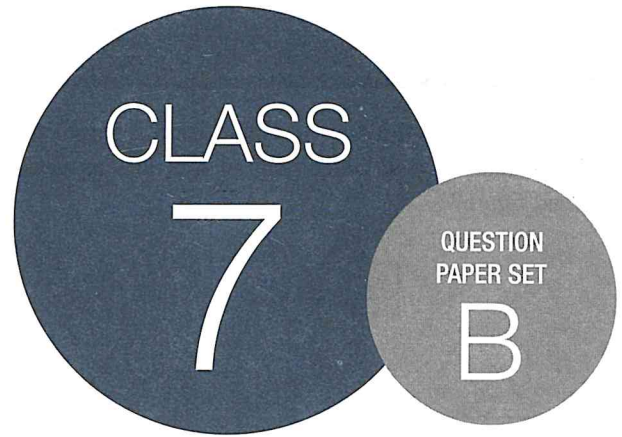


**SOF INTERNATIONAL
MATHEMATICS OLYMPIAD
2019-20**



DO NOT OPEN THIS BOOKLET UNTIL ASKED TO DO SO

Total Questions: 50 | Time: 1 hr.

Name:.....

Section:..... SOF Olympiad Roll No.:..... Contact No.:.....

Guidelines for the Candidate

1. You will get additional ten minutes to fill up information about yourself on the OMR Sheet, before the start of the exam.
2. Write your **Name, School Code, Class, Section, 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.
3. 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.

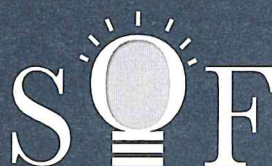
4. All questions are compulsory. There is no negative marking. Use of calculator is not permitted.
5. There is only ONE correct answer. Choose only ONE option for an answer.
6. To mark your choice of answers by darkening the circles on the OMR Sheet, use **HB Pencil** or **Blue / Black ball point pen** 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.

16. A B C D

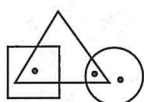
7. Rough work should be done in the blank space provided in the booklet.
8. Return the OMR Sheet to the invigilator at the end of the exam.
9. Please fill in your personal details in the space provided on this page before attempting the paper.



SCIENCE OLYMPIAD FOUNDATION
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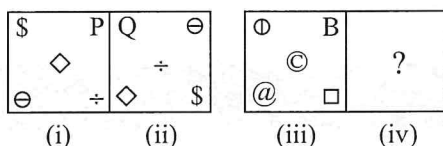
LOGICAL REASONING

1. Which of the following options does not satisfy the same conditions of placement of the dots as in the given figure?



- A. B. C. D.

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



- A.

@	⊙
□	
B	⊖

 B.

⊙	@
□	
⊖	C

 C.

C	@
□	
⊙	⊖

 D.

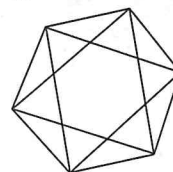
⊙	□
A	@
⊖	
3. Ashwini is in the South-West of Sushmita, Alka is to the East of Ashwini and South-East of Sushmita. Prerna is to the North of Alka in a line with Ashwini and Sushmita. In which direction Prerna is located with respect to Sushmita?
- A. North-West
B. South-West
C. South-East
D. North-East

4. Find the missing number, if a certain rule is followed either row-wise or column-wise.

2	4	0
1	3	4
3	2	3
36	?	49

- A. 85
B. 83
C. 59
D. 81

5. How many triangles are there in the given figure?



- A. 22
B. 27
C. 24
D. None of these

6. Select the odd one out.

- A. (25)
B. (24)
C. (49)
D. (64)

7. If the last ten characters of the given series are written in reverse order, then what will be the 6th character to the left of 13th character from the right end?

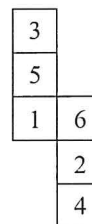
A 4 F # G U 2 M * Y P 9 S Q T 6 S B 5 D N H Z

- A. G
B. A
C. U
D. #

8. If 'P' stands for 'division', 'Q' stands for 'multiplication' and 'R' stands for 'subtraction', then find the value of 126 R 11 Q 56 P 14.

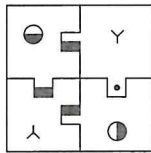
- A. 82
B. 138
C. 78
D. 52

9. Which of the following numbers lies on the face opposite to the face having number 5, when the given figure is folded to form a cube?



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

10. Which of the following is the correct water image of the given figure?

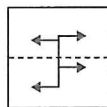


- A. B.
- C. D.

11. Priya is the mother of Vishal, who is the husband of Sonika. Nishant is the brother of Priya. Nikhil is the husband of Priya. How is Sonika related to Nikhil?

