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THOUGHTS AND ADVICE ON STUDYING MATHS IN BONN

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Abstract. This is a short collection of thoughts and advice on studying maths at the University of Bonn. Parts of this text are not very related to maths or to Bonn. I will probably keep working on this little essay. Comments are welcome.

1.

1.1. **Respect.**

- Be kind and respectful to your fellow students.
- Read a bit about the concept of *microaggressions* (and then try to avoid these).
- How do you treat your fellow students when it comes to understanding maths? Are you helping them when you understood something and they didn't? Or do you look down on them and make them feel small? Be happy if you are an academically good student, be a team player and use your skills for something positive. This turns you into a truly good student.
- Ask yourself how you would feel to be the only X person in a seminar or tutorial group. (Here X stands for *female* or *person of color* or any other human attribute.)
- Please help to create and maintain a safe and discrimination-free study environment.

1.2. **Competition versus cooperation.** The professors are not trying to fail half of the class to reduce student numbers or something like that. We are happy for everyone to stay and do a maths degree. So, the other students are not your competitors.

Of course, there are certain standards. A maths degree (especially in Bonn) is demanding. But in my opinion, a considerable amount of stress and competitive feelings are created by the student community itself and not by the degree program. The path to happiness is to study together (e.g. by creating study groups, and by preparing exams and seminar talks together) and see the others as team mates and friends.

1.3. **Future researchers versus average students.** There are always groups of fantastic maths students who won already maths competitions and who intend to become maths researchers. Bonn has an excellent record of helping these students to achieve their goals. This is one of the things Bonn stands for.

But there is also space for the other students who just want to do a maths degree. In fact, our maths department would eventually be drastically reduced in size if we only cared for the future researchers and loose all the others. Politicians and tax payers want to see that we educate a certain number of people each year, and of course they are right.

So, everyone involved should just accept that there are students of different academic levels.

1.4. **Female/male ratio.** In my opinion, the number of female students in the maths Bachelor is low but not catastrophically low. However, the maths Master program in Bonn needs more female students. I do not have the impression that someone knows how to achieve this. You can be part of a constructive process to understand and improve the situation.

1.5. **Asking questions.** I'm shocked to see that only a few students are asking questions. Asking questions in lectures, tutorial groups and seminars is an essential part of learning.

I'm aware that asking needs courage. In the first year, there will be 150 people or more in a class room, so you need to speak up and make yourself heard. It is easier to ask in a small tutorial group, but even there you need some courage. Please: Find that courage!

To some degree, maths is like learning a language. There are definitions (= vocabulary) which you need to memorize. If you don't, you will pretty soon not be able to ask questions, because you will not speak the same language as your professors and tutors. So, being able to ask questions needs some work.

Sometimes a few people dominate a tutorial group with their questions and other contributions. Often these might be the smartest students in the group, they want to shine and learn. But asking questions is for everyone. Questions on basic things (which might look trivial to some students) are equally important. Be patient and tolerant. Help others if they don't understand, and ask for help if you don't understand.

1.6. **Evaluations.** Each semester you are asked to evaluate each of your lecture courses via an online questionaire. This is a crucial tool for giving feedback to your professors and tutors. Use it in a constructive way.

Every 3-4 years there is a *Studiengangsbefragung* where the whole maths degree program is evaluated. The participation rate for this is around 20% of all maths students. This is not enough! Please participate and help improving our program.

1.7. **From Bachelor to Master.** Getting into the Bachelor program in Bonn is easy. You need the *Abitur*, that is it. One doesn't even need good marks in maths. Given that we are dealing with an excellent and demanding degree program, I find this quite remarkable.

In Bonn you need an average mark of 2,5 in your maths Bachelor degree to get admitted to our maths Master program. For most students in Bonn, this is not a problem. And even if you get something below 2,5, you can still go to another university in Germany in case you insist on a maths Master degree. I talked to excellent students which are closer to 1,5 than 2,5 and they constantly worried about this. Don't!

Be also aware that the average marks in seminars and in the Bachelor thesis are usually much better than the marks in the first year.

1.8. **From Master to PhD.** If your Master degree did not go well, you should probably not do a PhD in maths. There is no harm in that, you will have a very good professional future without a PhD. But you have to decide this by yourself.

If you did your maths Master in Bonn, you need usually excellent marks (I'm talking about 1,0-1,5) to get a PhD grant (from the BIGS or other sources) in Bonn. Numerous Master students who plan to do a PhD are horrified by this. They perceive the situation as very competitive.

But look, if you really want to do a PhD and won't get a spot in Bonn, just apply to another university (in Germany or the rest of the world). Bonn has an excellent reputation for maths. So your Master degree from Bonn will open many doors for you, even if your marks are not so great. (In my experience, having a 2,0 average should be good enough for getting a PhD position at a good university.) So don't ruin your time as a Master student by worrying all the time.

