Systems of Tangent Circles Inscribed in Generalized Archimedes Arbelos

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In the research we study the systems of tangent circles inscribed in generalized Archimedes arbeloses and its properties. By the generalized Archimedes arbelos we mean one of the following modifications of the well-known Archimedes arbelos: a shift of central axises of two circles with respect to the central axis of the third circle, or the transition from the inner touch of three circles to an external touch, wherein one of the circles may degenerate into a straight line. The main purpose of this research is to show that it is possible to extend Pappus' problem to the generalized Archimedes arbeloses. To achieve this aim explicit expressions for radii and coordinates of centers for systems tangent circles inscribed in the generalized Archimedes arbelos were obtained. In the study we used elementary geometry concepts and reasoning, the method of coordinates, the method of mathematical induction and algebraic methods, in particular, methods of solving equations of high degrees. In the research we have got recurrence formulas for characteristics of systems tangent circles inscribed in generalized Archimedes arbeloses and explicit expressions of the studied sets based on this recurrent formulas. Also the Pappus problem was spread on the systems of tangent circles inscribed in generalized Archimedes arbelos. Achievements of the research may be used in non-Euclidean geometry, technology, astronomy and 3D modeling. The main results of the study are new, they can't be improved and it generalizes the results of some other researchers in this field of science.

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