IMO

SOF INTERNATIONAL MATHEMATICS OLYMPIAD 2023-24

CLASS 8

QUESTION PAPER SET A
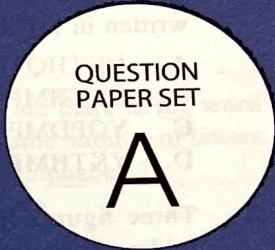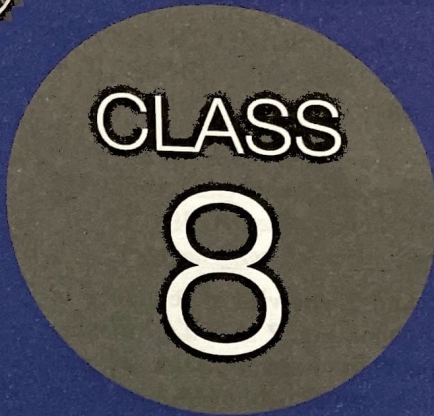
DO NOT OPEN THIS BOOKLET UNTIL ASKED TO DO SO

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: 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. ● Ⓑ Ⓒ Ⓓ

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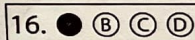
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SOF Olympiad Roll No.:... Contact No.:...

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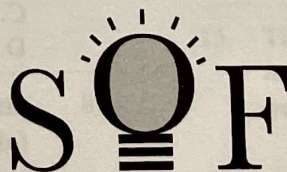
SCIENCE OLYMPIAD FOUNDATION

Inspiring Young Minds Through Knowledge Olympiads

1. In a certain code language, 'SUBJECTS' is written as 'UWDLCARQ', then how will 'AIRFORCE' be written in that language?

   A. CKTHQTEG
   B. CKTHMPAC
   C. YGPDMPAC
   D. YKTHMPAC

2. Three figures X, Y and Z showing a sequence of folding of a piece of paper. Fig. Z shows the manner in which the folded paper has been cut. Select a figure from the options which represents the unfolded form of Fig. Z.

X   Y   Z
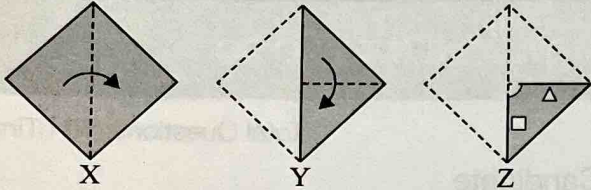
A.

B.

C.

D.

3. Which of the following Venn diagrams best represents the relationship amongst, "Fathers, Doctors and Mothers"?

A.

B.

C.

D.
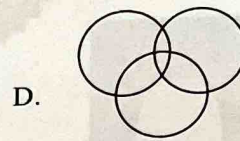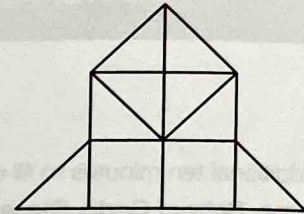
4. Which of the following options will continue the given series?

   K7J, N14I, Q21H, T28G

   A. W35F
   B. U35D
   C. W34E
   D. U35F

5. Find the minimum number of straight lines required to draw the given figure.
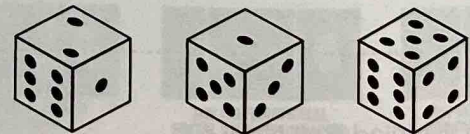

   A. 10
   B. 11
   C. 12
   D. More than 12

6. If the digits in the number 745293 are arranged in ascending order, then what will be the difference between the second digit from the right end and third digit from the left end in the new arrangement?

   A. 3
   B. 4
   C. 2
   D. 1

7. Three positions of a dice are given below. How many dots are there on the face opposite to the face having two dots?
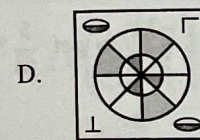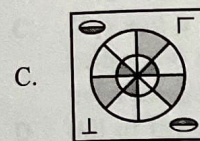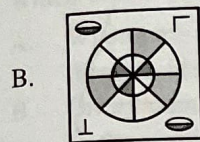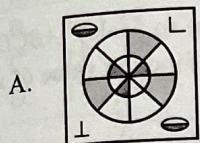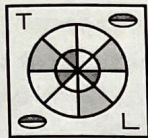

   A. 3
   B. 5
   C. 4
   D. 1

8. Study the given information carefully and answer the following question.

   'A * B' means 'A is the father of B'.
   'A + B' means 'A is the sister of B'.
   'A – B' means 'A is the brother of B'.
   'A ÷ B' means 'A is the mother of B'.

How is M related to N in 'M + J * L – N'?

A. Mother
B. Aunt
C. Grandmother
D. Sister

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

A.

