**History of math.** The most ancient mathematical activity was counting. The counting was necessary to keep up a livestock of cattle and to do business. Some primitive tribes counted up amount of subjects, comparing them various parts of a body, mainly fingers of hands and foots. Some pictures on the stone represents number 35 as a series of 35 sticks - fingers built in a line. The first essential success in arithmetic was the invention of four basic actions: additions, subtraction, multiplication and division. The first achievements of geometry are connected to such simple concepts, as a straight line and a circle. The further development of mathematics began approximately in 3000 up to AD due to Babylonians and Egyptians.

**BABYLONIA AND EGYPT**

**Babylonia.** The source of our knowledge about the Babylon civilization are well saved clay tablets covered with texts which are dated from 2000 AD and up to 300 AD . The mathematics on tablets basically has been connected to housekeeping. Arithmetic and simple algebra were used at an exchange of money and calculations for the goods, calculation of simple and complex percent, taxes and the share of a crop which are handed over for the benefit of the state, a temple or the land owner. Numerous arithmetic and geometrical problems arose in connection with construction of channels, granaries and other public jobs. Very important problem of mathematics was calculation of a calendar. A calendar was used to know the terms of agricultural jobs and religious holidays. Division of a circle on 360 and degree and minutes on 60 parts originates in the Babylon astronomy.

Babylonians have made tables of inverse numbers (which were used at performance of division), tables of squares and square roots, and also tables of cubes and cubic roots. They knew good approximation of a number . The texts devoted to the solving algebraic and geometrical problems, testify that they used the square-law formula for the solving quadratics and could solve some special types of the problems, including up to ten equations with ten unknown persons, and also separate versions of the cubic equations and the equations of the fourth degree. On the clay tablets problems and the basic steps of procedures of their decision are embodied only. About 700 AD babylonians began to apply mathematics to research of, motions of the Moon and planets. It has allowed them to predict positions of planets that were important both for astrology, and for astronomy.



In geometry babylonians knew about such parities, for example, as proportionality of the corresponding parties of similar triangles, Pythagoras’ theorem and that a corner entered in half-circle- was known for a straight line. They had also rules of calculation of the areas of simple flat figures, including correct polygons, and volumes of simple bodies. Number babylonians equaled to 3.



**Egypt.** Our knowledge about ancient greek mathematics is based mainly on two papyruses dated approximately 1700 AD. Mathematical data stated in these papyruses go back to earlier period - around 3500 AD. Egyptians used mathematics to calculate weight of bodies, the areas of crops and volumes of granaries, the amount of taxes and the quantity of stones required to build those or other constructions. In papyruses it is possible to find also the problems connected to solving of amount of a grain, to set number necessary to produce a beer, and also more the challenges connected to distinction in grades of a grain; for these cases translation factors were calculated.

But the main scope of mathematics was astronomy, the calculations connected to a calendar are more exact. The calendar was used find out dates of religious holidays and a prediction of annual floods of Nile. However the level of development of astronomy in Ancient Egypt was much weaker than development in Babylon.

Ancient greek writing was based on hieroglyphs. They used their alphabet. I think it’s not efficient; It’s difficult to count using letters. Just think how they could multiply such numbers as 146534 to 19870503 using alphabet. May be they needn’t to count such numbers. Nevertheless they’ve built an incredible things – pyramids. They had to count the quantity of the stones that were used and these quantities sometimes reached to thousands of stones. I imagine their papyruses like a paper with numbers ABC, that equals, for example, to 3257.

The geometry at Egyptians was reduced to calculations of the areas of rectangular, triangles, trapezes, a circle, and also formulas of calculation of volumes of some bodies. It is necessary to say, that mathematics which Egyptians used at construction of pyramids, was simple and primitive. I suppose that simple and primitive geometry can not create buildings that can stand for thousands of years but the author thinks differently.

Problems and the solving resulted in papyruses, are formulated without any explanations. Egyptians dealt only with the elementary types of quadratics and arithmetic and geometrical progressions that is why also those common rules which they could deduce, were also the most elementary kind. Neither Babylon, nor Egyptian mathematics had no the common methods; the arch of mathematical knowledge represented a congestion of empirical formulas and rules.

