CLASS 10

SET 3

IMO

SOF INTERNATIONAL MATHEMATICS OLYMPIAD

Level - 1

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, 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 on this page before attempting the paper.

SOF
SCIENCE OLYMPIAD FOUNDATION
Inspiring Young Minds Through Knowledge Olympiads

Name:.....

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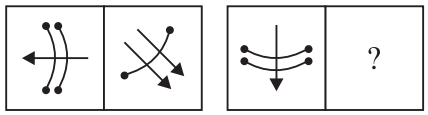
1. If in a certain code language TITAN is coded as #%#@2 and FASTRACK is coded as $@?#+@•β, then how will FANTASTIC be coded in the same code language?

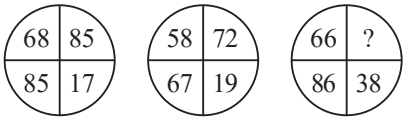
   A. •$@#2@?#%
   B. $@2#?@#%•
   C. $@2#@?%#•
   D. $@2#@?#%•

2. There is a definite relationship between figures (1) and (2). Establish the similar relationship between figures (3) and (4) by selecting a suitable figure from the options that will replace the question mark (?) in figure (4).



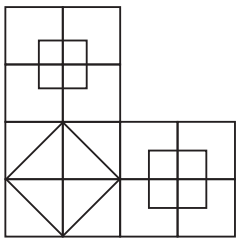
   A. 
   B. 
   C. 
   D. 

3. Find the missing number, if same rule is followed in all the three figures.



   A. 144
   B. 71
   C. 153
   D. 95

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



   A. 20
   B. 21
   C. 22
   D. More than 22

5. In which of the given options, Fig. (X) is exactly embedded as one of its parts?


Fig. (X)

   A. 
   B. 
   C. 
   D. 

6. Select the odd one out.

   A. JGDB
   B. UQNL
   C. NJGE
   D. YURP

7. Which of the following options satisfies the same conditions of placement of the dots as in Fig. (X)?

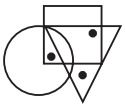
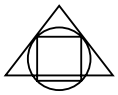
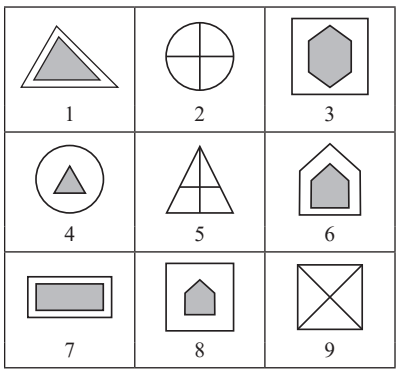


Fig. (X)

   A. 
   B. 
   C. 
   D. 

8. A set of some figures is given. Group these figures into three classes on the basis of their identical properties using each figure only once.



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

9. Arrange the given words in the sequence in which they occur in the dictionary and then select the correct sequence.

1. Forest
2. Fresher
3. Forever
4. Forward
5. Friend

A. 3, 1, 4, 2, 5
B. 1, 3, 4, 2, 5
C. 1, 3, 4, 5, 2
D. 3, 4, 1, 5, 2

10. Among five persons *M*, *N*, *T*, *R* and *D* each having a different height, *T* is taller than *D* but shorter than *M*. *R* is taller than *N* but shorter than *D*. Who among them is the tallest?

A. *D*
B. *T*
C. *M*
D. *R*

11. Three positions of a cube are given below. Which letter will be at the bottom, if letter *A* is at the top?

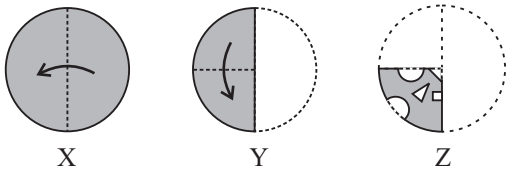
A. *M*
B. *B*
C. *P*
D. *H*

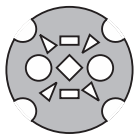
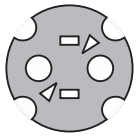
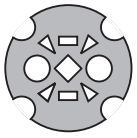
12. How many symbols are there in the given arrangement each of which is immediately preceded by a consonant and immediately followed by an odd number?

