# MMO 2020

## MetriX Mathematical Olympiad

---

# DAY 1

---

- The rules are same as the rules of the Actual IMO contest. Each problem is containing 7 points. There are partial markings so be sure that you solution is well explained also if your progress is right up to some part you will get some partial marks.

- It is advised to take the mock in the 4.5 hours as the standard time of IMO, however the submission deadline is two weeks. You can make a pdf of your latex solution or you can submit handwritten solutions but be sure its neat and clean subjective solutions.

- The problems are mostly original so search function won't help you much, if you find any problem which is known, please keep it with you or just PM us.

- This problems will be posted on HSO( High school Olympiad Forum) after the exam is over, just use the tag MMO and you can find it on HSO later.

- Please avoid any unfair means, try the problems yourselves. Also note that you can send the solutions one by one but it must be in the same pm and add all members - Aritra12, TLP.39, MNJ2357, Functional_Equation, Amar_04 and Mr.C.

# MMO 2020

1st MetriX Mathematical Olympiad

Day 1(English)

*Wednesday, 4th November 2020*

**MMO1.** Find the largest positive integer $N$ such that there exists $0 < x_1, \ldots, x_N \leq 2020, 0 \leq y_1, \ldots, y_N \leq 2020$ satisfying

$$\left| \frac{y_i}{x_i} - \frac{y_j}{x_j} \right| \geq \frac{1}{x_i x_j (y_i + y_j)}$$

for all $1 \leq i < j \leq N$.

**MMO2.** Does there exist a non constant polynomial $P$ with integer coefficients such that

$$p \text{ is prime, } p|P(n) \text{ for some integer } n \Longrightarrow p \equiv 3 (\text{mod } 4)?$$

**MMO3.** Does there exist a heptagon $P$ satisfying the following: There does not exist a square with exactly three of the vertices on the boundary of $P$.

*Language : English*

*Time: 4 hours and 30 minutes*
*Each problem is worth 7 points*