

THE EMERGENCY OF THE CONCEPT OF COMBINATORICS IN LINGUISTICS*Rajabova Bahora**Master's student at Sharof Rashidov Samarkand State University**rajabovabahora529@gmail.com+998976153116*

Annotatsiya: tilshunoslikda kombinatorika tushunchasi, tilning strukturaviy va matematik jihatlarini o'rganishda muhim ahamiyatga ega. Kombinatorika, asosan, elementlar to'plamining turli kombinatsiyalarini hisoblash va tahlil qilish bilan bog'liq bo'lib, tilshunoslikda so'zlar, frazalar va sintaktik tuzilmalar o'rtasidagi aloqalarni o'rganish uchun qo'llaniladi. Shuningdek, kombinatorika yordamida tilning morfologik va sintaktik jihatlarini, shuningdek, leksik birliklarning kombinatsiyalarini tahlil etiladi.

Kalit so'zlar: kombinatorika, tilshunoslik, sintaksis, kombinatsion tahlil, yondashuvlar, til va mantiq, tahlil qilish, struktura.

Аннотация: в лингвистике понятие комбинаторики важно при изучении структурных и математических аспектов языка. Комбинаторика в основном занимается расчетом и анализом различных комбинаций наборов элементов и используется в лингвистике для изучения взаимосвязей между словами, фразами и синтаксическими структурами. Комбинаторика также используется для анализа морфологических и синтаксических аспектов языка, а также комбинаций лексических единиц.

Ключевые слова: комбинаторика, лингвистика, синтаксис, комбинаторный анализ, подходы, язык и логика, анализ, структура.

Abstract: in linguistics, the concept of combinatorics is important in the study of the structural and mathematical aspects of language. Combinatorics is mainly concerned with the calculation and analysis of various combinations of sets of elements, and is used in linguistics to study the relationships between words, phrases, and syntactic structures. Combinatorics is also used to analyze the morphological and syntactic aspects of language, as well as combinations of lexical units.

Key words: combinatorics, linguistics, syntax, combinatorial analysis, approaches, language and logic, analysis, structure.

Combinatorics is a branch of mathematics that studies the combinatorial aspects of sets of elements. It is used in many fields, including statistics, computer science, economics, and linguistics. Combinatorics can be used to solve various problems, analyze statistical data, and develop algorithms. Set. The basic element of combinatorial analysis, representing a set of things. For example, the set {a, b, c} consists of three elements.

Combinations. A method of selecting a certain number of elements from a set. Combinations do not take order into account. For example, combinations of selecting 2 elements from the set {a, b, c} are: {a, b}, {a, c}, {b, c}.

Permutations. Ordered combinations of elements in a set. Permutations take order into account. For example, the permutations of choosing 2 elements from the set {a, b, c} are: ab, ac, ba, bc, ca, cb. Binomial coefficient. It represents the number of combinations of choosing k elements from n elements and is denoted by $C(n, k)$ or $\binom{n}{k}$. It is calculated by the following formula:

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

where $n!$ is the factorial of n.

Applications of combinatorics. 1. Statistics and Probability: Combinatorics plays a key role in probability theory. It helps in calculating random events and their probabilities. 2. Algorithms: Combinatorics algorithms are widely used in computer science. For example, combinatorial approaches are used in graph analysis and optimization. 3. Thinking and strategies: Combinatorics is also useful in strategic thinking and solving competitive problems. Game theory includes combinatorial analysis. 4. Biology and genetics: Combinatorics is used in genetic research to analyze combinations of genes. Combinatorics plays an important role in mathematics, and its application in many fields increases its importance. Using combinatorial methods, complex problems can be solved in a simple way. The development of combinatorics in the future will be associated with new technologies and scientific research, which will further expand its practical application. Combination is a fundamental concept in combinatorics. This concept is used to describe structures consisting of a certain number of elements of an arbitrary set. Combinatorics studies the main forms of such structures, called permutations, substitutions, and groupings. The mathematical science that deals with combinatorial problems is called combinatorics. Permutations. Let's start with the concepts widely used in solving combinatorial problems.

Definition: Forming a subset of a finite set of n elements by changing only the order of their placement is called a permutation of n elements.

The number of permutations of a given set of n elements is denoted as P_n . P is the first letter of the French word "Permutation", that is, permutation.

