**Прочитать текст и сделать краткий конспект и решить задачи в конце текста**

**Introduction**

**Mathematical notation** - a symbols used for the compact notation of mathematical equations and formulas. In addition to the numbers and letters of different alphabets, mathematical language uses a set of special characters that were invented in the last few centuries.

Mathematical signs are capable of recording in a compact and convenient form of a proposal, the expression of which in ordinary language would be extremely cumbersome. This contributes to raising awareness of their content, makes it easier to memorize.

Mathematical symbols used in mathematics effectively and without error, when they express well-defined concepts relating to the object of study of mathematical theories. So before you use reasoning and in the book certain signs, a mathematician trying to say that each of them represents. Otherwise, he can not understand.

When Indians in the V century BC. introduced a zero mark, they were able to leave radix number system and develop the absolute positional decimal system, the advantage is with the score if they do not realize that every day is used by hundreds of millions of people.

Algebra and analytic geometry indebted to many that Viet and Descartes developed a framework of algebraic calculus.Leibniz notation introduced derivative and integral helped to develop the differential and integral calculus, the problem for the calculation of areas, volumes, work force, etc., the solution of which was previously available only first-class mathematicians have solved almost automatically.

With this notation Leibniz widespread and penetrated into all fields of science that uses mathematical analysis.

**Algebraic signs**

The decimal point separating the fractional part of the whole, was introduced by the Italian astronomer Magini (1592).Earlier, instead of a comma put other symbols - vertical bar: 2 | 65, or zero in brackets: 2 (0) 65, some authors use a different color ink.

In England, preferred to use a comma instead of a point, which was put in the middle row, this tradition adopted in the U.S., but moved down a point not to confuse it with the multiplication sign.

Familiar to us, "two-storied" record common fraction is used by Greek mathematicians, although they recorded the denominator of the numerator of the fraction and the line of fractions were not.Indian mathematicians have moved up the numerator.Fraction bar first introduced in Europe by Leonardo Pisansky (1202), but she came into use only with the support of Johann Widmann (1489).

First the plus (+) and minus (-) were used in the book "Arithmetic", written by Johannes Widmann in 1489.Before this sign (+) denotes the Latin letter p (plus) and m (minus).In Widmann symbol plus replaces not only addition, but the word "and”.The origin of these symbols is not clear, but most of all, they have previously been used in the trading business as signs of profit and loss. Both letters will soon have a general distribution in Europe - with the exception of Italy, which is about a century used old notation.

Multiplication sign introduced in 1631 by William Otrad (England) in the form of oblique cross.Before it was used more often the letter M, while the proposed and other symbols: the symbol rectangle (Erigone, 1634), a star (Johannes Rahn, 1659).Leibniz later replaced the cross on the point (the end of XVII century), not to be confused with the letter x; such symbolism to it occurred in Regiomontanus (XV century) and the English scientist Thomas Herriot (1560-1621).

Signs of division. Oughtred preferred slash. Colon division came to refer to Leibniz.Up to them are often used with the letter D. Since the Fibonacci sequence, is also used horizontal line of the fraction, is used more in Girona, Diophantus and the Arab writings.

In England and the United States was spreading symbol ÷ (obelyus), who proposed Johannes Rahn (perhaps with the assistance of John Pell) in 1659.

The attempt of the U.S. National Committee on Mathematical Requirements bring obelyus of Practice (1923) was fruitless.

Exponentiation. The current record of the exponent introduced by Descartes in his "Geometry" (1637), though only for the natural powers of greater than 2. Newton later extended this notation to negative and fractional indices (1676), the interpretation of which had already offered Stevin, Wallis and Girard.

Medieval mathematics (for example, Cardano) denotes the square root symbol Rx (from Lat. Radix, root). Modern notation coined German mathematician Christoph Rudolff in 1525 .This symbol is a stylized first letter of that word radix. The bar over the radicand initially missing, and her later introduced Descartes (1637) for a different purpose (instead of brackets), and this feature soon merged with the root sign.

Round brackets appeared in Tartaglia (1556) (for the radicand) and later in Girard. Bombelli simultaneously used as a starting corner brackets with the letter L, and the ending - it is in inverted form (1550), this record was the ancestor of the brackets. Curly brackets introduced by Wyeth (1593). In common usage brackets introduced Leibniz and Euler.

Letter *i* like the code of the imaginary unit:  proposed Euler (1777), who took this first letter of the word imaginarius.

Designation of the absolute value of a complex number and the module appeared in Weierstrass in 1841. In 1903, Lorenz used the same symbols for the length of the vector.

The sign of equality proposed by Robert Record in 1557; mark symbol was much longer than the current one. The author explained that there is nothing in the world more equal than two parallel lines of equal length.

For a while the spread symbol Record hindered by the fact that since ancient times the same symbol used to denote parallel lines, and in the end it was decided to make the vertical character of parallelism. In continental Europe, the sign of equality was introduced by Leibniz.

Signs compare Thomas Harriot introduced in his book, published posthumously in 1631. Until he wrote the words: more, less.

Symbols nonstrict comparison suggested Wallis in 1670. Originally touch was the sign above comparison, not under it, as it is now. The general distribution of these characters have received support after the French mathematician Pierre Bouguer (1734), in which they have acquired a modern look.

**Signs of geometry and trigonometry**

The symbols "angle" and "perpendicular" coined in 1634 by the French mathematician Pierre Herigone. The symbol in the corner Erigone resembled icon **<**, modern form he gave William Oughtred (1657).

