IMPACT FACTOR (RESEARCH BIB) – 7,245
MAXSUS SON . VOLUME 5, ISSUE 1, 2023

LOGICAL OPERATIONS (IMPLICATION, CONJUNCTION, DISJUNCTION, EQUIVALENCE). AVAILABILITY AND OPTIONALITY QUANTIFIERS. METHOD OF MATHEMATICAL INDUCTION

Muallif	**Egamov Xursanali Umaraliyevich**
O'qish yoki ish joyi	**Senior (head) teacher Academic Lyceum of Tashkent State University of Economics**
Qabul qilindi	**21.09.2023**
Nashr qilindi	**21.09.2023**

Abstract

In this article, logical operations (in particular: implication, conjunction, disjunction, equivalence), existence and optionality quantifiers, and the method of mathematical induction, which are considered as one of the mathematical properties, are described in detail.

Keywords

logical process, proof, theorem, mathematical method, implication, conjunction, disjunction, equivalence, etc.

The desire to express the process of logic with various mathematical symbols is evident in the works of Aristotle. By the 16th and 17th centuries, with the development of mechanics and mathematics, the possibility of applying the mathematical method to logic expanded. The German philosopher Leibniz, striving to create a logical mathematical method that allows solving various problems, laid the foundation for the mathematization of logic. Representation of the logical process using mathematical methods began to develop mainly in the 19th century. Reflection and its value. One of the basic concepts of mathematical logic is reasoning. By "judgement" we mean a statement about the truth or falsity of which one can think. Any statement is either true or false. No opinion can be both true and false at the same time. For example, the first of the statements "", "", "5 is a prime number", "1 is a prime number", "the age of the son is older than the age of the father" is true, the second is false, the third is true, the 4th and 5 are false opinions. Interrogative and exclamatory sentences cannot be considered. Definitions cannot be judgments either. For example, the definition "A number divisible by 2 is called an even number" cannot be a reasoning. But the statement "if the whole number is divisible by 2, then this number is an even number" is a reasoning. This opinion is true.

By the value of an opinion, we understand whether it is true or false. Opinions are usually denoted by the capital letters of the Latin alphabet (A, B, C, ... X, Y, Z), and their values ("true", "false") by the letters R and Yo. Here R is true, Yo is false. They are also marked with numbers, and a true statement is marked with 1, and a false statement is marked with 0. Considerations that cannot be divided into parts are called elementary considerations. With the help of elementary considerations, more complex considerations can be made. If we put logical operations between the arguments, a new argument is formed, and such an argument is called a joint argument. In the

algebra of judgments, the concepts of true or false are among the main concepts. Based on the definition, it is somewhat convenient to see whether the collective reasoning is true or false based on the table. Such a table is also called a truth table. The meaning of the words "reasoning" and "proof" in marriage is quite unclear. Therefore, a special formal (that is, based on formulas) language is used to define these concepts first. In the formal language, special symbols called logical connectives are used: Ù - logical multiplication, Ú - logical addition operations. AÙB reasoning A and B; AÚB reasoning A or B; reasoning A leads to reasoning B, or if A, then B; we read that the reasoning A leads to B, and B leads to A, or A, only and only if B is the case. Let's mark the set of opinions with the letter M. In that case, the set M, together with all actions performed in it, is called algebra of considerations. Let us briefly denote the algebra of considerations by MA. The order of execution of the actions performed in the set M is as follows: first the negation operation is performed, if the negation operation is outside the brackets, then the operations inside the brackets are performed. Then conjunction, then disjunction, implication and finally equivalence operations are performed. Description. A, B, C,…. A complex reasoning formed by combining reasoning in a certain order with the means of logical connectors such as negation, disjunction, conjunction, implication, and equivalence is called a logical formula. Logical formulas are mathematical models of reasoning in natural language. Logical formulas in reasoning calculus are interpreted using truth tables. Such tables are determined based on the truth of the statements that make up the complex statement formed by a logical connector as true (1) or false (0). Using the truth tables of the above operations, it is possible to construct a truth table for more complex reasoning.

Logic is the science of rules, methods and forms (forms) of discussion, whose founder is the ancient Greek thinker Aristotle (384-322 BC). He was the first to create the theory of deduction, that is, the theory of logical inference, and showed that logical inference has a formal character. Aristotle's theory of logic forms the basis of formal logic. Formal logic examines the forms and laws of thought. Thus, Aristotle discovered the basic laws of logical thinking. The logic founded by Aristotle has been supplemented, modified and improved over the centuries by different thinkers, philosophers and entire philosophical schools. Among them, the great thinkers of the East, such as Abu Nasr Farabi, Abu Ali Ibn Sina, Abu Rayhan Beruni, Muhammad al-Khorazmi, Omar Khayyam, Alisher Navai, Mirza Bedil, made their great contributions. The works of the French scientist R. Descartes (1596-1650) played an important role in the renewal of logic. R. Descartes created the main principles of analytical thinking. German philosopher and mathematician G. Leibniz (1646-1716) was the first to come up with the idea that it is necessary to give the nature of calculation to logical thinking. For this, in his opinion, it is necessary to reduce all scientific concepts and considerations to the main logical elements and mark them with certain symbols. J. Bull, one of the founders of mathematical logic (J. Bull is the father of Lilien Voynich, the author of the famous novel "Sona") independently studied Greek, Latin, German, French and Italian, as well as mathematics. In the books "Mathematical Analysis of Logic", "Logical Calculus" written in 1847 and "Study of the Laws of Thinking" written in 1854, he brought logic into an algebraic form and created a system of axioms of mathematical logic. Boolean logical calculus is called boolean algebra. J. Bull applied algebraic symbols to logical conclusions based on the similarity between logic and mathematical operations. He introduced the following symbols to formalize logic operations:

- lowercase letters of the Latin alphabet (x, y, z, ...) to designate objects;

- initial letters of the Latin alphabet { X , Y , Z , ...) to determine the quality of objects;

- class 1 of all subjects reflected in a consideration;

- the sign of the absence of objects to be seen is 0;

- "+" sign for logical addition of comments;

- a sign of logical separation of opinions; - "=" sign of equality of opinions.

Bui's symbolic logic, which played a fundamental role in the creation of the modern science of mathematical logic, needed to be perfected. For example, according to Jevons, the logical subtraction operation causes some inconvenience. O. de Morgan developed Bui's ideas, applied the calculus of logic to the basis of the theorems of probability theory, and worked on the creation of symbolic calculus. Ch. Peirce justified the use of logical relations as a tool in the analysis of mathematics, he introduced the concept of quantifier to logic without knowing about the works of G. Fröge. G. Fröge worked on deriving the principles of mathematics from the principles of logic and created the calculus of logic. In the works of Bui and O. de Morgan, mathematical logic was formed in the form of a specific algebra - the algebra of logic.

References

1. T o 'ra y ev H .T. .Mulohazalar hisobi va predikatlar mantiqi. Muammoli lektsiyalar kursi. Samarkand. Sam DU nashriyoti, 2003.
2. T o 'ra y e v H .T . Birinchi tartibli matcmatik nazariya va algoritmlar. M uamm oli lektsiyalar kursi. Samarkand, Sam D U nashriyoti. 2003.
3. T o ’rayev H .T . Diskret matematikaning ribciTictikaga tatbiqi. M uamm oli lektsiyalar kursi. Samarkand, Sam DU nashriyoti, 2003.
4. T o'rayev H .T., A zizov I., O taqu lov S. Kombinatorika va graflar nazariyasi. T oshkent, «11m Z tyo». 20 0 9 .

WORDLY KNOWLEDGE