1. If two sets A and B are having 99 elements in common, then the number of elements common to each of the sets $A\times B$ and $B\times A$ are

(a) 2^{99} (b) 99^2 (c) 100 (d) 18

2. The square root of $\sqrt{(50)}+\sqrt{(48)}$ is

(a) $2^{1/4}(3+\sqrt{2})$ (b) $2^{1/4}(\sqrt{3}+2)$ (c) $2^{1/4}(2+\sqrt{2})$ (d) $2^{1/4}(\sqrt{3}+\sqrt{2})$

3. If $z(1+a)=b+ic$ and $a^2+b^2+c^2=1$, then $\frac{1+iz}{1-iz}=$

(a) $\frac{a+ib}{1+c}$ (b) $\frac{b-ic}{1+a}$ (c) $\frac{a+ic}{1+b}$ (d) None of these

4. The sixth term of an A.P. is equal to 2, the value of the common difference of the A.P. which makes the product $a_1a_4a_5$ least is given by

(a) $x=\frac{8}{5}$ (b) $x=\frac{5}{4}$ (c) $x=2/3$ (d) None of these

5. The value of m for which the equation $\frac{a}{x+a+m}+\frac{b}{x+b+m}=1$ has roots equal in magnitude but opposite in sign is

(a) $\frac{a+b}{a-b}$ (b) 0 (c) $\frac{a-b}{a+b}$ (d) $\frac{2(a-b)}{a+b}$

6. The number of ways in which ten candidates $A_1, A_2, ...A_{10}$ can be ranked such that A_1 is always above A_{10} is

(a) $5!$ (b) $2(5!)$ (c) $10!$ (d) $\frac{1}{2}(10!)$

7. Coefficients of $x^r[0\le r\le(n-1)]$ in the expansion of $(x+3)^{n-1}+(x+3)^{n-2}(x+2)+(x+3)^{n-3}(x+2)^2+...+(x+2)^{n-1}$

(a) ${}^nC_r(3^r-2^n)$ (b) ${}^nC_r(3^{n-r}-2^{n-r})$

(c) ${}^nC_r(3^r+2^{n-r})$ (d) None of these

8. $\frac{1.2}{1!}+\frac{2.3}{2!}+\frac{3.4}{3!}+\frac{4.5}{4!}+.....\infty=$

(a) $2e$ (b) $3e$ (c) $3e-1$ (d) e

9. The existence of the unique solution of the system $x+y+z=\lambda$, $5x-y+\mu z=10$, $2x+3y-z=6$ depends on

(a) μ only (b) λ only (c) λ and μ both (d) Neither λ nor μ

10. The value of $e^{\log_{10}\tan 1^\circ+\log_{10}\tan 2^\circ+\log_{10}\tan 3^\circ+..........+\log_{10}\tan 89^\circ}$ is

(a) 0 (b) e (c) $1/e$ (d) None of these

11. In ΔABC, $c\cos(A-\alpha)+a\cos(C+\alpha)=$

(a) $a\cos\alpha$ (b) $b\cos\alpha$ (c) $c\cos\alpha$ (d) $2b\cos\alpha$

12. If $\sin^{-1}x+\sin^{-1}y+\sin^{-1}z=\frac{\pi}{2}$, then the value of $x^2+y^2+z^2+2xyz$ is equal to

(a) 0 (b) 1 (c) 2 (d) 3

13. The position of a moving point in the *XY*-plane at time *t* is given by $\left((u\cos\alpha)t,(u\sin\alpha)t-\frac{1}{2}gt^2\right)$, where u,α,g are constants. The locus of the moving point is

(a) A circle (b) A parabola (c) An ellipse (d) None of these

14. The equation of the bisector of that angle between the lines $x+2y-11=0$, $3x-6y-5=0$ which contains the point (1, –3) is

