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Q-1. The number of surjections from $A = 1, 2, \dots, n$, $n \geq 2$ onto $B = \{a, b\}$ is

- (a) ${}_nP_2$
- (b) $2^n - 1$
- (c) $2^n + 1$
- (d) none of these

Q-2. Set A has 3 elements and set B has 4 elements. The number of injection that can be defined from A to B is

- (a) 144
- (b) 12
- (c) 24
- (d) 64

Q-3. $f : R \rightarrow R$ is a function defined by $f(x) = 10x - 7$. if $g = f^{-1}$, then $g(x) =$

- (a) $\frac{1}{10x - 7}$
- (b) $\frac{1}{10x + 7}$
- (c) $\frac{x + 7}{10}$
- (d) $\frac{x - 7}{10}$

Q-4. The number of objective function from set A to itself when A contains 106 elements is

- (a) 106
- (b) $(106)^2$
- (c) $106!$
- (d) 2^{106}

Q-5. $f(x) = |\sin x|$ has an inverse if its domain is

- (a) $[0, \pi]$
- (b) $\left[0, \frac{\pi}{2}\right]$ (c) $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$

(d) none

Q-6. If the area of the triangle formed by points z , iz and $z + iz$ is 50 square units, then $|z|$ is

(a) 5

(b) 10

(c) 15

(d) none of these

Q-7. if area of triangle on plane turned by number z , ωz and $z + \omega z$ is $4\sqrt{3}$, then $|z|$ is

(a) 4

(b) 2

(c) 6

(d) 3

Q-8. The locus of point z satisfying $\operatorname{Re}\left(\frac{1}{z}\right) = k$, when k is a non-real real number is

(a) Straight line

(b) A circle

(c) An ellipse

(d) A hyperbola

Q-9. The locus of point z satisfying $\operatorname{Re}(z^2) = 0$ is

(a) Point of straight lines

(b) Circle

(c) Hyperbola

(d) None of these

Q-10. If a_1, a_2, a_3 are in G. P with common ratio r , then value of $a_3 > 4a_2 - 3a_1$ holds if

(a) $1 < r < 3$

(b) $-3 < r < -1$

(c) $r < 3$ or $r < 1$

(d) none of these

Q-11 Let a, b, c be in A. P. and $|a| < 1, |b| < 1, |c| < 1$.

If $x = 1 + a + a^2 + \dots \infty$

$$y = 1 + b + b^2 + \dots \infty$$

$$z = 1 + c + c^2 + \dots \infty$$

Then x, y, z are in

(a) A. P

(b) G. P

(c) H. P

(d) None

Q-12. Let $S \subset (0, \pi)$ denotes set of values of x .

If $8^{1+|\cos x|+\cos^2 x+|(\cos^3)x|} + \dots \infty = 4^3$, then $s =$

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

(b) $(\frac{\pi}{3}, \frac{2\pi}{3})$

(c) $(-\frac{\pi}{3}, \frac{2\pi}{3})$

(d) $(\frac{\pi}{3}, \frac{2\pi}{3})$

Q-13. If $\log_x a, a^{(\frac{x}{2})}$ and $\log_x b$ are in G. P. then x is equal to

(a) $\log_a (\log_b a)$

(b) $\log_a (\log a)$

(c) $-\log_a (\log_a b)$

(d) $\log b$

Q-14. IF $a \in \mathbb{Z}$, $(x - a)(x - 10) + 1 = 0$ has integral roots, then values of a are

(a) 10,8

(b) 12,10

(c) 12,8

(d) none

Q-15. If $(3x)^2 + (27x3^{1-p} - 15)x + 4 = 0$ has equal roots, then p is equal to

(a) 0

(b) 2

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

(d) None

Q-16. The value of a for which $(1 - 2a)x^2 - 6ax - 1 = 0$ and $ax^2 - x + 1 = 0$ have atleast one root, in common are

(a) 0, $-\frac{1}{2}$

(b) $\frac{1}{2}, \frac{2}{9}$

(c) $\frac{2}{9}$

(d) 0, $\frac{1}{2}, \frac{2}{9}$

Q-17. There are m copies of each n different books in library. The number of ways in which one or more than one book can be selected as

(a) $m^n + 1$

(b) $(m + 1)^n - 1$

(c) $(n+1)^n - m$

(d) m

Q-18. The number of ways in which one or more balls. can be selected out of 10 white, 9 green and 7 blues balls, is

(a) 892

(b) 881

(c) 891

(d) 879

Q-19. The number of all 3 elements subsets of set $(a_1, a_2, a_3 \dots a_n)$ which contains a_3 is

