**S O F**
SCIENCE OLYMPIAD FOUNDATION

I M O
**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 :** Sets, Relations and Functions, Principle of Mathematical Induction, Logarithms, Complex Numbers & Quadratic Equations, Linear Inequations, Sequences and Series, Trigonometry, Straight Lines, Circles, Conic Sections, Permutations and Combinations, Binomial Theorem, Statistics, Mathematical Reasoning, Limits and Derivatives, Probability, Introduction to 3-D Geometry.

**Section – 3 :** The Syllabus of this section will be based on the Syllabus of Mathematical Reasoning and Quantitative Aptitude.
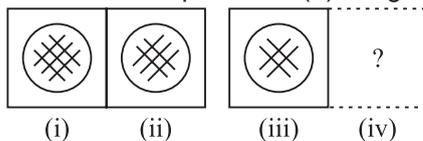
**Section – 4 :** Higher Order Thinking Questions - Syllabus as per Section – 2.

## LOGICAL REASONING

**1.** Mohit and Kunal are good in Hockey and Volleyball. Sachin and Mohit are good in Hockey and Baseball. Gaurav and Kunal are good in Cricket and Volleyball. Sachin, Gaurav and Rohit are good in Football and Baseball.
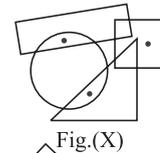Who is good in Baseball, Cricket, Volleyball and Football?
(A) Sachin　　　　　(B) Kunal
(C) Gaurav　　　　　(D) Mohit

**2.** There is a certain relation between fig. (i) and (ii). Establish the same relationship between fig. (iii) and (iv) by selecting a suitable figure from the options which will replace the (?) in fig. (iv).



(i)　　(ii)　　(iii)　　(iv)



(A)　　　　(B)　　　　(C)　　　　(D)

**3.** Select a figure from the options which satisfies the same conditions of placement of the dots as in Fig.(X).
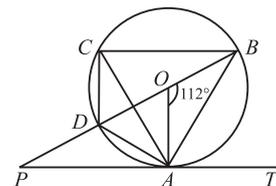


Fig.(X)



(A)　　　　(B)　　　　(C)　　　　(D)

## MATHEMATICAL REASONING

**4.** The value of the expression $3(\sin\theta - \cos\theta)^4 + 6(\sin\theta + \cos\theta)^2 + 4(\sin^6\theta + \cos^6\theta)$ is
(A) 1　　　　　　　(B) –1
(C) 13　　　　　　(D) 0

**5.** In the given figure (not drawn to scale), a circle with centre $O$ passes through $A$, $B$, $C$ and $D$. $PDOB$ is a straight line and $PAT$ is a tangent to the circle. If $\angle AOB = 112°$ and $AD = DC$, then find $\angle APO$ and $\angle ACB$ respectively.



(A) 20°, 60°
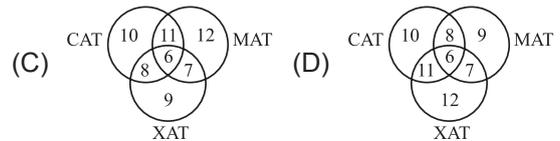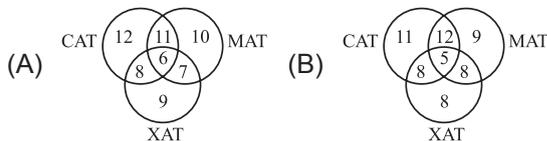(B) 28°, 56°
(C) 22°, 56°
(D) 38°, 68°

6. If $\dfrac{(a+ib)^2}{a-ib} - \dfrac{(a-ib)^2}{a+ib} = x + iy$, then the value of $x$ is

(A) 0

(B) $\dfrac{6a^2b}{(a^2+b^2)^2}$

(C) $\dfrac{-2b^3}{(a^2+b^2)^2}$

(D) None of these

## EVERYDAY MATHEMATICS

7. Rajan got married 8 years ago. His present age is $\dfrac{6}{5}$ times his age at the time of his marriage. Rajan's sister was 10 years younger to him at the time of his marriage. The present age of Rajan's sister is

(A) 32 years

(B) 36 years

(C) 38 years

(D) 40 years

8. A toothed wheel of diameter 50 cm is attached to a smaller wheel of diameter 30 cm. How many revolutions will the smaller wheel make when the larger one makes 15 revolutions?

(A) 18

(B) 20

(C) 25

(D) 30

## ACHIEVERS SECTION

9. Which of the following Venn diagrams represent the given question?

A survey was conducted at a coaching institute and it was found that there were 34 students who appeared in MAT. There were 37 students who appeared in CAT of which 17 students appeared in MAT. 30 students appeared in XAT of which 13 students appeared in MAT. Of the XAT applicants (i.e., appeared students) 14 appeared in CAT and 6 appeared in all three.

(A) 
CAT 12 11 10 MAT
8 6 7
9
XAT

(B)
CAT 11 12 9 MAT
8 5 8
8
XAT

(C)
CAT 10 11 12 MAT
8 6 7
9
XAT

(D)
CAT 10 8 9 MAT
11 6 7
12
XAT

10. Consider the following statements:

**Statement-1 :** Three non-zero real numbers $a$, $b$, $c$ are in G.P., if $b^2 = ac$.

**Statement-2 :** If the quadratic equation $(a^2 + b^2)x^2 - 2(ab + bc)x + (b^2 + c^2) = 0$ has equal roots, then $a$, $b$, $c$ are in G.P., $a$, $b$, $c$ being non-zero real numbers.

Which of the following options is correct?

(A) Statement-1 is true, statement-2 is false.

(B) Statement-1 is false, statement-2 is true.

(C) Both statements are false.

(D) Both statements are true.

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