Some problems in Hungarian mathematical competition. I.

Fang Chen

Department of Mathematics, Xinjiang Normal University

Urumchi 830054, China

Email: chenfang@stu.xjnu.edu.cn

Abstract

In this work, we present some interesting problems in the Transylvanian Hungarian Mathematical Competition held in 2012.

A1st Problem. Find that numbers $x, y \in \mathbb{N}$ for which relation $x + 2y + \frac{3x}{y} = 2012$ holds.

Béla Kovács

A2nd Problem. Let $a_1, b_1, c_1, a_2, b_2, c_2 \in \mathbb{R} \setminus \{0\}$ with $a_1^2 + b_1^2 + c_1^2 = a_2^2 + b_2^2 + c_2^2$. Prove that at least one of equations $a_1x^2 + 2c_2x + b_1 = 0$, $b_1x^2 + 2a_2x + c_1 = 0$, and $c_1x^2 + 2b_2x + a_1 = 0$ has real solutions.

Mihály Bencze

A3rd Problem. Solve equation $2^{[x]} = 1 + 2x$ with $x \in \mathbb{R}$, where $[x]$ denotes the integer part of x.

Anna-Mária Darvas

A4th Problem. Prove that for every acute angled and not isosceles triangle with the half of the segment determined by a vertex and the orthocenter, with the median from the same vertex, and with the circumradius of the triangle we can construct a triangle.

Ferenc Olosz

A5th Problem. The measures two angles of a triangle are of 45° and 30°. Find the ratio of the longest side of the triangle and the median from the vertex of the angle of 45°.

Ferenc Olosz

A6th Problem. Prove that among every seven vertexes of a regular 12-gon there exist three which are vertexes of a right-angled triangle! Is it also true that among every seven vertexes of a regular 12-gon there exist three which are vertexes of a right-angled and isosceles triangle?

Zoltán Bíró