

My Experience at PhD Interview at the Tata Institute of Fundamental Research

by Abhishek Khetan - Tuesday, May 31, 2016

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There were a total of 42 students who appeared at the interview date. There were two rounds : the first was a problem solving round and the second was the interview round. The problem solving round was a total of 1.5 hours long and consisted of 9 questions out of which we were to answer as many as we could. There were 8 subjective type questions and 1 objective type question. After the problem solving round, out of the 42 students, 21 were shortlisted for the interview round.

I was lucky enough to get past the problem solving round. There were two interview panels and I was assigned to panel B. The panel consisted of 5 professors. Sitting in the middle was Prof. Nazmuddin Fakhrudin (NF). On his right was a young professor, whom I will refer to as (YP). On NF's left was a middle aged prof whom I will denote as (MP). The remaining two professors didn't ask me any questions.

As I entered I wished everybody good afternoon, and was greeted back.

Question 1. (NF). So Mr. Khetan, where are you pursuing your MSc from?

Answer. I am pursuing my masters in Mathematics at the Chennai Mathematical Institute.

Question 2. (NF). And where were you prior to that?

Answer. I was a mechanical engineering undergraduate at IIT Kharagpur.

Question 3. (NF). Hmm.. So what are the topics that you find interesting?

Answer. I am mostly interested in topology and geometry. I also like algebra.

Question 4. (NF). So what have you read in topology.

Answer. I have done two courses. The first was on general topology with an introduction to the fundamental group. The second course was on homology theory.

Question 5. (NF). So can you give me some examples of the fundamental groups.

Answer. $\pi_1(S^1) = \mathbb{Z}$, $\pi_1(\mathbb{R}P^2) = \mathbb{Z}/2\mathbb{Z}$. And there is this bizarre space, the shrinking wedge of circles, whose fundamental group is larger than the fundamental group of the wedge of countably many circles.

Question 6. (NF). Any other fundamental groups you can create?

Answer. Chokes.

Question 7. (NF). What about $\mathbb{Z}/3\mathbb{Z}$?

Answer. I think if one attaches a two disc on S^1 via an attaching map which wraps around S^1 three times then the resulting space should have its fundamental group same as $\mathbb{Z}/3\mathbb{Z}$. But I am not a 100% sure.

(NF): Okay then, (MP) would you like to ask him some questions.. (turning towards me) though it's correct what you just said.

Question 8. (MP). What about the wedge sum of two circles?

Answer. The fundamental group is the free product of two copies of \mathbb{Z} .

Question 9. (MP). What about the Mobius band?

Answer. Since the Mobius band deformation retracts to a circle, the fundamental group of the Mobius band is \mathbb{Z} .

Question 10. (NF). Now let's do some algebra. Have you studied groups?

Answer. Yes.

Question 11. (NF). Classify all groups of order 15.

Answer. I used Sylow theorems and solved it with a hint. Gave the full details.

Question 12. (NF). What about groups of order 6? Does the same idea work?

Answer. I tried the same idea and got stuck. Before I would think of something else (NF) cut me off and asked (YP) to ask me something.

Question 13. (YP). Can you prove that a ring of order 15 with identity is necessarily commutative.

Answer. I choked. Even with many hints I was not able to solve the question.

I was then bid adieu.

After about a month, the results came and I was selected!

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