ABSTRACT FORMATTING RULES

Abstracts must be submitted in MS Word format. Please use the file *Abstract template.doc*.

Note that the abstracts that fail to comply with the formatting requirements will not be sent for a review.

The abstract must be preceded by the **form** included in the template (see below).

The abstract should be at most one A4 page, not counting the form; in special cases an extra half page is allowed.

Name of section (if not sure, give several) …
Contact person …
E-mail for correspondence …
Emergency telephone …
Title of project …
Name of author 1 …
Name of author 2 …
Name of author 3 …
Authors' grade …
Authors' school name, city of residence, country of residence …
Scientific advisor 1: name, affiliation, position, scientific degree …
Scientific advisor 2: name, affiliation, position, scientific degree …
Comments …

Usually, all authors are from the same grade, school, etc. If not, specify this information in the *Comments* field.

After filling the form, type the abstract from the next page, according to the following format:

Title

Authors' full names

Authors' grade, Authors' school name, city of residence, country of residence

Scientific advisor 1: full name, affiliation, position, scientific degree

Blank line.

The text of the abstract (at most one A4 page, Times New Roman, 14 pt, line spacing 1.0, margins 2 cm on both sides).

The abstract must contain:

– problem setting (the goal of research);

– a short description of the theory and methods of research, experimental equipment and data processing tools, etc.;

– formulation of the results.

Blank line.

References

Not more than 5 titles of the main sources. The text must contain the references to these sources.

Do not use any formatting except centering the header block and italicizing *accents* such as notions defined.

That is, do not use ~~**bold fonts**~~ or ~~CAPITALIZATION~~ in titles.

Do not indent paragraphs; use a blank line to separate them. Do not use spaces for indentation.

All abstracts will be formatted identically when edited for the publication.

For math abstracts: *all* mathematical symbols, signs and formulas must be typed using the MSWord formula editor or Microsoft Equation. Please do not use MathType. Place long formulas in separate lines, centered.

Figures must have 0.3 cm separation from the text, figure captions typed in 12 pt font.

A sample abstract follows.

Geodesics in the Discrete Heisenberg Group

Magdiev Ruslan
11 grade, Laboratory for Continuous Mathematical Education,
Saint-Petersburg, Russia
Scientific advisor: Ilya Alekseev, Laboratory of Modern Algebra
and Applications, research assistant

In my research, I study geodesic words in the Discrete Heisenberg group H(Z). This group is a subgroup in the continuous Heisenberg group H(R) of some matrices with real coefficients.

Geodesic words in the alphabet of two generators correspond to the shortest words representing a given element and play an essential role in the geometric group theory of H(Z). They are connected with geodesic curves in H(R). There is an important 2016's conjecture in geodesic growth theory related to the behavior of geodesic words in H(Z). In 1989, M.Shapiro introduced a geometric interpretation of words in H(Z) in terms of polygonal chains on a plane lattice Z×Z. He used this to study combinatorial and geometric properties of the language of geodesics and proved that it is not regular (in the sense of CS). In 2017, while studying boundaries at infinity of finitely generated groups, A.Vershik and A.Maluytin have found a grammar description of so-called «infinite geodesic words» in H(Z) i.e. infinite words whose any finite prefix-subword is geodesic. They noticed that there exist some geodesic words that cannot be described as prefixes of some infinite geodesic words, and also geodesic words (for example, geodesic words that correspond to closed polygonal chains) that cannot be continued to longer geodesic words even by one letter. In geometric group theory, such words are called dead end words. It turned out that the structure of geodesic words is complicated and unclear.

In my research, I give a complete description of geodesic words in H(Z). It turned out that all geodesic representatives of dead end elements correspond to closed polygonal chains that enclose oriented polyominoes of the minimal perimeter with a given area. The most unexpected is that any geodesic word in H(Z) is a prefix of some dead end word. This gives an amazing connection between the language of geodesic words in H(Z) and polyominoes, which was never mentioned or noticed before. As a result, the open problem of describing geodesic words in H(Z) was completely solved. It is remarkable that the group H(Z) is a free nilpotent group of rank two, so my results imply that any geodesic word in any nilpotent group of rank two is a part of minimal perimeter polyomino. My methods also give a new approach to the rationality of the geodesic growth of groups problem, stated in 2016.

References

1. Vershik A.M., Malyutin A.V. Infinite Geodesics in the Discrete Heisenberg Group, J. Math. Sci. (2017) 232:121.
2. Shapiro M. A geometric approach to the almost convexity and growth of some nilpotent groups, Math. Ann., 285, (1989).
3. Clary M., Margalit D. Office Hours with a Geometric Group Theorist, Princeton University Press (2017).