1.9. **How long does it take?** Official answer: 6 Semesters Bachelor and then 4 Semesters Master, and (in case you still want more) 3 years PhD.

You are supposed to do certain first year exams in a given period of time. In this way you find out if maths is the correct choice for you. It is good if you study fast and efficient. But in my personal opinion, there is not much harm done if your studies take a bit longer. I can't really see that this will affect your chances of getting a good job. In other words, there is a lot of liberty and flexibility.

I believe that one should not spend more than 3 years on a PhD (a PhD grant usually lasts this period of time). There are people who spend several additional years to optimize and improve their results. In most cases, this is not a good idea.

1.10. **Failing.** Many students feel overwhelmed by the amount and the level of maths which is thrown in their direction, especially in the first year of the Bachelor program. The transition from school to university can be quite shocking.

The first year is clearly the hardest. You need a very good work ethic to get through this.

I don't believe that one needs to be especially gifted to successfully study mathematics. It is usually enough to be able to concentrate (which might not be an easy task for a generation who grew up with mobile phones) and to work hard.

If you feel completely lost, e.g. you understand very little and/or failed some exams, then you should first go to our *Studienberatung* (Dr. Kiesel and Dr. Räsch) before you decide to drop out of the degree program.

Try to understand what the problem is. Are you investing enough work? Maybe it is an option to just concentrate on two of the three courses Lineare Algebra, Analysis and Algorithmische Mathematik and do the third one a year later?

If you drop out, it will probably feel like a disaster for you, but you should know that in many cases, maths dropouts change to other degree programs and finish them successfully.

1.11. **Politics.** Discussing politics (in a civilized, open and non-dogmatic manner) should be omnipresent on a university campus. The stuff mentioned in the bracket can be non-trivial (as numerous examples show), but one should at least try.

I'm really shocked about the lack of participation in the elections for the Uni Bonn Student Parlament (below 10% in 2024). One should be aware that the Student Parlament has quite some power (and money).

The same holds (or even more so) for the *Fachschaft Mathematik* (= student representatives for maths). There was a slightly better but still awfully low participation of 20% (in 2023) for the Fachschaft election. To be one of the 15 elected representatives, it was enough to have 6 votes (= 0,6% of the 1097 maths students in Bonn)...

Participating in elections is a privilege (elsewhere people die or rot in prison for demanding free elections). I can't comprehend how someone does not use their right to vote. The terms *affluent neglect* (= Wohlstandsverwahrlosung), *decadence* and *ignorance* come to mind. (I apologize for these harsh words.)

1.12. **Money and privilege.** Universities (and schools) in Germany are mainly financed with money from tax payers. There are no tuition fees (apart from a small contribution (about 50 Euro per month) which provides e.g. free public transport). The food in the *Mensa* is highly subsidized for students, and there is some (limited) subsidized student housing.

However, students usually have to pay for their cost of living in Bonn. This can be hard, since rents are high in Bonn and it is not easy to find accommodation. There is financial help (like the BAföG), most of which comes again from tax payers or from numerous foundations. If you get enough money from your parents, grandparents

or some foundation, please be aware that some of your fellow students are not so lucky.

On the bright side, a maths degree from Bonn will most likely lead to interesting job opportunities and a salary that is far above the average income. Your education will be an excellent foundation for a good future.

The chance of getting a university degree in Germany correlates quite a lot with the income and the education level of parents. (The reasons are manifold and a constant topic of debate.) Many tax payers have not enjoyed a university education, and many of their children won't get one either. Only about 22% of all adults aged 25-64 in Germany have completed a university education (= Bachelor degree or above).

1.13. **Bright future or doom?** On the doom side, we have political populists and demagogues (they enjoy the concept of destroying stuff (especially democratic structures) and they promote this in a cheerful and successful way), we have dictatorships and kleptocracies everywhere we look, we have climate change, gender inequality, discrimination of all sorts, social inequality, several wars (the ones in the spotlight and also the other ones), religious fanatics, crime, and many other topics of concern.

On the bright side, numerous things are constantly improving on this planet (e.g. life expectancy, infant mortality rates, food security, literacy rates, advances in medical sciences and in science and technology in general, to name only a few).

It is quite easy to name the many things which could be done better. Finding a realistic remedy for a concrete problem is the hard part. Education, science, technology and wise politics can help with that. They can improve this world. You can be part of this process and your education is the foundation for it. Studying mathematics will change the way you think and the way you see the world. Your skill set will go far beyond the actual maths we are teaching you. (Most likely, your future employers will hire you for this extended skill set and not for your knowledge on e.g. Algebraic Geometry.)

So, should you feel positive about your future?

There is no doubt in my mind: Yes! By all means, yes!

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