Algerian Mathematical Olympiad - Second Edition 2025

Category: Junior   **July 4th, 2025**

Problem 4. Mohamed wrote 9 distinct natural numbers around the circumference of a circle. Each time, he chooses two numbers and writes all positive divisors of their difference inside the circle, the process ends when all possible pairs have been chosen.
In this case, prove that all numbers less than 9 have been written inside the circle (not necessarily alone).

Problem 5. find all nonnegative integers $x, y \in \mathbb{N}$ and primes p such that:

$$x^2 = p - 2, y^2 = 2p^2 - 2$$

Problem 6. Let ABC be a triangle. Consider the points D, E, F as the feet of the altitudes from A, B, C, respectively and H its orthocenter which we suppose is the midpoint of CF. Let M be the midpoint of BC, N be the midpoint of BE, and $X = (AN) \cap (MF)$. Prove that $\angle HXM = 90°$.

Language: English

Time: 4 hours and 30 minutes
Each problem is worth 7 points.
The problems are ordered by difficulty.