

CLASS

9

QUESTION  
PAPER SET

A



**SOF INTERNATIONAL  
MATHEMATICS OLYMPIAD  
2022-23**

**DO NOT OPEN THIS BOOKLET UNTIL ASKED TO DO SO**

Total Questions: 50 | Time: 1 hr.

### Guidelines for the Candidate

- You will get additional ten minutes to fill up information about yourself on the OMR Sheet, before the start of the exam.
- Write your **Name, School Code, Class, Roll No.** and **Mobile Number** clearly on the **OMR Sheet** and do not forget to sign it. We will share your marks / result and other information related to SOF exams on your mobile number.
- The Question Paper comprises four sections:  
**Logical Reasoning** (15 Questions), **Mathematical Reasoning** (20 Questions), **Everyday Mathematics** (10 Questions) and **Achievers Section** (5 Questions)  
Each question in Achievers Section carries 3 marks, whereas all other questions carry one mark each.
- All questions are compulsory. There is no negative marking. Use of calculator is not permitted.
- There is only ONE correct answer. Choose only ONE option for an answer.
- To mark your choice of answers by darkening the circles on the OMR Sheet, use **HB Pencil** or **Blue / Black ball point pen** only. E.g.  
Q.16: Rahul bought 4 kg 90 g of apples, 2 kg 60 g of grapes and 5 kg 300 g of mangoes. The total weight of all the fruits he bought is \_\_\_\_\_.  
A. 11.450 kg      B. 11.000 kg      C. 11.350 kg      D. 11.250 kg  
As the correct answer is option A, you must darken the circle corresponding to option A on the OMR Sheet.
- Rough work should be done in the blank space provided in the booklet.
- Return the OMR Sheet to the invigilator at the end of the exam.
- Please fill in your personal details in the space provided on this page before attempting the paper.

16. ● (B) (C) (D)

**SOF**  
SCIENCE OLYMPIAD FOUNDATION  
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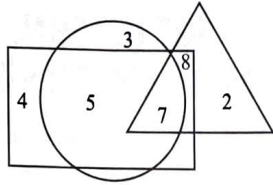
Name: .....

Contact No.: .....

SOF Olympiad Roll No.: .....

# LOGICAL REASONING

1. In the given Venn diagram, rectangle represents scientists, circle represents people worked in NASA and triangle represents people worked in ISRO. Which of the following number represents scientists who worked only in ISRO?



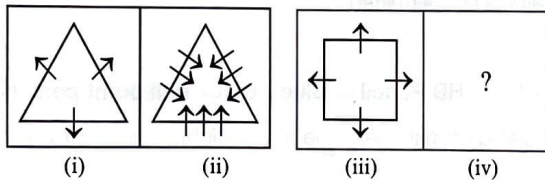
- A. 7  
B. 8  
C. 2  
D. 5

2. Find the missing number in the given number series.

4, 15, 48, 147, ?, 1335

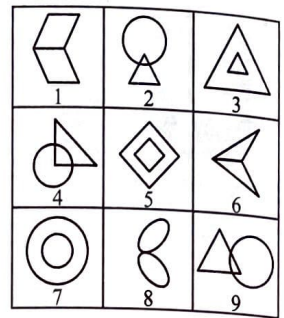
- A. 364  
B. 441  
C. 426  
D. 444

3. There is a definite relationship between figures (i) and (ii). Establish a similar relationship between figures (iii) and (iv) by selecting a suitable figure from the options that would replace the (?) in fig. (iv).



- A.   
B.   
C.   
D.

4. Group the given figures into three classes on the basis of their identical properties by using each figure only once.

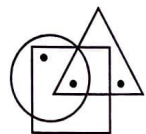


- A. 1, 6, 8; 2, 5, 9; 3, 4, 7  
B. 1, 5, 7; 2, 4, 6; 3, 8, 9  
C. 1, 6, 8; 2, 4, 9; 3, 5, 7  
D. 1, 3, 7; 2, 5, 9; 4, 6, 8

5. Vikrant walks 70 m to the East, then turns to his left and walks 60 m, then he turns left again and walks 20 m. Finally he turns towards right and walks 60 m. How far and in which direction is he now from the starting point?

