

# Discrete Mathematics I — Summer 2014

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**Time:** Lectures: Mondays 8:25-10:00, Takustr 9 Gr. Hörsaal,  
                  Tuesdays 14:15-16:00, Arnimallee 3 Hörsaal 001.  
          Exercises: Tuesdays 12:30-14:00, Arnimallee 6 SR 031.  
                  Thursdays 8:30-10:00, Arnimallee 6 SR 031.

**Course webpage:** <http://discretemath.imp.fu-berlin.de/DMI-2014/>

**Topics of the course** enumeration, graphs, and other discrete structures

- Enumeration (sets, functions, and multisets, binomial coefficients, Stirling numbers, recurrence relations, double counting, pigeonhole principle, Ramsey numbers, inclusion-exclusion, formal power series, generating functions, (in)homogeneous linear recurrence relations)
- Graph Theory (trees, matchings, coloring, connectivity, planarity, Eulerian circuits, Hamilton cycles)
- Further Discrete Structures (matroids, hypergraphs, posets)

**Prerequisite:** basic algebra and calculus

**Requirement for "active participation at the exercises".** There will be 10 sheets of exercises. You should try to solve all exercises and practice writing it up for yourself, because you will face some of them on the final exam. The exercise sheets will usually be placed on the website of the course after the Tuesday lecture. Please submit your written solutions the following week until Friday 2PM in the mailbox of Olaf Parczyk. (So you will have about 10 days for each exercise sheet.) **Late solutions are not accepted.** For the signature on the exercises ("aktive Teilnahme") you must achieve **60% of the total score** (for each exercise the same score will be given).

It is very beneficial to think about and discuss mathematics in small groups. You are absolutely encouraged to solve exercises in study groups

and **submit your solutions in pairs**. I also would like to encourage you to please feel free to approach me or your exercise group leader for discussion of your thoughts on particular exercises and ask for a hint about them. Nevertheless, I discourage you to search for the solutions on the internet. Most likely you *can* find one to most exercises, but copied solutions will never give you the deep understanding necessary to succeed on the final, so you cannot unfortunately spare the time you struggle on your own or with your study group while trying to solve exercises. Actually, *why* would you want to spare the struggle: that's exactly the creative and most fun part of the course!

It is also crucial to practice writing up proofs independently. Hence every student is required to **write up solutions at least four times** (out of the ten). At the beginning of each solution state the name of the person who wrote it up for the pair.

Furthermore, each student must **present a correct solution at the blackboard at least once**.

In conclusion, you need to fulfil each of the following:

- achieving at least 60% of the point value of the homework problems
- writing up the solutions yourself at least four times (on each solution you should clearly state who the scribe was (and of course the name of the coauthor)),
- presenting at least once a correct solution at the blackboard.

**Final.** The grade for the course is based solely on the final exam. The final takes place on July 21st (Monday) from 1:00PM to 4:00PM. The make-up final exam will be on the 2nd of October (Wednesday) from 9:00AM to 12:00PM. The better of the two grades will count.

The final is a closed-book/closed-notes exam, you must actively follow the material throughout the semester to be able to succeed. There will be two different types of exercises at the final:

- Lexical knowledge: Definitions, statements and proofs of theorems
- Problem solving: applying the encountered theorems and methods to solve exercises (some of these will be from the homework sheets, some you have never seen before)

**Literature.** There will be no separate lecture notes. Most of the material is taken from the following books, which are placed on the Handapparat in the mathematics library:

- M. Aigner, A Course in Enumeration

- Brualdi, Introductory Combinatorics
- D. West: Introduction to Graph Theory
- R. Diestel, Graph Theory (English and German editions).
- S. Jukna, Extremal Combinatorics

Further reading.

- B. Bollobás, Combinatorics
- L. Lovász, Combinatorial Problems and Exercises