The "parallelism" is known since ancient times, it was used Heron and Papp Alexandriyskiy. First character was similar to the current equals sign, but with the advent of the latter, in order to avoid confusion, the symbol was turned vertically (Oughtred (1677), John Kersey etc. of Mathematics XVII century).

Modern notation angular units (degrees, minutes, and seconds) are still in the "Almagest" of Ptolemy, but in medieval Europe instead wrote the words: gradus, minutes, secundae. Again, these symbols are used in 1568 by the French mathematician and poet Jacques Pelletier (1517-1582), after which they quickly came into common use (in particular, Tycho Brahe, Kepler, and Rheticus).

Radian measure of angles, more suitable for analysis, proposed in 1714, the British mathematician Roger Cotes. The term radian invented in 1873 by James Thomson, brother of the famous physicist Lord Kelvin.

The common designation number 3.14159 ... for the first time formed by William Jones in 1706, taking the first letter of the Greek words περιφέρεια - circle and περίμετρος - perimeter, ie the length of the circle. This reduction is like Euler, whose works are finally secured the designation.

Abbreviations for sine and cosine William Otrad introduced in the mid XVII century.

Abbreviations tangent and cotangent: introduced by Johann Bernoulli in XVIII century, they became widespread in Germany and Russia. In other countries, used the names of the functions **tan, cot** proposed by Albert Girard even earlier, in the beginning of the XVII century.

Manner denote the inverse trigonometric functions with the prefix arc (from Lat. Arcus, arc) appeared at the Austrian mathematician Karl Scherffer (1716-1783) and consolidated by Lagrange. Was meant that, for example, allows normal sinus circular arc find contracting its chord, and the inverse function solves the opposite problem. English and German schools of mathematics by the end of the XIX century offers other notation, but they are not accustomed.

**Signs of mathematical analysis**

Designation integral Leibniz made ​​from the first letter of the word “Summa”.Newton, in his works, has not offered an alternative symbolism integral, although tried different options: a vertical line above the function or symbol of the square that faces the function or its surrounds. The term integral coined Jacob Bernoulli (1690).

Notation differential, derivative and much of the other common symbols analysis belongs to Leibniz.

Making a definite integral in the usual form invented Fourier.

Partial derivative symbol made general use first Carl Jacobi (1837), and then Weierstrass, although this designation have already encountered in a work of Legendre (1786).

Symbol limit invited in 1787 at Simon L'Huilier, although limit value of the argument first pointed separately, after the symbol *lim.* Close to the modern notation introduced Weierstrass, but instead familiar to us the arrow he used the equal sign. Arrow appears at the beginning of XX century at once a few mathematicians for example, Hardy (1908).

**Other designations**

Percent symbol appears in the middle of XVII century in multiple sources, its origin is unclear. There is a hypothesis that it arose from an error typesetter that reduction cto (cento, a hundredth of a) typed as 0/0.

Until the end of XIX century, the conventional notation of the logarithm was not,base *a* pointed then the left and above symbol *log*, then the over it. Ultimately, mathematics came to the conclusion that the most suitable place for the base - below the line, after the symbol log.Brief notation of the logarithm of the most common - decimal and natural- appeared much earlier at once in several authors, centurydefinitively were fixed to the end of the XIX century.

Indexation for numbering of variables in the current form introduced Newton (1717). First, because of typographic constraints, indexes, printed not below the line, and on the same level. A double index (for the matrix elements) was introduced into general use Jacobi (1835).

The factorial proposed Christian Crump (1808).

Infinity symbol invented by Wallace, published in 1655.

Symbols logical operations suggested George Boole (1854). The alternative for the conjunction is ampersand & and vertical bars: | for disjunction.

First symbols for quantifiers have appeared in 1879, the book Frege "Calculus concepts”.Notation Frege had the appearance of bulky graphic designs were not accepted.Subsequently, it was proposed many more successful symbols but are generally accepted notation ∃ for the existential quantifier, proposed by Charles Peirce in 1885 and ∀ for quantifier formed by Gerhard Gentzen in 1935, similar to the symbol the existential quantifier (inverted first letters of words *exists* and *all* .

**Conclusion**

Signs and sign systems play a role in mathematics is very similar to the one that in the broader field of knowledge and practical activity belongs common spoken language.

Like ordinary language, the language of mathematical symbols can send set of mathematical truths, network scientists in collaborative research.

Decisive however, is that the language of mathematical symbols without ordinary language can not exist.

Ordinary language pithy language of mathematical symbols, it is necessary for the construction and development of the language of mathematical symbols.

Language of mathematical symbols only an aid, to join the ordinary language and used in mathematics and in the areas of applications of its methods.

Use of signs can formulate the laws of algebra, as well as other mathematical theories in general.

An example is the formula the same algebra:

1) 2)

1.\* The brother is 3 years old now. His sister was 5 years older than he was 2 years ago. How old is she now?

2. Put your two hands on a table: your ten fingers will serve as a «computer». Count from left to right. Say for instance, you want to multiply 4 by 9. The fourth finger gives you the answer: there are 3 fingers to the left and 6 fingers to the right of it, so the result is 36.
Another example: what is 7 times 9? The seventh finger has 6 fingers to the left and 3 fingers to the right. So 7 \* 9 gives you 63.

3.\* There were 17 white butterflies flying in a forest meadow and twice as many. How butterflies altogether were flying in the forest meadow?

4.\* The lesson begins at 30 minutes past 8 (8.30) and last 45 minutes. When does it end?
The break lasts 10 minutes. When does the next lesson begin and end?
The lessons begin at 8.30 and 5 hours later. What time do they end?

5.\* 12 brothers are walking along in a single file. They never overlap but follow one behind the other. What are their names?