Interview with IMO Contestants 2016

Glenn Lim

"I don't want to conduct another interview this year," complained the Interviewer, unnamed and mysterious as always.

"But isn't there always an interview? It's called 'Interview with IMO Contestants' for a reason! What would the readership think?" Glen replied incredulously.

"They'll deal," the Interviewer said with a dark glare.

"You're the Interviewer! Isn't interviewing, you know, your job?" Glen protested.

"Please. Do you know how hard it is to interview these people? All the things I have had to go through, just to conduct one miserable interview..."

"Fine, I get it. But what's going to happen instead?"

"Trivial. You tell me all about this year's IMO. No need to ask the others. Since you're the sanest one in the team—"

"Thanks."

"—I doubt I'll have to endure any such rubbish from you. Besides, you're the only one in the team who can participate in one IMO, so this is your only chance to be in the limelight."

"...I didn't need to be reminded of that."

And so Glen took in a deep breath and began.

"After more than a month of intensive training, the time had finally come for us to depart for Hong Kong. We met in Changi Airport Terminal 1 in the morning of the 9th of July. After taking some photos with Mr Zong and the observers, as well as the three soft toys we were bringing along with us, we said our goodbyes and went through security clearance. Then, as some of us were hungry, we went looking for food. Eventually, we settled on one of the small food courts and bought chicken rice. There was still some time before departure, so—"

"You don't have to go through every single detail, you know," snapped the Interviewer impatiently.

"Didn't you ask me to tell you all about this year's IMO?"

"Do you want me to interview Sheldon instead?"

"No! He's already been in two of these things! Fine, I'll be more concise. Nothing much happened on the first day, really, other than sparks flying between Bryan and our guide when they locked eyes, and us taking pictures with the IMO logo and other random symbols—we were banned from holding them upside-down, though—, and us getting lost as we looked for our halls, and us getting lost again as we looked for the canteen, and—"

"I'm calling Sheldon."

"Wait, wait! I'll cut to the opening ceremony, okay? There were a few speeches, and then each team was to go on stage, in the order of their country's first participation in the IMO. As someone who does Geography quizzes for fun, it was interesting to see teams from countries all around the world—and to name each country's capital. This was followed by a series of musical performances, including a percussion performance with various drums and water bottles and a rendition of a most...*memorable* IMO theme song."

"Memorable?"

"Yes, definitely. I can still remember it now: D D D D D C# B A F#—"

"That's enough, thank you. Tell me about the first day of the competition. That was on the day after the opening ceremony, right?"

Glen nodded. "It started at 9 a.m. the next day, yes."

"How was it like? Were you nervous? This is, after all, your first IMO."

"I didn't need to be reminded of that," Glen muttered. He then continued, "To be honest, it was pretty nerve-wracking at the start, because we were just

sitting there and not doing anything in particular. I calmed myself down by arranging all the stuff on my table—the coloured cards, for instance, and my stationery, and also the burette clip I had brought with me just for the fun of it—and probably stressing out everyone else around me by continuously moving and tapping the table. Then the competition started. I looked at the questions: a Geometry problem for Q1, which was good, because it was my weakest topic; a Combinatorics problem for Q2, which was good as that was my strongest topic; and what looked like a Combi-Coord Geom hybrid thing for Q3, which was most decidedly better than the Q3 Geometry questions that had been coming out for the past 3 years."

"So how were the questions?"

"Well, for Q1, I drew the diagram, then wrote down every single synthetic observation I could think of. Unexpectedly, I didn't get stuck, and around 10 observations in, I realised that I had solved the question. I wrote out my solution, which took surprisingly long, because I had forgotten how some of my observations had come about. I finished just past 10. That was a little longer than I had hoped, but it *was* a Geom, after all, so—"

"What about the next question?"

"Ah, the Combi. Figuring out that n had to be a multiple of 3 barely took me any time. Proving that n couldn't be 3 went smoothly, too. And then I got stuck. After a few short-lived panic moments (*I'm failing a Combi! I'm going to get bronze because of this!*) and a rather lengthy mental case-whack, I disproved the n=6 case and generalised that to find a colouring of the grid to show that n had to be a multiple of 9. I wrote out my solution, cringing as I wrote the word "subsubgrid", and was done with Q2 just before 11. That left me with just over two and a half hours for Q3, which was most definitely not what I thought it was."

