Discrete Mathematics - rules of the course

Grzegorz Kosiorowski

Krakow University of Economics

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What is discrete mathematics?

- Discrete mathematics deals with discrete sets (that is, sets whose elements are distinctly separated from one another).
- In this lecture (except for Presentation 2 and, to some extent, Presentation 3), we will deal with finite sets, $\mathbb{N}$, and $\mathbb{Z}$.
- The set of real numbers ($\mathbb{R}$) is not considered a discrete set because its elements are not "distinctly separated" from one another: the real numbers are densely packed.
- Natural applications: computers operate on discrete, usually finite, sets.

Plan of the lecture

Discrete mathematics covers an extremely wide range of subjects. Throughout this course, we will learn only the basics of a few selected areas:

- Basics of logic
- Theory of functions (in particular, inverse functions)
- Asymptotics (Big O notation)
- Recurrence and recursion (recursive algorithms, solving linear recurrence relations)
- Counting elements of sets and sequences (combinatorics)
- Elementary information about graphs and trees

Additionally, you will receive materials on other topics: number theory and its applications in cryptology (RSA algorithm) and mathematical induction (these topics are not required for the exam).

Introductory requirements

We will need basic arithmetic skills from school (especially regarding integers), in particular the ability to solve quadratic equations.
Moreover, some material from Calculus and Algebra will be useful, especially the definition of the limit of a function and de l'Hospital's rule.
It might be helpful (but not necessary) to be familiar with the following topics:

- Elementary logic
- Elements of number theory from school (GCD - greatest common divisor, LCM - least common multiple, division with remainder)
- Elements of combinatorics from school (variations, permutations, combinations)

Algorithms

Since we focus on applications of mathematics in computer science, we will discuss quite a few algorithms.

- We will not have computer lab classes, so there is no point in presenting the final code of the algorithms.
- Therefore, most algorithms in this course will be presented in the form of pseudocode (that is, a presentation of algorithmic steps using a mixture of notation typical for programming languages and informal descriptions of actions and conditions). You should be able to easily translate pseudocode into code in your favorite programming language.
- We will also use a notation system based on tables presenting partial results for the most important algorithms, in order to help you verify your understanding. This will be the preferred way of presenting your work during tests and exams (although any notation that clearly shows the result of each step of the algorithm will be accepted).

Bibliography

I do not require you to learn anything beyond the content of the lectures, presentations, and classes. However, if you would like to broaden your knowledge or gain a different perspective on some problems discussed during the course, I particularly recommend the following books:

- *Discrete Mathematics*, K. Ross, C. Wright.
- *Concrete Mathematics*, R. Graham, D. Knuth, O. Patashnik.

How to pass the course?

To pass the course, you need to pass the exam.
Detailed rules for the exam, including its structure and examples of tasks, are available on the course website: `kosiorowski.edu.pl` (we will discuss this website later).

Rules of the examination: quick review

- You will be assessed primarily by a written examination.
- The duration of the exam is approximately 90 minutes.
- The exam will consist of 4–6 "practical" tasks similar to those you solve during classes, and one "theoretical" task - a question about the theorems and definitions from the lecture.
- The exam date will be announced on the Moodle platform as soon as it is set.

Grading rules

- To be eligible to take the exam, you must obtain credit for the classes; otherwise you will fail the course.
- The final result for the course is a weighted average: classes (40%) and the written exam (60%).
- Grade thresholds: 50% corresponds to grade 3.0; each additional 10 percentage points raises the grade by 0.5, up to 5.0 for 90% and above. However, to obtain a grade higher than 2.0 you must score at least $\frac{1}{3}$ of the points on the exam. If you fail the first exam term, the maximum grade obtainable on a retake is 4.0.
- If you have already passed a discrete mathematics course as part of another programme and would like that grade transferred instead of attending this course, please contact the Director of the Institute of Computer Science.

Technicalities

- During the exam you may have only a basic calculator, an analog watch, and writing materials (and a drink, if necessary).
- You must not have any devices that allow contact with the outside world (e.g., phone, smartphone, smartwatch, tablet), nor any crib sheets. Breaking this rule will result in severe consequences, up to automatic failure of the course.
- Generally, the first exam term is made slightly easier than the second to compensate for the shorter preparation period.
- There are exactly two official exam terms. In case of emergencies (e.g., justified absences), an alternative date may be arranged, but there will be no third term after two attempts.

Justifying absences

- To justify an absence from the exam, you must provide a medical certificate or other equally important documentation.
- Absences for less serious reasons may be considered, but they must be discussed with me individually in advance (preferably at least one week before the exam).
- Except in emergencies, inform me as soon as possible about any problems or reasons for absence (preferably by e-mail).
- If the absence is not justified according to the rules above, the exam will be marked as failed.

Lecture attendance

- Lecture attendance is not compulsory; I do not take attendance and there are no penalties for missing lectures.
- I will try to make attending lectures worthwhile.
- I will provide all lecture slides (including this presentation), but I hope my live explanations will help you understand the material. You are encouraged to ask questions during lectures.

