FIITJEE

IOQM MOCK TEST - 1

Indian Olympiad Qualifier in Mathematics (IOQM) – 2020-21

Time: 3 hours **Maximum Marks: 30**

INSTRUCTIONS

Please read the instructions carefully

A: General:

1. Immediately fill in the particulars on this page of the Test Booklet with Blue/Black Ball point pen.
2. Use ***Black Ball Point Pen only*** for writing particulars on Answer Sheet. ***Use of pencil is strictly prohibited.***
3. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed.
4. The answer sheet, a machine-gradable Objective Response Sheet (ORS) is provided separately.
5. Do not Tamper/mutilate the **ORS** or this booklet.
6. No additional sheets will be provided for rough work.
7. On completion of this test, the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. ***However, the candidates are allowed to take away this Test Booklet with them.***

B: Questions paper format & **Marking Schema:**

1. The question paper consists of **30 questions** of Mathematics.
2. Answers will be whole numbers from 0 to 99, where students must fill OMR corresponding to correct answer.
3. **If your answer is 9 then you will have to fill in as 09.**
4. For each question you will be awarded **1** mark if you darken the bubble corresponding to the correct answer ONLY and zero **(0)** marks if no bubbles are darkened. There is no negative Marking.

Mathematics

1. How many two digits numbers are there having atleast one odd digit?

2. Two positive integers a & b are such that $a+b=\frac{a}{b}+\frac{b}{a}$. What is the value of a^2+b^2?

3. Let $P(x)$ be a non-zero polynomial with integer coefficients. If $P(n)$ is divisible by n for each positive integer n, what is the value of $P(0)$?

4. How many two-digit positive integers N have the property that the sum of 'N' and the number, obtained reversing the order of the digits of N is a perfect square?

5. Let n be the largest integer that is a product of exactly 3 distinct prime numbers x, y and $10x+y$, where x & y are digits. What is the sum of the digits of n?

6. A subset B of the set of first 100 positive integers has the property that no two elements of B sum to 125, what is the maximum possible numbers of elements in B?

7. A natural numbers K is such that $K^2<2014<(K+1)^2$, what is the largest prime factor of K?

8. Let ABCD be a convex quadrilateral with perpendicular diagonals. If $AB=20$, $BC=70$ & $CD=90$, then what is the value of DA?

9. The first term of a sequence is 2014. Each succeeding term is the sum of the cubes of the digits of the previous term. If the 2014^{th} term of the sequence is k, what is $\frac{k}{10}$?

10. If real numbers a, b, c, d, e satisfy $a+1=b+2=c+3=d+4=e+5=a+b+c+d+e+3$. What is the value of $a^2+b^2+c^2+d^2+e^2$?

11. What is the smallest possible natural number 'n' for which the equation $x^2-nx+2014=0$ has integer roots.

12. For natural numbers x & y, let (x, y) denote the greatest common divisor of x & y. How many pairs of natural numbers x & y with $x\le y$ satisfy the equation $xy=x+y+(x, y)$?

13. Let $x_1, x_2, ... x_{2014}$ be real numbers different from 1, such that $x_1+x_2+...x_{2014}=1$ & $\frac{x_1}{1-x_1}+\frac{x_2}{1-x_2}+...\frac{x_{2014}}{1-x_{2014}}=1$. What is the value of $\frac{x_1^2}{1-x_1}+\frac{x_2^2}{1-x_2}+.....\frac{x_{2014}^2}{1-x_{2014}}$.

14. One morning, each member of Amit's family drank an 8 ounce mixture of coffee and milk. The amounts of coffee and milk varied from cup to cup,but were never zero. Amit drank $\left(\frac{1}{7}\right)^{th}$ of the total amount of milk and $\left(\frac{2}{17}\right)^{th}$ of the total amount of coffee. How many people are there in Amit's family?

15. Find total possible integral solution of the equation $x^2+y^2+z^2+t^2=2^{2004}$, where $0\le x\le y\le z\le t$.

16. Find total number of positive integer x & y such that $x^5+y^5+1=(x+2)^5+(y-3)^5$

17. a, b, c, d, & e are positive real numbers such that $a+b+c+d+e=8$ & $a^2+b^2+c^2+d^2+e^2=16$. If range of e is $\left(0, \frac{\ell}{m}\right)$, where ℓ & m are natural numbers & are relatively prime. What is $\ell+m$?

18. Find total numbers of all non-zero real no triples (x, y, z) which satisfy $3(x^2+y^2+z^2)=1$; $x^2y^2+y^2z^2+z^2x^2=xyz(x+y+z)^3$.

19. If $f(x) = x^4 + ax^3 + bx^2 + cx + d$ is a polynomial such that $f(1) = 10$, $f(2) = 20$, $f(3) = 30$. If the value of $\frac{f(12) + f(-8)}{200}$ is m, find $[m]$, where $[.]$ is greatest integer function

20. Given real numbers x, y, z such that $x + y + z = 3$, $x^2 + y^2 + z^2 = 5$, $x^3 + y^3 + z^3 = 7$. Find $x^4 + y^4 + z^4$.

21. If all integral values of 'a' such that the quadratic expression $(x + a)(x + 1991) + 1$ can be factored as $(x + b)(x + c)$, where b & c are integers, are a_1 & a_2. Find the value of $|a_1 - a_2|$.

22. If the three-digit number that is equal to 4 times the product of its digits is k, what is the $\frac{k}{4}$?

23. If total ways a team of 5 members can be selected from 4 ladies and 8 gentlemen such that selection includes atleast 2 ladies is n, what is $\frac{n}{6}$?

24. In how many ways a person can buy 5 ice-creams from a shop in which four different flavors of ice-creams are available?

25. If the number of non-negative integral solutions $x_1 + x_2 + x_3 + 4x_4 = 20$ is ℓ, what is $\frac{\ell}{8}$?

26. Find the last two digits of $(1\,2\,3\,4\,5\,6\,7\,8\,9)^{41}$?

27. If the remainder when $(124)^{1000}$ is divided by 1000 is k, what is $\frac{k}{4}$?

28. Find total number of real ordered pair (x, y) satisfying $x^8 + y^8 = 8xy - 6$

29. $S = 1! + 2! + 3! + ... + 1997!$. Find the tens digits of S.

30. In how many ways 3 letters can be selected from letters AABBBC.

****** Best of Luck ******

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ANSWERS KEY

Q.No.	ANS
1.	70
2.	02
3.	00
4.	08
5.	12
6.	62
7.	11
8.	60
9.	37
10.	10
11.	91
12.	03
13.	00
14.	08
15.	02
16.	00
17.	21
18.	02
19.	99
20.	09
21.	04
22.	96
23.	76
24.	56
25.	67
26.	89
27.	94
28.	02
29.	01
30.	06