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MATHEMATICS SAMPLE QUESTIONS – VOL.03

1. For any two sets A and B, if $A \cup B = A \cap B$ implies
   a. A-B=0
   b. A = B
   c. A not equal to B
   d. None

2. For any two sets A and B, if P (A) = P (B) implies
   a. A is not equal to B
   b. A = B.
   c. A-B =0
   d. None

3. If A = {1,2,4,6,10,12} , B = {1,2,5,7} $A \cap B$
   a. {1,2,7}
   b. {1,2,5,}
   c. {1,2,5,7}
   d. {1,2,}

4. $(1 - 2i)^{-3}$ in the standard form

   a. -10-2i/125
   b. -11+2i/125
   c. -11-2i/25
   d. -11-2i/125

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5. Find the real values of x and y, if $(3x - 7) + 2iy = -5y + (5 + x)\,i$

   a. x=1,y=2

   b. x=1,y=3

   c. x=1,y=-2

   d. x=-1,y=2

6. Find $(1-i)^4$

   a. -1

   b. -4

   c. 2

   d. 3

7. If $E(\theta)=\begin{bmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{bmatrix}$ and θ and ϕ differ by an odd multiple of $\pi/2$, then $E(\theta)\,E(\phi)$ is

   (a) null matrix

   (b) unit matrix

   (c) diagonal matrix

   (d) none of these

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8. If $A=\begin{bmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{bmatrix}$ and $B=\begin{bmatrix} \cos^2\beta & \cos\beta\sin\beta \\ \cos\beta\sin\beta & \sin^2\beta \end{bmatrix}$ are two matrices such that the product AB is the null matrix, then $(\alpha - \beta)$ is

(a) 0

(b) multiple of π

(c) an odd multiple of $\pi/2$

(d) none of these

9. The matrix A satisfying the equation $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}A=\begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$ is

(a) $\begin{bmatrix} 1 & 4 \\ -1 & 0 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & -4 \\ 1 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 4 \\ 1 & -0 \end{bmatrix}$

(d) none of these

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10. Evaluate $\begin{vmatrix} 3 & -1 & -2 \\ 0 & 0 & -1 \\ 3 & -5 & 0 \end{vmatrix}$

a. -12
b. 12
c. 14
d. 15

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

a. 45
b. 20
c. 46
d. 14

12. Find the value of x if $\begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix}$

a. $x = \sqrt{3}$

b. $x = \pm \sqrt{3}$

c. $x = -\sqrt{3}$

d. x = None

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13. Differentiate $\frac{\sin x + \cos x}{\sin x - \cos x}$

a. $\frac{-2}{1-\sin x}$

b. $\frac{2}{1-\sin 2x}$

c. $\frac{1}{1-\sin 2x}$

d. $\frac{-2}{1-\sin 2x}$

14. Differentiate $\frac{e^x - \tan x}{\cot x - x^n}$

a. $\frac{(\cot x - x^n)(e^x - \sec^2 x) + (e^x - \tan x)(\operatorname{cosec}^2 x + nx^{n-1})}{(\cot x - x^n)^2}$

b. $\frac{(\cot x - x^n)(e^x - \sec^2 x) - (e^x - \tan x)(\operatorname{cosec}^2 x + nx^{n-1})}{(\cot x - x^n)^3}$

c. $\frac{(\cot x - x^n)(e^x - \sec^2 x) + (e^x + \sec x)(\operatorname{cosec}^2 x + nx^{n-1})}{(\cot x - x^n)^2}$

d. $\frac{(\cot x - x^{n-1})(e^x - \sec^2 x) + (e^x - \tan x)(\operatorname{cosec}^2 x - nx^{n-1})}{(\cot x - x^n)^2}$

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15. $\frac{ax+b}{px^2+qx+r}$ differentiate

a. $\frac{-apx^2-2bp+ar-bq}{(px^2+qx+r)^2}$

b. $\frac{-apx^2-2bpx+ar-bxq}{(px^2+qx+r)^2}$

c. $\frac{-apx^2-2bpx+ar-bq}{(px^2+qx+r)^2}$

d. $\frac{-apx^2-2bpx+axr-bq}{(px^2+qx+r)^2}$

16. Find the intervals in which the function f given by f(x) = $x^2 - 4x + 6$ is Strictly increasing

a. x>1
b. x<2
c. x>2
d. x>-2

17. The function given by f(x) = 3x + 17 is

a. Strictly increasing
b. Strictly decreasing
c. increasing
d. Decreasing

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18. The function given by $f(x) = e^{2x}$ is
    a. increasing
    b. Strictly decreasing
    c. Strictly increasing
    d. Decreasing

