CLASS 11th

*i*OM'13
International Olympiad of
Mathematics
Organized by Mathematics Olympiad Foundation, New Delhi, India

SILVER ZONE FOUNDATION

TEST PAPER TYPE

QUESTION PAPER

DD

Duration : 60 Minutes

Maximum Marks : 100

LEVEL 1

Enrollment No.											

Student Name

School Name

Read the following instructions carefully before you begin to answer the questions in the OMR Answer Sheets provided along with this question paper. Ask the Examination In-charge/Invigilator how to mark the OMR Answer Sheets, in case you have any doubts.

INSTRUCTION TO CANDIDATES TO BE EXPLAINED BY THE INVIGILATORS

1. This Booklet contains 40 questions. Each question carries an equal marks of 2.5.
2. All questions are compulsory.
3. This Booklet contains 6 pages. Please check, if any page is misprintied, missing or repeated.
4. Collect your OMR Answer Sheets from the Invigilator/Examination In-Charge to answer the questions given in this Booklet.
5. You must fill all the necessary information's which are required in the space provided in this booklet and OMR Answer Sheet.
6. Correct Answers must be marked by **"Darkening"** the corresponding circles on the OMR Answer Sheet, against the relevant question number with **Pencil** or **Blue/Black, Ball point Pen** only. Answers which are not darkened in circle will not be awarded with any mark.
7. Space for rough work is provided in this booklet. No rough work is to be done in the OMR Answer Sheet.
8. Mobile Phones and other Wireless equipments are banned in the examination halls/rooms.
9. OMR Answer Sheets must be handed over to the Examination In-charge/Invigilator before you leave the examination room/hall and recheck that you have filled all the required informations.
10. The results will be published in our web-site WWW.SILVERZONE.ORG in the month of Jan 2014. You can check it with your 12 digit Roll Number provided in the Enrollment Ticket.

TEACHERS ARE REQUESTED TO CHECK IF THE REQUIRED INFORMATIONS ARE PROPERLY FILLED BY THE CANDIDATES IN THE QUESTION PAPER & OMR ANSWER SHEETS, AND ALSO ENSURE THAT OMR ANSWER SHEETS ARE PROPERLY MARKED. PLEASE SEND US BACK THE OMR ANSWER SHEETS ONLY.
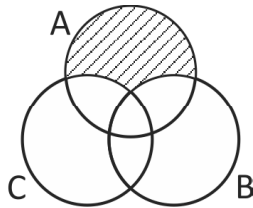
Note: Return this question paper along with answer sheet

1. If a set A has n elements, then the total number of subsets of A is

   (A) n

   (B) n^2

   (C) 2^n

   (D) 2n

   (E) None of these

2. Let U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, A = {1, 2, 5}, B = {6, 7}, then A $\cap$ B' is

   (A) B'

   (B) A

   (C) A'

   (D) B

   (E) None of these

3. The shaded region in the given figure is

   (A) A $\cap$ (B$\cup$C)

   (B) A$\cup$(B$\cap$C)

   (C) A$\cap$(B – C)

   (D) A – (B$\cup$C)

   (E) None of these

4. In a group of 100 people, 42 like coffee, 65 like tea, and each person likes at least one of the two drinks. How many people like both coffee and tea?

   (A) 19

   (B) 15

   (C) 7

   (D) 5

   (E) None of these

5. If f(x) = $\dfrac{1-x}{1+x}$, then f[f(cos 2θ)] =

   (A) tan 2θ

   (B) sec 2θ

   (C) cos 2θ

   (D) cot 2θ

   (E) None of these

6. If sin θ + cos θ = 1, then sin θ . cos θ =

   (A) 0   (B) 1

   (C) 2   (D) $\dfrac{1}{2}$

   (E) None of these

7. The value of cos 105° + sin 105° is

   (A) $\dfrac{1}{2}$ (B) 1

   (C) $\sqrt{2}$ (D) $\dfrac{1}{\sqrt{2}}$

   (E) None of these

8. If tan A = $\dfrac{-1}{2}$ and tan B = $\dfrac{-1}{3}$, then A + B =

   (A) $\dfrac{\pi}{4}$ (B) $\dfrac{3\pi}{4}$

   (C) $\dfrac{5\pi}{4}$ (D) $\dfrac{7\pi}{4}$

   (E) None of these

9. If the arcs of same length in two circles subtend angles of 60° and 75° at their centres. Find the ratio of their radii.

