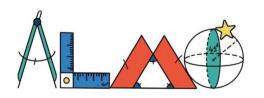
People's Democratic Republic of Algeria

Ministry of National Education

Directorate of Specialized Education and Private Education

National Committee of Olympiads of Educational Disciplines



Algerian Mathematical Olympiad - Second Edition 2025

Category: Senior July 3rd, 2025

Problem 1 Let ABC be an acute triangle with circumcircle ω . Let D be the intersection of ω with the angle bisector of $\angle BAC$. let E be on [DC) and assume that the circumcircle of triangle ACE meets [BC] at F. Let (DF) meet ω and (ACF) at G and H, respectively.

Prove that $(GC) \parallel (HE)$.

Problem 2. Find all positive integers a, b such that $a^2 + ab + b^2 = p^k$ and $ab = m^2$ for some prime p and positive integers m, k.

Problem 3. Find all surjective functions $f: \mathbb{Q}^* \to \mathbb{Q}^*$ such that:

$$(f(x) + f(y))f(x + y) = f(xy)$$

for all $x, y \in \mathbb{Q}^*$ with $x + y \neq 0$.

Language: English