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**SOF INTERNATIONAL
MATHEMATICS OLYMPIAD
2024-25**

**CLASS 9
SET-B**

Total Questions : 50 | Time : 1 hr.

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. Navya purchased a hand bag for ₹ 345.50, a pair of shoes for ₹ 480.25 and a cap for ₹ 75.50. How much money did she spend in all?
A. ₹ 901.25 B. ₹ 785.50 C. ₹ 895.75 D. ₹ 920.25
As the correct answer is option A, you must darken the circle corresponding to option A on the OMR Sheet.
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 before attempting the paper.

16. ● (A) (B) (C) (D)

Name:.....

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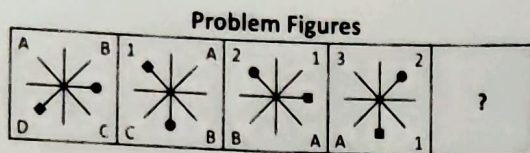
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LOGICAL REASONING

1. Select a figure from the options which will continue the same series as established by the Problem Figures.



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

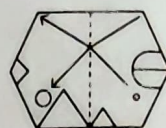
2. How many such pairs of letters are there in the word **ATMOSPHERE** each of which has the same number of letters between them as in the English alphabets?

- A. One
B. Two
C. Three
D. More than three

3. A man starts to walk from point A. He walks 100 m towards South and then turns left and walks 60 m. He then turns left again and walks 40 m. He then turns left and walks 30 m and finally turns right and walks 10 m to reach point B. Which of the following options is incorrect?

- A. Point A is in North-West direction with respect to point B.
B. The man is now $34\sqrt{10}$ m far from the starting point.
C. Point B is in South-East direction with respect to point A.
D. The man is now $10\sqrt{34}$ m far from the starting point.

4. A 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.

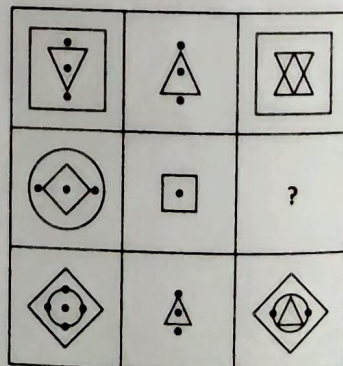


- A.
- B.
- C.
- D.

5. Which of the following Venn diagrams best represents the relationship amongst, "Women, Scientists and Educated people"?

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

6. Select a figure from the options which will complete the given figure matrix.





- | | | | | | | | | | | |
|--------|---|---|---|---|---|---|----|---|---|---|
| Digits | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Codes | M | * | # | @ | > | T | \$ | % | K | < |

Conditions :

- (i) If the first digit as well as the last digit is even, then both are to be coded as Q.
- (ii) If the exact middle digit is 0, then it is to be coded as α .
- (iii) If the second and the second last digits are prime numbers, then their codes are to be interchanged.
- (iv) If the first digit is odd and the last digit is even, then both are to be coded as β .

A. $\$T > \alpha \% \# <$
 B. $Q\# > \alpha \% TQ$
 C. $\$ \# > \alpha \% T <$
 D. $\beta T > \alpha \% * \beta$

- S 7 @ G % 4 T Q # 9 + 6 \$ S 8 * B K ÷ 2 E 5 > F

- A. Q
B. T
C. E
D. 9

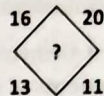
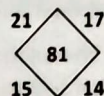
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- PU7NJ3A6B

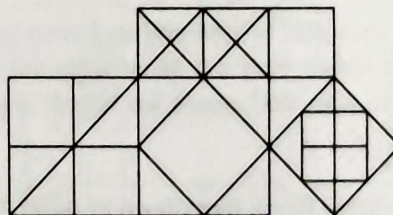
- A. $PU7NJ3A6B$
B. $PU7N13A6B$
C. $PU7N13A6B$
D. $PU7N13U6B$

- 14 18
121
9 12



- A. 169
B. 131
C. 144
D. 125

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



- A. 15
B. 16
C. 17
D. More than 17

- A. U7C
B. T5D
C. X3H
D. P5I

14. A word and number arrangement machine when given an input line of words and numbers rearranges them following a particular rule in each step. The following is an illustration of an input and steps of rearrangement.

