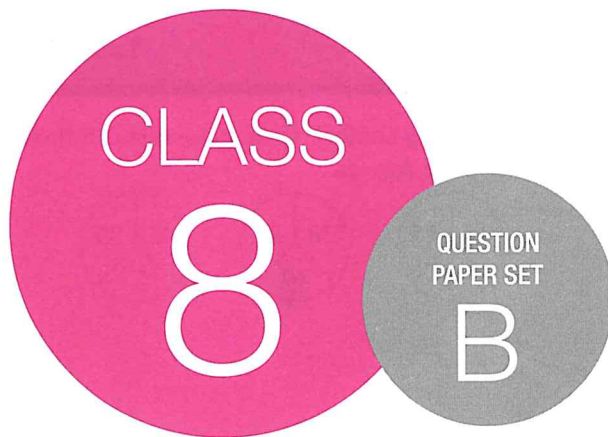


**SOF INTERNATIONAL  
MATHEMATICS OLYMPIAD  
2019-20**



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. ● (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.



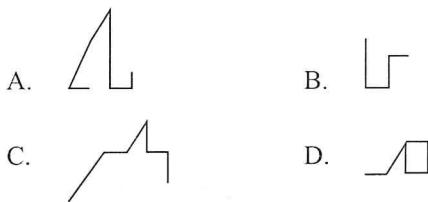
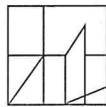
SCIENCE OLYMPIAD FOUNDATION  
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## LOGICAL REASONING

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



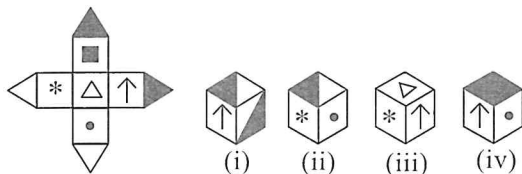
- A. 42  
B. 18  
C. 48  
D. 56
2. Select a figure from the options which is exactly embedded in the given figure as one of its parts.



3. Pointing towards Kirti, Manish said, "She is the wife of the grandson of my mother". How is Manish related to Kirti?

- A. Husband  
B. Father  
C. Grandfather  
D. Can't be determined

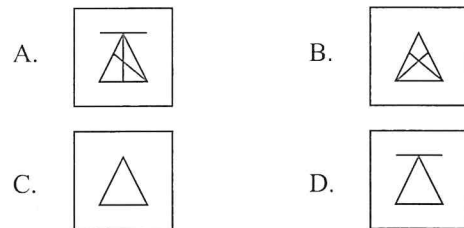
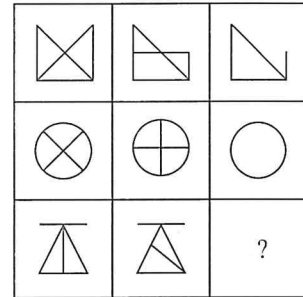
4. Choose the box that is similar to the box formed when the given sheet of paper is folded to form a box.



- A. (i) and (ii) only  
B. (ii) and (iv) only  
C. (ii) and (iii) only  
D. None of these
5. Which of the following Venn diagrams best represents the relationship amongst, "Elephants, Wolves and Animals"?



6. Which of the following options will replace the '?' to complete the given figure matrix?



7. In the following question, two rows of numbers are given. The resultant number in each row is to be worked out separately based on the following rules and the question below the rows is to be answered. The operations on numbers progress from left to right.

**Rules:**

- (i) If an even number is followed by another even number, then they are to be added.
- (ii) If an even number is followed by a prime number, then they are to be multiplied.
- (iii) If an odd number is followed by an even number, then the even number is to be subtracted from the odd number.
- (iv) If an odd number is followed by another odd number, then the first number is to be added to the square of the second number.
- (v) If an even number is followed by a composite odd number, then the even number is to be divided by the odd number.

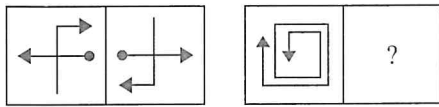
18   3   26

57   14   36

What is the difference between the resultants of the first row and the second row?

- A. 73  
B. 126  
C. 91  
D. 87

8. 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 figure (iv).



