

# 2025 Samuel Beatty Report

## 66th International Mathematical Olympiad in Sunshine Coast, Australia

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The International Mathematical Olympiad is a prestigious math competition held in a different country each year, where bright high school students from all over the world attempt to solve 6 problems over 2 days. This year, the 66th IMO was held in Sunshine Coast, Australia, with a total of 630 contestants from 110 countries competing.

The 2025 Canadian IMO Team was composed of 3 returning members: Warren Bei, Ming Yang, and Ryan Bai, and 3 new members: Zhekai (Bill) Shen, Leo Wu, and Tiger Li. The team was selected based on their combined performances on the Canadian Math Olympiad (CMO), the Asian Pacific Math Olympiad (APMO), and the Canadian IMO Team Selection Test (TST). To qualify for these olympiads, students must score well on the previous year's Canadian Open Math Challenge (COMC).

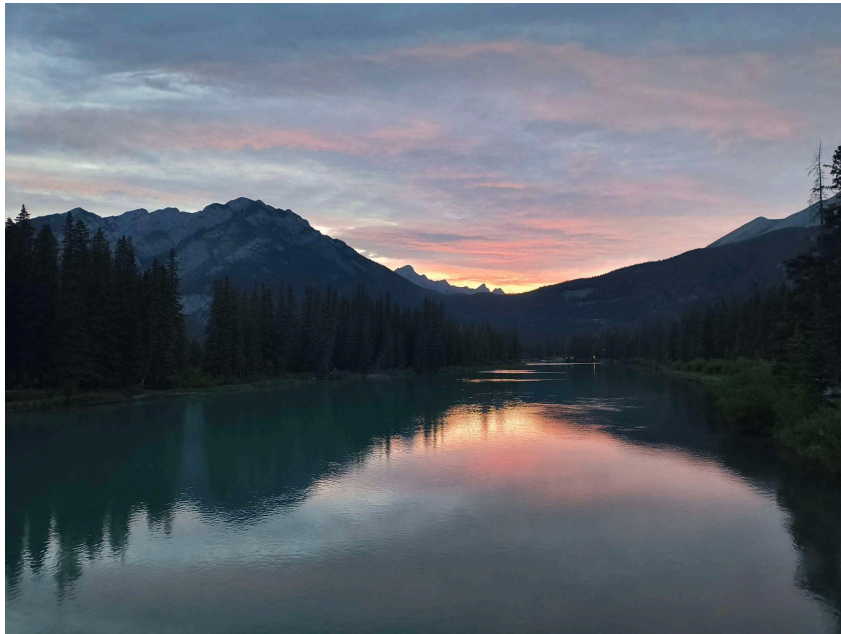
Prior to leaving for Australia, we participated in a two week long training camp at the Banff International Research Station (BIRS). Our trainers at the camp were Victor Rong, Eric Shen, Howard Halim, Miranda Zhao, Ben Yang, and Emily Ma. Victor, Eric, and Howard later accompanied us to the IMO as our team leader, deputy leader, and observer respectively.



*Team photo at Banff*

After arriving at camp, we got to know each other better through some icebreakers and fun games. We were also greeted by the breathtaking scenery of the Rocky Mountains and delicious food from the buffet. Beginning from the second day, we attended lectures on a wide range of fascinating topics such as functional equations,  $p$ -adic valuation, spiral similarity, and study examples. Lectures were typically 2-3 hours long, which gave us plenty of time to try problems from the handout together. Solving problems and discussing interesting theorems with my fellow campmates during these “group-solving sessions” were often my favourite parts of the lectures. Every other afternoon, we also took 4.5 hour long mock contests to mentally prepare for contest conditions. Problems on these mocks were often drawn from last year’s IMO Shortlist which made them great at simulating the IMO. The trainers then graded these mocks with in-depth feedback for us to learn from.

In addition to the lectures and mocks, the trainers also arranged many fun activities for us to participate in during our free time. On Canada Day, we walked to Banff to watch the Canada Day parade and had some delicious ice cream. Another evening, the trainers got a campfire going so we ate s’mores together. There was a day off around halfway through the camp so we took the opportunity to go hiking in the mountains. That afternoon, we went rock climbing and played card games once we became tired. We also had a karaoke night the next day, where many of us stayed up singing until well past 1 am! On the last day of camp, we walked around downtown Banff and had one last dinner together before departing to Australia.



*Sunset over the Bow River*

On July 11, the six of us, Eric, and Howard left Banff for the Sunshine Coast. Victor had already left 3 days earlier to vote on the problems that would appear on the IMO. After a long flight, including a connection in Vancouver, we arrived in Brisbane, Australia on the morning of July 13th. Although we had been travelling for over a day, most of us slept well on the plane so we weren't feeling much jetlag. After taking a shuttle to the Sunshine Coast, we arrived at the hotel and received our lanyards, room cards, and a backpack filled with IMO-themed merch. We were rather lucky to have adjacent rooms; Warren and I shared a room with two Danish contestants while the rest of the team shared a room together. We spent the rest of the arrival day meeting other teams in the lobby.