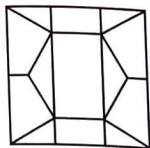
- A. 120 m, South-West  
B. 130 m, North  
C. 130 m, North-East  
D. 120 m, South-East

6. Select a figure from the options which satisfies the same conditions of placement of the dots as in the given figure.



- A.
- B.
- C.
- D.

7. Which of the following figures is exactly embedded in the given figure as one of its parts?



- A.
- B.
- C.
- D.

8. How many 7's are there in the given series each of which is immediately preceded by an even number and immediately followed by 5?

6 4 7 5 8 1 7 5 2 7 6 7 5 3 9 7 4 7 8 7 5 6

- A. Two
- B. One
- C. Three
- D. Four

9. Select the correct mirror image of the given figure.



- A.
- B.
- C.
- D.

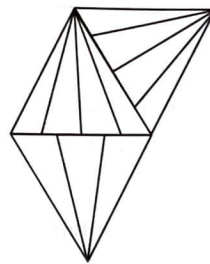
10. If in a certain code language, GUIDELINES is written as GFKWIUGPKN, then how will SEPARATELY be written in the same code language?

- A. TBRHUA NWCD
- B. UCRGVBN GVC
- C. TCRGUAN GVC
- D. UBRIUBNHVC

11. If '@' stands for '+', '©' stands for '-', '\$' stands for '÷' and '#' stands for '×', then what is the value of  $24©65\$13@16\#5$ ?

- A. 99
- B. 87
- C. 109
- D. 61

12. Find the number of triangles formed in the given figure.



- A. 20
- B. 19
- C. 18
- D. More than 20

13. How many pairs of letters are there in the word APPOINTMENT each of which has as many letters between them in the word as in the English alphabets?

- A. None
- B. One
- C. Three
- D. Four

14. Study the given information and answer the following question.

$P * Q$  means P is the sister of Q.

$P \% Q$  means P is the father of Q.

$P \$ Q$  means P is the brother of Q.

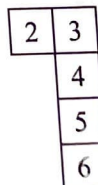
$P + Q$  means P is the mother of Q.

Then how will H be related to G in  $H \% E * D \$ G$ ?

- A. Brother
- B. Father
- C. Mother
- D. Uncle

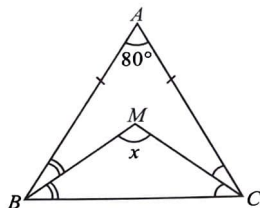
15. Which of the following numbers lie on the face opposite to the face having number 6 when the given net is folded to form a cube?

- A. 2
- B. 4
- C. 1
- D. 5



# MATHEMATICAL REASONING

16. In the given figure, find the value of  $x$ , if  $\angle BAC = 80^\circ$  and  $AB = AC$ .



- A.  $110^\circ$   
 B.  $130^\circ$   
 C.  $95^\circ$   
 D.  $85^\circ$

17. If  $x = 3$ ,  $y = -2$  is a solution of the linear equation  $3x - ky = 1$ , then find the value of  $k$ .

- A. 6  
 B. -2  
 C. 3  
 D. -4

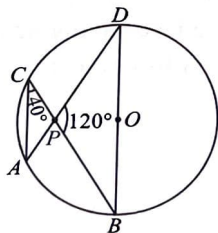
18. If a sum of ₹ 25600 amount to ₹ 36450 in  $t$  years at the rate of 25% p.a. compounded half yearly, then find the value of  $t$ .

- A. 3 years  
 B.  $1\frac{1}{2}$  years  
 C. 2 years  
 D.  $2\frac{1}{2}$  years

19. Simplify :  $\frac{5^{n+2} - 6 \times 5^{n+1}}{13 \times 5^n - 2 \times 5^{n+1}}$

- A. 1  
 B. 0  
 C.  $\frac{5}{3}$   
 D.  $-\frac{5}{3}$

20. In the given figure (not drawn to scale),  $\angle ACP = 40^\circ$  and  $\angle BPD = 120^\circ$ , then  $\angle CBD =$  \_\_\_\_\_.