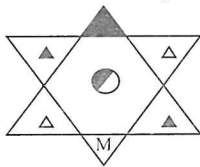
- (i) (ii) (iii) (iv)
- A. B. C. D.

9. If it is possible to make a meaningful word with the 8<sup>th</sup>, 15<sup>th</sup>, 16<sup>th</sup> and 20<sup>th</sup> letters of the given arrangement, then what will be the first letter of the word so formed? If no such word can be formed, then give \$ as the answer and if more than one such word can be formed, then give £ as the answer.

ACZTVXF IJMOQY P RESGBDLUNKHW

- A. D B. R  
C. \$ D. £

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



- A. B. C. D.

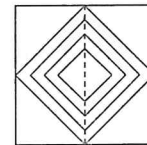
11. Aakash walks 30 m North. Then he turns right and walks 60 m. Again, he turns right and walks 45 m. How far and in which direction is he now from his initial position?

- A. 30 m, West  
B.  $15\sqrt{17}$  m, South-West  
C.  $40\sqrt{3}$  m, South-West  
D.  $15\sqrt{17}$  m, South-East

12. If 'P' is called '×', 'Q' is called '+', 'R' is called '÷' and 'S' is called '-', then what is the value of  $240 R 12 Q 18 P 3 S 52$ ?

- A. 58  
B. 50  
C. 28  
D. 22

13. A square transparent sheet with a pattern and a dotted line on it is given. Select the 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.

14. In a certain code language, if 'UNIVERSITY' is written as 'WPKXGPPQGRW', then how will 'CORRECTION' be written in that language?

- A. DUJPODPSSF  
B. DPSSFDUJPO  
C. EQTTGLMGRA  
D. EQTTGARGML

15. Find the next term in the given series.  
PMT, OOS, NQR, MSQ, \_?

- A. NTR  
B. MTP  
C. LUP  
D. LTM

## MATHEMATICAL REASONING

16. Find the least number that must be subtracted from 50730 to make it a perfect square.

- A. 205

- B. 105  
C. 110  
D. None of these

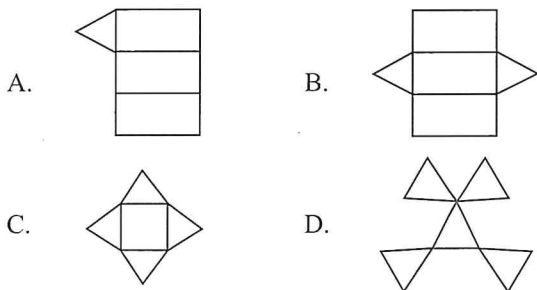
17. The denominator of a rational number is greater than its numerator by 10. If the numerator is increased by 5 and denominator is decreased by 1, then the number obtained is  $\frac{3}{4}$ . Find the original rational number.

- A.  $\frac{3}{14}$   
 B.  $\frac{7}{17}$   
 C.  $\frac{2}{17}$   
 D.  $\frac{4}{15}$

18. Which of the following statements is INCORRECT?

- A. All rhombuses are parallelograms.  
 B. All squares are not parallelograms.  
 C. All rectangles are not squares.  
 D. All rhombuses are not squares.

19. Which of the following options shows the net of a triangular prism?



20. Using Euler's formula, find the value of P, Q and R.

<b>Faces</b>	6	8	<b>Q</b>
<b>Vertices</b>	<b>P</b>	4	13
<b>Edges</b>	8	<b>R</b>	28

- |    | <b>P</b> | <b>Q</b> | <b>R</b> |
|----|----------|----------|----------|
| A. | 4        | 10       | 17       |
| B. | 6        | 10       | 10       |
| C. | 5        | 20       | 18       |
| D. | 4        | 8        | 17       |

21. Which of the following is a linear equation in one variable?

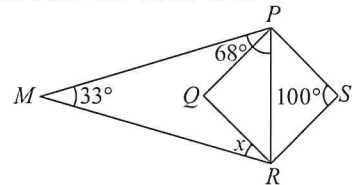
- A.  $(3x - 1)^2 = 9x^2 + 4x - 4$   
 B.  $(9x - 2)^2 = 5x - 5x^2 + 5$   
 C.  $2x^2 = 3x - 2$   
 D. None of these

22. If  $\sqrt[3]{3\left(\sqrt[3]{x} - \frac{1}{\sqrt[3]{x}}\right)} = 2$ , then  $\sqrt[3]{x} + \frac{1}{\sqrt[3]{x}} =$  \_\_\_\_\_.

