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Truth Tables of Considerations and Operations on Them

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Abstract: *In this article, one of the mathematical properties, reasoning, and the truth tables of operations on them are described in detail.*

Keywords: *reasoning, logic, proof, theorem, mathematical examples, tables, etc.*

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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 values. One of the basic concepts of mathematical logic is the concept of reasoning. By "judgment" we mean a proposition about the truth or falsity of which one can reason. Any statement is either true or false. No statement can be both true and false at the same time. For example, " ", " ", "5 is a prime number", "1 is a prime number", "the age of my son is older than the age of his father", the first statement is true, the second is false, the third is true, the 4th and 5 are false opinions. Interrogative and exclamatory sentences cannot be judgments. Definitions cannot be judgments either. For example, the definition "A number divisible by 2 is called an even number" cannot be a judgment. But the proposition that "if a whole number is divisible by 2, then this number is even" is a reasoning. This opinion is true. By the value of an opinion we mean whether it is true or false. Assumptions are usually denoted by the capital letters of the Latin alphabet (A, B, C, ... X, ,), and their values ("true", "false") by the letters R and Y. Here R is true and Y is false. They are also marked with numbers, 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.

1. $\neg(\forall x P(x))\ \exists x \neg P(x).$
2. $\neg(\exists x P(x))\ \forall x \neg P(x).$
3. $\forall x P(x)\ \neg(\exists x \neg P(x)).$
4. $\exists x P(x)\ \neg(\forall x \neg P(x)).$
5. $\exists x A(x) \vee \exists x B(x)\ \exists x(A(x) \vee B(x)).$
6. $\forall x A(x) \wedge \forall x B(x)\ \forall(x)(A(x) \wedge B(x)).$

It is known that there are such important expressions used in mathematics that they cannot be considered reasoning. For example, you cannot say that if an integer is not divisible by 2, then the next integer is divisible by 2. Because the truth of this statement has not been single-valued. Let's assume that p is the proposition that "if p is an integer between 1 and 7 that is not divisible by 2, then the next integer is divisible by 2." If the replacement of the elementary formulas in the A formula of predicate logic with any predicates results in a true predicate, such a formula is called a true formula or a law of logic or a universal formula. Two formulas of the algebra of predicates are said to be equally strong if they take the same values when we replace all the predicates included in them with any predicates. Formulas A and B are equally strong as A * B. In addition to these equal strengths, there are also equally strong formulas whose predicates are unique to logic.

The main goal of learning the elements of mathematical logic is one of the simplest forms of the application of mathematical logic to several mathematical sciences such as algebra, geometry, mathematical analysis, mathematical sentences (axiom, theorem, definition,...) is to teach students to express them through the language of propositions and predicate algebras. We will consider a few examples of expressions of definitions and theorems with the help of reasoning formulas created as a result of applying quantifiers to predicate formulas. Zeno, the famous runner, "proved" by mathematical reasoning that he could never catch up with the tortoise crawling in front of him. Achilles can run 10 times faster than a tortoise. Initially, let the turtle be 100 meters ahead. Before Achilles runs this 100 meters, the tortoise advances 10 meters. Until Achilles runs this 10 meters, the tortoise moves another 1 meter, and so on. The distance between them is always decreasing, but never zero. Zeno's problems are related to the concepts of infinity, movement, and the universe, and they became of great importance in the development of mathematics and physics. Some sophisms were discussed in the works of our great ancestors Farabi, in the correspondence of Beruni and Ibn Sina. Example (where did 1000 soums). 3 university students invited one of their friends to a cafe. After they finished eating, the waiter gave them a bill for 25,000 soums. 3 students gave 10,000 soums each and gave 30,000 soums to the waiter. The waiter returned 5,000 soums to them. 3 students shared 1000 soums and gave 2000 soums for a taxi. On the way back to the university, one of the students started counting, "Each of us spent 9,000 soums, that's 27,000 soums, we gave 2,000 soums for a taxi, and if we add it up, it's 29,000 soums." Where did 1000 soums go?" The main "mistake" here is the wrong calculation. 3 students paid from 9000 soums to 27000 soums. 25,000 soums were paid to the cafe, 2,000 soums were given to a friend for a taxi, so the total amount is 27,000 soums. In the above calculation, 2,000 soums are included in 27,000 soums. Paradox is an unexpected opinion that sharply contradicts the traditional opinion, experience accepted by the majority in its content or form. Any paradox appears to be a denial of one or another idea that is considered "unquestionably true" (justified, unjustified, whatever). The term "paradox" itself was originally used in ancient philosophy to express any strange, original idea.

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).

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