   (A) 5 : 4   (B) 4 : 5

   (C) 5 : 3   (D) 3 : 5

   (E) None of these

10. The probability that an ordinary or a non-leap year has 53 Sunday is

   (A) $\dfrac{2}{7}$ (B) $\dfrac{3}{7}$

   (C) $\dfrac{1}{7}$ (D) $\dfrac{5}{7}$

   (E) None of these

11. $\lim\limits_{x \to 1} \dfrac{\log x}{x-1} =$

(A) 1

(B) −1

(C) 0

(D) ∞

(E) None of these

12. Match the column in the table given below:

S.No.	Sets		Roster Form
1.	{x:x²−3=0 and x is a rational number}	a.	{4}
2.	{x: x is an even prime number}	b.	{-5, 5}
3.	{x: 3<x<5, x is a natural number}	c.	{*}
4.	{x: x² =25, and x is an odd integer}	d.	{2}

(A) 1 − c, 2 − d, 3 − a, 4 − b

(B) 1 − d, 2 − c, 3 − a, 4 − b

(C) 1 − c, 2 − a, 3 − d, 4 − b

(D) 1 − b, 2 − d, 3 − a, 4 − c

(E) None of these

13. Conjugate of 1 + i is

(A) i

(B) 1

(C) 1 − i

(D) 1 + i

(E) None of these

14. If $\left(\dfrac{1+i}{1-i}\right)^m = 1$, then the least integral value of m is

(A) 2 (B) 4

(C) 8 (D) 10

(E) None of these

15. The amplitude of $\dfrac{1+\sqrt{3}i}{\sqrt{3}+i}$ is

(A) $\dfrac{\pi}{6}$

(B) $-\dfrac{\pi}{6}$

(C) $\dfrac{\pi}{3}$

(D) $\dfrac{\pi}{2}$

(E) None of these

16. If one root of $5x^2 + 13x + k = 0$ is reciprocal of the other, then k =

(A) 0 (B) 5

(C) $\dfrac{1}{6}$ (D) 6

(E) None of these

17. If the 9ᵗʰ term of an A.P be zero, then the ratio of its 29ᵗʰ and 19ᵗʰ term is

(A) 1:2 (B) 2:1

(C) 1:3 (D) 3:1

(E) None of these

18. The sum of the roots of a equation is 2 and sum of their cubes is 98, then the equation is

(A) $x^2 + 2x + 15 = 0$

(B) $x^2 + 15x + 2 = 0$

(C) $2x^2 - 2x + 15 = 0$

(D) $x^2 - 2x - 15 = 0$

(E) None of these

19. The number of ways in which 6 rings can be worn on the four fingers of one hand is

(A) 4^6 (B) $^6C_4$

(C) 6^4 (D) 24

(E) None of these

20. The sum of n arithmetic mean between a and b, is

(A) $(n + 1)(a + b)$

(B) $\dfrac{(n+1)(a+b)}{2}$

(C) $n(a + b)$

(D) $\dfrac{n(a+b)}{2}$

(E) None of these

21. The angle between the lines $y - 2x = 9$ and $x + 2y = -7$, is

(A) 60° (B) 45°

(C) 30° (D) 90°

(E) None of these

22. If a man and his wife enter in a bus, in which five seats are vacant, then the number of different ways in which they can be seated is

