Guidelines to write a research proposal for PhD admission (<u>Mathematics</u>)
Exam for Cycle XXXVI (2020)

Disclaimer: these guidelines are only intended as help to assist candidates to the Ph.D. admission selection and are not mandatory, in particular the partition and the number of characters of the subtopics.

General notes:
- It is strongly recommended to write the research proposal in English.
- The research proposal will be used and discussed to evaluate the candidate. *It will not be necessarily the actual research that will be performed by the candidate*, if admitted to the PhD curriculum.
- The research proposal must describe a *three-year research project*.
- The mandatory information and constraints (*8.000 characters minimum*, 16.000 maximum, including blanks and excluding title and references) are reported in the annex describing the call for PhD School in Mathematics and Computer Science:
  - In Italian: https://www.unica.it/unica/protected/228412/0/def/ref/AVS228196/
  - In English: https://www.unica.it/unica/protected/228765/0/def/ref/AVS228196/.
- The candidate is encouraged, *but not constrained*, to present a research proposal related to his/her own master degree thesis.

Research proposal suggested form:

Title of the research
Max. 100 chars

Disciplinary sector – Choose one or two amongst:
- MAT/01 - Mathematical Logic
- MAT/02 - Algebra
- MAT/03 - Geometry
- MAT/04 - Teaching, history and foundations of mathematics
- MAT/05 - Mathematical Analysis
- MAT/06 - Mathematical Probability and Statistics
- MAT/07 - Mathematical Physics
- MAT/08 - Numerical Analysis
- MAT/09 - Operational Research
- SECS-S/01 - Statistics

1. Object of the research and
2. Status Quaestionis (State-of-the-Art)
Min. 3000 chars

The candidate should describe here an area on which s/he wishes to carry out the research work. This description should begin with the illustration of general arguments and ideas.

Next, the candidate may deal with more advanced topics, theorems and examples. Finally, the candidate may point out possible lines for future developments and specific research.

3. Phases of the research
Min. 2000 chars

Describe how the research will be carried on over three years. Typical phases are:
1. Deep analysis of the state of the art of the field
2. Detailed planning of the work to be performed. This might include:
   - Description of the methods which will be used to perform the project.
   - Description of the existing tools/papers/methods the research will be based on.
   - Description of the data which will be used, and how they will be gathered.
   - Analysis and design of the system/prototype to be developed.
3. Description of the actual work to resolve the problem, to analyze the data, to build a solution.
4. Description of data analysis, if present.

Note that **not all of the above quoted phases are necessarily present, and that some of them can be splitted in more than one phase**. Each phase should preferably have forecasted starting and end dates.

4. Expected results
Min. 2000 chars

Description of the expected results of the research:
- New methods, algorithms, theorems, etc.
- New tools, prototypes, systems, software, etc.
- Results expected from the analysis of data.
- Possible applications if any.
- Why the results are significant, and how they will advance the state of the art.
- Description on how the results will be used/disseminated (presentation to conferences, papers, working papers, release of open source software, etc.).

5. Declaration of intent
Max. 1000 chars (this is <u>mandatory</u>)

What are the reasons and the motivations for which you are interested to participate to this PhD curriculum?

Overall, the research proposal <u>must have 8.000 characters minimum and 16.000 maximum</u>, including blanks and excluding title and references.

The research proposal must be written in a PDF file, uploaded within the application form for admission to the doctorate.