Seminar for Discrete Mathematics I -- WiSe17/18

Instructor:
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Schedule:
Tuesday, 14:00
Arnimallee 2 Seminar Room

First meeting: October 17 2017
If you can not make it to the first meeting, write an email to the instructor.

Requirements

You need to have completed the equivalent of the course Discrete Mathematics I at FU Berlin.

Seminar Objectives

1. As for the content of the seminar:
   - Further understand advanced enumeration techniques
   - Introduce the study of extremal combinatorics of simplicial complexes
   - Deepen the knowledge of poset and lattice theory
2. As for students' presentations:
   - Give an understandable presentation of an advanced mathematical topic
   - Learn about new mathematical structures and techniques
3. The goal **IS NOT** to show that the speaker understands a difficult topic but to present it in an understandable way.

Seminar Contents

Here is a list of potential topics to be covered. It is possible to extend some topics to cover more material.

Algebraic Methods Group actions, Polya Theory, Holonomic and hypergeometric sequences

Linear Algebra Methods Lindström-Gessel-Viennot lemma, Kirchhoff's Matrix-Tree Theorem

Generating Functions Species Theory, Polynomials, Quasi-polynomials, Transfer-Matrix method

Facial enumeration of simplicial complexes Kruskal-Katona-Schutzenberger Theorem, Frankl-Furedi-Kalai Theorem, van Kampen-Flores Theorem

Posets and Lattices Boolean Algebras, Knaster-Tarski's fixed-point Theorem, Fundamental Theorem of finite distributive lattices, Galois connections.

Course work

- Give a 90 minutes presentation
- Compose a 3-6 pages summary (Typesetted in Latex) of the presentation for the other students to follow the lecture

Before the presentation, each student should meet with the instructor **twice**.

First meeting Three weeks before the presentation. The student should ask precise questions regarding the understanding of the scientific material. The student should have read the material and taken notes where steps are still unclear. This meeting is to make sure that the student understands the material.

Second meeting One week before the presentation. The student should show the structure and content of the presentation. This will be a short rehearsal talk. Projector slides or notes to be written on the board should be ready and brought to the meeting. This meeting is to make suggestions to improve the presentation.

The 3-6 pages summary should be finished and brought the day of the presentation.

Evaluation

To get the credits, students must fulfill the following conditions.

Attendance Students must attend at least 13 of the 15 lectures.

Participation Students should ask questions demanding more clear explanations when necessary.

The grading will consider the following criteria:

- Quality of the presentation
- Understanding of the topic
- The quality of the summary
- Participation and Attendance to the seminar

Bibliography

For each of the above topics, the appropriate references will be given by the instructor.