Input : mind 42 peace 78 find 84

Step I : find mind 42 peace 78 84

Step II : find 84 mind 42 peace 78

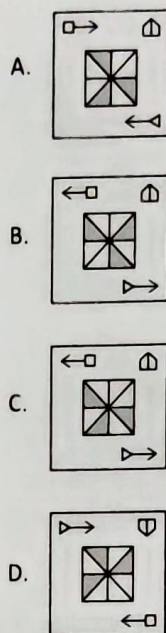
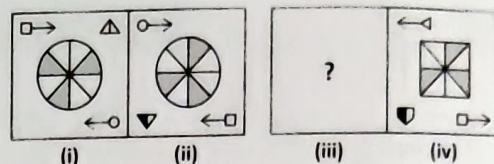
Step III : find 84 mind 78 42 peace

Step IV : find 84 mind 78 peace 42

And step IV is the last step for the above input. As per the rule followed in the above steps, which of the following is the third step for the input given below?

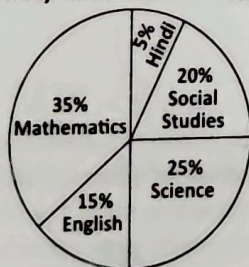
Input : wind 58 cold 31 fog 64

- A. cold 64 fog wind 58 31
B. cold 64 wind 58 31 fog
C. cold 64 fog wind 31 58
D. cold 64 fog 58 wind 31
15. There is a definite relationship between the 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 figure (iii).

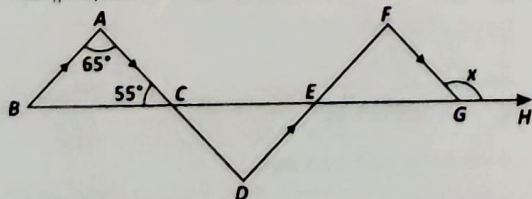


MATHEMATICAL REASONING

16. The given pie chart shows the subjects liked by some students of a school. If 140 students like Mathematics, then how many students like English?

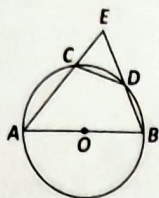


- A. 60
B. 80
C. 50
D. 65
17. In the given figure (not drawn to scale), if $BA \parallel DF$, $AD \parallel FG$, $\angle BAC = 65^\circ$ and $\angle ACB = 55^\circ$, then find $\angle FGH$.



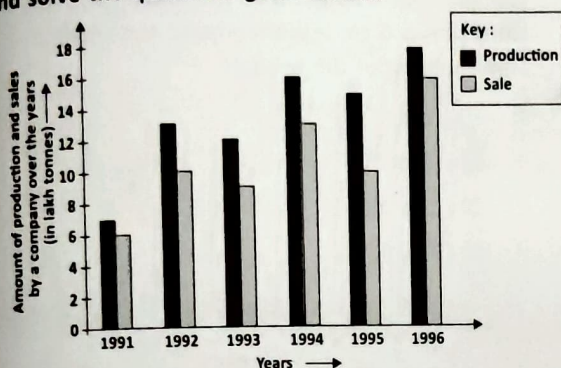
18. If $x = \frac{\sqrt{p+2q} + \sqrt{p-2q}}{\sqrt{p+2q} - \sqrt{p-2q}} + \frac{\sqrt{p+2q} - \sqrt{p-2q}}{\sqrt{p+2q} + \sqrt{p-2q}}$, then $x^3 - qx^2 + p^2q^2x + 1$ is _____.
- A. $(p^3 - p^2q^2 + p^3q^4 + q^3)/q^3$
B. 0
C. $(p^3 - q^3)/q^2$
D. $1/q^3$
19. Simple interest on a certain sum at a certain annual rate of interest is $\frac{1}{9}$ of the sum. If the numbers representing rate percent and time in years be equal, then the rate of interest is _____.
- A. $3\frac{1}{3}\%$
B. 5%
C. $6\frac{2}{3}\%$
D. 10%
20. If the coordinates of two points A and B are (10, 5) and (-7, -4) respectively, then the value of (abscissa of A) - (ordinate of B) is _____.
- A. 14
B. -14
C. -10
D. 17

21. In the given figure (not drawn to scale), AB is the diameter of the circle. CD is a chord equal to the radius of the circle. AC and BD when extended intersect at a point E . Find $\angle AEB$.



