

# Geometric Inequalities

**Author:** Aleksa Vučković, first grade student, Mathematical Grammar School, Belgrade

**Supervisor:** Branko Grbić

Center for talented youth "Mihajlo Pupin", Dimitrija Tucovića 2, Pančevo

## Introduction

A wide class of inequalities encountered in applications make geometric inequalities. Under geometric inequality, it is most commonly understood that inequality that applies to elements of a triangle or some other geometric figures (quadruple, couples, rollers, balls, etc.). In a wider sense, a geometric inequality is any inequality that relates to a geometric drawing.

## Objective

The aim of the research work is to process and apply elemental inequalities in continue mathematics in elementary and secondary school, as well as to prepare for competition. The paper includes the synthesis of the theory with application, which is a standard of contemporary literature.

## Materials and methods

Methods of research are collecting literature, as well as their interpretation and resolution. The correlation between theoretical and practical considerations was sought application, the process of reaching the solution is presented in detail. It's in work the combined method of research used was studied literature where there is a diverse application of inequality.

## Results

The object of this scientific research work is geometric inequalities in the plane, with a particular emphasis on inequalities in a triangle. In addition to elementary planimetric inequalities, Ptolemy's inequality

$$AB \cdot CD + AD \cdot BC \geq AC \cdot BD.$$

was shown, which is valid in space, and whose applicability and effectiveness in

solving the competition tasks is shown in this paper. In addition, Euler's inequality

$$R \geq 2r$$

is also shown, which remains one of the greatest discoveries in this field of mathematics in the past two and a half centuries. Although simple, Euler's inequality is not trivial in any way and contributes to understanding the relationship between two important aspects of the triangle. The inequalities between means, which are showing the connection between the algebra and geometry itself in some way, are also presented in the picture. In addition to the aforementioned things, a selection of the most important things about this topic was made in the author's opinion with which the reader will meet in the upcoming paper.

## Conclusion

Inequalities can be used as a good manual to mathematicians, physicists, engineers, mechanics, statisticians, economists. The application of inequality is present in mathematical analysis, geometry, probability theory, mathematical statistics, mathematical data processing, linear and dynamic programming, as well as in theoretical and applied mathematics.

## Literature

- [1] Z. Kadelburg, D. Djukić, M. Lukić, I. Matić, *Nejednakosti*, second supplemented edition, DMS, Beograd 2014.
- [2] M. Mitrović, S. Ognjanović, M. Veljković, Lj. Petrović, N. Lazarević, *Geometrija za prvi razred Matematičke gimnazije*, fourth edition, Krug, Belgrade 2013.
- [3] Z. Cvetkovski, *Inequalities, Theorems, Techniques and Selected Problems*
- [4] O. Bottema, R. Ž. Djordjević, R. R. Janić, D. S. Mitrinović, P. M. Vasić, *Geometric Inequalities*, Wolters-Noordhoff Publishing, Groningen, Netherlands 1969.