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MATHEMATICS SAMPLE QUESTIONS – VOL.03

1. For any set A, $A \cup A$ is

- a. A
- b. U
- c. \emptyset
- d. None

2. For any set A, $A \cap A$ is

- a. A
- b. U
- c. \emptyset
- d. None

3. For any set A, $A \cup \emptyset$ is

- a. A
- b. U
- c. \emptyset
- d. None

4. Evaluate : $(1 + i)^6 + (1 - i)^3$

- a. $-2 - 10i$
- b. $2 - 10i$
- c. $-2 + 10i$
- d. $2 + 10i$



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5. If $(x+iy)^{\frac{1}{3}} = a + ib$, where $x, y, a, b \in \mathbb{R}$, then

a. $\frac{x}{a} + \frac{y}{b} = 4(a^2 + b^2)$

b. $\frac{x}{a} - \frac{y}{b} = -2(a^2 + b^2)$

c. $\frac{x}{a} - \frac{y}{b} = 2(a^2 + b^2)$

d. $-\frac{x}{a} - \frac{y}{b} = -2(a^2 + b^2)$

6. The standard form of $\frac{(33-2i)(2+3i)}{(1+2i)(2-i)}$

a. $573+154i/5$

b. $573+154i/125$

c. $573+154i/25$

d. $573-154i/25$

7. A matrix $A = [a_{ij}]$ is an upper triangular matrix, if

(a) it is a square matrix and $a_{ij} = 0, i < j$

(b) it is a square matrix and $a_{ij} = 0, i > j$

(c) it is not a square matrix and $a_{ij} = 0, i > j$

(d) it is not a square matrix and $a_{ij} = 0, i < j$

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8. If A is any $m \times n$ matrix such that AB and BA are both defined, then B is an

- (a) $m \times n$ matrix
- (b) $n \times m$ matrix
- (c) $n \times n$ matrix
- (d) $m \times m$ matrix

9. If $E(\theta) = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then $E(\alpha) E(\beta)$ is equal to

- (a) $E(0^\circ)$
- (b) $E(\alpha\beta)$

(c) $E(\alpha + \beta)$

(d) $E(\alpha - \beta)$

10. The value of $\begin{vmatrix} 2 & 4 \\ -5 & -1 \end{vmatrix}$

- a. 18
- b. 22
- c. -18
- d. 16

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11. The value of $\begin{vmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{vmatrix}$

a. -1
b. 1
c. 2
d. 0

12. The value of $\begin{vmatrix} x^2 - x + 1 & x - 1 \\ x + 1 & x + 1 \end{vmatrix}$

a. $x^3 - x^2 + 1$
b. $x^3 - x^2 - 2$
c. $x^3 - x^2 + 2$
d. $x^3 - x^2 + 12$

13. if $xy = e^{x-y}$ then $\frac{dy}{dx}$ is

a. $\frac{1+x}{1+\log x}$
b. $\frac{1-\log x}{1+\log x}$
c. not defined
d. $\frac{\log x}{(1+\log x)^2}$



14. let $y=t^{10}+1$ & $x=t^8+1$ then $\frac{d^2y}{dx^2}$ is equal to

a. $5t/2$
b. $20t^8$
c. $5/16t^6$
d. none

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15. if $2^x+2^y=2^{x+y}$ then $\frac{dy}{dx}$ is equal to
- $\frac{2^x+2^y}{2^x-2^y}$
 - $\frac{2^x+2^y}{1+2^{y+x}}$
 - $2^{x-y} \left(\frac{2^y-1}{1-2^x} \right)$
 - $\frac{2^{x+y}-2^x}{2^y}$
16. The function given by $f(x) = 7x - 3$ is strictly
- Strictly increasing
 - Strictly decreasing
 - increasing
 - Decreasing
17. the function f given by $f(x) = x^3 - 3x^2 + 4x, x \in \mathbb{R}$ is
- Strictly increasing
 - Strictly decreasing
 - increasing
 - Decreasing
18. The function given by $f(x) = \cos x$ is
- Strictly decreasing in $(0, \pi)$
 - Strictly decreasing in $(0, \pi)$
 - Strictly decreasing in $(0, \pi)$
 - Strictly decreasing in $(0, \pi)$

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19. The function $f(x) = 5x - 3$ is continuous
- Everywhere
 - Only Natural number
 - No where
 - none

20. $f(x) = x - 5$
- is continuous at each $x \in \mathbb{R}$.
 - is continuous at each $x \in \mathbb{Z}$.
 - is continuous at each $x \in \mathbb{N}$.
 - is discontinuous at each $x \in \mathbb{R}$.

21. The function $f(x) = x^n$ is continuous
- is continuous at each $x \in \mathbb{R}$.
 - is continuous at each $x \in \mathbb{Z}$.
 - is continuous at each $x \in \mathbb{N}$.
 - is discontinuous at each $x \in \mathbb{R}$.

