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FROM THE HISTORY OF THE SCIENCE OF MATHEMATICS (THE ANCIENT WORLD)

Gadaev Daniyor Rajabovich
Jizzakh State Pedagogical Institute, Teacher of the Department
“ Distance Education in Natural and Exact Sciences”

Akhatkulov Anvar Almasovich
Jizzakh State Pedagogical Institute, Teacher of the Department
“ Distance Education in Natural and Exact Sciences".

Abstract
The article tells about famous scientists in the history of mathematics and their lives. The article tells about the mathematical scientists who lived and worked in the history of the ancient world and their contributions to science.

Keywords: mathematics, the ancient world, numbers, Pythagoras, Euclid, Rome, Greece.

Introduction

We think that in the history of the ancient world there was no science of mathematics. In fact, the history of mathematical science is rooted in ancient history.

Pythagoras of Samos was born between 530 and 510 BC. e. Although we are accustomed to think of Pythagoras primarily as a mathematician, for his contemporaries he was primarily a religious prophet, "an eminent fist," as the historian Herodotus called him, and some revered Pythagoras as a saint.

In this era, Greek mathematics was only in its infancy, and scientists consider the mathematics of ancient Egypt and Babylon to be its main source. This historical fact is indirectly confirmed by the fact that there are many points of contact between the Egyptian, Babylonian and Greek mathematics of that period.

Pythagoras was one of the first, thanks to whom the achievements of mathematics of previous civilizations penetrated ancient Hellas. According to legend, Pythagoras traveled a lot, spent 22 years in Egypt and 12 years in Babylon, where he comprehended the secrets of mathematics, music and astronomy. Returning to his homeland, he founded a philosophical school of a religious nature, which united a group of sophist philosophers who studied geometry, arithmetic, astronomy and music (the so-called "quadrivius"). The Pythagoreans, like other philosophers, wanted to comprehend the harmony of the world, that is, to know the laws of nature. But unlike

philosophers of other directions, they believed that the logical harmony that exists in mathematics does not exist without reason, but reflects the properties of the universe. Therefore, the Pythagoreans looked for the laws of nature in the properties of numbers and geometric figures, and for them mathematics was primarily of mystical significance. (Apparently, that mysticism and that mystery with which the Egyptian priests surrounded science, jealously protecting it from the uninitiated, deeply penetrated into the soul of Pythagoras.)

The Pythagoreans made few mathematical discoveries. Much of what is attributed to them was known before them. In particular, they attributed the well-known theorem on the sum of the squares of the legs of a right-angled triangle to Pythagoras, although it has been proven that Babylonian mathematicians already knew it. The most significant achievement of the Pythagoreans was the discovery of irrational numbers, which they represented as incommensurable segments. For example, the diagonal of a square with side one is equal to the root of two, i.e. these segments - the side and the diagonal - are incommensurable. Most likely, the Pythagoreans knew the proof of the irrationality of the number $\sqrt{2}$, which is given on p. 17.

The Pythagoreans were active in teaching (their charter forbade paying for lessons!), and it was largely thanks to them that mathematics later occupied such a significant place in Greece. The followers of the Pythagoreans (Neo-Pythagoreans) have already made significant mathematical discoveries.

Euclid lived, apparently, during the time of King Ptolemy I. The exact dates of his birth and death are unknown, it is assumed that he was born in the period from 365 to 335, and died in the period from 300 to 275 BC. e. Ptolemy I was one of the commanders of Alexander the Great, and after the death of the great conqueror, Egypt was given control. Greek civilization penetrated Egypt and its new capital, Alexandria, became one of the scientific centers of the world. It is known that Euclid was a professional scientist. The most famous and outstanding of his work "Beginnings" consists of thirteen books. In them, Euclid masterfully presented all the information on geometry available by that time, adding many missing theorems and proofs. “Euclid's presentation is built in the form of strict logical conclusions from a system of definitions, postulates and axioms. The first four books deal with geometry on the plane. Starting from the simplest properties of lines and angles, we come here to the equality of triangles, the equality of areas, the Pythagorean theorem, the construction of a square equal in size to a given rectangle, the golden section, the circle, and regular polygons...” ([15], p. 69) .

Tradition says that Euclid replied to King Ptolemy, who wished to study geometry: "There is no royal road to geometry."

Archimedes (287-212 BC) was the most outstanding mathematician and mechanic of antiquity. He lived in Syracuse and was an adviser to King Heron. There is a lot of information about Archimedes, primarily in the works of ancient writers - Plutarch, Polybius, Cicero, Vitruvius, etc. Bearing in mind Archimedes' unusual for that time penchant for practical matters, Plutarch writes: “Although these inventions earned him a reputation for superhuman insight, he did not condescend to leave any work written on such matters, but, considering mechanics and art of any kind base and unworthy, if it is for profit and profit, he based all his ambitious claims on those speculations, beauty and the subtlety of which is not stained by any admixture of the ordinary needs of life.

