International scientific conference

“Algebraic and Geometric Methods of Analysis”

Book of abstracts

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Odesa, Ukraine

Conference webpage: *imath.kiev.ua/~topology/conf/agma2019/*

List of topics

- Algebraic methods in geometry
- Differential geometry in the large
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Dynamical systems and their applications
- Geometric problems in mathematical analysis
- Geometric and topological methods in natural sciences
- History and methodology of teaching in mathematics

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The construction of squaring the circle

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The paper contains the original method for the construction of squaring the circle, one of the famous Greek problems more than 25 centuries old, known to be unsolvable by using only a ruler and compass. The solution of the problem is possible if the diameter of the given circle is divided by a point using the Thales theorem on proportional length in and the ratio of large real numbers. The process of solving the above-mentioned problem relies on the Euclidean geometry and contains a description of the construction, construction, proof, and discussion. The construction leading to the solution of the problem is based on the assumption that the tools (instruments) are perfectly precise and that the solution is completed if used a finite number of times.

The proof contains two derived formulas in accordance with the rules of Numerical analysis, combined into a single (universal) formula which can be used in practice. In discussion the conditions on which the problem can be solvable, as well as number of solutions are given.

1. Squaring the circle using only a straightedge and compass is possible

Description of construction:

A given circle with a central point O and radius r are denoted by $k(O,r)$. The length AB is diameter of an arbitrary circle k. (Fig.1) As shown by the previous method, when constructing of the length $X=\sqrt{2}$, we divide diameter AB by the point C in the ratio of integers 11000000 and 3005681, i.e. $AC:CB=11000000:3005681$,

in the following way:

On the arbitrary ray A_q we determine point M by "transferring" 11000000 arbitrary unit lengths. Then we determine the point N so that the length MN equals 3005681 arbitrary unit lengths.

Then we construct a length NB. Through the point M we draw a line s parallel to the length NB. The intersection of the line s and length AB is denoted by C. Through the point C we construct the line l so that it is parallel to the ray A_q and its intersection with the length NB we denote by the point L. (Fig. 1) The length AB is divided in the above mentioned ration by the point C.

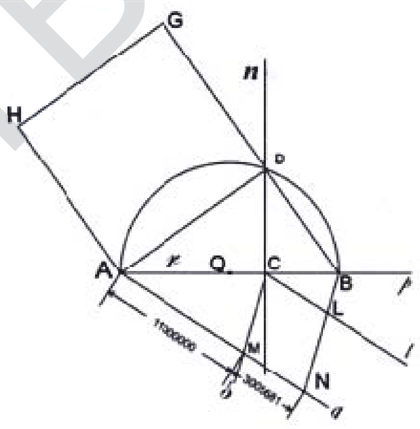

Fig.1

Triangles AMC and CLB are similar, so we can form the proportion:

$$AC:AM=CB:CL...(3)$$

Based on relation (3), we replace:

$$AM = 11{\cdot}106 \text{ and } MN = CL = 3005681 = 3,005681{\cdot}106$$

It follows that $AC : CB = 11 \cdot 10^6 : 3,005681 \cdot 10^6$, Q.E.D. (Quod erat demonstrandum)

After having it shortened with 106, we get:

$$AC : CB = 11 : 3,005681 = t...(4)$$

Based on relation (4) $AC : 11 = t => AC = 11t$ and

$$CB : 3,005681 = t => CB = 3,005681t....(5),$$

where t is a non-negative real number, i.e. $t > 0$ and $t \in R$.

Let us construct a line n through the point C to be perpendicular to the diameter AB, and denote its (one) intersection with the periphery of the circle by D. Then we draw lengths AD and BD. AD represents the side of the square whose area is equal to the area of the given circle. Then we construct the square $ADGH$ (Figure 1).