



OIM – type Test, Juniors

Problema 1. Show that the number

$$\overbrace{aaa \dots a}^{2011 \text{ ori}} 0a$$

is not a perfect square for any non-nil digit a .

Problema 2. Find all positive integers a, b for which there exists sets $A, B \subset \mathbb{N}^*$ so that $A \cap B = \emptyset$, $A \cup B = \mathbb{N}^*$ and $aA = bB$ (if x is a number and M is a set of numbers, $xM = \{xm \mid m \in M\}$).

Problema 3. A set \mathcal{D} of n straight lines in a plane has the property that each line of the set intersects exactly 2011 straight lines of \mathcal{D} .

Find n .

Problema 4. Consider a triangle ABC and the points $M \in (BC)$, $N \in (AC)$, $P \in (AB)$ such that $\angle BMP \equiv \angle CNM \equiv \angle APN$ and $BM = CN = AP$. Prove that the triangle ABC is equilateral.