(a) $3x=19$ (b) $3y=7$

(c) $3x=19$ and $3y=7$ (d) None of these

15. If the distance of two lines passing through origin from the point (x_1,y_1) is 'd', then the equation of lines is

(a) $(xy_1 - yx_1)^2 = d^2(x^2 + y^2)$ (b) $(x_1y_1 - xy)^2 = (x^2 + y^2)$

(c) $(xy_1 + yx_1)^2 = (x^2 - y^2)$ (d) $(x^2 - y^2) = 2(x_1 + y_1)$

16. The locus of the centres of the circles which touch externally the circles $x^2 + y^2 = a^2$ and $x^2 + y^2 = 4ax$, will be

(a) $12x^2 - 4y^2 - 24ax + 9a^2 = 0$ (b) $12x^2 + 4y^2 - 24ax + 9a^2 = 0$

(c) $12x^2 - 4y^2 + 24ax + 9a^2 = 0$ (d) $12x^2 + 4y^2 + 24ax + 9a^2 = 0$

17. If the line $y = mx + c$ is a tangent to the parabola $y^2 = 4a(x + a)$ then $ma + \frac{a}{m}$ is equal to

(a) c (b) $2c$ (c) $-c$ (d) $3c$

18. P is a point on the side BC of the ΔABC and Q is a point such that $\overrightarrow{PQ}$ is the resultant of $\overrightarrow{AP}, \overrightarrow{PB}, \overrightarrow{PC}$. Then $ABQC$ is a

(a) Square (b) Rectangle (c) Parallelogram (d) Trapezium

19. The direction cosines of three lines passing through the origin are $l_1, m_1, n_1; l_2, m_2, n_2$ and l_3, m_3, n_3. The lines will be coplanar, if

(a) $\begin{vmatrix} l_1 & n_1 & m_1 \\ l_2 & n_2 & m_2 \\ l_3 & n_3 & m_3 \end{vmatrix} = 0$ (b) $\begin{vmatrix} l_1 & m_2 & n_3 \\ l_2 & m_3 & n_1 \\ l_3 & m_1 & n_2 \end{vmatrix} = 0$

(c) $l_1l_2l_3 + m_1m_2m_3 + n_1n_2n_3 = 0$ (d) None of these

20. The value of $\lim_{x \to \infty} \frac{x^2 \sin\frac{1}{x} - x}{1 - |x|}$ is

(a) 0 (b) 1 (c) –1 (d) None of these

21. Let $g(x)$ be the inverse of an invertible function $f(x)$ which is differentiable at $x = c$, then $g'(f(c))$ equals

(a) $f'(c)$ (b) $\frac{1}{f'(c)}$ (c) $f(c)$ (d) None of these

22. $\int (x+3)(x^2+6x+10)^9\, dx$ equals

(a) $\frac{1}{20}(x^2+6x+10)^{10}+c$ (b) $\frac{1}{20}(x+3)^2(x^2+6x+10)^{10}+c$

(c) $\frac{1}{16}(x^2+6x+10)^8+c$ (d) $\frac{1}{38}(x+3)^{19}+\frac{1}{2}(x+3)+c$

23. The least value of the function $F(x)=\int_{5\pi/4}^{x}(3\sin u+4\cos u)\,du$ on the interval $\left[\frac{5\pi}{4},\frac{4\pi}{3}\right]$ is

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

(c) $\frac{3}{2}+\frac{1}{\sqrt{2}}$ (d) None of these

24. The solution of $\frac{d^2y}{dx^2}=\sec^2 x+xe^x$ is

(a) $y=\log(\sec x)+(x-2)e^x+c_1x+c_2$

(b) $y=\log(\sec x)+(x+2)e^x+c_1x+c_2$

(c) $y=\log(\sec x)-(x+2)e^x+c_1x+c_2$

(d) None of these

25. Let A and B be events for which $P(A)=x$, $P(B)=y$, $P(A\cap B)=z$, then $P(\bar{A}\cap B)$ equals

(a) $(1-x)y$ (b) $1-x+y$ (c) $y-z$ (d) $1-x+y-z$

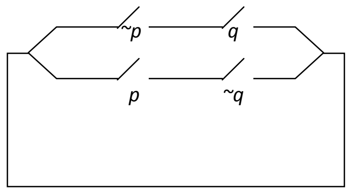
26. The A.M. of n observations is M. If the sum of $n-4$ observations is a, then the mean of remaining 4 observations is