19. $\int x^2\left(1-\frac{1}{x^2}\right)dx$

    a. $\frac{x^3}{2}-x+C$

    b. $\frac{x^3}{3}+x+C$

    c. $\frac{x^3}{3}-x+C$

    d. $\frac{x^2}{3}-x+C$

20. $\int (ax^2 + bx + c)dx$

a. $\frac{ax^3}{3} + \frac{bx^2}{3} + cx + C$

b. $\frac{ax^3}{3} + \frac{bx^2}{2} + cx + C$

c. $\frac{ax^3}{3} + \frac{bx^2}{1} + cx + C$

d. $\frac{ay^3}{3} + \frac{bx^2}{2} + cx + C$

21. $\int (2x^2 + e^x)dx$

a. $\frac{2x^3}{3} + e^x + C$

b. $\frac{2x^3}{2} + e^x + C$

c. $\frac{2x^3}{1} + e^x + C$

d. $\frac{2x^2}{3} + e^x + C$

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22. Let ABC be a triangle such that $\angle ACB = \frac{\pi}{6}$ and let a, b and c denote the lengths of the sides opposite to A, B and C respectively. The value(s) of x for which $a = x^2 + x + 1$, $b = x^2 - 1$ and $c = 2x + 1$ is equal to

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

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

(c) $2 + \sqrt{3}$

(d) $4\sqrt{3}$

23. If the angles of a triangle are in the ratio 2 : 3 : 7, then sides are in the ratio of

(a) $\pi : 2 : (\sqrt{3} + 1)$

(b) $\sqrt{2} : 2 : (\sqrt{3} + 1)$

(c) $\sqrt{2} : (\sqrt{3} + 1) : 2$

(d) $2 : (\sqrt{3} + 1) : \sqrt{2}$

24. If angles A, B and C are in AP, then $\frac{a+c}{b}$ is equal to

(a) $2 \sin \frac{A-C}{2}$

(b) $2 \cos \frac{A-C}{2}$

(c) $\cos \frac{A-C}{2}$

(d) $\sin \frac{A-C}{2}$

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25. Find the value of $\cos 210^{o}$

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

b. $-\frac{\sqrt{3}}{3}$

c. $\frac{\sqrt{3}}{2}$

d. $-\frac{\sqrt{2}}{2}$

26. Find the value of $\cos(-480^{o})$

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

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

c. $-\frac{3}{2}$

d. $-\frac{6}{2}$

27. Find the value of $\sin(-1125^{o})$

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

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

c. $-\frac{3}{\sqrt{2}}$

d. $-\frac{1}{4}$

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28. The angles of a quadrilateral are in A.P. whose common difference is 10^0. The Smallest angle is

(a) 75
(b) 85
(c) 90
(d) 95

29. The sum of the series: 5 + 13 + 21 + … + 181

(a) 2138
(b) 2139
(c) 3182
(d) 2832

30. The sum of first 24 terms of the A.P. $a_1, a_2, a_3, \ldots\ldots$ if its is known that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$.

(a) 500
(b) 521
(c) 900
(d) 124

31. The ratio of the sum of m and n terms of an A.P. is $m^2 : n^2$. Then the ratio of the m^{th} and n^{th} terms is

(a) (2n – 1) : (2m – 1)
(b) (2n – 1) : (2m + 1)
(c) (2m + 1) : (2n + 1)
(d) (2m – 1) : (2n – 1)

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32. Suppose $f(x) = \begin{cases} a+bx, & x<1 \\ 4, & x=1 \\ b-ax, & x>1 \end{cases}$ and, if $\lim_{x\to 1} f(x) = f(1)$. What are possible values of a and b?