"What was it, then?"

"It turned out to be some monstrous Number Theory-Geometry-Algebra hybrid. It was awful. Using the shoelace formula gave me an expression which I couldn't do much about, except for some primes. A direct bash with coordinate geometry didn't work. I proved the base case pretty easily, but couldn't continue with the induction. All in all, I wrote 10 pages of working, with each new approach starting on a different page. As it turned out, pages 3a (proving for primes 3 mod 4) and 8 (base case) together would have given me one mark; so would have 8 and 9 (attempt at induction step). Any of them on their own would not have done so."

"So how did you feel about your performance on Day 1?"

"Well, I was generally happy with my performance, although I was pretty annoyed with myself for not explicitly proving that the area of the polygon was an integer in Q3. The Chinese translation of the question, which I had only read after the paper, asked us to prove that 2S was an integer, *and* that it was divisible by n, so I thought the former half may have been worth a mark. It wasn't."

"And how was the rest of the team?"

"We weren't allowed to compare our solutions or how we had done, but everyone was pretty much just like their usual: Joel, energetic; Bryan, expressionless; Dylan, happy, albeit disappointed he didn't solve Q3; Sheldon, help-I-bit-a-bigger-hole-in-my-gums; Zhao Yu, I-bet-Dylan-solved-Q3-and-just-didn't-want-to-tell-me."

"Zhao Yu actually said that?"

"Yes."

"Oh. So how did the team prepare for Day 2?"

"To be honest, not much. We rested, had a delicious seafood dinner, and then we discussed what might come out back at the hostel. Odds were that it would be Q4 Number Theory, Q5 Algebra—most likely a functional equation since that had been in fashion for a while—, and Q6 Geometry, because an IMO with the only Geom question being a Q1 was pretty improbable. Things weren't looking good for me, because we all know how last year's Q5 functional equation turned out, and I had no confidence in being able to solve a Q6 Geom."

"That wasn't how it turned out, though."

"Not at all. When I looked at the paper, my first thought was, 'this is actually a paper I can do well in.' My second thought was, 'oh, Sheldon will be so angry that there isn't an FE.' Q4 was indeed Number Theory. Q5 *was* an Algebra question, though not a

functional equation, and Q6 looked like a Combi-Geom, which was better than a pure Geom, at least. So I began the paper buoyed by this newfound hope. I solved Q4 relatively quickly. It was a highly tedious question requiring an extensive use of the Euclidean Algorithm and the systematic disproving of the smaller cases. I took much longer to write it out than to solve it, so about an hour had passed by the time I was done."

"Which left two more questions."

"Indeed. For Q5, it was pretty obvious that at least 2016 linear factors had to be erased in total, and trying the small cases, first with four linear factors in each side, then with eight, led me to guess the construction for the question. I was a little suspicious of it at first, because I had thought that more than 2016 linear factors would need to be erased, as the bound was too obvious, but drawing the graphs convinced me that the construction probably worked. Now if this had been a question in H2 Math, I could have just drawn the graphs and written 'from the sketch, the two graphs do not intersect' and I would have been considered to have solved the question. The IMO is not H2 Math. The main part of the question was to prove that very statement. At this point in time, I needed a break, so I raised the toilet card...and was told that I had to wait, because apparently everyone else also needed a break. Oh well. So I continued working on the question, and eventually found a way to group the inequality to be proven into a product of smaller inequalities. I was halfway through writing down my solution when I was finally told that I could go to the toilet. I didn't want to stop right then, but I didn't want to endure another 30 minute wait when I really needed to use the toilet either, so I went. That proved to be a good decision because the wait increased. Sheldon had to wait 45 minutes and Joel had to wait an hour until the paper ended before he could use the toilet. I completed my solution around 11, the same as the previous day."

"And what about Q6?"

