



Duration : 60 Min.

Total Ques. : 50

Paper Type : M 1

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GLOBAL COMPETITION SOCIETY

12
CLASS

SAMPLE Q.P: GLOBAL MATHS OLYMPIAD (GMO)

1. The Actual Question Paper Contains 50 Questions.
2. Each question carry an equal marks of 2 against 50 question
3. The Duration of the Test Paper is 60 Minutes

1. If A and B are invertible matrices, then which of the following is not true?

- (A) $\text{adj}(A) = |A| A^{-1}$
- (B) $\det(A^{-1}) = [\det A]^{-1}$
- (C) $(AB)^{-1} = B^{-1} A^{-1}$
- (D) $(A + B)^{-1} = B^{-1} + A^{-1}$
- (E) None of these

2. The number of real solutions of the equation $\sqrt{1 + \cos 2x} = \sqrt{2} \cos^{-1}(\cos x)$ in $\left[\frac{\pi}{2}, \pi\right]$ is

- (A) 0
- (B) 1
- (C) 2
- (D) infinite
- (E) None of these

3. If B, C are square matrices of order n and if $A = B + C$, $BC \neq CB$, $C^2 = 0$, then for any positive integer p, $A^{p+1} = B^k[B + (p+1)C]$, where k is _____

- (A) $p + 1$
- (B) p
- (C) $p - 1$
- (D) $p + 2$
- (E) None of these

4. Ram gives $\frac{1}{5}$ of his income to his mother, $\frac{2}{5}$ of the remainder to his brother and his sister and 140 rupees to his friends. Now if he is left with $\frac{1}{5}$ th of his earnings, find his earnings.

- (A) Rs. 600
- (B) Rs. 500
- (C) Rs. 875
- (D) Rs. 1100
- (E) None of these

5. Given $f(x) = \log \frac{1+x}{1-x}$ and $g(x) = \frac{3x+x^3}{1+3x^2}$, then $f \circ g(x)$ equals

- (A) $-f(x)$
- (B) $3f(x)$
- (C) $[f(x)]^3$
- (D) $[f(x)]^2$
- (E) None of these

6. A train is going from Mumbai to Pune and makes 5 stops on the way. 3 persons enter the train during the journey with 3 different tickets. How many different sets of tickets they may have had?

- (A) ${}^{15}C_3$
- (B) ${}^{15}C_{13}$
- (C) 3C_1
- (D) ${}^{15}C_1$
- (E) None of these

7. Let $g(x) = 2f\left(\frac{x}{2}\right) + f(2-x)$ and $f''(x) < 0 \forall x \in (0, 2)$. Then $g(x)$ increases in

- (A) $\left(\frac{1}{2}, 2\right)$
- (B) $\left(\frac{4}{3}, 2\right)$
- (C) $(0, 2)$
- (D) $\left(0, \frac{4}{3}\right)$
- (E) None of these

8. The range of the function $f(x) = 6^x + 3^x 6^{-x} + 3^{-x} + 2$ is

- (A) $[-2, \infty)$
- (B) $(-2, \infty)$
- (C) $(6, \infty)$
- (D) $[6, \infty)$
- (E) None of these

9. If A and B are square matrices of the same order and A is non-singular, then for positive integer n, $(A^{-1}BA)^n$ is equal to
- (A) $A^n B^n A^n$
 (B) $A^n B^n A^{-n}$
 (C) $A^{-1} B^n A$
 (D) $n(A^{-1}BA)$
 (E) None of these

10. Domain of the function

$$f(x) = \sqrt{\log_{0.5}(3x-8) - \log_{0.5}(x^2+4)}$$

- (A) $(0, \infty)$ (B) $(-\infty, 8/3)$
 (C) $(-\infty, \infty)$ (D) $(8/3, \infty)$
 (E) None of these
11. The odds against a husband who is 50 years old, living till he is 70 are 7 : 5 and the odds against his wife who is now 40, living till she is 60 are 5 : 3. Find the probability that the couple will be alive 20 years hence.

- (A) $\frac{21}{32}$ (B) $\frac{5}{32}$
 (C) $\frac{15}{32}$ (D) $\frac{12}{32}$
 (E) None of these

12. The vector \vec{c} directed along the internal bisector of the angle between the vectors $\vec{a} = 7\hat{i} - 4\hat{j} - 4\hat{k}$ and $\vec{b} = -2\hat{i} - 2\hat{j} + 2\hat{k}$ with $|\vec{c}| = 5\sqrt{6}$ is

- (A) $\pm \frac{5}{3}(\hat{i} - 7\hat{j} + 2\hat{k})$
 (B) $\frac{5}{3}(5\hat{i} + 5\hat{j} + 2\hat{k})$
 (C) $\frac{5}{3}(\hat{i} + 7\hat{j} + 2\hat{k})$
 (D) $\frac{5}{3}(-5\hat{i} + 5\hat{j} + 2\hat{k})$
 (E) None of these

13. The point in the interval $[0, 2\pi]$, where $f(x) = \sin x$ has maximum slope is

- (A) $\frac{\pi}{4}$ (B) $\frac{\pi}{2}$
 (C) π (D) $2\pi \frac{\pi}{4}$
 (E) None of these

14. If A is a skew symmetric matrix of order n and C is a column matrix of order $n \times 1$, then $C^T AC$ is

- (A) An identity matrix of order n
 (B) An identity matrix of order 1
 (C) A zero matrix of order 1
 (D) All of these
 (E) None of these

15. A class prefect goes to meet the principal every week. His class has 30 people besides him. If he has to make groups of three every time he goes to the principal, in how many weeks will he be able to go to the principal without repeating the group of same three which accompanies him?

- (A) ${}^{30}P_3$ (B) ${}^{30}C_3$
 (C) $30!/3$ (D) ${}^3C_{30}$
 (E) None of these

16. Purnima borrowed a sum of money and returned it in three equal quarterly installments of ₹ 17576 each. Find the sum borrowed, if the rate of interest charged was 16% per annum compounded quarterly. Find also the total interest charged?

- (A) ₹ 46900 and ₹ 4700
 (B) ₹ 48775 and ₹ 3953
 (C) ₹ 68320 and ₹ 1200
 (D) All of these
 (E) None of these

17. The probability that a student will pass in Mathematics is $\frac{3}{5}$ and the probability that he will pass in English is $\frac{1}{3}$. If the probability that he will pass in both Mathematics and English is $\frac{1}{38}$, what is the probability that he will pass in at least one subject?

- (A) $\frac{97}{120}$ (B) $\frac{87}{120}$
 (C) $\frac{53}{120}$ (D) $\frac{120}{297}$
 (E) None of these

18. If $\tan x = n \tan y$, $n \in \mathbb{R}^+$, then maximum value of $\sec^2(x - y)$ is equal to _____.

- (A) $\frac{(n+1)^2}{2n}$ (B) $\frac{(n+1)^2}{n}$
 (C) $\frac{(n+1)^2}{2}$ (D) $\frac{(n+1)^2}{4n}$
 (E) None of these