(A) 2

(B) 5

(C) 20

(D) 40

(E) None of these

23. The greatest number among $\sqrt[3]{9}$, $\sqrt[4]{11}$, $\sqrt[6]{17}$ is

(A) $\sqrt[3]{9}$

(B) $\sqrt[4]{11}$

(C) $\sqrt[6]{17}$

(D) Can not be determine

(E) None of these

24. How many words can be formed using the letter A thrice, the letter B twice and the letter C thrice?

(A) 500 (B) 560

(C) 580 (D) 520

(E) None of these

25. The middle term in the expansion of $\left(x - \dfrac{1}{x} \right)^{18}$ is

(A) $^{18}C_9$ (B) $^{-18}C_9$

(C) $^{18}C_0$ (D) $^{-18}C_{10}$

(E) None of these

26. If n^{th} terms of two A.P.'s are $3n + 8$ and $7n + 15$, then the ratio of their 12th terms will be

(A) $\dfrac{4}{9}$ (B) $\dfrac{7}{16}$

(C) $\dfrac{3}{7}$ (D) $\dfrac{8}{15}$

(E) None of these

27. If the first term of an A.P is 2 and common difference is 4. The sum of its 40 terms will be

(A) 3200

(B) 2800

(C) 1600

(D) 200

(E) None of these

28. Distance between the points (1, 3, 2) and (2, 1, 3) is

(A) 12

(B) $\sqrt{12}$

(C) $\sqrt{6}$

(D) 6

(E) None of these

29. The length of the latus rectum of the ellipse $5x^2 + 9y^2 = 45$ is

(A) $\dfrac{\sqrt{5}}{4}$ (B) $\dfrac{\sqrt{5}}{2}$

(C) $\dfrac{5}{3}$ (D) $\dfrac{10}{3}$

(E) None of these

30. $\lim\limits_{x \to \infty} \dfrac{\sin x}{x}$

(A) 0

(B) ∞

(C) 1

(D) 2

(E) None of these

31. The distance between two parallel lines 3x + 4y − 8 = 0 and 3x + 4y − 3 = 0, is given by

(A) 4   (B) 5

(C) 3   (D) 1

(E) None of these

32. The eccentricity of the conic $x^2 - 4y^2 = 1$ is

(A) $\dfrac{2}{\sqrt{3}}$ (B) $\dfrac{\sqrt{3}}{2}$

(C) $\dfrac{2}{\sqrt{5}}$ (D) $\dfrac{\sqrt{5}}{2}$

(E) None of these

33. If A and B are two events such that $P(A \cup B)$ + $P(A \cap B) = \dfrac{7}{8}$ and P(A) = 2P(B), then P(A) =

(A) $\dfrac{17}{24}$ (B) $\dfrac{5}{12}$

(C) $\dfrac{7}{12}$ (D) $\dfrac{7}{24}$

(E) None of these

34. Find the value of:

sin 20° sin 40° sin 60° sin 80°

(A) $\dfrac{5}{16}$ (B) $\dfrac{3}{16}$

(C) $\dfrac{1}{4}$ (D) 1

(E) None of these

35. The triangle formed by the points (0, 7, 10), (−1, 6, 6), (−4, 9, 6) is

(A) Equilateral

(B) Isosceles

(C) Right angled

(D) Right angled isosceles

(E) None of these

36. Argument and modulus of $\dfrac{1+i}{1-i}$ are respectively

(A) $\dfrac{-\pi}{2}$ and 1

(B) $\dfrac{\pi}{2}$ and $\sqrt{2}$

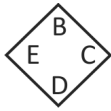(C) $\dfrac{\pi}{2}$ and 1

(D) 0 and $\sqrt{2}$

(E) None of these

37. $\lim\limits_{x \to 0} \dfrac{1 - \cos 2x}{x}$ **is**

(A) 0

(B) 1

(C) 2

(D) 4

(E) None of these

38. If P(A) = $\dfrac{2}{3}$, P(B) = $\dfrac{1}{2}$ and P(A $\cup$ B) = $\dfrac{5}{6}$, then events A and B are

(A) Mutually exclusive

(B) Independent as well as mutually exhaustive

(C) Independent

(D) Dependent only on A

(E) None of these

39. From the following figures, find the figure which does not belong to the series.

| A | B | C | D |

(A) A   (B) B

(C) C   (D) D

(E) None of these

40. If the numerator of a certain fraction is increased by 100% and the denominator is increased by 200%, the new fraction thus formed is $\dfrac{4}{21}$. What is the original fraction?

(A) $\dfrac{2}{5}$ (B) $\dfrac{3}{7}$

(C) $\dfrac{2}{7}$ (D) $\dfrac{4}{7}$

(E) None of these

Space for Rough Work