AMERICAN Journal of Engineering, Mechanics and Architecture
Volume 2, Issue 4, 2024 ISSN (E): 2993-2637

Comparative Analysis of Euclid and Lobachevsky Geometries

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Abstract: In the article, Lobachevsky geometry is a widely applied theory in mathematics, mechanics and physics. This geometry is important because it is a geometric theory based on a cistern of axioms, which differs from the system of axioms of Euclidean geometry only by the axiom of parallelism. The role of Euclid in the field of mathematics, the principal separation of geometry from arithmetic, planametry from stereometry, has been studied.

Keywords: Euclid, scientists who contributed to the science of geometry, geometric algebra.

Euclid systematized the knowledge in the field of mathematics before him and was the first to fundamentally separate geometry from arithmetic, planometry from stereometry. Geometry, as known from Euclid's "Principles", deals with concrete concepts. All concepts in geometry can be divided into two categories, i.e. basic concepts and derived concepts (concepts defined by means of basic concepts). For example, to define a new concept, we build on a previous concept, which, in turn, builds on the previous concept. However, this sequence cannot continue indefinitely, some concepts should be taken as the main starting concept, the content of these concepts should not be based on any definition. Among the complete mathematical works that have come down to us, e.o. These are the works of Euclid, Archimedes, and Apollonius, belonging to the IV century. In these, mathematics was formed as a scientific discipline.

It is a mathematical work of the philosopher Hippocrates of Chios, which has been completely preserved to us. This work is significant due to the sufficient completeness of mathematical considerations and the raising of theoretical issues. In this: 1. Calculation of the surface of leaves bounded by two circular arcs. 2. The ratio of the surfaces of similar circular segments, as the ratio of the squares of the chords that subtend them. 3. Triangle inequality and Pythagorean theorem. 4. The main problems of antiquity were information about trisecting an angle, doubling a cube, squaring a circle, the first steps of axiomatics were taken, and the principle of logical deduction was applied. Pythagoreans in the field of arithmetic:

1. They divided the numbers into even-odd, prime and complex, perfect, double, triangular, square, pentagonal and so on classes. Current appearances are inherited from them.
2. Properties of regular polyhedra and regular polygons.
3. Those who know the method of covering the plane with the system of regular triangles, rectangles, hexagons, and the way of covering the space with the system of cubes.
4. Proof of the Pythagorean theorem.
5. a:b=b:c - those who discovered the irrationality of cross-sections without dimensions as a result of studying the geometric mean.

Searching for what the geometric mean of the divine numbers one and two is equal to leads to the relationship between the side and the diagonal of the square, which is not expressed by a rational number in their understanding - leads to irrationality.

As a result of the attempt to create a mathematical theory that is valid for irrational numbers as well as for rational numbers, a new branch was created under the name of geometric algebra. But the disadvantage of geometric algebra is that there are enough problems that cannot be solved with the help of a ruler and a circle. Such issues include:

Double the cube;

Trisection of an angle;

Includes squaring the circle and more.

1. Doubling the cube, that is, making a cube whose size is twice the size of the given cube. Let the given cube edge be equal to , then the new cube edge, the problem comes down to solving equation $x^3 = 2a^3$ or making a section. Let's get acquainted with the method recommended by Hippocrates of Chios (mid-5th century AD) at home. It makes the problem more general, that is, forming a cube from a parallelepiped. This brings him to the problem of finding two proportional mids.

To us $V = a_1b_1c_1$ let the parallelepiped be given. It is a new parallelepiped with a square base $V = a^2b$ be referred to. Now this $x^3 = a^2b$ we transfer to the cube. The edge of the wanted cube is according to Hippocrates $a : x = x : y = y : b$ determined from the proportion. for this $x^2 = ay$, $xy = ab$ va $y^2 = bx$ geometric positions in the view were checked and they (and) solved the coordinates of the point of intersection of these geometric positions in the form of finding the mean proportional. This is a problem that can be solved in the form of conic sections. In another view, Eratosthenes made a device (mesolabium) that roughly doubled the cube. Regarding the further fate of the problem, in 1637 Descartes expressed doubt that this problem could be solved. In 1837, Vantselb elaborated on this issue, that is, he proved that cubic irrational numbers do not belong to the set of rational numbers, nor to the set extended by quadratic irrationality. So, the problem cannot be solved with the help of a ruler and circle. 2. Trisection the angle. The second famous problem of antiquity is the trisection of an arbitrary angle by the methods of geometric algebra. This problem, like the previous one, is reduced to solving a third-order equation, i.e $a = 4x^3 - 3x$ or in trigonometric form $\cos\varphi = 4\cos^3(\frac{\varphi}{3}) - 3\cos(\frac{\varphi}{3})$.

3. The third problem is to find a circle whose face is equal to the face of a square. The face of a circle πr^2, the face of the square x^2. In that case $\pi r^2 = x^2$, $\sqrt{\pi} r = x$ being, π This problem was waiting for a solution until the arithmetic nature of Only by the 18th century I. Lambert and A. Legends π proved that it is not a rational number. Lindemon in 1882 π proved that is a transcendental number, that is, it cannot be a root of any algebraic equation with integer coefficients.

Of course, ancient mathematicians did not know this. They discovered many new facts and methods while solving the problem, which undoubtedly made a great contribution to the development of mathematics. They managed to solve the problem for some special cases. Summary Improving the quality and efficiency of education in the continuous education system is one of the important requirements of today. The use of modern new pedagogical technologies, the use of various active methods in the organization of the lesson gives a positive result. In order to increase students' interest in the lesson, it is necessary to help them acquire a culture of free thinking. If the teacher and, at the same time, the student are not ready for the lesson, there will be no opportunity to use any active method. The use of historical information during the lesson, the life and work of great mathematicians, and the concrete facts about the significance of their scientific conclusions for the development of science and society will increase students' enthusiasm for learning.

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