**THE GREEK MATHEMATICS**

**Classical Greece.** From the point of view of 20 century ancestors of mathematics were Greeks of the classical period (6-4 centuries AD). The mathematics existing during earlier period, was a set of the empirical conclusions. On the contrary, in a deductive reasoning the new statement is deduced from the accepted parcels by the way excluding an opportunity of its aversion.

Insisting of Greeks on the deductive proof was extraordinary step. Any other civilization has not reached idea of reception of the conclusions extremely on the basis of the deductive reasoning which is starting with obviously formulated axioms. The reason is a greek society of the classical period. Mathematics and philosophers (quite often it there were same persons) belonged to the supreme layers of a society where any practical activities were considered as unworthy employment. Mathematics preferred abstract reasoning on numbers and spatial attitudes to the solving of practical problems. The mathematics consisted of a arithmetic - theoretical aspect and logistic - computing aspect. The lowest layers were engaged in logistic.

Deductive character of the Greek mathematics was completely generated by Plato’s and Eratosthenes’ time. Other great Greek, with whose name connect development of mathematics, was Pythagoras. He could meet the Babylon and Egyptian mathematics during the long wanderings. Pythagoras has based movement which blossoming falls at the period around 550-300 AD. Pythagoreans have created pure mathematics in the form of the theory of numbers and geometry. They represented integers as configurations from points or a little stones, classifying these numbers according to the form of arising figures (« figured numbers »). The word "accounting" (counting, calculation) originates from the Greek word meaning "a little stone". Numbers 3, 6, 10, etc. Pythagoreans named triangular as the corresponding number of the stones can be arranged as a triangle, numbers 4, 9, 16, etc. - square as the corresponding number of the stones can be arranged as a square, etc.

From simple geometrical configurations there were some properties of integers. For example, Pythagoreans have found out, that the sum of two consecutive triangular numbers is always equal to some square number. They have opened, that if (in modern designations) *n* - square number, *n* + *2n* +1 = (*n* + 1). The number equal to the sum of all own dividers, except for most this number, Pythagoreans named accomplished. As examples of the perfect numbers such integers, as 6, 28 and 496 can serve. Two numbers Pythagoreans named friendly, if each of numbers equally to the sum of dividers of another; for example, 220 and 284 - friendly numbers (here again the number is excluded from own dividers).



For Pythagoreans any number represented something the greater, than quantitative value. For example, number 2 according to their view meant distinction and consequently was identified with opinion. The 4 represented validity, as this first equal to product of two identical multipliers.

Pythagoreans also have opened, that the sum of some pairs of square numbers is again square number. For example, the sum 9 and 16 is equal 25, and the sum 25 and 144 is equal 169. Such three of numbers as 3, 4 and 5 or 5, 12 and 13, are called “Pythagorean” numbers. They have geometrical interpretation: if two numbers from three to equate to lengths of cathetuses of a rectangular triangle the third will be equal to length of its hypotenuse. Such interpretation, apparently, has led Pythagoreans to comprehension more common fact known nowadays under the name of a pythagoras’ theorem, according to which the square of length of a hypotenuse is equal the sum of squares of lengths of cathetuses.

Considering a rectangular triangle with cathetuses equaled to 1, Pythagoreans have found out, that the length of its hypotenuse is equal to , and it made them confusion because they tried to present number as the division of two integers that was extremely important for their philosophy. Values, not representable as the division of integers, Pythagoreans have named incommensurable; the modern term - « irrational numbers ». About 300 AD Euclid has proved, that the number is incommensurable. Pythagoreans dealt with irrational numbers, representing all sizes in the geometrical images. If 1 and to count lengths of some pieces distinction between rational and irrational numbers smoothes out. Product of numbers also is the area of a rectangular with the sides in length and .Today sometimes we speak about number 25 as about a square of 5, and about number 27 - as about a cube of 3.



Ancient Greeks solved the equations with unknown values by means of geometrical constructions. Special constructions for performance of addition, subtraction, multiplication and division of pieces, extraction of square roots from lengths of pieces have been developed; nowadays this method is called as geometrical algebra.

