MATHEMATICAL BACKGROUND OF THE BEAUTIFUL

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ABSTRACT

This article discusses the importance of the mathematical background of the beautiful.

Keywords: Mathematics, cognitive competence, learning, development, elementary mathematics.

INTRODUCTION, LITERATURE REVIEW AND DISCUSSION

Life on our planet originated about 2.5 billion, the plants appeared almost 450 million, vertebrates about 400 million years ago. But only a reasonable person for so small, numbering about 40 thousand years ago, began to create and solve his most important life questions and problems. Each epoch of human development posed its own tasks and managed to find the best options for solving them, considering them from a more perfect and optimal point of view for their time, developing a special kind of thinking that was universal in nature. Contrasting order with disorder, simplicity, complexity, certainty – uncertainty, people sought harmony. The ancient Chinese symbol "Yin-Yang" meant the sun, light, good, beauty, truth, Yang, earth, darkness, evil, disgrace, lies, inaction, Yin, as the beginning of two opposites.

Fig 1

Complementing each other the center of each beginning contains a grain of another beginning, reflects the unity of the two opposites, the symmetry of mutually complementary principles as a symbol of harmony. Yin-Yang and Tao in the books of the Taoist sages, Henri and Nui in the cosmological myths of ancient Egypt, Moloch and Ahriman in the Avesta of Zaraustrata, Cosmos and Chaos are imbued with the ideas of harmony. By geometrizing, they tried to express the hypotenuse of a right-angled triangle through its leg, the diagonal of a square through its sides, which led them to the concept of incommensurability of segments, where the ratio of these segments could not be expressed by a single number. The points defining this relationship were numerous, endless. They considered this situation "not rational", that is, "αloγos", they considered the calculation of this relationship unreasonable, which exceeds all human capabilities. According to the Pythagorean logic, it is possible only in the ratios of infinitely large numbers, which they found in the structure and motion of the luminaries in the universe, what they called "xosmos", that according to the Pythagorean theory all opposites are brought to unity, to harmony. Adhering to this logic, they attached particular importance to the

ratio of the segment as the so-called "golden division" (Fig. 2). From a mathematical point of view, it is presented in relation to segments a and "x", where the fulfillment of proportion (1) is required.

A   C   B
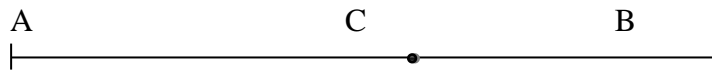
(Fig 2)

$\frac{AB}{AC} = \frac{AC}{CB}$ (1)   AB=a, AC=x, CB=a-x

$\frac{a}{x} = \frac{x}{a-x}$ => $x^2 + ax - a^2 = 0$ $x_1 = \frac{-a-a\sqrt{5}}{2}$ $x_2 = \frac{a+a\sqrt{5}}{2}$ $x \approx 0{,}618a$,

the value of the golden division, which in honor of the Greek sculptor Fedia was later designated by the letter F. As the Pythagoreans found and what was proved by subsequent many scholars of the world, things and figures that give us the impression of the greatest perfection contain a harmonious relationship. They found this harmony in regular geometric figures, in musical sounds. The correct triangle in the Babylonians, the square in the Egyptians, the regular pentagon was famous among the Greeks. Continuing the sides of a regular pentagon, or sequentially connecting through one of its vertices, you can get a figure that the Pythagoreans called the pentagram, the Pythagorean star (Fig 3).
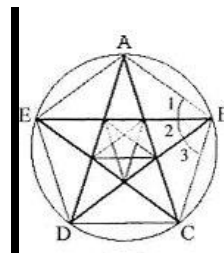

Fig 3

Diagonali of this figure divide each other in the "golden division", also working with a compass and a ruler, you can form many interlocking pentagrams, denoting countless harmonic relations, which served as a connection between the figure and mysterious forces and properties, used by the people in the form of a "witch foot" as a means of protection from evil spirits and ailments. An example of this can be obtained in the poem "Faust", the German thinker I. Goethe.

Fifty-nine drawings of these models served as an illustration of the book by Luca Pacioli, published in 1509, "On Divine Proportion", where the author called the "golden division" "Divine Proportion". He found thirty golden division effects, in the most perfect forms — in five platonic solids. Archimedes described thirteen half-right bodies, Albert Durer lists the properties of seven Archimedean bodies. In 1619, Johann Kepler built two, in 1809 Poinsot - two more semi-correct bodies, later these bodies were called Kepler-Punson bodies.
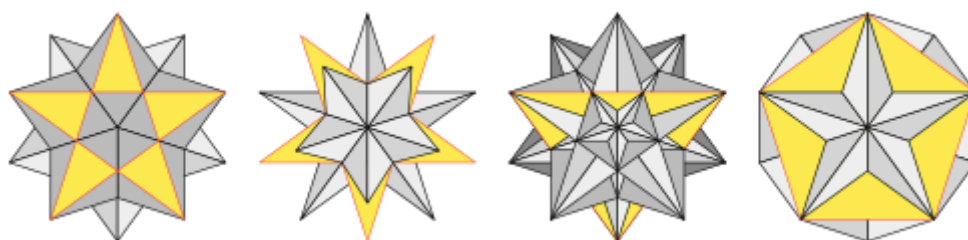
In the modern world, the forms of these bodies are successfully used for aura and jewelry.

The penetration of mathematical concepts into the sphere of music contributed to the emergence of the theory of music, while the use of geometric methods in the construction of architectural forms gave rise to the science of geometric skillful techniques and geometric harmonization in architecture. While adhering to the ancient Greek views on harmony, Vitruvius found that if proportions of the human body are expressed in ratios 1:10, 1: 8, 1: 6, 1: 4, 1: 3 and 3: 1, 3: 3 circles and squares, then in one form or another they can express harmonic relationship in architecture; separate architectural parts of the temple should be in constant proportion to the whole. Studying the history of development of mathematical disciplines, the logic of substantiation of mathematical concepts, theories for establishing logical links between branches of mathematical disciplines, substantiation of humanitarian features of mathematics, as well as mathematical prerequisites of the beautiful contributes not only to the enrichment of mathematical knowledge, but also to the formation of mathematical and humanitarian culture and poetic thinking, it contributes to the formation of intelligence. Mathematics has a large functional opportunity, where you can talk about the internal logical beauty of the subject, logical argumentation, strict and complete beauty of logical constructions, grace of wit, a word about what reflects the beauty of the laws of mind, about the intellectual beauty that gives satisfaction in itself. Thanks to these masterpieces of intelligence, intelligence, a person receives greater inner satisfaction and spirituality. An inspired person, one can say "born twice," this is how philanthropy, peacefulness is formed. Enrichment of the inner world, the intellect call for humane actions, which in our opinion is important and necessary in the activities of every mentor, educator, and especially the teacher.

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