a. a=3,b=4
b. a=0,b=4
c. a=1,b=4
d. a=0,b=2

33. Evaluate $\lim_{x\to 2^+} \frac{x-3}{x^2-4}$

a. $-\infty$
b.0
c.1
d.None

34. Evaluate $\lim_{x\to 2^-} \frac{x-3}{x^2-4}$

a. 1
b. α
c. ∞
d. $-\beta$

35. A mint prepares metallic calendars specifying months, dates and days in the form of monthly sheets (one plate for each month). How many types of calendars should it prepare to serve for all the possibilities in future years?

a.18
b.16
c.14
d.21

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36. There are four parcels and five post offices. In how many different ways can the parcels be sent by registered post?

a.625
b.676
c.898
d.565

37. A coin is tossed five times and outcomes are recorded. How many possible outcomes are there?

a.23
b.32
c.44
d.54

38. In how many ways can an examinee answer a set of ten true/false type questions?

a.1022
b.1034
c.1024
d.1044

39. A bag contains three green marbles, four blue marbles, and two orange marbles. If a marble is picked at random, then the probability that it is not an orange marble is

a. $\frac{1}{4}$
b. $\frac{1}{3}$
c. $\frac{4}{9}$
d. $\frac{7}{9}$

40. A number is selected at random from the numbers, 3,5,5,7,7,7,9,9,9. The probability that the selected number is their average is

a. $\frac{1}{10}$

b. $\frac{3}{10}$

c. $\frac{7}{10}$

d. $\frac{9}{10}$

41. If a number x is chosen from the numbers 1,2,3 and a number y is selected from the numbers 1,4,9. Then, $P(xy < 9)$.

a. $\frac{7}{9}$

b. $\frac{5}{9}$

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

d. $\frac{1}{9}$

42. The coefficient of x^n in the expansion of $(1+x)^{2n}$ and $(1+x)^{2n-1}$ are in the ratio

a.1:2 b.1:3 c.3:1 d.2:1

43. If the coefficient of the middle term in the expansion of $(1+x)^{2n+2}$ is a and the coefficients of middle terms in the expansion of $(1+x)^{2n+1}$ are b and c then

a. $a+b=c$ b. $a+c=b$ c. $a=b+c$ d. $a+b+c=0$

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44. The term independent of x in $\left(2x^{1/2} - 3x^{-1/3}\right)^{20}$ is :

a. $20C_{12}.2^9.3^{12}$ b. $20C_{12}.2^8.3^{11}$ c. $20C_{12}.2^8.3^{12}$ d. $20C_{12}.2^9.3^{11}$

45. If $ax^2 + bx + c = 0$ has equal roots, then c =

(a) $\frac{-b}{2a}$ (b) $\frac{b}{2a}$ (c) $\frac{-b^2}{4a}$ (d) $\frac{b^2}{4a}$

46. If the equation $ax^2 + 2x + a = 0$ has two distinct roots, if

(a) $a = \pm 1$ (b) a = 0 (c) a = 0, 1 (d) a = -1, 0

47. The positive value of k for which the equation $x^2 + kx + 64 = 0$ and $x^2 - 8x + k = 0$ will both have real roots, is

(a) 4 (b) 8 (c) 12 (d) 16

48. The function f defined by $f(x) = \begin{cases} x, \text{if } x \le 1 \\ 5, \text{if } x > 1 \end{cases}$ continuous

a. at x = 0 ?,
b. at x=1
c. at x=3
d. none

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49. The function f defined by $f(x) = \begin{cases} x, \text{if } x \le 1 \\ 5, \text{if } x > 1 \end{cases}$ discontinuous

a. at x = 0 ?,
b. at x=1
c. at x=3
d. none

50. All points of discontinuity of f $\begin{cases} 2x+3, & x \le 2 \\ 2x-3, & x > 2 \end{cases}$

a. x=3
b. x=2
c. x=4
d. x=1

ANSWER KEYS

1	B	11	C	21	A	31	D	41	B
2	B	12	B	22	B	32	B	42	D
3	D	13	A	23	B	33	A	43	C
4	D	14	A	24	B	34	C	44	C
5	A	15	C	25	A	35	C	45	D
6	B	16	A	26	B	36	A	46	A
7	A	17	A	27	A	37	B	47	D
8	C	18	C	28	A	38	C	48	A
9	C	19	C	29	B	39	D	49	B

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10	A	20	B	30	C	40	B	50	B