Cyprus Mathematical Society

Regional Competition
November 2025

«Lyceum B′»

Date: 8/11/2025 Time: 10:00-12:00

Οδηγίες

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.
5. Each problem is worth 10 points

Problem 1. With the notation $\overline{xy\omega}$ we indicate that the number $xy\omega$ is in decimal notation i.e. $\overline{xy\omega} = 100x + 10y + \omega$. Determine all sums of the form

$$S = \overline{4\alpha 5} + \overline{2\beta 7} + \overline{1\gamma 4}$$

which are multiples of 9.

Problem 2.

i. Prove that for every natural number $\nu \geq 5$

$$2^\nu > \nu^2$$

ii. Determine the positive values of $\nu \in \mathbb{N}$ for which the equation

$$2^\nu - 17 = \nu^2 - 6\nu$$

has solutions

Problem 3. If for the triangle $\triangle AB\Gamma$

$$\sin^2(B - 27^\circ) - \sin^2(A - 55^\circ) = 1$$

determine the angles of the triangle $\triangle AB\Gamma$.

Problem 4. Let $\triangle AB\Gamma$ be a triangle and Δ the midpoint of $B\Gamma$. On the median $A\Delta$ a point E is chosen such that $\frac{AE}{A\Delta} = \frac{1}{3}$. The extension of ΓE meets AB at K. If $AK = \frac{3}{2}$, compute the length of AB.