



**SOF INTERNATIONAL MATHEMATICS OLYMPIAD**

Total Questions : 50

Time : 1 hr.

PATTERN & MARKING SCHEME				
Section	(1) Logical Reasoning	(2) Mathematical Reasoning	(3) Everyday Mathematics	(4) Achievers Section
No. of Questions	15	20	10	5
Marks per Ques.	1	1	1	3

**SYLLABUS**

**Section – 1 :** Verbal and Non-Verbal Reasoning.

**Section – 2 :** Relations and Functions, Inverse Trigonometric Functions, Matrices and Determinants, Continuity and Differentiability, Application of Derivatives, Integrals, Application of Integrals, Differential Equations, Vector Algebra, Three Dimensional Geometry, Probability, Linear Programming.

**Section – 3 :** The Syllabus of this section will be based on the Syllabus of Mathematical Reasoning and Quantitative Aptitude.

**Section – 4 :** Higher Order Thinking Questions - Syllabus as per Section – 2.

**LOGICAL REASONING**

1. In the given letter series, some of the letters are missing which are given in that order as one of the options below it. Choose the correct option.

a\_cb\_a\_aba\_abc\_

- (A) cccbc (B) cbbac  
(C) bccba (D) abbba

2. There is a group of letters followed by four combinations of digits/symbols. You have to find out which of the combinations correctly represents the group of letters based on the following coding system and the conditions.

**Letter:** R D A E J M K T B U I P W H F

**Digit/** 4 8 5 \$ \* 1 2 6 % © 7 @ 3 9 #

**Symbol:**

**Conditions:**

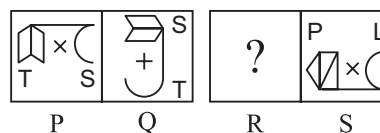
- (i) If the first letter is a consonant and the last letter is a vowel, both are to be coded as d.  
(ii) If both the first and the last letters are consonants, both are to be coded as the code for the last letter.

- (iii) If the first letter is a vowel and the last letter is a consonant, their codes are to be interchanged.

METUFB

- (A) %\$6©#1 (B) 1\$6©#1  
(C) %\$6©#% (D) 1\$6©#%

3. There is a definite relationship between figures P and Q. Establish a similar relationship between figures R and S by selecting a figure from the options that would replace (?) in figure R.



- (A) (B)   
(C) (D)

**MATHEMATICAL REASONING**

4.  $\int \frac{dx}{[(x-1)^3(x+2)^5]^{1/4}} =$
- (A)  $\frac{4}{3} \left(\frac{x-1}{x+2}\right)^{1/4} + C$  (B)  $\frac{4}{3} \left(\frac{x+2}{x-1}\right)^{1/4} + C$   
(C)  $\frac{1}{3} \left(\frac{x-1}{x+2}\right)^{1/4} + C$  (D)  $\frac{1}{3} \left(\frac{x+2}{x-1}\right)^{1/4} + C$

5. Degree of the differential equation

$$\left[1 + 2 \left(\frac{dy}{dx}\right)^2\right]^{3/2} = 5 \frac{d^2y}{dx^2}$$

- (A) 1 (B) 2  
(C) 3 (D) 4

6. The value of  $x$  for which the matrix product

$$\begin{bmatrix} 2 & 0 & 7 \\ 0 & 1 & 0 \\ 1 & -2 & 1 \end{bmatrix} \begin{bmatrix} -x & 14x & 7x \\ 0 & 1 & 0 \\ x & -4x & -2x \end{bmatrix}$$

equals an identity matrix is

- (A)  $\frac{1}{2}$  (B)  $\frac{1}{3}$   
 (C)  $\frac{1}{4}$  (D)  $\frac{1}{5}$

### EVERYDAY MATHEMATICS

7. A can lay railway track between two given stations in 16 days and B can do the same job in 12 days. With the help of C, they did the job in 4 days only. Then C alone can do the job in
- (A)  $9\frac{1}{5}$  days (B)  $9\frac{2}{5}$  days  
 (C)  $9\frac{3}{5}$  days (D) 10 days
8. In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?
- (A) 159 (B) 194  
 (C) 205 (D) 209

### ACHIEVERS SECTION

9. Consider the following statements.

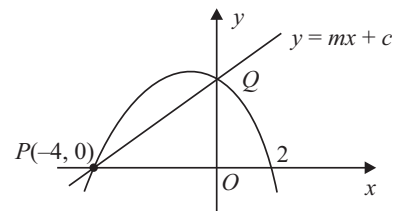
**Statement 1 :** A tangent parallel to  $x$ -axis can be drawn for  $f(x) = (x - 1)(x - 2)(x - 3)$  in the interval  $[1, 3]$ .

**Statement 2 :** A horizontal tangent can be drawn in Rolle's theorem.

Which of the following option hold?

- (A) Both statement 1 and statement 2 are true.  
 (B) Both statement 1 and statement 2 are false.  
 (C) Statement 1 is true, Statement 2 is false.  
 (D) Statement 1 is false, Statement 2 is true.
10. The diagram shows a quadratic curve and a straight line  $y = mx + c$ . They meet at the points

$P$  and  $Q$  on the  $x$ -axis and  $y$ -axis respectively.



- (a) Find the equation of the quadratic curve.  
 (b) Find the values of  $m$  and  $c$  respectively.
- |                     |      |
|---------------------|------|
| (a)                 | (b)  |
| (A) $-x^2 - 2x + 8$ | 2, 8 |
| (B) $x^2 + 2x + 8$  | 6, 4 |
| (C) $x^2 - 2x - 8$  | 4, 6 |
| (D) $-x^2 - 2x + 8$ | 8, 2 |

SPACE FOR ROUGH WORK

### ANSWERS

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