Math Q&A Session

- Question: Do you have a favorite math proof? (Adam)
- Answer: Adam - Applications of Burnside Lemma
- Question: I am a double major in math and physics (minor philosophy). Goal: math side of physics, but finding a hard time finding the intersection between math and physics for graduate school and PhD. How much disciplinary research is there in math and physics grad schools?
- Answer: Most people who do that route go into a PhD in physics, with the emphasis in theoretical physics (often). A small number of math programs will have a strong group of people in physics. At rutgers people in the math department also hold joint positions with physics department. So students usually enter the physics program for PhD. Brown has two math departments (math/applied math). What will be the most important is getting a feel about what kind of physics is most appealing to you, so you know the area of math as well. If you're thinking of a PhD program, it is nice to know what area of math you might be doing, but not necessary.
- Question: At what point in what course would you say really help determine what path you wanted to go in? I.e. theoretical, quant side, what classes do you want to go for?
- Answer: So I was considering pure math/theoretical cs. I did an REU, and got a mentor and did some research, and I felt that it was a really good experience and it really helped
- Answer: I really like the idea of doing something over the summer, another idea is to do an internship rather than an REU. Over the school years I was doing research in the EE department Over the summer I could try out stuff in industry. I didn't SWE, and when I tried finance, I also learned it wasn't for me. So, I'm currently looking for different branches. This helped me narrow down what I want to try out. I reccommend picking up a coding language that will make you appealing to companies. I.e. python. This will open up different
- Question: You said you didn't like your first internship? What didn't you like?
- Answer:
- Question: Talking about learning programming languages, there are many ways we can learn a language. It is very hard to measure how proficient one is at the language. What approach would you best recommend to display proficiency?
- Answer: There is a lot of ways, one of the best ways is to do a lot of side projects. I.e. create a personal website, want something to appeal to companies. Another way is to solve challenge programs, (RUCP, the club), as to show people what they're doing
- Answer: Also, codeforces and project euler. Rating of 1500-1600 on codeforces is really good. Side projects are also good.
- Question: Can you explain how the honors track works?
- Answer: Leads to a B.S. in math science as it is credit intensive, and it makes sure that you have taken our two year long sequences 411, 412, 451, 452. Those courses will prepare you for graduate courses if you are going to do a graduate program in mathematics anywhere you go. How to get to that point or parts of that point before senior year? We usually invite students to honors sections like 291 and 251H, that are on our radar (Beals' radar). If you do well, Prof Beals will pay attention and check and see if you're ready for the next level. You would hope to do math 300 honors. We really expect students to appreciate a proof in the abstract, or construct a reasonable proof. If you've ogtten into math 300H, Prof. Beals will keep paying attention to you until you stumble. The students who do best in 300H, he will suggest 311H and 350H at the same time. If he is worried about it, he will recommend you do one of them in the time. Those courses will get you into 411,412 and 451, 452. Completing those will lead to a bachelors of science. That is the typical path, but you can also skip the lower 311H and

350H path by independently studying. That is not necsesarily recommended though. If you aren't in 350H and 311H, then you can still get into 451 and 411 by doing well in the non-honors class. Another caveat is that the number of double majors is a lot (especially math majors), but that leads to time constraints. So a lot of our honors majors cannot take all 4. But 2 of them will lead to honors or high honors in math. If you can only take one, then you usually take the one that will best complement. The ones who have gotten through 411, 412, can take the serious graduate courses if they will still be at RU. But the standard math first year graduate courses are in analysis, algebra, and topology if given a strong enough preparation. Our strongest majors that have the advantage of focusing on math, will take a number of graduate courses. You have to have the good fortune of scheduling and focusing to take a lot of grad schools. It can be hard without being a sole math major though. I.e. math education majors have a hard time taking both of them. FOr all intensive purposes, you don't have to apply.

- Question: The math department offers the 5 year BAMS program, for undergrads if we aren't too sure if we want the intenseive 4 year BS program, or the 5 year BAMS program, when will we have to decide?
- Answer: Look at the courses that intersect with undergraduate courses you want to take. Those who take 451, 411, 412, 452 take a lot of math courses, that go with their interests. You sample around and talk to people as you develop interest, and talk to Beals about interests. Take courses at the undergraduate level that may lead to graduate courses you're interested in. At RU there is a lot of flexibility regarding courses and interests. Example: first year econ grad students like to take functional analysis.
- Question: Can you speak about the research prospects for math related to computer science? (Graduate school) I.e. what is the benefit of having a math major on top of a cs major for cs grad school.
- Answer: It can depend on the cs interest. I.e. cryptopgrahy has heavy math. We have a lot of people who do comp sci and combinatorics. Comp sci and combo sort of mix into one big field.
- Answer: It is good to be good at math. There will be some aspect of proof in them with papers even if its just mostly empirical data. Having the math background to understand and drive to make those models better. Also math will help you differentiate you from others. Will make you look better on paper.
- ANswer: Every cs major with a math background is stronger than a cs major. It is good to know math
- ANswer: Ask the CS department
- Question: Question for education: HOw did you choose to go into the educational track? I love to teach, but theres so many other things that it paralyzes me to look at all the other options. SO why did you want to go into education?
- Answer: coming into rutgers 2014, I know I wanted to go into math, one of my intersets in comp sci. I did tutoring at RU, and was hired to me a tutor as a sophomore. Tutoring these kids, they were mostly first generation students, so they seeked help for math and other things like how to deal with rutgers and financial aid. Things that are new to them and their family. In my sophomor eyear, my interests in education increased. I genuniely wanted to help these people. Looking at RU only having a 5 year program, I looked at it and thought it was doable for me to do the program at RU. The hardest thing about the teacher program is finishing the math degree on time with good grades. Based on experiences, that does seem to be the biggest obstacle, as you don't want to go past 4 years.
- Answer: If you like teaching, get a job teaching at RU! (LA, tutoring, etc.) Find an opportunity for teaching. Brian really liked teaching undergrads in his undergrad. Teaching at a higher level is nice. If Brian wants to teach fun math, then he ends up teaching at a university and not a middle school.
- Answer: There is a lot of options at different levels. Don't discourage people who want to teach at a lower level. DOn't listen to those people. Don't model yourself about the worst aspects of people. If you go into pure math, unless you are going to IAS, you will be teaching.

- Question: Besides education, comp sci, and finance, what are other options for people looking into a phd in pure math, but not commiting to academia forever.
- Answer: There are industry/tech positions and research at corporations. Also, there are different views of finance, so I would hesitate to group someone under 1 umbrella of finance. ALso economics is cool, and advertising as well. Also theres the NSA and research jobs, and nIST. Lots of interesting government jobs. Very much like an academic job, just no teaching. Lots of times doing the same abstract problems that you find interesting.
- QUestion: Would you first get a phd?
- Answer: Don't need one to start, but you can. Do something you love.
- Question: HOw often do you see honors math students transition into law school.
- Answer: It happens, it happens. A stat I learned last year for the LSATS. Interesting trivia: The people with the highest LSATS are the math majors.
- Question: For Brian - how is grad school life in general?
- ANswer: I really like it here. People talk about how grad school is a depression factory, this is true for a nontrivial number of people. But there are a lot of grad students who are happy with what they're doing. For those in math grad school, it is hard to accidently walk into math grad school. SO you want to make sure you like doing math, as well as teaching. If you don't like teaching very much, you may not be that happy. But I like it here: no homework, deal with undergrads, learn math.
- Answer: The above may also be true for the theoretical sciences.