- A.  $\frac{10}{3}$

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

23. In the given figure (not drawn to scale), PQRS is a rhombus. Find the value of x.



- A.  $39^\circ$   
 B.  $40^\circ$   
 C.  $49^\circ$   
 D.  $29^\circ$

24. If the angles P, Q, R and S of the quadrilateral PQRS are in the ratio 11: 19 : 21 : 9, then which of the following statements is true?

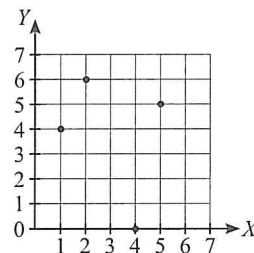
- A. PQRS is a parallelogram with  $PQ \parallel SR$ .  
 B. PQRS is a trapezium with  $PQ \parallel SR$ .  
 C. PQRS is a kite.  
 D. PQRS is a trapezium with  $PS \parallel QR$ .

25. Simplify :

$$\left[2x^2 - \frac{1}{400}y^2\right]^2 - \left[2x^2 + \frac{1}{400}y^2\right]^2$$

- A.  $-\frac{x^2y^2}{40}$   
 B.  $-\frac{x^2y^2}{50}$   
 C.  $\frac{xy}{50}$   
 D.  $-\frac{x^2y^2}{5}$

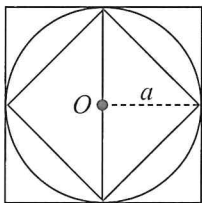
26. Study the given graph carefully. Complete the table and find the value of P - Q + R + S.



<b>X</b>	2	Q	1	S
<b>Y</b>	P	0	R	5

- A. 11  
 B. 5  
 C. 10  
 D. 8

27. The difference between the area of the outer and the inner square of a circle is  $63 \text{ cm}^2$  and  $O$  is the centre of the circle. Find the area of the circle.



- A.  $77 \text{ cm}^2$   
 B.  $80 \text{ cm}^2$   
 C.  $99 \text{ cm}^2$   
 D.  $50 \text{ cm}^2$
28. A man invested  $\frac{2}{5}$  of his capital at 8% p.a.,  $\frac{3}{8}$  of his capital at 10% p.a. and the remaining at 12% p.a. If his annual income at simple interest is ₹ 965, then his capital is \_\_\_\_\_.

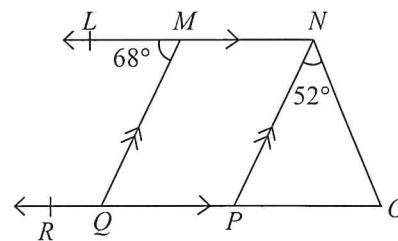
- A. ₹ 8000  
 B. ₹ 9000  
 C. ₹ 10000  
 D. ₹ 11000
29. The sum of two numbers is 1280. If 3.5 % of one number is equal to 4.5 % of another number, then find the two numbers.

- A. 768, 512  
 B. 338, 914  
 C. 720, 560  
 D. 830, 450
30. The ratio between the exterior angle and the interior angle of a regular polygon is 2 : 3. Find the number of sides of the polygon.

- A. 10  
 B. 5  
 C. 6  
 D. 3
31. A number is multiplied by  $2\frac{1}{3}$  times itself and then 61 is subtracted from the product obtained. If the final result is 9200, then the number is \_\_\_\_\_.

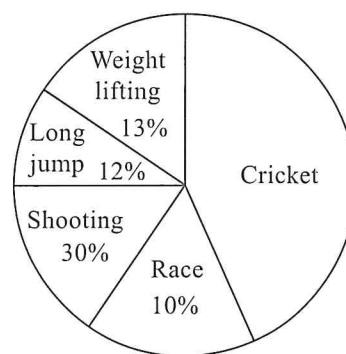
- A. 36  
 B. 63  
 C. 67  
 D. 37

32. In the given figure (not drawn to scale), if  $LN \parallel RO$  and  $QM \parallel PN$ , then find the value of  $\angle PON$ .