(a) nC_3

(b) $n-1C_3$

(c) $n-1C_2$

(d) None of these

Q-20. The number of terms which are free from radical signs in expansion

$(y^{\frac{1}{5}} + x^{\frac{1}{10}})^{55}$ is

(a) 5

(b) 6

(c) 7

(d) None of these

Q-21. If sum of coefficient of $(a+b)^n$ is 4096, then greatest coefficient is

(a) 924

(b) 792

(c) 1594

(d) None of these

Q-22. 3rd term in the expansion of $(\frac{1}{x} + (x^{\log_{10} x})^5)^5$ $x > 1$ is 1000, then x is

(a) 100

(b) 1000

(c) 1

(d) $\frac{1}{\sqrt{10}}$

Q-23. If A is square matrix of order n, then $\text{adj}(\text{adj} A)$ is equal to

(a) $|A|^n A$

(b) $|A|^{n-1} A$

(c) $|A|^{n-1} A$

(d) $|A|^{n-3} A$

Q-24. If A is singular, then A adj A is matrix

(a) Identify

(b) Null

(c) Scalar

(d) None of these

Q-25. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ and $n \in N$, then A^n equals

(a) $2^n A$

(b) $2^{n-1} A$

(c) nA

(d) None of these

Q-26. If $\begin{vmatrix} x^n & x^{n+2} & x^{n+3} \\ y^n & y^{n+2} & y^{n+3} \\ z^n & z^{n+2} & z^{n+3} \end{vmatrix} = (x-y)(y-z)(z-x) \left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z} \right)$, then n equals

(a) 1

(b) -1

(c) 2

(d) -2

Q-27. The orthocenter of the triangle formed by lines $xy = 0$ and $x + y = 1$ is

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

(b) $\left(\frac{1}{3}, \frac{1}{3}\right)$

(c) (0,0)

(d) $\left(\frac{1}{4}, \frac{1}{4}\right)$

Q-28. The area of figure formed by $ax \pm by \pm c = 0$ is

(a) $\frac{c^2}{ab}$

(b) $\frac{2c^2}{ab}$

(c) $\frac{c^2}{2ab}$

(d) None of these

Q-29. The equation $ax^2 + by^2 + cx + cy = 0$ represent pair of lines if

(a) $c = 0$

(b) $a + b = 0$

(c) $c = 0$ or $a + b = 0$

(d) None of these

Q-30. If an equilateral triangle is inscribed in circle $x^2 + y^2 = a^2$, then length of each side is

- (a) $\sqrt{2a}$
- (b) $\frac{\sqrt{3}}{2}a$
- (c) $\sqrt{3} a$
- (d) None of these

Q-31. The latus rectum of parabola whose focal chord is P S Q is such that SP = 3 and SQ = 2 is given by

- (a) $\frac{24}{5}$
- (b) $\frac{12}{5}$
- (c) $\frac{6}{5}$
- (d) None of these

Q-32. Find c such that straight line $y = 4x + c$ touches curve $\frac{x^2}{4} + y^2 = 1$ is

- (a) 0
- (b) 3
- (c) 2
- (d) Infinite

Q-33. The eccentricity of the conic represented by $x^2 - y^2 - 4x + 4 + 4y + 16 = 0$ is

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

Q-34. If $f(x + 2y, x - 2y) = xy$, then $f(x, y)$ equal

- (a) $\frac{x^2 - y^2}{8}$
- (b) $\frac{x^2 - y^2}{4}$
- (c) $\frac{x^2 + y^2}{2}$
- (d) $\frac{x^2 - y^2}{2}$

Q-35. The period of $f(x) = \sin^4 x + \cos^4 x$ is

- (a) .
- (b) $\frac{\pi}{2}$
- (c) 2π
- (d) None of these

Q-36. $\lim_{x \rightarrow 0} \frac{\sqrt{x^2 + 1} - 1}{\sqrt{x^2 + 9} - 3}$ is equal to

(a) 3

(b) 4

(c) 1

(d) 2

Q-37. $\lim_{x \rightarrow 0} \left(\frac{x+5}{x-1} \right)^x$ is equal to

(a) e^6

(b) e^5

(c) e

(d) 1

Q-38. If $f(x) = \sin^{-1} \left(\frac{2x}{1+x^2} \right)$, then $f(x)$ is differentiable on

(a) $[-1, 1]$

(b) $\mathbb{R} - [-1, 1]$

(c) $\mathbb{R} - (-1, 1)$

(d) None of these

Q-39. If $f(x) = |x - a|\phi(x)$ is continuous, then

(a) $f'(a+) = \phi(a)$

(b) $f'(a) = -\phi(a)$

(c) $f'(a^+) = \phi'(a^{-1})$

(d) None of these

Q-40. If $f(x) = \sqrt{x^2 + 9}$ then $\lim_{x \rightarrow 0} \frac{f(x) - f(4)}{x - 5}$ equals

(a) $\frac{5}{4}$

(b) $-\frac{4}{5}$

(c) $\frac{4}{5}$

(d) None of these