5 P # 6 G @ F * 5 % L 8 + E @ 7 R # 9 K M ÷ 6 G T

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

13. A set of three figures X, Y and Z showing folding of a piece of paper is given. Figure Z shows the manner in which the folded paper has been cut. Select a figure from the options which would most closely resembles the unfolded form of figure Z.



A. 
B. 
C. 
D. 

14. Pointing to a lady, a man said, "She is the only daughter of my father-in-law's wife". How is the lady related to that man?

A. Wife
B. Sister
C. Mother
D. Cousin

15. Select the correct mirror image of Fig. (X).

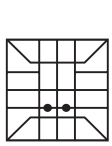
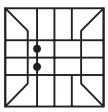
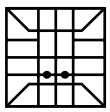


Fig. (X)


Mirror

A. 
B. 
C. 
D. 

MATHEMATICAL REASONING

16. The decimal expansion of the rational number $\frac{14587}{1250}$ will terminate after _____ .

A. One decimal place
B. Two decimal places
C. Three decimal places
D. Four decimal places

17. If $5 \cot \theta = 3$, then find the value of $\frac{5\sin\theta - 3\cos\theta}{4\sin\theta + 3\cos\theta}$.

A. $\frac{15}{29}$
B. $\frac{16}{29}$
C. $\frac{17}{29}$
D. None of these

18. Find the mean of the following data.

Age	0-6	6-12	12-18	18-24	24-30	30-36	36-42
Frequency	6	11	25	35	18	12	6

A. 20.85
B. 20.73
C. 21.44
D. 20.14

---

19. If $x = 5-2\sqrt{6}$, then find the value of $x^3+\frac{1}{x^3}$.

A. 1000
B. 970
C. 830
D. 950

---

20. In a trapezium $ABCD$, $AB \parallel DC$ and $DC = 2AB$. EF drawn parallel to AB cuts AD at F and BC at E such that $\frac{BE}{EC}=\frac{3}{4}$. Diagonal DB intersects EF at G. Then value of $\frac{FE}{AB}$ is _____ .

A. $\frac{9}{6}$
B. $\frac{8}{7}$
C. $\frac{11}{8}$
D. $\frac{10}{7}$

---

21. A line intersects the x-axis and y-axis at the point P and Q respectively. If (3, –7) is the mid-point of PQ, then the coordinates of P and Q are

A. (3, 0), (0, –7)
B. (–14, 0), (0, 6)
C. (–7, 0), (0, 3)
D. (6, 0), (0, –14)

---

22. The perpendicular distance of the point (–5, 6) from the x-axis is _____.

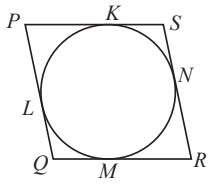
A. 5 units
B. 6 units
C. 11 units
D. 1 unit

---

23. If x and y be two positive real numbers such that $x > 3y$, $x^2 + 9y^2 = 369$ and $xy = 60$, then the value of $x - 3y$ is

A. 4
B. 3
C. 2
D. 5

24. In the given figure, quadrilateral $PQRS$ is circumscribed touching the circle at K, L, M and N. If $QM = 6$ cm, $RM = 5$ cm, $SN = 3$ cm and $PK = 4$ cm, then the perimeter of quadrilateral $PQRS$ is



A. 30 cm
B. 36 cm
C. 40 cm
D. 46 cm

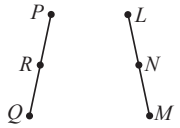
---

25. A hollow sphere of internal and external radii 2 cm and 4 cm respectively. Find the volume of the hollow sphere.

A. 348.53 cm^3
B. 234.67 cm^3
C. 164.74 cm^3
D. 198.56 cm^3

---

26. In the given figure, R is the mid-point of PQ and N is the mid-point of LM. If $PR = NM$, then which of the following is true?



A. $PR = LM$
B. $NM = PQ$
C. $QR = LM$
D. $PQ = LM$

---

27. If one root of the equation $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$ is 1, then find the other root of the equation.