Moodle platform: e-card

- On the UEK Moodle platform you can find my (Grzegorz Kosiorowski's) page (e-wizytówka / e-card).
- There you can find my e-mail address, my website address (with all course materials), details of my office hours, and a link to the Moodle page of our course (Discrete Mathematics, Computer Science, full-time, 1st year).

Moodle platform: course

I strongly recommend signing up for the Discrete Mathematics course on Moodle (link in my e-card, no password required). You will find:

- Forums: announcements (e.g., the exam date and details, responses to group requests, and any other information relevant to all of you), e-consultations, and corrections to slides and other course files;
- A link to the website with all course materials;
- Exam results (!).

Learning materials website

The most important learning materials for the course will be available on the website `www.kosiorowski.edu.pl`. You can access them by selecting our course from the menu or by following the link from the Moodle platform. There you can find:

- Complete sets of slides for each lecture (there might be some corrections before the end of the year but I will always inform you about any major changes), including this presentation on course rules.
- All necessary information about the exam (a file explaining the detailed grading rules and the structure of the exam, last year exam, the list of theoretical questions).

Corrections to slides

I did my best to ensure that the slides are correct and helpful, and I intend to improve them further. However, this is the first time I am running the course in this exact form, so some mistakes are inevitable. Pointing out mistakes and unclear parts in the slides (via the appropriate forum on Moodle) will be rewarded with bonus exam points.

The number of bonus points will naturally depend on the significance of the correction: pointing out a single typo or grammar mistake will not earn you any points, but finding multiple typos (for example, around 10) will be rewarded. On the other hand, finding a factual error in a theorem, definition, or algorithm may earn you multiple bonus points for the final result of the course (depending on the seriousness of the mistake).

Lecture, learning materials and copyrights

I did not invent the theorems and definitions presented in the lecture; they mostly come from the sources listed in the bibliography (in the syllabus), and I adapted them to fit our course. Main conclusions:

- From time to time, I use materials published under a CC (Creative Commons) licence. This is always indicated on one of the neighbouring slides.
- The rest is created by me. You may use the slides freely.
- If anyone notices any copyright infringement in any part of this lecture, please let me know, I will be more than happy to correct.
- I do not mind if you record the lecture, if it helps you learn (just try not to make noise or disturb me or other students).

Contact

There are three basic ways to contact me outside the lecture:

- e-mail (standard UEK address: grzegorz.kosiorowski@uek.krakow.pl) - for personal matters (justifying absences, BON attestation, etc.)
- e-consultation forum in our Moodle course - for any issues that may concern more than one person, in particular factual questions about discrete mathematics (or any other area of mathematics), learning materials, office hours, exams, extra classes, etc. I respond to such questions regularly (every 2-3 days). Please read the forum rules before posting a question.
- Standard office hours (consultations) - usually in room 003 in building F. Details are available on my e-card.

Office hours

I strongly recommend taking the opportunity to visit me during my office hours if you have any questions about the course - especially during the first months of the semester. Shortly before the exam, there are usually many students who need to talk, and there may not be enough time to fully address everyone's needs.
If you have only a short and simple question (e.g., you need a hint for solving a particular task or you do not understand a theorem from the lecture), I suggest using the e-consultation forum on Moodle. It is very likely that you are not the only person with such a problem, and an open discussion may be useful to everyone.
If several students need more help with the course, I am willing (if arranged in advance) to offer additional office hours or even extra classes. However, the closer it is to the exam, the less likely it is that I will have enough time to do so.

My requirements

I require that:

- You obtain credit for the classes.
- You study for the exam (this is serious!).
- You do not cheat during the exam or in class.
- You do not disrupt the lecture. In particular, please switch off your mobile phones and avoid making unnecessary noise. Of course, feel free to ask questions if you do not understand something: just raise your hand. However, remember that you are not the only person in the lecture room.
- If we make a special arrangement (e.g., a different exam date, BON attestation), please send me an e-mail summarising the agreement (to avoid misunderstandings or forgetting).

My non-requirements

I **do not** require:

- Any particular clothing during the exam (as long as it does not bother anyone else).
- Paying attention during the lecture - as long as you do not disrupt it or disturb other students (or me).
- If you need to leave the lecture room for any reason, you may do so without asking for permission. Please leave quietly. If you arrive late, take a seat as quietly and unobtrusively as possible.

Recommendations

I recommend:

- General goodwill.
- Asking questions if anything is unclear (or might be incorrect).
- Taking advantage of lectures and office hours.
- Thinking during lectures.
- Passing the course in June.

Final remarks

I strongly discourage:

- Asking for non-standard privileges without a non-standard justification (e.g., asking for an extra exam attempt because "I really want to pass").
- Breaking the rules presented here and pretending that you did not know them.
- Disrupting the lecture (you may leave at any moment if necessary).
- Not respecting agreements.
- Plagiarism.
- Corruption or intimidation.