B.

C.

D.

10. Vikram left his home and walked 25 m towards East. He then turns right and walks 40 m and again after turning right he walks 8 m. Finally, he turns right and walks 8 m to reach his school.

In which direction is he now with respect to his home?

A. South
B. North-West
C. East
D. South-East

11. Select a figure from the options which is exactly embedded in the given figure as one of its parts.

A.

B.

C.

D.
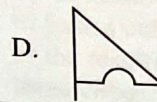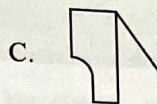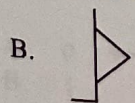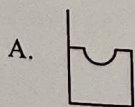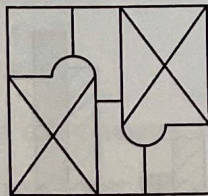
12. How many such pairs of letters are there in the word ORIGINAL each of which has same number of letters between them as in the English alphabets?

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

13. Which of the following interchange of signs would make the given equation true?

$$18 + 12 \times 2 \div 5 – 20 = 28$$

A. + and ÷
B. ÷ and ×
C. + and –
D. ÷ and –

14. 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.
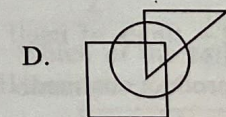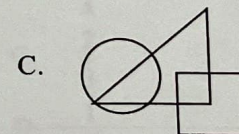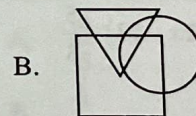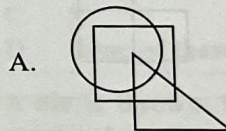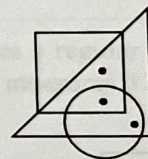
15. There is a certain relationship between the pair of numbers on the either side of ::. Identify the relationship between the given pair and find the missing number.

$$16 : 51 :: 18 : ?$$

A. 57
B. 54
C. 61
D. 60

16. If 40% of $1640 + X = 35\%$ of $980 + 150\%$ of 850, then the value of X is ___.

    A. 715
    B. 962
    C. 844
    D. 648

17. Factorisation of $25(x + y)^2 - 36(x - 2y)^2$ is

    A. $(11x - 7y)(17y - x)$
    B. $(11x + 7y)(17y + x)$
    C. $(11x - 7y)(11x - 7y)$
    D. $(17y - x)(17y - x)$

18. Which of the following is the top view of the given figure?

    A.
    B.
    C.
    D.
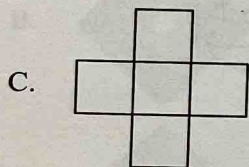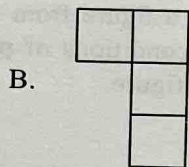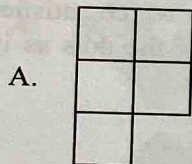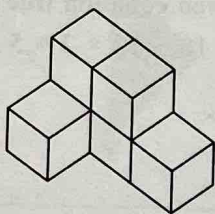
19. Solve for x :
$$x - \left(3x - \frac{2x - 5}{10}\right) = \frac{1}{6}(2x - 57) - \frac{5}{3}$$

    A. 19
    B. $\dfrac{7}{3}$
    C. -10
    D. 5

20. A number is multiplied by $2\dfrac{1}{3}$ times of itself and then 61 is subtracted from the product obtained. If the final result is 9200, then the number is ___.

    A. 36
    B. 63
    C. 67
    D. 37

21. At what rate of simple interest per annum, does the interest on ₹ 1200 in 2 years equals the interest on ₹ 600 in 4 years at $\dfrac{7}{2}\%$ per annum?

    A. $\dfrac{7}{2}\%$
    B. $\dfrac{3}{5}\%$
    C. $\dfrac{7}{8}\%$
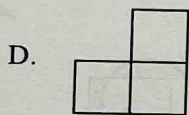   D. None of these

22. In the given figure (not drawn to scale), ABCD and EFGH are two parallelograms. Find the value of $x + y$.
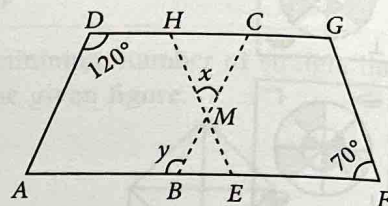
    A. $120°$
    B. $50°$
    C. $170°$
    D. $180°$

