



# International Olympiad of Mathematics



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## CLASS : 12 SAMPLE QUESTIONS

The Actual Question Paper Contains 40 Questions. The Duration of the Test Paper is 50 Minutes.

- The degree of the differential equation satisfying  $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$  is \_\_\_\_\_.  
 (A) 1 (B) 2  
 (C) 3 (D) 4
- $\int 7^{7^{7^x}} \cdot 7^{7^x} \cdot 7^x dx$  is equal to \_\_\_\_\_.  
 (A)  $\frac{7^{7^{7^x}}}{(\log_e 7)^2} + C$   
 (B)  $\frac{7^{7^{7^x}}}{(\log_e 7)^3} + C$   
 (C)  $7^{7^{7^x}} \cdot (\log 7)^3 + C$   
 (D)  $7^{7^{7^x}} (\log_e 7)^2 + C$
- The value of  $\tan^{-1}\left(\frac{\sin 2 - 1}{\cos 2}\right)$  is \_\_\_\_\_.  
 (A)  $\frac{\pi}{4} - 1$  (B)  $\frac{\pi}{2} - 1$   
 (C)  $1 - \frac{\pi}{4}$  (D)  $1 - \frac{\pi}{2}$
- Let  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  and  $B = \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ ;  $a, b \in \mathbb{N}$ . Then, \_\_\_\_\_.  
 (A) There exists more than one but finite number of B's such that  $AB = BA$   
 (B) There cannot exist any B such that  $AB = BA$   
 (C) There exist infinitely many B's such that  $AB = BA$   
 (D) There exists exactly one B such that  $AB = BA$
- The minimum value of  $\frac{x}{\log x}$  is \_\_\_\_\_.  
 (A) e (B)  $\frac{1}{e}$   
 (C)  $e^2$  (D)  $e^3$
- A is one of 6 horses entered for a race and is to be ridden by one of two jockeys B and C. It is 2 : 1 that B rides A, in which case all the horses are equally likely to win. If C rides A, his chance of winning is trebled. What are the odds against winning of A?  
 (A) 5 : 18 (B) 5 : 13  
 (C) 18 : 5 (D) 13 : 5
- What should come next in the letter series given below?  
 c b a a c b a a b c b a a b c c b a a b  
 c d c b a a  
 (A) a (B) b  
 (C) c (D) d

8. A lizard, at an initial distance of 21 cm behind an insect, moves from rest with an acceleration of  $2 \text{ cm/sec}^2$  and pursues the insect which is crawling uniformly along a straight line at a speed of 20 cm/sec. Then, the lizard will catch the insect after \_\_\_\_\_.
- (A) 24 sec                      (B) 1 sec  
(C) 21 sec                      (D) 20 sec
- 
9. In a certain code language, '3a, 2b, 7c' means 'Truth is Eternal', '7c, 9a, 8b, 3a' means 'Enmity is not Eternal' and '9a, 4b, 2b, 6b' means 'Truth does not perish'. Which of the following means 'enmity' in that language?
- (A) 3a                              (B) 7c  
(C) 8b                              (D) 9a
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10. Consider a pyramid OPQRS located in the first octant ( $x \geq 0, y \geq 0, z \geq 0$ ) with O as origin and OP and OR along the X-axis and the Y-axis, respectively. The base OPQR of the pyramid is a square with  $OP = 3$ . The point S is directly above the mid-point T of diagonal OQ such that  $TS = 3$ . Then, \_\_\_\_\_.
- (A) the acute angle between OQ and OS is  $\frac{\pi}{3}$ .
- (B) the equation of the plane containing the  $\Delta OQS$  is  $x - y = 0$ .
- (C) the length of the perpendicular from O to the plane containing the  $\Delta OQS$  is  $\frac{1}{\sqrt{2}}$ .
- (D) the perpendicular distance from O to the straight line containing RS is  $\frac{\sqrt{13}}{2}$ .



## ANSWERS

1. (A)    2. (B)    3. (C)    4. (C)    5. (A)    6. (D)    7. (B)    8. (C)    9. (C)    10. (B)