- A. 90°
B. 30°
C. 45°
D. 60°

DIRECTIONS (22-23) : Read the given bar graph carefully and solve the questions given below.

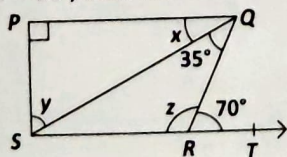


22. Total sales in 1991 and 1992 together is approximately what percentage of the sales in 1994?
- A. 140%
B. 100%
C. 123%
D. 200%
23. In which year, the difference between the production and the sales was maximum?
- A. 1992
B. 1993
C. 1995
D. 1996

24. Find the values of p and q for which $x = 1$, $y = 1$ are solutions of the equations, $9px + 12py = 63$ and $5x + 2qy = 3q$.

- A. $p = 3$, $q = 5$
B. $p = 5$, $q = 3$
C. $p = 5$, $q = 9$
D. None of these

25. In the given figure, if $PQ \perp PS$, $PQ \parallel SR$, $\angle SQR = 35^\circ$ and $\angle QRT = 70^\circ$, then find the value of $x + y + z$.



- A. 37°
B. 28°
C. 65°
D. 200°

26. The value of x , if $5^{2x-1} = 25^{x-1} + 100$ is _____.

- A. 8
B. 5
C. 2
D. 0

27. Two dice are rolled simultaneously. The probability of getting a sum greater than 9 is _____.

- A. $\frac{11}{10}$
B. $\frac{5}{6}$
C. $\frac{1}{6}$
D. $\frac{8}{9}$

28. Which of the following options is correct?

- A. Number of sides of a regular polygon

$$= \frac{360^\circ}{180^\circ - \text{each interior angle}}$$
- B. Measure of each interior angle of a regular polygon of n sides

$$= \frac{n \times 180^\circ}{n - 2}$$
- C. Measure of each interior angle of a regular polygon of n sides

$$= \frac{(n - 2) \times 90^\circ}{n}$$
- D. Number of sides of a regular polygon

$$= \frac{180^\circ}{360^\circ - 2(\text{each interior angle})}$$

29. The curved surface area of one cone is twice that of the other while the slant height of the later is twice that of the former. The ratio of their radii is

- A. 2 : 1
B. 4 : 1
C. 8 : 1
D. 1 : 1

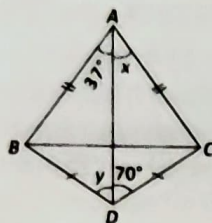
30. Which of the following options is incorrect?

- A. If $\frac{2x+1}{3x+5} = \frac{11}{20}$, then $x = 5$.
- B. If $\frac{3}{x-1} - \frac{2}{x-2} = \frac{1}{x-3}$, then $x = 5/2$.
- C. If $2(x+3) + 3(x+1) = 4(2x-3) + 3$, then $x = 6$.
- D. None of these

31. Which of the following is the Euclid's third postulate?

- A. A circle can be drawn with any centre and any radius.
- B. A terminated line can be produced indefinitely.
- C. The whole is greater than the part.
- D. All right angles are equal to one other.

32. Observe the given figure and select the correct option.



- A. $x = 70^\circ$, $y = 37^\circ$
- B. $x = 37^\circ$, $y = 70^\circ$
- C. $x + y = 117^\circ$
- D. $x - y = 100^\circ$

33. The denominator of a rational number is greater than its numerator by 3. If 3 is subtracted from the numerator and 2 is added to its denominator, then the new number becomes $1/5$. The original rational number is _____.

- A. $\frac{5}{8}$
- B. $\frac{7}{8}$
- C. $\frac{3}{8}$
- D. None of these

34. $\sqrt[3]{333} + \sqrt[3]{987} + \sqrt[3]{2197}$ is equal to

- A. 21
- B. 18
- C. 7
- D. 3

35. The perimeter of a triangle is 50 cm. One side of a triangle is 4 cm longer than the smaller side and the third side is 6 cm less than twice the smaller side. Find the area of the triangle.

