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METHODS OF SOLVING EXTREME PROBLEMS OF PRACTICAL IMPORTANCE

M. Y. Qosimova
Assistant, Department of Higher Mathematics,
Fergana Polytechnic Institute, Fergana, Uzbekistan

Abstract

It is known that this or that mathematical method, by its nature, is not applied directly to real realities, but to its mathematical model built on the basis of certain laws. And the mathematical model is a functional relationship of one form or another that embodies all the changes of reality.

Keywords: functional relationship, problem, requirements, extremal problems, elementary mathematics.

Introduction

The solution of extremal problems of practical importance is to find the optimal values of the constructed basic function under certain conditions. In our opinion, it is important to take into account the following requirements when creating a system of practically significant extremal problems in a school mathematics course [1-4].

1. The created (chosen) issues should be based on the information of current production.
2. The problems should not be based on some mathematical problem, but should directly correspond to the results of production.
3. It is necessary to understand the condition of the problem, if it involves terms related to production, they must be explained in detail before starting the solution.
4. The solution to the problem should not be outside the school curriculum.

From now on, in the text, we will mean extreme problems of practical nature.

Before getting acquainted with the methods of solving extremal problems, let's consider the following problem:

The sides are 6 cm. and 4 cm. let the face of the rectangle be determined [5-9].

The answer is obvious $S = 24$ kv. cm.

Now let's change the condition of the matter a little. The perimeter is 20 cm. Let the face of the rectangle be calculated.
In the given condition, the answer to the problem is no longer clear, because the perimeter is 20 cm. the number of rectangles is infinitely large. We make the following table: (a and v – are the sides of a rectangle, S surface)

a	1	2	3	4	5	6	6,5
v	9	8	7	6	5	4	3,5
S	9	16	21	24	25	24	22,75

It can be seen from this table that as the sides change, the surface also changes, and at a certain relationship between the sides, the surface reaches its greatest value. $A=5, B=5$ at $S=25$ (kv.cm.) that is, the figure with the largest area when the perimeter remains unchanged is a square.
In order to positively solve this problem, which seems simple at first glance, it is necessary to know how to use different methods of solving extreme problems (this problem can be solved in at least 3 different ways).
Below we will consider some basic methods of solving extreme problems.
The great mathematician Jakob Steiner (1796-1863) thought about two methods of solving extreme problems [8-12].
I. Calculation method using differential calculus.
II. Synthetic method (using proprietary methods).
Let's talk about both methods separately.
I. Calculation method using differential calculus.
Many practical problems involve finding the largest or smallest value of a function in an interval. The methods of solving such problems are shown in the textbook and are based on finding the largest and smallest value of the function in a closed interval.
However, in extreme problems, the function under investigation can often be open, even in an infinite interval.
Therefore, it is appropriate to supplement point 28 of the training manual with another rule for checking functions. The rule presented below as a theorem does not cause significant difficulties for students to master.

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Conclusion

In short, the real history of extreme issues is that ancient Egyptian, Greek, and Roman scientists worked hard to solve these issues. Especially the services of scientists like Pythagoras, Euclid, Archimedes in this regard are incomparable. Nevertheless, elementary mathematics apparatus was not strong enough to solve extreme problems with mathematical rigor. By the 16th and 17th centuries, the creation of differential and integral calculus by Newton, Euler, Leibniz, Bernoulli, and others allowed a serious approach to solving extreme problems. Since this period, solving various extreme problems has taken an important place in the activities of scientists, and the methods of solving them have been improved more and more.

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