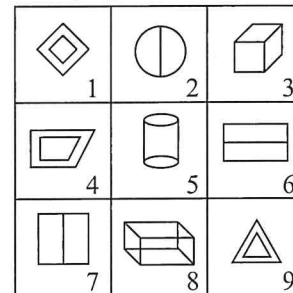
- A. Daughter-in-law
B. Daughter
C. Mother
D. Sister-in-law

12. A square transparent sheet with a pattern and a dotted line on it is given. Select a figure from the options as to how the pattern would appear when the transparent sheet is folded along the dotted line.



- A. B. C. D.

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

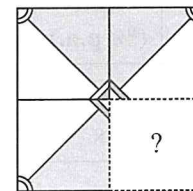


- A. 1, 4, 7; 2, 5, 8; 3, 6, 9
B. 1, 4, 9; 2, 6, 7; 3, 5, 8
C. 1, 3, 4; 2, 5, 8; 6, 7, 9
D. 1, 2, 3; 4, 5, 6; 7, 8, 9

14. If in a certain code language, SEARCH is written as IDSBFT, then how will VERBAL be written in that code language?

- A. MGBFCN
B. MBCSFW
C. WGBFCG
D. MCSBWF

15. Select a figure from the options which will complete the pattern in the given figure.



- A. B. C. D.

MATHEMATICAL REASONING

16. The value of $(-5) \times (-1) \times (-3) \times (-2) \times (-4) + 0 \times 6 \times 7 \times 8 \times 4 \times 5$ is _____.

- A. 120
B. -120
C. 240
D. 0

17. If $\frac{\left(-\frac{1}{2}\right)^6 \left(\frac{1}{4}\right)^{13}}{\left(-\frac{1}{2}\right)^4 \left(\frac{1}{4}\right)^{10}} = 2^x$, then find the value of x .

- A. 4
B. 0
C. 1
D. -4

18. If 184 is divided into two parts such that one-third of one part exceeds one-seventh of the other part by 8, then the greater part is _____.

- A. 72
B. 110
C. 112
D. 114

19. The product of two fractions is $\frac{11}{5}$. If one of the fractions is $\frac{3}{5}$, then find the sum of the two fractions.

- A. $4\frac{4}{15}$
 B. $\frac{16}{25}$
 C. $\frac{6}{25}$
 D. $3\frac{4}{15}$

20. How many faces and edges does the pentagonal pyramid have?

- A. 8, 12
 B. 8, 8
 C. 6, 10
 D. 5, 10

21. Find the value of $\frac{m}{n}$.

Principal (in ₹)	Rate (% p.a.)	Time (in years)	S.I. (in ₹)
2500	12	3	m
n	8	5	1255

- A. 70/251
 B. 62/351
 C. 72/251
 D. 60/351

22. Which of the following statements is incorrect?

- A. Every integer is a rational number.
 B. Reciprocal of zero is not defined.
 C. The product of two rational numbers is always a rational number.
 D. Every negative rational number is greater than zero.

23. Find the value of x .

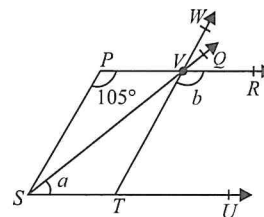
$$3889 + 12.952 - x = 3854.002$$

- A. 47.095
 B. 47.752
 C. 47.932
 D. 47.95

24. The mean of three numbers is 51. All the three numbers are different natural numbers. If two of them are 29 and 59, then find the third number.

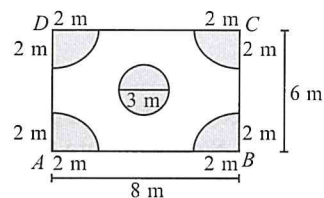
- A. 65
 B. 40
 C. 100
 D. 71

25. In the given figure (not drawn to scale), if $PR \parallel SU$, $\angle WVQ = 105^\circ$ and $PS \parallel VT$, then the sum of a and b is _____.



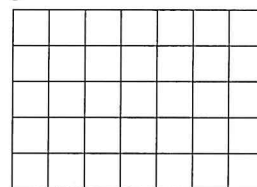
- A. 170°
 B. 150°
 C. 115°
 D. 180°

26. In the given figure (not drawn to scale) if $ABCD$ is a rectangle, then find the area of the unshaded region. (Take $\pi = 3.14$)



- A. 28.375 m^2
 B. 48.478 m^2
 C. 25.766 m^2
 D. 36.472 m^2

27. The given figure is divided into equal squares. How many squares should not be shaded to show 60% of the whole figure shaded?