Theorem: The number of permutations of n elements is calculated by the formula $P_n = n!$ (3).

For example: Ten wrestlers (boxing, wrestling, fencing, ...) can be entered into a competition in several different ways:

- combining the qualities of physical qualities (strength, speed, agility, flexibility, endurance) in different orders;
- developing physical qualities (strength, speed, agility, flexibility, endurance) in different orders in sports.

Linguistics is a science that studies and analyzes human language, and its main goal is to determine the structure, functions of language, and its role in a social context. Combinatorics, on the other hand, studies the combinatorial aspects of sets of elements in mathematics. In linguistics, the concept of combinatorics is important in analyzing the structural aspects of language, the relationships between lexical units and phrases.

The term "combinatorics" is derived from Latin, meaning "to combine" or "to unite." The term "combinatorics" was first introduced by the mathematician Leibniz in his 1666 work titled "Thoughts on the Art of Combinatorics." The term combinatorics is primarily studied within discrete mathematics, particularly in the context of graph theory.[1]

Initially used in mathematics, this term later emerged in other fields as well. With the development of computer technologies and the emergence of significant tasks such as digitization, electronification, and automation, the field of combinatorial linguistics also came into being. One of the mathematicians who associated this term with language was Axel Thue, and during the 20th century, as mathematical and computational linguistics began to develop, this term started to be used alongside other related concepts. Combinatorics in mathematics refers to the branch that studies the possibility of forming various combinations of given objects under certain conditions. In linguistics, the concept of combinatorics is considered an analogue of the "positional" concept.[2]

By the 20th century, language began to be viewed as a structural system, and theories were developed in this regard. The connection between language and mathematics, along with ideas of machine translation and formal grammar theory, as well as the modeling of formal languages, began to take shape. Influenced by these ideas, computational linguistics emerged as a distinct discipline. While the contributions of several scholars were significant in the development of mathematical linguistics, the ideas of Louis Hjelmslev, a representative of the Copenhagen School, served as a "foundation," we might say. The scholar proposed that the field dealing with the relationship between language and mathematics should be called "Linguistic Algebra.

"The application of combinatorics in linguistics is closely associated with the name of Noam Chomsky. In the 1950s, while studying the formal structure of language, he made significant contributions to linguistics by developing the "combinatorics of words" and the "hierarchy of formal grammars" (Chomsky hierarchy). The Chomsky hierarchy is linked to combinatorics through the use of alphabets and their combinations to describe language structure. This hierarchy enabled the mathematical and combinatorial analysis of language syntax. Although Chomsky did not directly introduce this term into linguistics, his work on formal languages and automata theory laid the groundwork for incorporating combinatorial concepts into linguistics. In his generative grammar theory, he attempted to identify correct sentences in a language using formal grammar and combinatorial rules. This, in turn, became the basis for the application of combinatorics in phonology, morphology, and syntax. As a result, the calculation and modeling of language units through combinatorial methods emerged. Although combinatorics is not considered a primary branch in linguistics, some of its principles can be applied in certain areas of linguistics. For instance, it is significant in computational linguistics for modeling language and analyzing the semantic structure of syntactic constructions.

Combinatorics is used in linguistics to study the syntactic and morphological structure of language. In this process, words, phrases, and their combinations are analyzed. The following issues are solved using combinatorial approaches. Combinations of words. How lexical units of a language can be combined with each other. Syntactic structure: how sentences are constructed and their compliance with grammatical rules. Morphological combination: the internal structure of words and their changes.

Combinatorics is important in linguistics in several ways.

- Structural foundations of language: Combinatorics is used to determine the main structural aspects of language. For example, how words are connected to each other and create new meanings.
- Mathematical models. Using combinatorial approaches, mathematical models can be developed in linguistics. These models are useful in analyzing the dynamics and changes of language.
- Semantic analysis. Combinatorics also helps to study semantic aspects. The semantic relationships between words and phrases are analyzed. In linguistics, the concept of combinatorics plays an important role in studying the complex structure of language and its dynamics. It allows for the mathematical analysis of language and creates new approaches to linguistic research. The role of combinatorics in linguistics is expected to expand further in the future, as modern technologies and algorithms create new opportunities for analyzing language.

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