"I spent around 2 hours trying various methods, all of which failed. I alternated between parts a and b, hoping that something would give me insight into either part. Thinking that the question, with all its lines and points and moving objects, looked like the 2011 windmill question, I tried dividing the intersections into sets of convex hulls, which led to many multi-coloured diagrams which did nothing more than look pretty. After that, I tried an inductive approach, as I realised lines could be removed from certain configurations. However, moving the lines around to transform them into those configurations proved messy and unviable. Like many contestants, I thought that there would always be 2 frogs which would collide regardless of direction in part b, which was, in actual fact, untrue. Just before 1 o'clock, with barely half an hour left to the paper, I drew a construction for the n=5 case, and realised that if I looked at the lines in clockwise order, the frogs went in, out, in, out, and so on. I gasped in surprise. Could that be it? Had I actually solved part a? I had. I began writing down my solution to part a. Halfway through that, I realised that the same idea, quite surprisingly, solved part b too, which meant that I was left with a race against the clock. After 4 pages of furious scribbling, I was done, with less than 10 minutes to spare. I spent the last ten minutes reading through and sorting out my solutions, and trying not to weep with joy for having solved a Q6."

"Wow, what a rollercoaster ride."

"Definitely more exhilarating than *Space Mountain*! Anyway, on the way out, I met Sheldon at the doors of the exam hall. He remarked, 'That paper was too easy.' I concurred, saying, 'South Korea is going to get 6 perfect scores.' (There had been a rumour that the South Korean team was hoping for 6 perfect scores after Day 1.) So we went out, thinking that everyone had done really well on Day 2. Separately, Dylan and Zhao Yu had also bumped into each other, and had concluded that 6b was impossible as both of them had solved 6a and could not extend their methods to solve the second part. Sheldon and I burst their bubble. Oops. Zhao Yu spent the rest of the trip intermittently complaining that he had wasted his chance at a perfect score."

"Why didn't their solutions extend to the second part?"

"Q6 was a very interesting question. Zhao Yu and Dylan had both come up with very—" Glen paused to clear his throat, "—*innovative* solutions, one of which involved the winding number of a car driving along the lines. It was the simplest method which worked in the end, though. I'll admit that the key to solving the question was to not find any other method other than the intended one, which may not have been exactly fair. Q5 was better in that various solutions would all

work, instead of solving just half the question. Dylan and Joel came up with 2 different solutions using different infinite series."

"Now that the competition was over, you were free to do anything you want?"

"That's right. We discussed solutions and played cards, mostly, with more of the latter. We had the rest of the day off because nothing had been planned. You wouldn't be interested in that."

It's a Small World was probably one of the most child-oriented rides but it was one of our favourites.

"Tell me about the outings, then."

"The first day after the competition was the highlight of the trip: the excursion to Disneyland. You see, inside every Math Olympian resides an inner 5-year-old. Clearly, the organisers must have been aware of that fact, because there is no other reason why they would have sent a horde of teenagers to an attraction targeted at children. I sort of pity the tourists who visited Disneyland on that day, because IMO contestants were *everywhere*. Unfortunately, this meant that the queues were ridiculously long for quite a few of the rides we had intended to go on."

"What was your favourite ride?"

"It's so hard to pick one! Maybe…hmm, no, not that. How about…umm…I know! *Mickey's Philharmagic*! We only went for that to get a respite from the scorching hot sun, but I thoroughly enjoyed it. I loved rewatching all the best songs from the Disney animated classics, even if they *were* truncated. Special mention goes to *It's a small world*. We only went in to escape the rain—yes, I know, this is beginning to sound like a pattern—but I enjoyed it far more than I expected. I can't say the same for the rest of the team, though. 'This is so stupid,' Zhao Yu had complained at the start of the ride. 'All this ride does is reinforce stereotypes,' Joel commented at the end. Dylan recorded the whole thing, though, so I guess he must have enjoyed it too. For all I know, he watches that video every day."

"How did you find the other excursion?"

"If only we could have gone to Disneyland again. The morning trip to Victoria Peak was fun and the scenery was nice and all, and everything would have been fine had the excursion just ended then and there. But alas, we also had to visit a high school in the middle of the mountains. Now, if it had been anything *else* in the middle of the mountains—another lookout point, a monastery, a secret hidden kingdom, a portal to Shangri-La or Mars or Milliways or something; anything, really—, I would have been happy. All we got was a tour of a fairly typical high school, albeit with a couple of old buildings and having some significance in a World War that I didn't catch because I was too hungry to think about anything other than how close I was to collapsing from hunger. Anyway, after a long-awaited lunch and souvenir shopping in a nearby market, we returned to the hostel."

"So, more card games?"