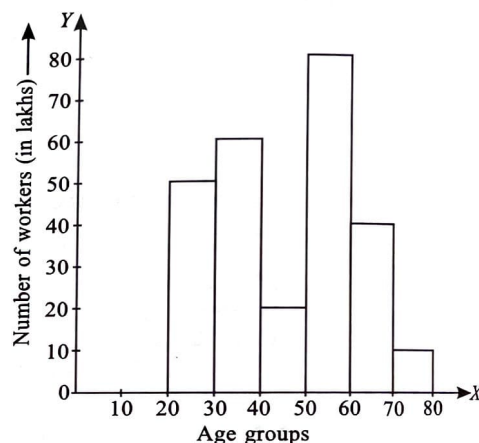


- A.  $30^\circ$   
 B.  $45^\circ$   
 C.  $20^\circ$   
 D.  $35^\circ$

21. Which smallest number should be added in 454189 to make it a perfect square number?

- A. 68  
 B. 92  
 C. 87  
 D. 58

22. The given histogram shows the number of workers of different age groups. Study the graph carefully and answer the given questions.



- (i) Which age group (in years) has the highest number of workers?

- (ii) Find the ratio of number of workers of age group 30-40 to that of 60-70.

- |    | (i)   | (ii)  |
|----|-------|-------|
| A. | 30-40 | 2 : 3 |
| B. | 50-60 | 3 : 2 |
| C. | 60-70 | 4 : 3 |
| D. | 20-30 | 3 : 4 |

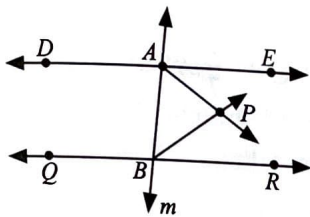
23. Factorisation of  $2x^2 - 5\sqrt{5}x - 15$  is \_\_\_\_\_.

- A.  $(x - \sqrt{5})(2x + 3\sqrt{5})$   
 B.  $(2x + \sqrt{5})(x - 3\sqrt{5})$   
 C.  $(2x - 3)(x + 2\sqrt{5})$   
 D.  $(x + 3\sqrt{5})(3x - \sqrt{5})$

24. If  $x + y + z = 1$ ,  $xy + yz + zx = -1$  and  $xyz = -1$ , then the value of  $x^3 + y^3 + z^3$  is:
- 1
  - 1
  - 2
  - 2

25. The number of faces in a polyhedron is 5 and total number of vertices is two-third of the total number of edges. Find the total number of vertices.
- 8
  - 9
  - 12
  - 6

26. In the given figure,  $DE \parallel QR$  and  $AP$  and  $BP$  are bisectors of  $\angle EAB$  and  $\angle RBA$  respectively. Find the measure of  $\angle APB$ .



- $70^\circ$
  - $65^\circ$
  - $90^\circ$
  - $85^\circ$
27. Things which are equal to the same thing are \_\_\_\_\_ to one another.
- perpendicular
  - not equal
  - equal
  - parallel
28. The ratio of two numbers is 7:5. If each number is decreased by 3, then their ratio becomes 3:2. Find the sum of both the numbers.
- 64
  - 48
  - 58
  - 36
29. The area of a triangle, two sides of which are 8 cm and 11 cm and the perimeter is 32 cm, is  $k\sqrt{30}$  cm<sup>2</sup>. Find the value of  $k$ .
- 8
  - 6
  - 7
  - 9
30. Given below are the steps of construction of a quadrilateral PQRS, where  $PQ = 5$  cm,  $QR = 5.5$  cm and  $RS = 7$  cm,  $\angle PQR = 75^\circ$  and  $\angle QRS = 45^\circ$ . Which of the following steps is incorrect?