Reduction of problems to a geometrical kind had a number of the important consequences. In particular, numbers began to be considered separately from geometry because to work with incommensurable divisions it was possible only with the help of geometrical methods. The geometry became a basis almost all strict mathematics at least to 1600 AD. And even in 18 century when the algebra and the mathematical analysis have already been advanced enough, the strict mathematics was treated as geometry, and the word "geometer" was equivalent to a word "mathematician".



One of the most outstanding Pythagoreans was Plato. Plato has been convinced, that the physical world is conceivable only by means of mathematics. It is considered, that exactly to him belongs a merit of the invention of an analytical method of the proof. (the Analytical method begins with the statement which it is required to prove, and then from it consequences, which are consistently deduced until any known fact will be achieved; the proof turns out with the help of return procedure.) It is considered to be, that Plato’s followers have invented the method of the proof which have received the name "rule of contraries". The appreciable place in a history of mathematics is occupied by Aristotle; he was the Plato’s learner. Aristotle has put in pawn bases of a science of logic and has stated a number of ideas concerning definitions, axioms, infinity and opportunities of geometrical constructions.

About 300 AD results of many Greek mathematicians have been shown in the one work by Euclid, who had written a mathematical masterpiece *“the Beginning”*. From few selected axioms Euclid has deduced about 500 theorems which have captured all most important results of the classical period. Euclid’s Composition was begun from definition of such terms, as a straight line, with a corner and a circle. Then he has formulated ten axiomatic trues, such, as « the integer more than any of parts ». And from these ten axioms Euclid managed to deduce all theorems.

Apollonius lived during the Alexandria period, but his basic work is sustained in spirit of classical traditions. The analysis of conic sections suggested by him - circles, an ellipse, a parabola and a hyperbole - was the culmination of development of the Greek geometry. Apollonius also became the founder of quantitative mathematical astronomy.

**The Alexandria period.** During this period which began about 300 AD, the character of a Greek mathematics has changed. The Alexandria mathematics has arisen as a result of merge of classical Greek mathematics to mathematics of Babylonia and Egypt. Generally the mathematics of the Alexandria period were more inclined to the solving technical problems, than to philosophy. Great Alexandria mathematics - Eratosthenes, Archimedes and Ptolemaist - have shown force of the Greek genius in theoretical abstraction, but also willingly applied the talent for the solving of practical problems and only quantitative problems.

Eratosthenes has found a simple method of exact calculation of length of a circle of the Earth, he possesses a calendar in which each fourth year has for one day more, than others. The astronomer the Aristarch has written the composition *“About the sizes and distances of the Sun and the Moon”*, containing one of the first attempts of definition of these sizes and distances; the character of the Aristarch’s job was geometrical.

The greatest mathematician of an antiquity was Archimedes. He possesses formulations of many theorems of the areas and volumes of complex figures and the bodies. Archimedes always aspired to receive exact decisions and found the top and bottom estimations for irrational numbers. For example, working with a correct 96-square, he has irreproachably proved, that exact value of number is between3 and 3. Архимед has proved also some theorems, containing new results of geometrical algebra.



Archimedes also was the greatest mathematical physicist of an antiquity. For the proof of theorems of mechanics he used geometrical reasons. His composition *“About floating bodies”* has put in pawn bases of a hydrostatics.

**Decline of Greece.** After a gain of Egypt Romans in 31 AD great Greek Alexandria civilization has come to decline. Cicerones with pride approved, that as against Greeks Romans not dreamers that is why put the mathematical knowledge into practice, taking from them real advantage. However in development of the mathematics the contribution of roman was insignificant.

**INDIA AND ARABS**

Successors of Greeks in a history of mathematics were Indians. Indian mathematics were not engaged in proofs, but they have entered original concepts and a number of effective methods. They have entered zero as cardinal number and as a symbol of absence of units in the corresponding category. Moravia (850 AD) has established rules of operations with zero, believing, however, that division of number into zero leaves number constant. The right answer for a case of division of number on zero has been given by Bharskar (born In 1114 AD -?), he possesses rules of actions above irrational numbers. Indians have entered concept of negative numbers (for a designation of duties). We find their earliest use at Brahmagupta’s (around 630). Ariabhata (born in 476 AD-?) has gone further in use of continuous fractions at the decision of the uncertain equations.