- A. $20\sqrt{30} \text{ cm}^2$
- B. $12\sqrt{15} \text{ cm}^2$
- C. $20\sqrt{15} \text{ cm}^2$
- D. $12\sqrt{30} \text{ cm}^2$

EVERYDAY MATHEMATICS

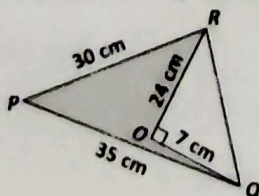
36. A dress costs ₹ 90 which is paid by means of ₹ 20 notes and ₹ 5 notes. 6 notes are used in all. If x is the number of ₹ 20 notes and y is the number of ₹ 5 notes, then

- A. $x - y = 6$, $4x + y = 18$
- B. $x + y = 6$, $x + 4y = 16$
- C. $x - y = 6$, $x + 4y = 16$
- D. $x + y = 6$, $4x + y = 18$

37. Sahil sold a television and a washing machine for ₹12,500 each. If the television was sold at a gain of 30% and the washing machine at a loss of 30%, then the entire transaction resulted in _____.

- A. 6% gain
- B. 8% loss
- C. 11% gain
- D. None of these

38. Anand has a triangular plot PQR as shown in the figure. He sown some flowers in the shaded area. Find the area of shaded region.



- A. $(150\sqrt{6} - 84) \text{ cm}^2$
- B. $(250\sqrt{11} - 84) \text{ cm}^2$
- C. $(200\sqrt{6} - 84) \text{ cm}^2$
- D. $(400\sqrt{11} - 84) \text{ cm}^2$

39. A cistern has two inlets A and B which can fill it in 12 minutes and 15 minutes respectively. An outlet C can empty the full cistern in 10 minutes. If all the three pipes are opened together in the empty cistern, then the time taken to fill the cistern completely is _____.

- A. 20 minutes
- B. 10 minutes
- C. 15 minutes
- D. 5 minutes

40. A and B started a business jointly. A's investment was thrice the investment of B and period of this investment was twice the period of investment of B. If B gets ₹ 9000 as profit, then what will be the 25% of total profit?

- A. ₹ 1575
- B. ₹ 2250
- C. ₹ 63000
- D. ₹ 15750

41. A shopkeeper sells a transistor at 15% above its C.P. If he had bought it 5% more than what he paid for it and sold it for ₹ 6 more he would have gained 10%, the C.P. of the transistor is

A. ₹ 1200
B. ₹ 1400
C. ₹ 1000
D. ₹ 800

42. A hemispherical dome of a building needs to be painted from outside. If the circumference of the base of the dome is 17.6 m, then find the cost of painting it at the rate of ₹ 8 per 100 cm².

A. ₹ 35680
B. ₹ 28650
C. ₹ 39424
D. None of these

43. 6 men and 8 boys can do a piece of work in 10 days while 26 men and 48 boys can do it only in 2 days, then what is the time taken by 15 men and 20 boys in doing the same type of work?

A. 4 days
B. 5 days
C. 6 days
D. 7 days

44. Area of a rectangular field is $(2x^3 - 11x^2 - 4x + 5)$ sq. units and side of a square field is $(2x^2 + 4)$ units. Find the difference between their areas (in sq. units).

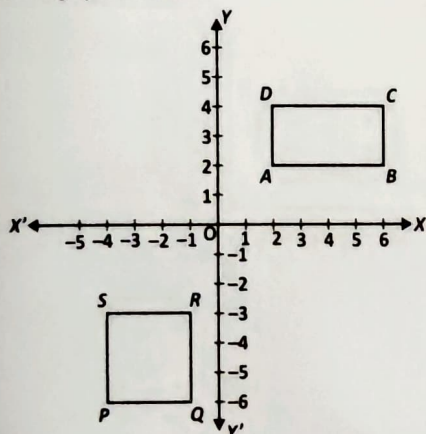
A. $4x^4 - 2x^3 - 27x^2 - 4x + 11$
B. $4x^4 - 2x^3 + 27x^2 + 4x + 11$
C. $4x^4 + 27x^2 + 4x - 11$
D. $4x^4 + 2x^3 + 27x^2 + 4x + 11$

45. The population of a town currently is 7500. It increased by 10% in first survey, in second survey (next year) it decreased by 20% because of some reason. In the third survey of next year it increased by 15%, what will be the population at the end of third survey?