22. $\sin 2x$

- $-\frac{1}{2}\cos 2x + C$
- $-\frac{1}{2}\cos x + C$
- $\frac{1}{2}\cos 2x + C$
- $-\frac{1}{2}\cos 2x + C$

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23. $\cos 3x$

a. $\frac{1}{3} \sin 3x + C$

b. $\frac{1}{3} \sin 2x + C$

c. $\frac{1}{3} \sin x + C$

d. $-\frac{1}{3} \sin 3x + C$

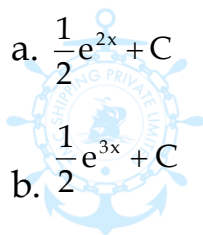
24. e^{2x}

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

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

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

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



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25. If the angles of a triangle are in the ratio 1 : 2 : 3, then the sides are in the ratio

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

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

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

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

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26. If the angles A, B and C of a triangle are in an arithmetic progression and if

a, b and c denote the lengths of the sides opposite to A, B and C respectively,

then the value of the expression $\frac{a}{c} \sin 2C + \frac{c}{a} \sin 2A$ is

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

27. If $b = 3$, $c = 4$, $B = 60^\circ$, then the number of triangles that can be constructed

is:

- (a) Nil
- (b) 1
- (c) 2
- (d) Infinitely many

28. Find $\sin \theta$ if $\cot \theta = \frac{12}{5}$, θ in quadrant III

- a. $-5/12$
- b. $-4/12$
- c. $-5/-13$
- d. $-5/13$

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29. Find $\cot\theta$, if $\cos\theta = \frac{1}{2}$, θ in quadrant II

a. $\frac{-1}{\sqrt{3}}$

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

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

d. $\frac{1}{\sqrt{3}}$

30. Find the value of $\sin 315^\circ$

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

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

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

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

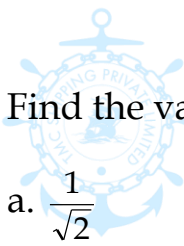
31. How many terms are there in the sequence 3, 6, 9, 12, ..., 111

(a) 37

(b) 38

(c) 39

(d) 40



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32. Which term of the sequence $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \dots$ is the first negative term
- (a) 27
 - (b) 28
 - (c) 20
 - (d) 30
33. If m times the m^{th} term of an A.P. is equal to n times its n^{th} term of A.P then its $(m + n)^{\text{th}}$ is
- (a) 10
 - (b) 9
 - (c) 0
 - (d) None
34. The sum of three numbers in A.P. is -3 , and their product is 8. The numbers are
- (a) 4, 6, 8
 - (b) 14, 16, 18
 - (c) 16, 18, 20
 - (d) -4, -1, 2
35. Discuss the existence of limit $\lim_{x \rightarrow 0} \frac{1}{x}$
- a. 0
 - b. 3
 - c. 6
 - d. Does not exist

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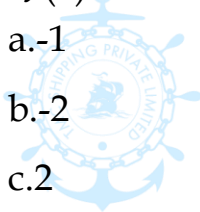
36. Let $f(x) = \begin{cases} \cos x, & \text{if } x > 0 \\ x + k, & \text{if } x < 0 \end{cases}$. Find the value of constant k , given that $\lim_{x \rightarrow 0} f(x)$ exists.

- a. $K = 1$
- b. $K = 2$
- c. $K = -2$
- d. $K = 3$

37. Let $f(x)$ be a function defined by $f(x) = \begin{cases} 4x - 5, & \text{if } x \leq 2 \\ x - \lambda, & \text{if } x > 2 \end{cases}$. Find λ , if

$f(x)$ exists.

- a. -1
- b. -2
- c. 2



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38. In a class there are 27 boys and 14 girls. The teacher wants to select 1 boy and 1 girl to represent the class in a function. In how many ways can the teacher make this selection?
- a. 378
 - b. 377
 - c. 356
 - d. 345

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39. A person wants to buy one fountain pen, one ball pen and one pencil from a stationary shop. If there are 10 fountain pen varieties, 12 ball pen varieties and 5 pencil varieties, in how many ways can he select these articles?
- a.600
 - b.700
 - c.602
 - d.702
40. From Goa to Bombay there are two routes; air, and sea. From Bombay to Delhi there are three routes; air, rail and road. From Goa to Delhi via Bombay, how many kinds of routes are there?
- a.5
 - b.6
 - c.8
 - d.9
41. If three coins are tossed simultaneously, then the probability of getting at least two heads, is
- a. $\frac{1}{4}$
 - b. $\frac{3}{8}$
 - c. $\frac{1}{2}$
 - d. $\frac{1}{4}$

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42. In a single throw of a die, the probability of getting a multiple of 3 is

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

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

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

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

43. A number x is chosen at random from the numbers $-3, -2, -1, 0, 1, 2, 3$ the probability that $|x| < 2$ is

a. $\frac{5}{7}$

b. $\frac{2}{7}$

c. $\frac{3}{7}$

d. $\frac{1}{7}$



44. The probability of guessing the correct answer to a certain test question is $\frac{x}{12}$. If the probability of not guessing the correct answer to this question is $\frac{2}{3}$, then $x = a$.

a. 2

b. 3

c. 4

d. 6

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45. The term containing x^3 in the expansion $\left(\sqrt{x^5} + \frac{3}{\sqrt{x^3}}\right)^6$ appears in
- a. 3rd term b. 5th term c. 6th term d. 4th term
46. The coefficient of x^{-4} in $\left(\frac{x}{2} - \frac{3}{x^2}\right)^{10}$ is
- a. $\frac{405}{256}$ b. $\frac{405}{225}$ c. $\frac{405}{201}$ d. $\frac{226}{405}$
47. If the coefficient of x in $\left(x^2 + \frac{k}{x}\right)^5$ is 270 then $k = 1$
- a.3 b.4 c.5 d.2
48. If the equation $x^2 + 4x + k = 0$ has real and distinct roots, then
- (a) $k < 4$ (b) $k > 4$ (c) $k \geq 4$ (d) $k \leq 4$
49. If the equation $x^2 - ax + 1 = 0$ has two distinct roots, then
- (a) $|a| = 2$ (b) $|a| < 2$ (c) $|a| > 2$ (d) None of these
50. If the equation $9x^2 + 6kx + 4 = 0$ has equal roots, then the roots are both equal to
- (a) $\pm \frac{2}{3}$ (b) $\pm \frac{3}{2}$ (c) 0 (d) ± 3

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ANSWER KEYS:

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