At the same time, the characterization of Archimedes given by the modern historian I. N. Veselovsky is also interesting: “If we stick to the facts, then Archimedes began his scientific activity as a mechanic, and ended it as a mechanic, and in his mathematical works, mechanics is a powerful tool to obtain mathematical results, and these results themselves are not fruitlessly hanging in the air, but are used to substantiate mathematical theories.

The main mathematical results of Archimedes are related to the calculation of areas and volumes of various figures. Using a regular 96-gon (!) he found a very good approximation for the number p. In his treatise "On Floating Bodies" there is a well-known theorem named after him on the loss of weight by bodies immersed in a liquid. Mathematicians are well aware of the so-called axiom of Archimedes, which states that a segment of any length can be measured by an arbitrarily small segment.

One of the most amazing and significant inventions of Archimedes in astronomy was the planetarium he built. It was a hollow rotating sphere, inside of which there was a mechanism that set in motion models of the Moon, the Sun and the five planets. Here is the testimony of Cicero, who saw this device: “As soon as Gallus set the sphere in motion, it became clear how with each revolution the Moon rose above the earth 's horizon after the Sun, as it happens every day in the sky; and then one could see how the Sun was eclipsed, and the Moon fell into the shadow cone of the Earth, when the Sun was just opposite...” ([14], p. 293).

The tombstone of Archimedes depicts a cylinder with a ball inscribed in it, and the epitaph tells of one of the most remarkable discoveries of Archimedes: the volumes of these bodies are related as 3:2.

Apollonius of Perga (approximately 260-170 BC) was the third (after Euclid and Archimedes) great mathematician of the Hellenistic era. His main work, On Conics, is

an eight-book treatise on conic sections. Recall that these are ellipses, hyperbolas and parabolas (see footnote on p. 108). Apollonius studied their properties in such detail that in the next 18 centuries (before Descartes) nothing essentially new in this direction was obtained.

Apollonius was way ahead of his time. His results on second-order curves found application in Kepler's laws of planetary motion (17th century). Apollonius was able, for example, using only a compass and a straightedge to construct a circle tangent to three given circles. This difficult task (it is called the Apollonius problem) is still included in the training program for students - future teachers of mathematics. He introduced the terms "hyperbola", "parabola", "asymptote", which we still use today. Like Archimedes, he made significant contributions to the practice of computing.

Eratosthenes of Cyrene lived around 276-194. BC e., that is, he was a contemporary of Archimedes. He was famous as a mathematician, geographer, philologist, historian and poet. He mapped the world on the assumption that the Earth was a sphere. Eratosthenes is considered the founder of chronology, that is, the science of accurately determining historical dates. He calculated the tilt of the ecliptic, the distances from the Earth to the Sun and the Moon, and the length of the equator.

The biggest discovery of Eratosthenes in arithmetic was his famous "sieve" (sieve of Eratosthenes), which allows you to select prime numbers (see Ch. I, § 1). He also found a simple mechanical solution to the famous ancient problem of doubling a cube,* i.e., constructing a cube with a volume twice the given one. Of great historical value is the poetic epigram of Eratosthenes, which has come down to us, dedicated to this task. In it, he compares his solution with others by famous mathematicians of antiquity:

* The so-called Delhi problem.

If, friend, you planned to do big things out of small things,
Whether to create a cube double, or rebuild the volume,
It is possible - to expand the canopy, and the pit is more spacious
You will dig and fill the reservoir with moisture double.
Here is my device: between the rulers you will immediately find two middle ones,
Between the edges of others you will mark their ends.
You will no longer need the wise cylinder of Archytas,
Menechmus carved the triad in a cone not for you.
And with the godlike Eudoxus there is no need for curved lines,
Armed with a compass, find a thin bend.
Having boldly moved the rulers, it is easy to build myriads
Your average desired ones, starting with the smallest of the data.
Happy are you, king Ptolemy, - you gave to the eternally young

son
Equally blessed is a sweet gift for Muses and kings.*
Zeus, god of the universe!
In the future, let him accept with the same mercy
The scepter is from the royal hand - and let it be done.
The one who sees the sacrifice in the great temple, let him say:
- This gift Eratosthenes, having thought up, brought to people.
* Eratosthenes was the tutor of the heir to the throne - the son of King Ptolemy and the head of the world-famous Library of Alexandria.

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