- A.  $80^\circ$   
 B.  $90^\circ$   
 C.  $60^\circ$   
 D.  $45^\circ$

**Direction (33-34) :** The given pie chart shows the number of sportsmen who participated in different sports. If the total number of sportsmen who participated are 800, then answer the following questions.



33. What fraction of the sportsmen participated in shooting to the total number of sportsmen participated?
- A.  $\frac{2}{10}$   
 B.  $\frac{3}{10}$   
 C.  $\frac{8}{15}$   
 D.  $\frac{7}{10}$
34. How many more sportsmen participated in cricket than the sportsmen who participated in weight lifting and long jump together?
- A. 120  
 B. 90  
 C. 200  
 D. 80

35. To construct a kite, which of the following is necessary?
- A. Two adjacent unequal sides and included diagonal  
 B. Two adjacent equal sides and included diagonal  
 C. Length of opposite sides  
 D. None of these

36. Rohit has 6 wooden sticks of equal length. He wants to join all of them in such a way that they make a regular polygon. At what internal angle he has to join wooden stick with each other?
- A.  $105^\circ$   
 B.  $120^\circ$   
 C.  $115^\circ$   
 D.  $90^\circ$

37. 15 years ago, Kanika's father was five times as old as Kanika. After 15 years, her father will be thrice as old as her. The present age of Kanika is \_\_\_\_\_.
- A. 30 years  
 B. 10 years  
 C. 45 years  
 D. 25 years

38. 1000 soldiers in a fort had enough food for 20 days. But some soldiers were transferred to another fort and the food lasted for 25 days. How many soldiers were transferred?
- A. 200  
 B. 250  
 C. 310  
 D. None of these

39. A car owner buys petrol at the rate of ₹ 62.50, ₹ 52.50 and ₹ 57.50 per litre for three successive years. What is the average rate per litre of petrol, if he spends ₹ 24150 each year?
- A. ₹ 57.21  
 B. ₹ 57.50  
 C. ₹ 52.50  
 D. ₹ 56.20

40. One-third of Karan's marks in Science exceeds a half of his marks in Hindi by 30. If he got 240 marks in the two subjects together, then how many marks did he get in Hindi?
- A. 42  
 B. 50  
 C. 60  
 D. 180

41. In a marriage party, three different lights shine after every 10 seconds, 15 seconds and 25 seconds respectively. If all these lights change simultaneously at 6 : 25 : 00 hours, then the time when they will again shine simultaneously is

- A. 6 : 26 : 30 hours  
 B. 6 : 27 : 30 hours  
 C. 6 : 28 : 30 hours  
 D. None of these.

42. Manya selected a card from a deck of 52 playing cards. Find the probability that the selected card is a black king.

- A.  $\frac{2}{13}$   
 B.  $\frac{1}{24}$   
 C.  $\frac{1}{13}$   
 D.  $\frac{1}{26}$

43. The wingspans of different species of birds is given below.

Species of birds	Blue jay	Golden eagle	Seagull	Albatross
Length of wingspans	$\frac{41}{100}$ m	$2\frac{1}{2}$ m	$1\frac{7}{10}$ m	$3\frac{3}{5}$ m

How much longer is the wingspan of a Golden eagle than the wingspan of a Blue jay?

- A.  $\frac{209}{100}$  cm  
 B.  $\frac{209}{100}$  m  
 C.  $\frac{9}{100}$  m  
 D.  $\frac{215}{100}$  cm

44. How many coins of 1.4 cm in diameter and 0.4 cm thick are to be melted to form a right circular cylinder of height 16 cm and diameter 3.5 cm?

- A. 400  
 B. 250  
 C. 180  
 D. 230

45. Pooja sold two of her cars for ₹ 350000 each. On one, she made a gain of 25% and on the other a loss of 20%. Find her overall gain or loss.

