Writing Test

INMOTC MP Region

January 3, 2026

The goal of this exercise is NOT to test whether you can find the answer in a given time, but rather to test if you can pen down your thoughts properly. Please write the complete solution as you would write in the actual test. It may take around 60 minutes. However, if you need more time to solve it, please do!

Problem 1. *Let $n \geqslant 3$ be an integer. Jyoti and Kartick play a game in a regular n-sided polygon with a vertex marked as a trap. Initially Kartick places a token at one vertex of the polygon. In each step, Jyoti says a positive integer and Kartick moves the token that number of vertices clockwise or counterclockwise, at his choice. Determine all the n such that Jyoti can force Kartick to fall into the trap.*

Problem 2. *Find all pairs (a, b) of positive integers such that $a! + b$ and $b! + a$ are both powers of 5.*