begin{bmatrix} -3 & 4 \\ -4 & 13 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & 4 \\ 14 & 13 \end{bmatrix}$

(c) $\begin{bmatrix} -3 & 4 \\ 14 & -13 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & -4 \\ -14 & 13 \end{bmatrix}$

41. If $\vec{a}, \vec{b}, \vec{c}$ are coplanar vectors, then $[\vec{a} + \vec{b}\ \vec{b} + \vec{c}\ \vec{c} + \vec{a}]$ is equal to :

(a) $2|\vec{a}\ \vec{b}\ \vec{c}|$ (b) $|\vec{a}\ \vec{b}\ \vec{c}|$

(c) $3|\vec{a}\ \vec{b}\ \vec{c}|$ (d) 0

42. If the resultant of two unlike parallel forces of magnitudes 10 N and 16 N act along a line at a distance of 24 cm from the line of action of the smaller force is 8 N, then the distance between the lines of action of the force is :

(a) 12 cm (b) 8 cm

(c) 10.66 cm (d) 18 cm

43. The resultant of two forces $\vec{P}$ and $\vec{Q}$ is of magnitude P. If the force $\vec{P}$ is doubled, $\vec{Q}$ remaining unaltered, then the new resultant will be :

(a) along $\vec{P}$ (b) along $\vec{Q}$

(c) at 60° to $\vec{Q}$ (d) at right angle to $\vec{Q}$

44. If the ratio of the sum of m and n terms of an AP is $m^2 : n^2$, then the ratio of its mth and nth terms is :

(a) $m - 1 : n - 1$ (b) $2m + 1 : 2n + 1$

(c) $2m - 1 : 2n - 1$ (d) none of these

45. A body dropped from a height h at time $t = 0$ reaches the ground at time t_0. It would have reached a height $h/2$ at time :

(a) $\frac{t_0}{2}$ (b) $\frac{t_0}{\sqrt{2}}$

(c) t_0^2 (d) $\frac{1}{t_0^2}$

46. The area in the first quadrant between $x^2 + y^2 = \pi^2$ and $y = \sin x$ is :

(a) $\frac{\pi^3}{4}$ sq unit (b) $\frac{\pi^3 - 16}{4}$ sq unit

(c) $\frac{\pi^3 - 8}{2}$ sq unit (d) $\frac{\pi^3 - 8}{4}$ sq unit

47. In triangle ABC, if $3a = b + c$, then $\cot\frac{B}{2}\cot\frac{C}{2}$ is equal to :

(a) $\sqrt{3}$ (b) 1

(c) 2 (d) 3

48. If $f(x) = 2x + \cot^{-1} x + \log(\sqrt{1 + x^2} - x)$, then $f(x)$:

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

(b) decreases in $(0, \infty)$

(c) neither increases nor decreases in $(0, \infty)$

(d) sometimes increases and sometimes decreases

49. The series $(1 + 3)\log_e 3 + \frac{1 + 3^2}{2!}(\log_e 3)^2 + \frac{1 + 3^2}{3!}(\log_e 3)^2 + \ldots$ is equal to :

(a) 28 (b) 30

(c) 25 (d) 0

50. $\int \frac{\cos 4x - 1}{\cot x - \tan x}\,dx$ is equal to :

(a) $-\frac{1}{2}\cos 4x + c$ (b) $-\frac{1}{4}\cos 4x + c$

(c) $-\frac{1}{2}\sin 2x + c$ (d) none of these

Answer – Key

1. c	**2.** c	**3.** c	**4.** c	**5.** b	**6.** d	**7.** b	**8.** b	**9.** c	**10.** a
11. b	**12.** c	**13.** c	**14.** b	**15.** c	**16.** c	**17.** a	**18.** a	**19.** a	**20.** b
21. c	**22.** b	**23.** c	**24.** c	**25.** a	**26.** b	**27.** c	**28.** b	**29.** c	**30.** b
31. a	**32.** a	**33.** b	**34.** b	**35.** a	**36.** a	**37.** d	**38.** b	**39.** b	**40.** c
41. d	**42.** c	**43.** d	**44.** c	**45.** b	**46.** d	**47.** c	**48.** a	**49.** a	**50.** d