# 17th IMO 1975

A1. Let x1 = x2 = ... = xn, and y1 = y2 = ... = yn be real numbers. Prove that if zi is any permutation of the yi, then:

?1=i=n (xi - yi)2 = ?1=i=n (xi - zi)2.

A2. Let a1 < a2 < a3 < ... be positive integers. Prove that for every i = 1, there are infinitely many an that can be written in the form an = rai + saj, with r, s positive integers and j > i.

A3. Given any triangle ABC, construct external triangles ABR, BCP, CAQ on the sides, so that ?PBC = 45o, ?PCB = 30o, ?QAC = 45o, ?QCA = 30o, ?RAB = 15o, ?RBA = 15o. Prove that ?QRP = 90o and QR = RP.

B1. Let A be the sum of the decimal digits of 44444444, and B be the sum of the decimal digits of A. Find the sum of the decimal digits of B.

B2. Find 1975 points on the circumference of a unit circle such that the distance between each pair is rational, or prove it impossible.

B3. Find all polynomials P(x, y) in two variables such that:

(1) P(tx, ty) = tnP(x, y) for some positive integer n and all real t, x, y;

(2) for all real x, y, z: P(y + z, x) + P(z + x, y) + P(x + y, z) = 0;

(3) P(1, 0) = 1.