(a) $\frac{nM-a}{4}$ (b) $\frac{nM+a}{2}$ (c) $\frac{nM-A}{2}$ (d) $nM+a$

27. The minimum value of linear objective function $c=2x+2y$ under linear constraints $3x+2y\geq 12$, $x+3y\geq 11$ and $x, y\geq 0$, is

(a) 10 (b) 12 (c) 6 (d) 5

28. For the circuits shown below, the Boolean polynomial is



(a) $(\sim p\vee q)\vee(p\vee\sim q)$

(b) $(\sim p\wedge p)\wedge(q\wedge q)$

(c) $(\sim p\wedge\sim q)\wedge(q\wedge p)$

(d) $(\sim p\wedge q)\vee(p\wedge\sim q)$

29. Let *z* be the set of integers and *o* be a binary operation on *z* defined as $a o b=a+b-ab$ for all $a,b\in z$. The inverse of an element $a(\neq 1)\in z$ is

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

30. If $z_1, z_2\in C$, then $amp\left(\frac{z_1}{\bar{z}_2}\right)=$

(a) $amp(z_1\bar{z}_2)$ (b) $amp(\bar{z}_1 z_2)$ (c) $amp\left(\frac{z_2}{\bar{z}_1}\right)$ (d) $amp\left(\frac{z_1}{z_2}\right)$

31. The solution of $\log_{\sqrt{3}}x+\log_{\sqrt[4]{3}}x+\log_{\sqrt[6]{3}}x+.........+\log_{\sqrt[16]{3}}x=36$ is

(a) $x=3$ (b) $x=4\sqrt{3}$ (c) $x=9$ (d) $x=\sqrt{3}$

32. If α and β be the roots of the equation $2x^2+2(a+b)x+a^2+b^2=0$, then the equation whose roots are $(\alpha+\beta)^2$ and $(\alpha-\beta)^2$ is

(a) $x^2-2abx-(a^2-b^2)^2=0$ (b) $x^2-4abx-(a^2-b^2)^2=0$

(c) $x^2-4abx+(a^2-b^2)^2=0$ (d) None of these

33. If $A=\begin{pmatrix}1 & 2 & 0\\ 0 & 1 & 2\\ 2 & 0 & 1\end{pmatrix}$, then *adj A*

(a) $\begin{pmatrix}1 & 4 & -2\\ -2 & 1 & 4\\ 4 & -2 & 1\end{pmatrix}$ (b) $\begin{pmatrix}1 & -2 & 4\\ 4 & 1 & -2\\ -2 & 4 & 1\end{pmatrix}$

(c) $\begin{pmatrix}1 & 2 & 4\\ -4 & 1 & 2\\ -4 & -2 & 1\end{pmatrix}$ (d) None of these

34. If $\dfrac{\sin A-\sin C}{\cos C-\cos A}=\cot B$, then *A,B,C* are in

(a) A.P. (b) G.P. (c) H.P. (d) None of these

35. The number of pairs (*x*, *y*) satisfying the equations $\sin x+\sin y=\sin(x+y)$ and $|x|+|y|=1$ is

(a) 2 (b) 4 (c) 6 (d) ∞

36. Chord of contact of the point $(3,\ 2)$ *w.r.t.* the circle $x^2+y^2=25$ meets the coordinate axes in *A* and *B*. The circumcentre of triangle *OAB* is

(a) $\left(\dfrac{25}{4},\dfrac{25}{6}\right)$ (b) $\left(\dfrac{2}{50},\dfrac{3}{50}\right)$ (c) $\left(\dfrac{25}{6},\dfrac{25}{4}\right)$ (d) None of these

37. Eccentricity of the ellipse whose latus rectum is equal to the distance between two focus points, is

(a) $\dfrac{\sqrt{5}+1}{2}$ (b) $\dfrac{\sqrt{5}-1}{2}$ (c) $\dfrac{\sqrt{5}}{2}$ (d) $\dfrac{\sqrt{3}}{2}$

