Mathematics

Background: The goal of this document is to assist NWO panel members in gauging the quality of mathematical research proposals. By pointing out aspects in which research in mathematics may differ from research in other fields, we hope to prevent valuable research from being postponed for lack of funding.
One characterising aspect of research in mathematics is the extremely high level of specialisation it requires. This makes it difficult, even for mathematicians in neighbouring fields, to understand and value each other's work. Faith in expert judgements is crucial. The high level of specialisation is also the main reason for most characteristics listed below:

- Research mathematics tends to involve collaborations on a small scale (1-3 collaborators). Although there are large communities within mathematics that share a common language and common goals, a scientific breakthrough is usually obtained by two or three collaborators (e.g., a researcher with a PhD student/post-doc).
- Mathematics research tends to be on a long time scale. Even an excellent PhD student may take two, three, and sometimes even four years to obtain their first publishable results. Consequently, it is difficult to estimate the quality of a junior researcher based on their publications.
- University research groups tend to be based on common interests, not common goals. In particular, it is common for a junior researcher (assistant professor level) to be working on entirely different projects than the head of the group. This is valued and considered a sign of independence.
- Research in mathematics frequently contributes to a better understanding of phenomena studied in other sciences. However, to create a strong and healthy mathematical research environment, mathematics must also develop in its own right. Newly developed mathematical theory may initially only impact mathematics itself; its appreciation might be limited to a small circle of experts. Nevertheless, over a period of years (or decades) the impact will 'trickle down' to other fields.
- Regarding the publication culture: researchers in mathematics publish fewer papers than researchers in other fields. The order of authors is usually alphabetical. A paper can be anything between 5 and 150 pages in length. Some mathematicians never co-author papers with their PhD students, despite contributing. A single authored paper is seen as a sign of independence. The review process is generally slow: the time to publication may be a year, sometimes substantially more.
- Mathematicians usually publish in scientific journals, but some fields in mathematics have a publication culture comparable to that of Theoretical Computer Science with publications in competitive conference proceedings. In that case, researchers typically present the same result both in a conference proceeding and in a journal publication (the latter typically containing the full-length version).
- Next to publications in journals and conferences, some fields of mathematics rely on other forms of research output, such as algorithm implementations or software. Such contributions, also called artifacts, are highly valued and contribute significantly to the progress of a field.