- A. Loss of ₹ 18000  
 B. Gain of ₹ 38000  
 C. Gain of ₹ 42000  
 D. Loss of ₹ 17500

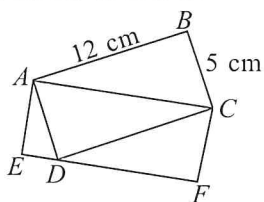
## ACHIEVERS SECTION

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

**Statement-1 :** If a number is divisible by both 3 and 6, then it must be divisible by 18.

**Statement-2 :** If  $295x4$  is divisible by 11, then the least value of  $x$  is 2.

- A. Both Statement-1 and Statement-2 are true.  
 B. Both Statement-1 and Statement-2 are false.  
 C. Statement-1 is true but Statement-2 is false.  
 D. Statement-1 is false but Statement-2 is true.
- 
47.  $ABCD$  is a rectangle of dimensions 12 cm and 5 cm.  $AEFC$  is a rectangle drawn in such a way that the diagonal  $AC$  of the first rectangle is one of its sides and side opposite to it is touching the first rectangle at  $D$  as shown in figure. What is the ratio of the area of rectangle  $ABCD$  to  $AEFC$ ?



- A. 3 : 1  
 B. 2 : 3  
 C. 1 : 1  
 D. 5 : 4
- 
48. Read the given statements carefully and state 'T' for true and 'F' for false.
- (i) If the ratio of three numbers is 3 : 4 : 5 and sum of their squares is 1250, then the sum of numbers is 60.
- (ii)  $\text{Decrease \%} = \left( \frac{\text{Decreased value}}{\text{New value}} \times 100 \right) \%$
- (iii) If an article is sold for ₹  $p$  after giving a discount of  $q$  %, then its marked price is ₹  $\frac{100p}{100-q}$ .

- (iv) If 44 % of a number is 275, then 64 % of the same number is 400.

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

49. If seven slips of paper are labelled as 1, 2, 3, 4, 6, 7, 8 and one slip is drawn out of it, then what is the probability that it is

(i) a 7?  
 (ii) greater than 4?  
 (iii) an odd number?

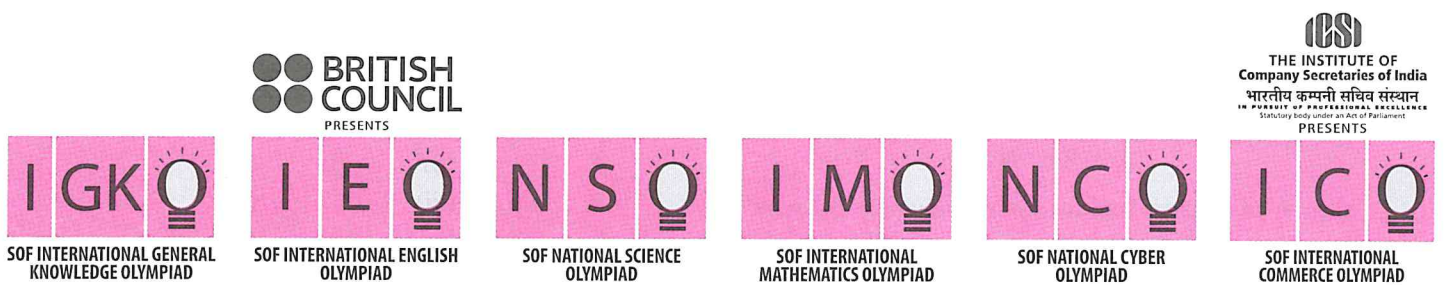
	(i)	(ii)	(iii)
A.	1/7	3/7	4/7
B.	1/7	3/7	3/7
C.	1/7	2/7	5/7
D.	1/7	5/7	2/7

50. Solve for  $x$  and match the following :

Column A	Column B
(P) $\frac{(243)^{0.13} \times (243)^{0.07}}{(7)^{0.25} \times (49)^{0.075} \times (343)^{0.2}}$	(i) $x = \frac{1}{2}$
$= \left( \frac{3}{7} \right)^x$	
(Q) $(256)^{0.16} \times (256)^{0.09} = 2^x$	(ii) $x = 1$
(R) $\frac{2^{x-1} \cdot 4^{2x+1}}{8^{x-1}} = 32$	(iii) $x = 2$
(S) $3^x - 3^{x-1} = 54$	(iv) $x = 4$
<b>(P)</b> <b>(Q)</b> <b>(R)</b> <b>(S)</b>	
A. (i)    (ii)    (iii)    (iv)	
B. (ii)    (iii)    (i)    (iv)	
C. (iii)    (i)    (ii)    (iv)	
D. (ii)    (i)    (iii)    (iv)	

SPACE FOR ROUGH WORK

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