"Yes, but not exactly. We played some rotato-table tennis, just as last year's team had. One of my slippers broke. But more importantly, the results were also coming out that night. Personally, I wasn't particularly nervous because there was no way the gold cut-off would be so high as to deny me of a gold medal. Furthermore, our 4th place ranking was pretty much sealed because we couldn't catch up with the top 3 teams and were way above the rest. So we just sat in one of our rooms and thought of games we weren't sick of playing, all the while trying to access the results and being thwarted by the slow internet connection and the fact that every other team was probably trying to do the same. And then the page loaded. We looked the results: 4 golds, 2 silvers, and quite high golds at that. I, for one, was elated. Sheldon was annoyed that he only scored 1 for Q3, which let me tie with him; Zhao Yu moaned about him missing his chance to attain a perfect score; Dylan seemed generally relieved that he had finally gotten his gold medal; Joel was okay with the results, and noted that he would have been more upset, had he been closer to the cut-off. Bryan messaged us, 'I jumping off the mountain now'. He didn't."

"That's a relief. I'm sure everyone must have been looking forward to the closing ceremony, then."

"Well, *I* was. I don't know about the rest. The closing ceremony was fun. We distributed the items amongst ourselves: 1 flag, 1 duck, 1 snake and 1 bear. Originally, we had intended for Sheldon, Zhao Yu and me to take the flag, while the rest were to each get one animal, but Joel wanted the flag too, so in the end everyone got the flag but Dylan, because he wouldn't have been able to pass it to us in time. Sorry, Dylan. Anyway, it was a pleasant surprise when the top 11 all went onstage together, so we were on stage together with the perfect scorers! Sheldon pointed out that it was the first year he could remember when all the top 10 scorers came from only the top 4 countries. The closing ceremony was followed by the formal dinner, during which the 6 perfect scorers were invited onstage for a short interview, prompting Zhao Yu to whinge, yet again, about how he wished he'd solved Q6."

"Thank you, Glen, for your detailed account of the IMO 2016. I guess this interview has come to an—"

"Wait! Aren't you going to ask me about what I learnt or some other questions like that?"

"Do I really have to?"

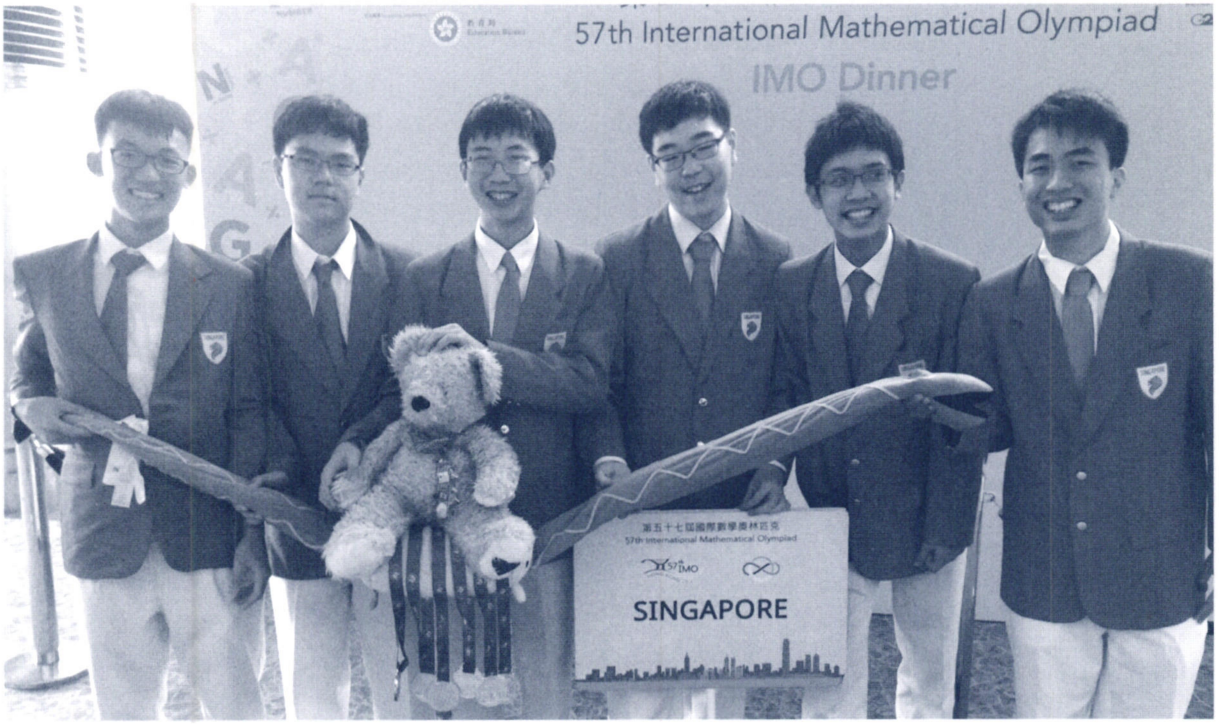
"It's my only chance to be in the limelight!"

