Yugoslav IMO Team Selection Test 1992

Novi Sad, April 25, 1992

Time allowed 3 *hours.*
Each problem is worth 25 *points.*

1. Three squares $BCDE$, $CAFG$ and $ABHI$ are constructed outside the triangle ABC. Let $GCDQ$ and $EBHP$ be parallelograms. Prove that APQ is isosceles and rectangular triangle.

2. Periodical sequences (a_n), (b_n), (c_n) and (d_n) satisfy the following conditions:

$$a_{n+1} = a_n + b_n, \qquad b_{n+1} = b_n + c_n,$$

$$c_{n+1} = c_n + d_n, \qquad d_{n+1} = d_n + a_n,$$

for $n = 1, 2, \ldots$. Prove that $a_2 = b_2 = c_2 = d_2 = 0$.

3. Does it exist a permutation of the numbers $1, 2, \ldots, 1992$ such that the arithmetic mean of arbitrary two of the numbers is not equal to any of the numbers which is placed between these two numbers in the permutation?

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