Step 1: Draw  $QR = 5.5$  cm.

Step 2: Draw  $\angle XQR = 75^\circ$  at  $Q$  and  $\angle QRY = 45^\circ$  at  $R$ .

Step 3: With  $Q$  as centre and radius 5 cm, draw an arc to intersect  $QX$  at  $P$ .

Step 4: With  $R$  as centre and radius 7 cm, draw an arc to intersect  $RY$  at  $S$ .

Join  $P$  to  $S$ . Thus,  $PQRS$  is the required quadrilateral.

- Step 1 only
  - Step 2 only
  - Step 3 only
  - Step 4 only
31. ABCD is a parallelogram. If  $AB$  is produced to  $E$  such that  $ED$  bisects  $BC$  at  $O$ . Then which of the following is correct?
- $AB = OE$
  - $AB = BE$
  - $OE = OC$
  - None of these
32. If  $\frac{2x}{3} - \frac{4y}{5} = 4$  and  $xy = 60$ , then what will be the value of  $\frac{4}{9}x^2 + \frac{16}{25}y^2$ ?
- 76
  - 80
  - 48
  - 56
33. The point whose abscissa and ordinate have different signs will lie in:
- I and II quadrants
  - II and III quadrants
  - I and III quadrants
  - II and IV quadrants
34. If  $a$  and  $b$  both represent single digits in the number  $3a9b94$ , then for which of the following value of  $(a + b)$ , the given number will be divisible by 11?
- 7
  - 6
  - 9
  - 8
35. A cone, a hemisphere and a cylinder are formed on the same base and with same height. The ratio of their volumes is \_\_\_\_\_.
- 2 : 1 : 3
  - 1 : 2 : 3
  - 3 : 1 : 2
  - 1 : 3 : 2

36. If a solid sphere of radius 12 cm is moulded into 8 small spherical solid balls of equal radii, then the surface area of each ball is
- A.  $45\pi \text{ cm}^2$
  - B.  $108\pi \text{ cm}^2$
  - C.  $144\pi \text{ cm}^2$
  - D.  $124\pi \text{ cm}^2$

37. A shopkeeper marked 25% above the C.P. on an article and then gave a discount of 10% on that article. Find the profit percent of shopkeeper on that article.

A.  $15\frac{3}{4}\%$

B.  $8\frac{1}{3}\%$

C.  $9\frac{4}{5}\%$

D.  $12\frac{1}{2}\%$

38. A triangular park has sides 120 m, 80 m and 50 m. A gardener has to plant grass inside. How much area is available for plantation?

A.  $180\sqrt{5} \text{ m}^2$

B.  $375\sqrt{15} \text{ m}^2$

C.  $270\sqrt{5} \text{ m}^2$

D.  $225\sqrt{15} \text{ m}^2$

39. In a hostel of 300 students, there is sufficient food for 24 days. Some students left the hostel and now the food lasts for 36 days, then how many students have left the hostel?

A. 175

B. 150

C. 200

D. 100

40. The cost of a notebook is twice the cost of a pen. If the cost of a notebook is ₹  $x$  and that of a pen is ₹  $y$ , then a linear equation in two variables to represent the given condition is \_\_\_\_\_.

A.  $x + 2y = 0$

B.  $x - 2y = 0$

C.  $2x + y = 0$

D.  $2x - y = 0$

41.  $A$ ,  $B$  and  $C$  are three taps connected to a tank.  $A$  and  $B$  together fill the tank in 8 hours,  $B$  and  $C$  together fill it in 12 hours while  $A$  and  $C$  together fill the tank in 16 hours. In how much time  $A$ ,  $B$  and  $C$  together fill up the tank?

A.  $9\frac{14}{13}$  hours

B.  $9\frac{17}{13}$  hours

C.  $8\frac{17}{13}$  hours

D.  $7\frac{5}{13}$  hours

42. By walking at  $\frac{5}{7}$  of his usual speed, a man reaches his office 14 minutes late than usual time. Find the usual time taken by him.

