



ΚΥΠΡΙΑΚΗ ΜΑΘΗΜΑΤΙΚΗ ΕΤΑΙΡΕΙΑ

A' Selection Test for under 15 1/2 years old

«Ευκλείδης»

Date: 28/01/2023

Time: 10:00-14:30

ΟΔΗΓΙΕΣ

1. Solve all problems, **justifying** fully your answers.
 2. Write using blue or black ink. (Figures can be drawn using a pencil)
 3. Correction fluid (Tipp-ex) is not permitted.
 4. Calculators are not permitted.
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Problem 1. Prove, for every integer k , that the number $10k + 2023$ is not a perfect square.

Problem 2. Find all integer pairs (x, y) satisfying

$$3x^2 - 15x - yx^2 + 5xy - 24 = 0.$$

Problem 3. Let $AB\Gamma$ be an acute-angled triangle with height $A\Delta$. The point E is the symmetric point of Δ with respect to $A\Gamma$ and the perpendicular to AE through B meets $A\Gamma$ at K . Prove that the triangle KBF is isosceles.

Problem 4. Consider 100 distinct integer numbers

$$1 \leq a_1 < a_2 < \dots < a_{100} \leq 400.$$

For $i = 1, 2, \dots, 99$ define $d_i = a_{i+1} - a_i$. Prove that there is an integer number n , such that for at least 15 distinct values of i it holds that $d_i = n$.