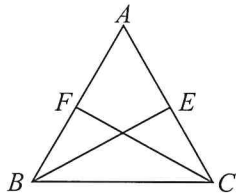
- A. 14
 B. 7
 C. 18
 D. 21

28. To fence a circular field, the total cost is ₹ 26400 at the rate of ₹ 50 per metre. Find the cost of ploughing the field at the rate of ₹ 10 per metre square.

- A. ₹ 221760
 B. ₹ 154740
 C. ₹ 212706
 D. ₹ 202500

29. Two numbers are in the ratio 3 : 5. If each number is increased by 10, then the ratio becomes 5 : 7. The numbers are _____.
- A. 3, 5
 B. 7, 9
 C. 13, 22
 D. 15, 25

30. In the given figure, ABC is an isosceles triangle in which $AB = AC$. If E and F are the midpoints of AC and AB respectively, then which of the following is correct?



- I. $BE = CF$
 II. $\triangle BCF \cong \triangle CBE$
 III. $\angle EBC = \angle FCB$
- A. Only I and III
 B. Only II and III
 C. Only II
 D. I, II and III
31. The sum of number of lines of symmetry and the order of rotational symmetry of the given figure is _____.



- A. 2
 B. 1
 C. 0
 D. 3
32. Subtract the sum of $(9x - 4y + 6z^2)$ and $(-5x - 4y - z^2)$ from the sum of $(6z + 9y - 2z^2)$ and $(-x - y - z^2)$.
- A. $5x - 16y - 8z + 6z^2$
 B. $4x + 14z^2 - 9y + 7z$
 C. $-5x + 16y + 6z - 8z^2$
 D. $5x - 14y + 8z - 16z^2$

33. If 6 is added to five times of a number, then it becomes the same as 9 is subtracted from eight times of the same number. Which of the following equations would you use to find the number?
- A. $6x + 5 = 8x + 9$
 B. $5x + 6 = 8x - 9$
 C. $6 + 5x = 9 - 8x$
 D. $6x + 5 = 8x - 9$

34. The given table shows the production of three different types of cars over the years. Study it carefully and answer the following question.

Years	Production of Car P	Production of Car Q	Production of Car R
2001	76	59	28
2002	82	62	36
2003	65	47	42
2004	70	54	31
2005	85	57	49
2006	80	68	38

The average production of which of the following types of cars was maximum?

- A. Q
 B. P
 C. R
 D. Can't be determined
35. Which of the following steps is incorrect while constructing a $\triangle XYZ$, given that $XY = 8$ cm, $YZ = 9$ cm and $XZ = 10$ cm?
- Step 1 :** Draw a line segment YZ of length 9 cm.
Step 2 : With Y as centre, draw an arc of radius 8 cm.
Step 3 : With Z as centre, draw an arc of radius 9 cm.
Step 4 : Mark the point of intersection of arcs as X . Join XY and XZ .
- A. Only Step 1
 B. Only Step 3
 C. Both Step 2 and Step 3
 D. Both Step 3 and Step 4

EVERYDAY MATHEMATICS

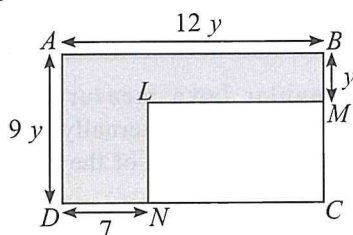
36. Ram's father's age is 3 years more than two times of Ram's age. Ram's father is 45 years old. Form an equation to find Ram's age.
- A. $2x + 3 = 45$
 B. $3x + 2 = 45$
 C. $6x + 3 = 45$
 D. $5x + 1 = 45$

37. A rectangular lawn measuring 44 m by 32 m is to be surrounded externally by a path which is 4 m wide. Find the area of the path.
- A. 248 m^2
 B. 246 m^2
 C. 1088 m^2
 D. 672 m^2