23. What should be added to $\dfrac{-3}{-8} - \left(\dfrac{-2}{7}\right)$ to get $\dfrac{5}{14}$?

    A. $\dfrac{37}{56}$
    B. $\dfrac{-27}{14}$
    C. $\dfrac{-37}{56}$
    D. $\dfrac{-17}{56}$

Direction (24-25) : The given double bar graph shows the marks obtained by Ashima in Mathematics and Science from Test I to Test IV in Class VIII. Study the given graph carefully and answer the following questions.
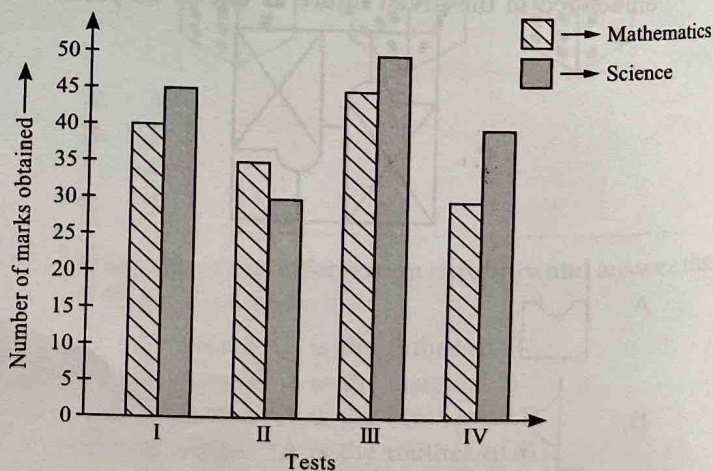
24. In which of the following tests did Ashima score the highest marks in total in both the subjects?

A. Test II
B. Test III
C. Test I
D. Test IV

25. Find the ratio of marks scored by Ashima in Mathematics in Test I and Test III together to the marks scored in Science in Test II and Test IV together.

A. 14 : 15
B. 15 : 14
C. 15 : 17
D. 17 : 14

26. Which of the following options is correct?

A. When two integers are added in any order, then the sum always remains the same.
B. On a number line, the value of (−71 + 52) lies to the right of (71 − 52).
C. If p and q are positive integers such that p is prime and q is composite, then pq cannot be an even integer.
D. All of these

27. If $x = \left(\dfrac{3}{2}\right)^{2} \times \left(\dfrac{2}{3}\right)^{-4}$, then find the value of x^{-2}.

A. $\left(\dfrac{4}{3}\right)^{12}$

B. $\left(\dfrac{2}{3}\right)^{12}$

C. $\left(\dfrac{3}{2}\right)^{12}$

D. $\left(\dfrac{3}{4}\right)^{12}$

28. How much is $x^3 + 3x^2y - 3xy^2 - y^3$ less than $4x^3 - 2x^2y + 5xy^2 - y^3$?

A. $3x^3 + 6x^2y - 8xy^2$
B. $-3x^3 - 5x^2y + 8x^2y^2$
C. $3x^3 - 8x^2y + 5xy^2$
D. $3x^3 - 5x^2y + 8xy^2$

29. How many line(s) of symmetry is/are there in the given figure?
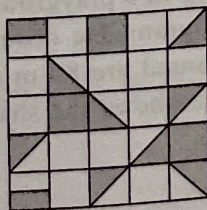
A. 0
B. 1

C. 2
D. 3

30. Three cubes of sides 4 cm each are joined end to end to form a cuboid. What is the ratio of the surface area of the resulting cuboid to the total surface area of the three cubes?

A. 7 : 9
B. 7 : 8
C. 9 : 7
D. 8 : 7

31. If $m = \sqrt[3]{140 \times 2450}$ and $n = \sqrt[3]{-216}$, then $\sqrt[3]{m+n} = $ _____.

A. 6
B. 8
C. 4
D. 64

32. If ₹ 1600 becomes ₹ 2000 in 2 years at a certain rate (p.a.) of compound interest, then what will be the sum after 4 years?

A. ₹ 3600
B. ₹ 2000
C. ₹ 3500
D. ₹ 2500

33. How many sides does a regular polygon has, if each of its interior angle measures 120°?

A. 6
B. 7
C. 5
D. None of these

34. A die is thrown. Find the probability of getting a number less than or equal to 4.

A. $\dfrac{4}{5}$

B. $\dfrac{1}{3}$

C. $\dfrac{2}{3}$

D. $\dfrac{1}{2}$

35. Which of the following option shows x and y vary directly?

A.
x	4	2	1
y	25	50	100

B.
x	5	20	15
y	12	3	4

C.
x	7	21	42
y	28	84	168

D. Both A and B

ROUGH WORK

36. A man buys a plot of agricultural land for ₹ 300000. He sells one-third at a loss of 20% and two-fifths at a gain of 25%. At what price must he sell the remaining land so as to make an overall profit of 10%?

  A. ₹ 120000
  B. ₹ 100000
  C. ₹ 75000
  D. ₹ 95000

37. The size of a red blood cell is 0.000007 m and the size of a plant cell is 0.00001275 m. Find the ratio of the size of red blood cell to that of plant cell.