A. 7560
B. 7495
C. 7535
D. 7590

ACHIEVERS SECTION

46. Study the given graph carefully and answer the following questions.



- (i) The coordinates of S and C are _____ and _____ respectively.

- (ii) Find the difference between the area of square PQRS and rectangle ABCD.

(i)	(ii)
A. (6, 4), (-4, 3)	1 sq. unit
B. (4, 6), (3, 4)	2 sq. units
C. (-4, -6), (3, -4)	3 sq. units
D. (-4, -3), (6, 4)	1 sq. unit

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

Statement-I : If D, E and F are, respectively the mid-points of sides BC, CA and AB of an equilateral triangle ABC, then DEF is also an equilateral triangle.

Statement-II : If the diagonals of a quadrilateral ABCD are perpendicular, then the quadrilateral formed by joining the mid-points of its sides is a rectangle.

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

48. Match the following and select the correct option.

Column-I	Column-II
P. If $x = 2 - \sqrt{3}$, then the value of $x^2 + \frac{1}{x^2}$ is	(i) 4
Q. If $x = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$ and $y = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$, then the value of $x + y$ is	(ii) 3
R. If $x = 9 + 4\sqrt{5}$, then the value of $\sqrt{x} - \frac{1}{\sqrt{x}}$ is	(iii) 10
S. If $\frac{30}{4\sqrt{3} + 3\sqrt{2}} = 4\sqrt{3} - a\sqrt{2}$, then the value of a is	(iv) 14
A. $P \rightarrow$ (iii), $Q \rightarrow$ (iv), $R \rightarrow$ (i), $S \rightarrow$ (ii)	
B. $P \rightarrow$ (iv), $Q \rightarrow$ (i), $R \rightarrow$ (iii), $S \rightarrow$ (ii)	
C. $P \rightarrow$ (i), $Q \rightarrow$ (ii), $R \rightarrow$ (iv), $S \rightarrow$ (iii)	
D. $P \rightarrow$ (iv), $Q \rightarrow$ (iii), $R \rightarrow$ (i), $S \rightarrow$ (ii)	

49. The given question is followed by some information given in (I, II, III) three statements. Study the question along with the statements and decide the information given in which of the statements is/are necessary to answer the question.

A solid metallic cone is melted and recast into a sphere. What is the radius of the sphere?

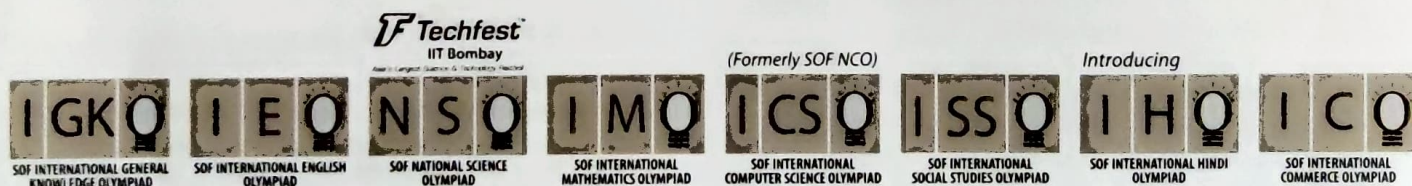
- I. The radius of the base of the cone is 2.1 cm.
 II. The height of the cone is four times the radius of its base.
 III. The height of the cone is 8.4 cm.
 A. Only I and II
 B. Only II and III
 C. Only I and III
 D. Any two of three

50. Study the following statements carefully. State T for true and F for false.

- (p) If the sides of a triangular field measure 51 m, 37 m and 20 m, then the cost of levelling it at ₹ 5 per m^2 is ₹ 1530.
 (q) The lengths of the sides of a triangle are 5 cm, 12 cm and 13 cm. The length of perpendicular from the opposite vertex to the side whose length is 13 cm is $\frac{60}{17}$ cm.
 (r) If an advertisement board is in the form of an isosceles triangle with its sides equal to 12 m, 10 m and 10 m, then the cost of painting it at ₹ 2.25 per m^2 is ₹ 98.

	(p)	(q)	(r)
A.	T	T	F
B.	T	F	F
C.	F	T	F
D.	F	F	T

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