A. $\frac{c(a-b)}{a(b-c)}$
B. $\frac{b(c-a)}{a(b-c)}$
C. $\frac{a(b-c)}{c(a-b)}$
D. $\frac{a(b-c)}{b(c-a)}$

---

28. The diagonals of a rectangle $PQRS$ intersect at O. If $\angle POQ = 38°$, then find $\angle SRO$.

A. 19°
B. 71°
C. 142°
D. 108°

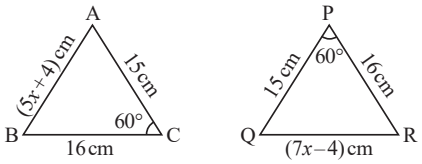
29. If three times the larger of the two numbers is divided by the smaller one, we get 4 as quotient and 3 as the remainder. Also, if seven times the smaller number is divided by the larger one, we get 5 as quotient and 1 as remainder. Find both the numbers.

A. 18, 26
B. 24, 17
C. 18, 24
D. 25, 18

30. If the first, second and last terms of an A.P. are x, y and $2x$ respectively, then the sum of A.P. is

A. $\frac{3xy}{2(y-x)}$
B. $\frac{3(y-x)}{2xy}$
C. $\frac{3(x-y)}{2xy}$
D. $\frac{3xy}{2(x-y)}$

31. In the given figure, find the length of QR.



A. 21 cm
B. 12 cm
C. 24 cm
D. 26 cm

32. The circumference of a circle is 21.6 m. If the length of the arc of the circle is 5.4 m, then the central angle of the corresponding sector of the circle is

A. 90°
B. 120°
C. 60°
D. 45°

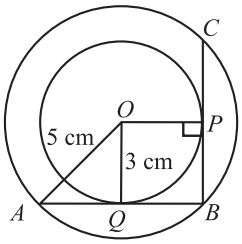
33. If $x = 3q - 19$ and $y = 6q - 17$ is a solution of the equation $27x - 37y = -166$, then the value of q is _____.

A. 1
B. 2
C. 6
D. 4

34. Two boats approach a light house in mid-sea from opposite directions. The angles of elevation of the top of the light house from two boats are 60° and 45° respectively. If the distance between two boats is 100 m, then find the height of the light house.

A. $50\sqrt{2}(\sqrt{2}-1)$ m
B. $50\sqrt{2}(\sqrt{3}+1)$ m
C. $50\sqrt{3}(\sqrt{3}-1)$ m
D. $45\sqrt{2}(\sqrt{2}+1)$ m

35. Two concentric circles of radii 3 cm and 5 cm are given. Length of chord BC which touches the inner circle at P is equal to _____ .



A. 4 cm
B. 6 cm
C. 8 cm
D. 10 cm

EVERYDAY MATHEMATICS

36. A manufacturing company of mobile phones produced 6000 units in 3rd year and 6500 units in 5th year. Assuming that production increases uniformly by a fixed number every year, find the production in 8th year.

A. 7250 units
B. 6700 units
C. 7500 units
D. 8250 units

37. Sudha is going away from the lamp post at a speed of 1.5 m/sec. If the lamp post is 3.9 m above the ground and height of Sudha is 120 cm, then find the length of her shadow after 3 seconds.

A. 3 m
B. 2 m
C. 4 m
D. 5 m

38. A game consists of tossing a five rupee coin three times and noting its outcome each time. Hussam wins if all the tosses give the same result. Find the probability that Hussam will lose the game.

A. $\frac{1}{4}$

B. $\frac{5}{8}$

C. $\frac{1}{2}$

D. $\frac{3}{4}$

---

39. A rectangular courtyard 3.78 metres long and 5.25 metres wide is to be paved exactly with square tiles, all of the same size. What is the largest size of the tile which could be used for the purpose?

A. 14 cm

B. 21 cm

C. 42 cm

D. None of these

---

40. A traffic signal board is in the shape of a triangle. The three sides of the signal board are in the ratio of 3 : 4 : 5. If its perimeter is 48 cm, then its area is _____.

A. 144 cm^2

B. 84 cm^2

C. 112 cm^2

D. 96 cm^2

---

41. Six years ago, a mother was nine times as old as his son. Six years later, her age will be three times the age of her son. Then present ages of son and mother respectively are _____ .

A. 10 yrs, 42 yrs

B. 15 yrs, 30 yrs

C. 13 yrs, 40 yrs

D. 14 yrs, 35 yrs

---

42. A dome of a building is in the form of a hemisphere needs to be painted. If the cost of painting at ₹ 17 per square metre is ₹ 83776, then find the diameter of the dome.

