THE SIGNIFICANCE OF THEOREMS IN TEACHING MATHEMATICS

Ummatova Makhbuba Akhmedovna
Kokand SPI, Mathematics Department Senior Lecturer

Muhiddinova Maftunabonu Akhadjan's Daughter
Kokand SPI, Mathematics-Informatics Direction 1st Year Student

Abstract

The goal of this service is to encourage students' interest in mathematics and increase their understanding of concepts by showing how theorems relate to everyday life. The service method involves creating educational materials such as theorems, teacher training workshops, collaborative learning, and action research in schools. Results include the creation of new learning modules, increased student understanding of problem solving, and the discovery of innovative teaching methods. The effects of this service include improving the quality of mathematics education, developing a more relevant curriculum, increasing students' abilities in critical and analytical thinking through theorem-based problem solving, and increasing students' abilities in critical and analytical thinking..

Keywords: Mathematics, Theorems, Education, Collaborative learning, Problem solving

INTRODUCTION

As you know from the high school course, in learning mathematics, you have to work with words called theorems. Properties of concepts that are not basic and not included in the definitions are usually proved. Provable properties of concepts are called theorems.

They are opinions that require proof, regardless of how they are expressed. Thus, a theorem is an idea about the derivation of ***A*** property from ***B*** property. The truth of this opinion is determined by proof.

To carry out the proof, it is necessary to know the structure of theorems based on considerations, predicates and quantifiers. Let's look at the following theorem: "If a point lies in the middle perpendiculars of a cross-section, then the point lies equidistant from the ends of the cross-section."

In this case, the condition of the theorem is "the point lies in the middle perpendiculars of the cross-section" and the conclusion of the theorem is "the point lies equidistant from the ends of the cross-section".

The condition and conclusion of the theorem consists of a predicate defined in the set R of all points in the plane. We denote these predicates as $A(x)$ and $B(x)$ respectively. In that case, the theorem is defined in the form of $A(x) \Rightarrow B(x)$ implication and is written in the following form using the generality quantifier:

$$(\forall x \in P)(A(x) \Rightarrow B(x))$$

It can be seen that the structure of the theorem consists of three parts.

Condition of the theorem: the $A(x)$ predicate is given in the set R of all points in the plane; conclusion of the theorem: the $B(x)$ predicate is given in the set R of all points in the plane; the explanatory part describes the set of objects mentioned in the theorem.

The explanation part can also be learned from the content of the theorem. When expressing an arbitrary theorem using words, the words "If ..., then ... will be" are used, the formula is as follows:

$$(\forall x \in X)(A(x) \Rightarrow B(x)) \qquad (1)$$

Proof in mathematics is performed according to the rules of logic without any reference to demonstration and experiments.

Reasoning-logical (logical) is the basis of proof. As a result of this variation, a sentence is formed that is interconnected according to its meaning or contains new (compared to the given knowledge) knowledge from several sentences. For example, let's see the reasoning of a primary school student in determining the "small" relationship between the numbers 6 and 7. The student says: "6<7 because 6 comes before 7 in the number."

RESULT AND DISSCUSION

Let's find out what facts the conclusion is based on. The bases are two: if the a number is mentioned before the b number in the count, then it is a<b (for arbitrary a and b natural numbers).

6 comes before 7 in counting.

The first sentence has a general nature, because it contains a generality quantifier that confirms that the sentence is valid for arbitrary and natural numbers, therefore it is called a general basis.

The second sentence refers to concrete numbers 6 and 7, expresses special cases, so it is called a special basis.

From the two premises, a new conclusion (6<7) is derived, which is called a conclusion.

In general, any reasoning has both a basis and a conclusion. There is a certain connection between the premise and the conclusion, with the help of this connection they form a reasoning.

A reasoning in which the relation of origin between the premise and the conclusion is appropriate is called a deductive reasoning.

In other words, if it is not possible to draw a false conclusion from a true premise with the help of reasoning, then this reasoning is deductive. Otherwise, it is not deductive.

The method of incomplete induction is also used in proving theorems.

Incomplete induction

We can say that 10 is divisible by 5, 20 is divisible by 5, 100 is divisible by 5, and 1000 is divisible by 5. 15 is divisible by 5, 25 is divisible by 5, and 35 is divisible by

5. Summarizing these considerations, we conclude that any number ending with 0 and 5 is divisible by 5.

Similarly, if the numbers 1,2,3,4, etc. are replaced in the n^2+n+41 expression, then the value of the $n=1$ expression is equal to the prime number 43, the value of the $n=2$ expression is equal to the prime number 47, and the value of the $n=3$ expression is equal to the prime number 53 can be seen. In the $n=3,4,...$ values of n, the result is a prime number.

Based on these results, it can be concluded that the value of the n^2+n+41 expression in arbitrary natural values of n is a prime number.

Incomplete induction is a reasoning in which, from the fact that some objects of a set of objects have certain properties, it is based on the conclusion that all the objects of this set also have these properties.

Conclusions obtained as a result of incomplete induction can be true or false. For example, the conclusion that the number ending with 5 is divisible by 5 is true. The conclusion that the value of the n^2+n+41 expression is a prime number at an arbitrary natural value of n is false. Indeed, if $n=41$, we have $41^2+41+41=41^2+2\cdot 41=41(41+2)=41\cdot 43$, which shows that the value of the n^2+n+41 expression is a complex number.

Although inductive reasoning does not always lead to correct conclusions, their role in learning mathematics and other sciences is very important. In the course of conducting inductive reasoning, the skills of being able to see the generality in concrete and specific cases and to state one's own assumptions are formed.

In addition to the incomplete inductive conclusion, drawing conclusions by analogy (by comparison) is widely used, in which knowledge is transferred to less studied objects compared to studied objects. Knowledge of the signs of similarity and difference of these objects serves as a basis for transfer.

Analogy leads us to guesses and hypotheses, allows us to develop mathematical induction.

At the same time, the conclusions made as a result of analogy can be true or false. Conclusions made as a result of analogy should be proved by deductive method.

Methods of proving the truth of ideas.

Deductive reasoning is the main method of mathematical proofs. In this case, mathematical proof represents such a chain of deductive considerations that the conclusion of each of them, except for the last one, is the basis for one of the subsequent considerations.

The proof of the truth of the claim 6<7 consists of one reasoning that includes one step.

CONCLUSION

In mathematics teaching, the application of theorems has a significant impact on students' understanding of mathematical concepts and piques their interest by demonstrating the relevance of theorems in everyday life. By using educational materials that focus on theorems, teacher training, collaborative research, and action research in schools, new learning modules can be created that increase students' understanding of problem solving

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