38. If $\int_0^1 e^{x^2}(x-\alpha)\,dx=0$, then

(a) $1<\alpha<2$ (b) $\alpha<0$ (c) $0<\alpha<1$ (d) None of these

39. The scalars l and m such that $l\mathbf{a}+m\mathbf{b}=\mathbf{c}$, where **a**, **b** and **c** are given vectors, are equal to

(a) $l=\dfrac{(\mathbf{c}\times\mathbf{b}).(\mathbf{a}\times\mathbf{b})}{(\mathbf{a}\times\mathbf{b})^2},\ m=\dfrac{(\mathbf{c}\times\mathbf{a}).(\mathbf{b}\times\mathbf{a})}{(\mathbf{b}\times\mathbf{a})^2}$

(b) $l=\dfrac{(\mathbf{c}\times\mathbf{b}).(\mathbf{a}\times\mathbf{b})}{(\mathbf{a}\times\mathbf{b})},\ m=\dfrac{(\mathbf{c}\times\mathbf{a}).(\mathbf{b}\times\mathbf{a})}{(\mathbf{b}\times\mathbf{a})}$

(c) $l=\dfrac{(\mathbf{c}\times\mathbf{b})\times(\mathbf{a}\times\mathbf{b})}{(\mathbf{a}\times\mathbf{b})^2},\ m=\dfrac{(\mathbf{c}\times\mathbf{a})\times(\mathbf{b}\times\mathbf{a})}{(\mathbf{b}\times\mathbf{a})}$

(d) None of these

40. Consider $f(x)=\begin{cases}\dfrac{x^2}{|x|}, x\neq 0\\ 0, x=0\end{cases}$

(a) $f(x)$ is discontinuous everywhere

(b) $f(x)$ is continuous everywhere

(c) $f'(x)$ exists in $(-1,1)$

(d) $f'(x)$ exists in $(-2,2)$

41. The minimum value of the function $2\cos 2x-\cos 4x$ in $0\leq x\leq \pi$ is

(a) 0 (b) 1 (c) $\dfrac{3}{2}$ (d) – 3

42. Which one is the correct statement about the function $f(x)=\sin 2x$

(a) $f(x)$ is increasing in $\left(0,\dfrac{\pi}{2}\right)$ and decreasing in $\left(\dfrac{\pi}{2},\pi\right)$

(b) $f(x)$ is decreasing in $\left(0,\dfrac{\pi}{2}\right)$ and increasing in $\left(\dfrac{\pi}{2},\pi\right)$

(c) $f(x)$ is increasing in $\left(0,\dfrac{\pi}{4}\right)$ and decreasing in $\left(\dfrac{\pi}{4},\dfrac{\pi}{2}\right)$

(d) The statements (a), (b) and (c) are all correct

43. $\int e^{\tan^{-1}x}\left(\frac{1+x+x^2}{1+x^2}\right)dx$ is equal to

(a) $xe^{\tan^{-1}x}+c$ (b) $x^2e^{\tan^{-1}x}+c$ (c) $\frac{1}{x}e^{\tan^{-1}x}+c$ (d) None of these

44. The vertices of a hyperbola are at (0, 0) and (10, 0) and one of its foci is at (18, 0). The equation of the hyperbola is

(a) $\frac{x^2}{25}-\frac{y^2}{144}=1$ (b) $\frac{(x-5)^2}{25}-\frac{y^2}{144}=1$

(c) $\frac{x^2}{25}-\frac{(y-5)^2}{144}=1$ (d) $\frac{(x-5)^2}{25}-\frac{(y-5)^2}{144}=1$

45. In a bag there are three tickets numbered 1, 2, 3. A ticket is drawn at random and put back and this is done four times. The probability that the sum of the numbers is even, is

(a) $\frac{41}{81}$ (b) $\frac{39}{81}$ (c) $\frac{40}{81}$ (d) None of these