38. There are some flowers in a garden and some butterflies are hovering around. If one butterfly lands on each flower, then one will be left. If two butterflies land on each flower, then one flower will be left. Find the number of flowers and butterflies respectively.
- A. 3, 4
B. 4, 3
C. 2, 3
D. 3, 2
-
39. If 65% of the people in a meeting are males and the number of females are 504, then the number of males is _____.
- A. 1176
B. 1408
C. 1440
D. 936
-
40. Two jackets were bought at the same cost. One was sold at a profit of 9% and the other at a profit of 15%. If the difference in the selling price of both the jackets was ₹ 105, then what was the cost price of each jacket?
- A. ₹ 1155
B. ₹ 1750
C. ₹ 1050
D. ₹ 950
-
41. After travelling 27 km, Karan found that $\frac{3}{5}$ of his journey was still left. Find the distance of his whole journey.
- A. 135 km
B. 60.5 km
C. 155 km
D. 67.5 km
-
42. Priyanka has 8 red hair clips and 12 green hair clips. She chooses a hair clip randomly. Find the probability that the chosen hair clip is of green colour.
- A. $\frac{5}{3}$
B. $\frac{7}{12}$
C. $\frac{1}{6}$
D. $\frac{3}{5}$
-
43. A tower is broken at a height of 12 m from the floor and its top touches the floor at a distance of 5 m from the base of the tower. Find the actual height of the tower.
- A. 20 m
B. 36 m
C. 18 m
D. 25 m
-
44. A submarine is 397 feet below sea level. A helicopter is directly above the submarine. The helicopter is 1964 feet above sea level. What is the distance between the helicopter and submarine?
- A. 2361 feet
B. 983 feet
C. 1570 feet
D. 1567 feet
-
45. Simran has a certain sum deposited in a bank at 5% per annum. Rajat also have the same sum deposited in the same bank at 9% per annum. The difference between the annual interest received by both of them is ₹ 220. Find the sum.
- A. ₹ 4500
B. ₹ 5500
C. ₹ 6792
D. ₹ 10000

ACHIEVERS SECTION

46. In the given figure (not drawn to scale), $ABCD$ and $LMCN$ are rectangles. The dimensions shown in the figure are in metres. If the perimeter of the rectangle $LMCN$ is 66 m, then find the area of the shaded region.



- A. 124 m^2
B. 432 m^2

- C. 160 m^2
D. 284 m^2

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

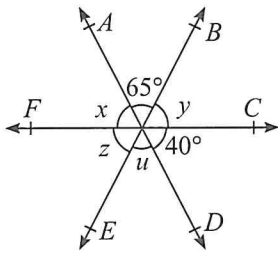
Statement-1 : The perimeter of a triangle whose sides are $2p^2 + 3p + 1$, $p^2 + 7$ and $3p^2 - 2p + 3$ is $6p^2 - p + 11$.

Statement-2 : The value of the expression $x^5 - y^4 + y^3 - x^2 + 1$, when $x = 2$ and $y = 1$ is 29.

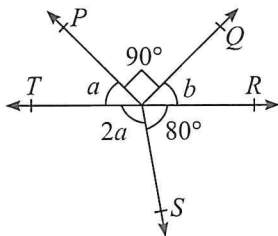
- A. Statement-1 is true but Statement-2 is false.
B. Statement-1 is false but Statement-2 is true.
C. Both Statement-1 and Statement-2 are true.
D. Both Statement-1 and Statement-2 are false.

48. Answer the following questions.

(i) Find the value of $z - x$.



(ii) Find the value of $a + 2b$.



- | (i) | (ii) |
|---------------|-------------|
| A. 35° | 145° |
| B. 35° | 130° |
| C. 30° | 145° |
| D. 30° | 130° |

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

(i) The difference between the lengths of any two sides of a triangle is _____ than the length of the third side.

(ii) If the three angles of a triangle are in the ratio $1 : 5 : 4$, then the measure of the greatest angle is _____.

(iii) In an equilateral triangle, all angles are _____.

(iv) In a right angled triangle, the side opposite to the right angle is called _____.

- | | (i) | (ii) | (iii) | (iv) |
|----|---------|------------|--------|---------------|
| A. | Smaller | 72° | obtuse | perpendicular |
| B. | Greater | 72° | right | base |
| C. | Greater | 90° | acute | hypotenuse |
| D. | Smaller | 90° | acute | hypotenuse |

50. Match the following and select the correct option.

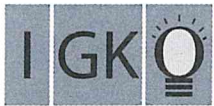
- | | Column-A | Column-B | |
|-------|---|----------|---|
| (i) | If $\frac{\left(\frac{8}{9}\right)^2 \times (3)^7 \times \left(\frac{1}{2}\right)^3}{(27)^2 \times 64} = \frac{1}{6^x}$,
then $x =$ | P. 5 | |
| (ii) | If $\frac{(4^3)^2 \times (2 \times 5)^2 \times 2^3}{(2^2)^3 \times (5 \times 4)^2} = 2^{x+2}$,
then $x =$ | Q. 6 | |
| (iii) | If $6^{2x} \times 36^2 = 6^{16}$, then $x =$ | R. 3 | |
| | (i) (ii) (iii) | | |
| A. | P | Q | R |
| B. | Q | P | R |
| C. | R | Q | P |
| D. | R | P | Q |

SPACE FOR ROUGH WORK

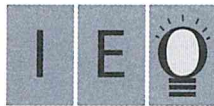
SPACE FOR ROUGH WORK



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