9-th German Federal Mathematical Competition 1978/79

Second Round

1. Each point in a plane is colored either red or blue. Show that there exists a rectangle whose all vertices are of the same color. State and prove a generalization.

2. A circle k with center M and radius r is given. Find the locus of the incenters of all obtuse-angled triangles inscribed in k.

3. The n participants of a tournament are numbered with 0 through $n-1$. At the end of the tournament it turned out that for every team, numbered with s and having t points, there are exactly t teams having s points each. Determine all possibilities for the final score list.

4. A infinite sequence $p_1, p_2, p_3, \dots$ of natural numbers in the decimal system has the following property: For every $i \in \mathbb{N}$ the last digit of p_{i+1} is different from 9, and omitting this digit one obtains number p_i. Prove that this sequence contains infinitely many composite numbers.

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