A. 35 mins

B. 49 mins

C. 63 mins

D. 1 hr 12 mins

43. In a party, certain number of people were present. Each person contributed twice as many rupees as the total number of people. If the total contribution was ₹4418, then find the number of people present in the party.

A. 36

B. 38

C. 41

D. 47

44. 8 children and 12 men complete a certain piece of work in 9 days. If each child takes twice the time taken by a man to finish the work, in how many days will 12 men finish the same work?

A. 8 days

B. 15 days

C. 9 days

D. 12 days

45. A rectangular field has an area  $(14x^2 - 11x - 15) \text{ m}^2$ . What could be the possible expression for length and breadth of the field?

A.  $(3x - 2) \text{ m}$  and  $(5x + 8) \text{ m}$

B.  $(7x + 5) \text{ m}$  and  $(2x - 3) \text{ m}$

C. Both A and B

D. None of these

## ACHIEVERS SECTION

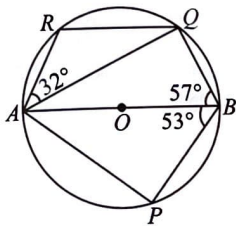
46. Read the following statements carefully and select the correct option.

**Statement-I:** The radius of a sphere is 10 cm. If the radius is increased by 5%, then the ratio of surface area of two spheres will be 40:41.

**Statement-II:** A right circular cone is 5.4 cm high and radius of its base is 3 cm. If it is melted and recast into another right circular cone with radius of base 1.5 cm, then the height of the new cone is 21 cm.

- A. Statement-I is true but Statement-II is false.  
 B. Statement-I is false but Statement-II is true.  
 C. Both Statement-I and Statement-II are true.  
 D. Both Statement-I and Statement-II are false.

47. In the given figure (not drawn to scale),  $AB$  is the diameter of the circle with centre  $O$ . If  $\angle ABQ = 57^\circ$ ,  $\angle QAR = 32^\circ$  and  $\angle ABP = 53^\circ$ , then find:



- (i) the value of  $\angle BQR$ .  
 (ii) the ratio of measure of  $\angle BPA$  to  $\angle BAQ$ .

	(i)		(ii)
A.	140°		12:7
B.	135°		24:13
C.	150°		8:5
D.	115°		30:11

48. Fill in the blanks and select the correct option.

- (i) If  $(5^2)^7 = (125)^x$ , then the value of  $x$  is P.

- (ii) If  $\sqrt{3} = 1.732$ , then the approx. value of  $\frac{\sqrt{3}-1}{\sqrt{3}+1}$  is Q.

- (iii) The value of  $0.\bar{7} + 0.4\bar{7}$  is R.

	(P)	(Q)	(R)
A.	7	0.732	7/90
B.	14/3	0.268	113/90
C.	4	0.414	43/90
D.	14/3	1.732	4/9

49. Solve the following questions and select the correct option.

- (i) If  $(x + 1)$  and  $(x - 1)$  are the factors of  $px^3 + x^2 - 2x + q$ , then find the value of  $(p + q)$ .

- (ii) If  $x^{\frac{1}{3}} + y^{\frac{1}{3}} + z^{\frac{1}{3}} = 0$ , then find the value of  $\frac{(x + y + z)^3}{xyz}$ .

	(i)	(ii)
A.	1	-36
B.	-7	64
C.	1	27
D.	4	-125

50. Study the following statements carefully and select the correct option.

P. For the linear equation  $\frac{3x}{2} - \frac{y}{3} = \frac{-11}{6}$ ,  $(-1, 1)$  is one of the solution.

Q. If  $x = 3, y = \frac{7}{2}$  is the solution of linear equation  $k - 3x - 2y = 0$ , then the value of  $k$  is 17.

R. The abscissa of all the points on the  $y$ -axis is 0.

- A. Only P is true  
 B. Both P and Q are true  
 C. Only Q is true  
 D. Both P and R are true

SPACE FOR ROUGH WORK