

Research project objectives

The project's objectives are:

- a. Providing a detailed analysis of philosophical aspects of the notion of explanation in mathematics – in particular:
- b. exploiting the relevant metamathematical results in this context;
- c. discussing the enhanced indispensability argument in the light of these results.

According to the main working hypothesis, the notion of explanation can be treated as a key notion in the interpretation of the status of mathematics. The problems which will be analyzed in detail are: (a) the problem of mathematical explanations of in empirical science; (b) The problem of the explanatory character of mathematical proofs; (c) the impact of these problems on the realism-antirealism debate (concerning in particular the indispensability argument); (d) the importance of logical and metamathematical results for the problem of explanation in mathematics

The research to be carried out

Speaking in general terms, the following research topics will be investigated:

- The identification of the relevant technical results, including reverse mathematics, and independence from arithmetic and set theory.
- The enhanced indispensability argument.
- The explanatory role of mathematical proofs.
- The explanatory role of mathematics in science (in particular the debated topic of mathematical explanations in science)

Reasons for choosing the research topics

Impact for philosophy of mathematics: The investigations will result a better understanding of the notion of explanation in mathematics. On the one hand, the model will make it possible to gather scattered results already known from the literature (as well as new original results), on the other hand it will provide new impulses and inspirations for the debate.

Impact for philosophy in general: Philosophy of mathematics is a discipline in which many classical philosophical problems can be given a clear (sometimes even formal) reformulation. Therefore investigations concerning philosophy of mathematics shed new light on the classical philosophical discussions – and often they inspire to ask new, original questions. The results of the project may also have an impact on the discussion concerning the problem of explanation in science – and the relevant role of mathematics in this context.