A. 28 m

B. 56 m

C. 14 m

D. 42 m

---

43. Two stations *A* and *B* are 110 km apart on a straight line. One train starts from *A* at 7 a.m. and travels towards *B* at 20 km/h. Another train starts from *B* at 8 a.m. and travels towards *A* at a speed of 25 km/h. At what time will they meet ?

A. 9 a.m.

B. 10 a.m.

C. 10:30 a.m.

D. 11 a.m.

---

44. A person lent out a certain sum on simple interest and the same sum on compound interest at a certain rate of interest per annum. He noticed that the ratio between the difference of compound interest and simple interest of 3 years and that of 2 years is 25 : 8. The rate of interest per annum is _____ .

A. 10%

B. 11%

C. 12%

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

---

45. A vessel is in the form of a hemispherical bowl mounted by a right circular cylinder. The diameter of the hemisphere is 7 cm and the total height of the vessel is 10 cm. Find its capacity.

A. 286.16 cm^3

B. 340.08 cm^3

C. 346.12 cm^3

D. 292.24 cm^3

ACHIEVERS SECTION

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

P. The common difference of the A.P. $-3, \frac{-1}{2}, 2\ldots$ is 5.

Q. The sum of first 19 terms of the A.P. 8, 3, –2 … is –703.

R. If the sum of first 14 terms of an A.P. is 1050 and its first term is 10, then 20^{th} term is 752.

	P	Q	R
A.	T	F	T
B.	T	T	F
C.	F	T	T
D.	F	T	F

---

47. A bag contains 11 red balls, 19 green balls, 29 yellow balls, 36 blue balls and 15 orange balls. If one ball is drawn at random from the bag, then find the probability of getting

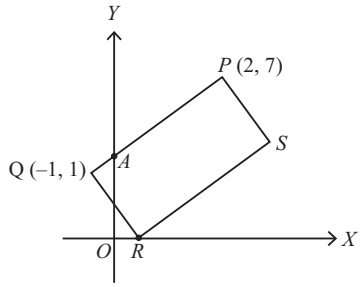
(i) not a blue ball

(ii) a yellow ball

(iii) not an orange ball

	(i)	(ii)	(iii)
A.	$\frac{74}{110}$	$\frac{27}{110}$	$\frac{95}{110}$
B.	$\frac{37}{55}$	$\frac{29}{110}$	$\frac{19}{22}$
C.	$\frac{37}{55}$	$\frac{19}{22}$	$\frac{29}{110}$
D.	$\frac{74}{110}$	$\frac{26}{110}$	$\frac{19}{22}$

48. In the following figure (not drawn to scale) $PQRS$ is a rectangle. Area of the rectangle is 15 sq. units and point A lies on PQ such that $PQ = 3QA$. Find coordinates of A and R respectively.



A. (0, 8) and (2, 0)

B. (0, 5) and (0, 1)

C. (0, 6) and (2, 2)

D. (0, 3) and (1, 0)

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

(i) If sum of a natural number and its reciprocal is $\frac{37}{6}$, then the natural number is **P** .

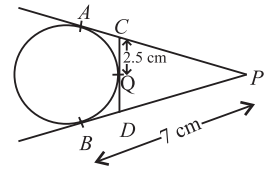
(ii) If $x = \frac{3}{2}$ is a root of the quadratic equation $Kx^2 + x - 15 = 0$, then the value of K is **Q** .

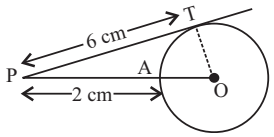
(iii) If discriminant of the quadratic equation $x^2 + 2x - m = 0$ is 40, then the value of $\sqrt{m}$ is **R** .

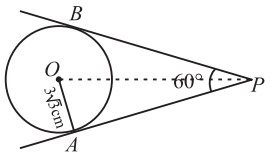
	P	Q	R
A.	6	6	9
B.	6	6	3
C.	4	4	3
D.	4	4	9

50. Match the following and select the correct option.

	Column I	Column II
(a)	Length of CP is____.	(i) $6\sqrt{3}$ cm
(b)	Radius of the given circle is____.	(ii) 4.5 cm
(c)	The length of OP is ____.	(iii) 8 cm







A. (a)-(ii), (b)-(i), (c)-(iii)

B. (a)-(i), (b)-(ii), (c)-(iii)

C. (a)-(ii), (b)-(iii), (c)-(i)

D. (a)-(iii), (b)-(i), (c)-(ii)

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK