Problem 2018-2

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Editor's comments. Generalizations and farther comments for this problem are not required. There is no deadline of submission.
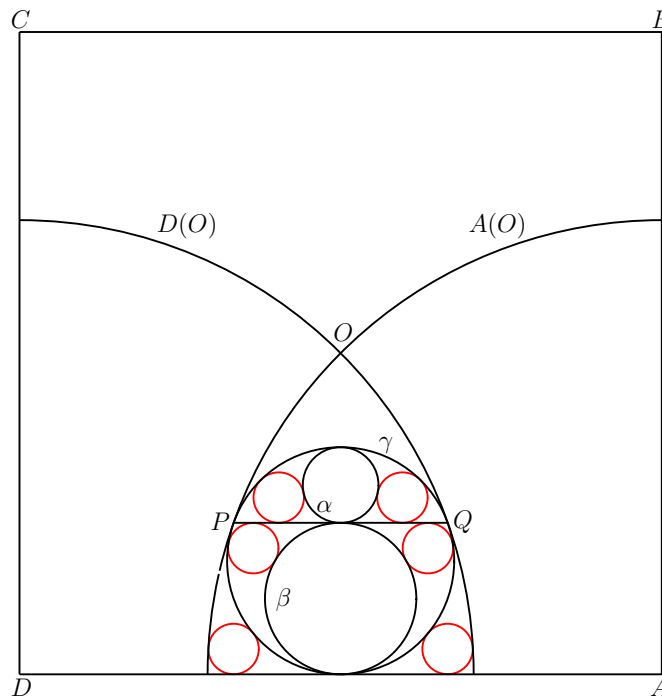

Figure 1.

Problem 1. Let $ABCD$ be a square with center O (see Figure 1). γ is a circle touching the side DA from the inside of $ABCD$ and the circle $A(O)$ and $D(O)$ internally at points P and Q, respectively, where $A(O)$ is the circle with center A passing through O and similarly $D(O)$ is defined. Circles touching the segment PQ at the midpoint and γ internally are denoted by α and β. Prove or disprove that all the incircles of the curvilinear triangles made by α, γ and PQ, the curvilinear triangles made by β, γ and PQ, the curvilinear triangle made by $A(O)$, γ and DA are congruent.