The Interviewer sighed, clearly regretting his decision to point that out in the first place. **"Fine. What did you learn from this IMO?"**

"I learnt that North Korea isn't actually *beihan* in Chinese," Glen replied.

The Interviewer glared at him.

It turned out that rotato-table tennis was contagious - many of the other tables adopted it soon after.



Taking a picture with our official mascot (Simon the bear) and two unofficial mascots.
From left to right: **Dylan Toh Shan Hong, Ma Zhao Yu, Sheldon Kieren Tan, Bryan Wang Peng Jun, Joel Tan Junyao, Glen Lim Wei An**

"Umm…I also learnt…more about my teammates! For example, I learnt that Sheldon likes to bite holes in his gums when he's bored. Come to think of it, this was my first overseas competition with Sheldon, even though we're in the same batch. I also learnt that climbing stairs can cure bladder cramps, or maybe that's just Joel," Glen added.

"Good to know. So, what advice do you have for your juniors?"

"Eat well. During the IMO, I ate porridge every morning while the rest ate fried food. I was the only one who wasn't ill at some point during the trip. These two events are clearly correlated."

"I'm ending the interview," the Interviewer threatened.

"Okay, okay! I'll give some better advice. To my juniors: don't give up. This applies both for competitions and as a Math Olympian as a whole. I mean, just look at my Q6. It took me 2 hours of dead ends and wrong approaches to think of the solution. More importantly, to those who want to make it to the IMO but to whom the IMO seems far out of reach: I was there too. I had been doing Math Olympiads since primary school, to varying degrees of success. I went through the SIMO Senior Team twice before entering the National Team. I looked at all the people who were so far ahead of me and thought that getting into the IMO was nigh on impossible. But even when other options presented themselves—switching to Chemistry, for instance—, I continued working hard and look where it got me. So don't be intimidated by the 2 people in your batch who ranked in SMO in P6, while you couldn't even do so in Year 1. Don't be cowed by the juniors who suddenly appear and outscore you in everything. Don't be daunted by the seemingly massive gap between your level and the IMO. Don't lose hope."

Just then, Sheldon sailed in on the backs of a thousand swans. "I feel just like David, except that I'm not as tall!" he cackled gleefully.

Zhao Yu galloped in behind him. "Wait, what's happening?" he asked in confusion.

Joel sprinted in. "Running is the best cure to bladder cramps!" he said with a smile.

Dylan entered the classroom. Seeing that almost everyone was there, he groaned. "Don't tell me I have to go through Q6 again," he sighed.

Bryan strolled in, saying simply, "GG!"

"Don't throw a chair at me!" the Interviewer yelped in terror, raising his hands in surrender.

Bryan ignored him and proceeded to use the broom to clean the whiteboard.

"Anyway, you guys came in too late," the Interviewer said, **"the interview's already over."**

"What?" everyone but Glen and Bryan shouted in unison. Bryan wrote the words "what", "trash" and "gg" on his freshly swept whiteboard.

"Don't worry. All of you can star in next year's interview. This is the only chance for Glen to be in the limelight!"

"I didn't need to be reminded of that yet *again*," Glen said under his breath.

"I can't be in next year's interview!" Sheldon protested.

Bryan wrote the words "star", "interview", "chance", and "gg" on the whiteboard.

"Will this interview never end?" the Interviewer wailed. **"Fine, I'll ask you one last question, okay? What were your highest and lowest points of the IMO?"**

"7 and 3," Zhao Yu said, most likely regretting that he couldn't say, "7 and 7".

"The mountainy place and our campus," Dylan replied. Joel nodded in approval.

"This question is harder than Q3 of the IMO," Sheldon groaned.

"And this is why I didn't want to interview all of you," said the Interviewer as he left the room.