  A. 13 : 56
  B. 28 : 51
  C. 31 : 39
  D. 22 : 31

38. A sum of ₹ 3000 is partly lent at 3% per annum simple interest for $\frac{7}{2}$ years and partly at 2% per annum simple interest for 4 years. If total interest earned is ₹ 280, then the sum lent at 3% per annum is _____.

  A. ₹ 1600
  B. ₹ 1400
  C. ₹ 1800
  D. ₹ 2000

39. A train T travelling at a speed of 54 kmph passes an electric pole in 20 s. Find the time taken by it to cross a bridge of length 900 m (in seconds).

  A. 70
  B. 50
  C. 40
  D. None of these

40. A, B and C can do a piece of work in 12, 18 and 9 days, respectively. A started the work and worked for 4 days. Then B alone worked for 2 days. How many days would C alone take to complete the remaining work?

  A. 5
  B. 4
  C. 3
  D. 6

41. A reservoir is in the form of a cuboid of length 8 m, breadth 6 m and height 3 m. Water flows into it through a pipe at the rate of 60 l/min. Find the time taken by the pipe to fill the reservoir.

  A. 30 hrs
  B. 24 hrs
  C. 40 hrs
  D. 52 hrs

42. Out of 30 teachers of a school, one teacher of age 60 years retired. In his place another teacher of age 30 years was appointed, due to this, the average age of the teachers will

  A. Decrease by 6 months
  B. Remain same
  C. Decrease by 1 year
  D. Decrease by 2 years.

43. Four years ago, Shyam's age was $\frac{3}{4}$ times as that of Ram. Four years hence, Shyam's age will be $\frac{5}{6}$ times that of Ram. What is the present age of Shyam?

  A. 20 years
  B. 24 years
  C. 16 years
  D. None of these

44. There are three poles, A, B and C. The height of pole C is $\frac{2}{3}$ of pole B, the height of pole B is $\frac{4}{3}$ of the pole A. Find the height of pole C, if the height of pole A is $\frac{97}{3}$ m.

  A. $15\frac{10}{63}$ m
  B. $3\frac{17}{27}$ m
  C. $28\frac{20}{27}$ m
  D. $4\frac{20}{63}$ m

45. Atul is playing in a playground which is of the form of a parallelogram. He observes that the diagonals of the playground are 80 m and 60 m long. So, the playground can be of the shape of _____.

  A. Rectangle
  B. Rhombus
  C. Kite
  D. Square

46. A cube having numbers 1, 2, 2, 3, 4 and 5 written on its six faces, is rolled once. What is the probability that the number appearing will be

(i) an even number

(ii) an even prime number

(iii) a multiple of 3?

	(i)	(ii)	(iii)
A.	$\frac{2}{3}$	$\frac{1}{2}$	$\frac{1}{3}$
B.	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{6}$
C.	$\frac{2}{3}$	$\frac{1}{3}$	$\frac{1}{6}$
D.	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{3}$

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

Statement-I : The simplest form of $\left(\frac{3}{5} \times \frac{-15}{21}\right) + \left(\frac{-9}{4} \div \frac{45}{28}\right) - \left(\frac{2}{3} \times \frac{30}{12}\right)$ is $1\frac{17}{35}$.

Statement-II : The number that should be multiplied with $\frac{-3}{14}$ so that the product is $\frac{5}{12}$, is $\frac{-35}{18}$.

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. Fill in the blanks and select the correct option.

(i) The greatest member of the Pythagorean triplet, if the other two members are 20 and 99, is __P__ .

(ii) The value of $\sqrt{156.25}$ is __Q__ .

(iii) If $\sqrt{13 - a\sqrt{10}} = \sqrt{8} + \sqrt{5}$, then the value of a is __R__ .

	P	Q	R
A.	101	1.25	5
B.	99	1.25	4
C.	88	125	−3
D.	101	12.5	−4

49. Select the correct option.

A. The length of both diagonals of a rectangle are equal.
B. Square, rectangle and rhombus are all different types of parallelograms.
C. The diagonals of a square are perpendicular bisector of each other.
D. All of these

50. Read the given statements carefully and state T for true and F for false.

(i) The number of terms in the product of $(4x + y)$ and $(6x^2 + 5xy - y^2)$ is 5.

(ii) The value of $4q^2 \times (5pq + p^2 - 6q^2)$ is −528, if $p = 1$ and $q = -2$.

(iii) On multiplying $5b + 2bc - c - \frac{3}{5}$ by $5abc$, we get $25ab^2c - 10abc^2 + 5a^2bc - 3abc$.

	(i)	(ii)	(iii)
A.	T	T	F
B.	F	T	T
C.	F	T	F
D.	T	F	T

SPACE FOR ROUGH WORK