Our modern notation based on an item principle of record of numbers and zero as cardinal number and use of a designation of the empty category, is called Indo-Arabian. On a wall of the temple constructed in India around 250 AD, some figures, reminding on the outlines our modern figures are revealed.

About 800 Indian mathematics has achieved Baghdad. The term "algebra" occurs from the beginning of the name of book *Al-Jebr vah-l-mukabala -Completion and opposition (Аль-джебр ва-л-мукабала)*, written in 830 astronomer and the mathematician Al-Horezmi. In the composition he did justice to merits of the Indian mathematics. The algebra of Al-Horezmi has been based on works of Brahmagupta, but in that work Babylon and Greek math influences are clearly distinct. Other outstanding Arabian mathematician Ibn Al-Haisam (around 965-1039) has developed a way of reception of algebraic solvings of the square and cubic equations. Arabian mathematics, among them and Omar Khayyam, were able to solve some cubic equations with the help of geometrical methods, using conic sections. The Arabian astronomers have entered into trigonometry concept of a tangent and cotangent. Nasyreddin Tusy (1201-1274 AD) in *the “Treatise about a full quadrangle”* has regularly stated flat and spherical to geometry and the first has considered trigonometry separately from astronomy.

And still the most important contribution of arabs to mathematics of steel their translations and comments to great creations of Greeks. Europe has met these jobs after a gain arabs of Northern Africa and Spain, and later works of Greeks have been translated to Latin.

**MIDDLE AGES AND REVIVAL**

**Medieval Europe.** The Roman civilization has not left an appreciable trace in mathematics as was too involved in the solving of practical problems. A civilization developed in Europe of the early Middle Ages (around 400-1100 AD), was not productive for the opposite reason: the intellectual life has concentrated almost exclusively on theology and future life. The level of mathematical knowledge did not rise above arithmetics and simple sections fromEuclid’s *“Beginnings”*. In Middle Ages the astrology was considered as the most important section of mathematics; astrologists named mathematicians.

About 1100 in the West-European mathematics began almost three-century period of development saved by arabs and the Byzantian Greeks of a heritage of the Ancient world and the East. Europe has received the extensive mathematical literature because of arabs owned almost all works of ancient Greeks. Translation of these works into Latin promoted rise of mathematical researches. All great scientists of that time recognized, that scooped inspiration in works of Greeks.

The first European mathematician deserving a mention became Leonardo Byzantian (Fibonacci). In the composition *“the Book Abaca”* (1202) he has acquainted Europeans with the Indо-Arabian figures and methods of calculations and also with the Arabian algebra. Within the next several centuries mathematical activity in Europe came down.

**Revival.** Among the best geometers of Renaissance there were the artists developed idea of prospect which demanded geometry with converging parallel straight lines. The artist Leon Batista Alberty (1404-1472) has entered concepts of a projection and section. Rectilinear rays of light from an eye of the observer to various points of a represented stage form a projection; the section turns out at passage of a plane through a projection. That the drawn picture looked realistic, it should be such section. Concepts of a projection and section generated only mathematical questions. For example, what general geometrical properties the section and an initial stage, what properties of two various sections of the same projection, formed possess two various planes crossing a projection under various corners? From such questions also there was a projective geometry. Its founder - Z. Dezarg (1593-1662 AD) with the help of the proofs based on a projection and section, unified the approach to various types of conic sections which great Greek geometer Apollonius considered separately.

I think that mathematics developed by attempts and mistakes. There is no perfect science today. Also math has own mistakes, but it aspires to be more accurate. A development of math goes thru a development of the society. Starting from counting on fingers, finishing on solving difficult problems, mathematics prolong it way of development. I suppose that it’s no people who can say what will be in 100-200 or 500 years. But everybody knows that math will get new level, higher one. It will be new high-tech level and new methods of solving today’s problems. May in the future some man will find mistakes in our thinking, but I think it’s good, it’s good that math will not stop.

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