The main lobby area contained tons of drinks, snacks, and exciting activities such as a board game room, an arcade, and a large room filled with bean bags and puzzles. On non-contest days, we spent most of our time here conversing and playing games with other teams. In recent years it has become a tradition to hand out Canadian IMO pins to any contestant we meet; we had nearly 200 pins to give out! These pins were a great way to start conversations and sometimes, other teams would exchange souvenirs with us.

The Opening Ceremony was held the day before the contest. The ceremony began with speeches from people such as the President of the IMO Board and the Mayor of Sunshine Coast. After this was the country parade, where each team walked up on stage while displaying their country's flag. This year, the order of countries in the parade was based on their capital's distance from the Sunshine Coast. There were also some musical performances towards the end of the ceremony. We spent the rest of the day meeting new people and decompressing before the contest.

The IMO format is as follows: on each of the 2 days of the contest, students are given 3 problems to be solved in 4.5 hours. Each problem is worth 7 points for a total of 42 points per contestant. The problems are typically arranged in ascending order of difficulty, although this is not always the case. To decide which problems appear on the IMO, the IMO committee first assembles a Shortlist of around 30 problems proposed by various participating countries. The team leaders are then presented with the Shortlist and select the IMO problems through a voting process.

On both contest days, the team woke up early and had a quick breakfast before heading to the exam halls. Problem 1 was about a set of lattice points covered with lines and counting the number of "sunny" lines with a specific property. It was a cute and approachable problem that was fun to solve. Our team did very well on this problem, with all six of us solving it using an inductive approach. Next up was Problem 2, an interesting geometry problem involving several circles and a tangent line. Our weakest subject as a team was geometry and hence several of us were irritated to see this appear as Problem 2. Warren, Ming, and Ryan solved this problem through a mix of either synthetic geometry or trigonometry, and I was awarded 1 point for characterizing the tangency point. Problem 3 asked us to find an upper bound on a positive

integer function satisfying a certain divisibility condition. Ming and Warren earned full points on this problem, and I received 6 points for having several key claims down on paper. We ended the first day with a decent performance, with two of our team members “sweeping” the test!

The first and second days of the contest were highly contrasting. Problem 4 asked us to analyze an interesting sequence of positive integers related to a sum of divisors. It was quite difficult for its position and working through the details in each case was a tedious procedure. Five of us solved the problem and Bill made significant progress, earning him 3 points. Problem 5 was about two people playing a game involving two inequality conditions. The problem also had some amazing flavor text; after the contest, our team couldn’t stop using the pun “ine-koala-ty”! Personally, this was my favourite problem in the contest. The entire team solved the problem with similar solutions, an extremely strong result! Finally, Problem 6 was a combinatorics problem about covering a  $2025$  by  $2025$  figure in the least number of rectangles possible. Warren solved the problem and Ming obtained 1 point for providing the optimal construction. This was a brutally difficult problem despite the deceptively simple problem statement. In fact, there were only 6 full solves across all of the contestants. We were quite content with our performance on the second day, with Warren sweeping both days of the contest!

The next two days were full of excursions and fun activities to engage in. The day after the contest, we went on a trip to the Australia Zoo. We saw all sorts of cool Australian animals, got to pet and feed kangaroos, and I watched a cool crocodile show with Ryan. It rained cats and dogs the next day so we stayed indoors and played a ton of games. We played table tennis, pool, chess, poker, Tractor, and arcade games such as Mario Kart. I also played a lengthy game against Tiger in an extremely wacky variant of classic Tetris. A few of us stayed up late into the night playing Avalon and socializing with contestants from other countries. We also attended some talks and Q&A panels on interesting topics such as the future usages of AI in mathematics.

Throughout these two days, our team leaders were involved in an arduous process known as coordination. Each problem has a grading rubric in which points are awarded for proving certain statements. During coordination, leaders compare their team members’ submissions to the rubrics and explain why they deserve as many points as they can possibly contend for. This can take on many forms such as filling in the details of a rushed solution, explaining an obvious claim that wasn’t written down on paper, or even deciphering poor handwriting. Thanks to our leaders’ hard work, almost none of our correct solutions were docked and we obtained several partial marks for Bill on Problem 4 and myself on Problem 3.

The next day was the closing ceremony where we went up onstage to receive our medals. Warren and Ming won gold medals, Ryan and I won silver medals, and Tiger won a bronze medal. Warren received a perfect score of 42 points, a super impressive feat! As we checked the other teams’ results we realized that this year’s IMO was on the easier side: the cutoffs of 35 for gold,

28 for silver, and 19 for bronze were all around 5 points higher than their historical averages. This was probably since Problem 3 was relatively easy for its position and there were no super difficult problems other than Problem 6. Overall, Canada ranked 21st out of 110 countries with a team score of 169 points. Tiger, Bill, and I are still eligible for future IMOs, and I hope that we win many more gold medals for Canada!



*Closing ceremony*

There was a large barbeque following the closing ceremony where we stuffed ourselves with a great deal of food. Afterwards we went to the closing dance party. There we danced to the music, formed huge conga lines, duelled with glowstick swords, and relaxed on beanbags while sipping cold drinks. We all had a fantastic time at the party before returning to our rooms at around midnight. The next morning, we left the Sunshine Coast to return to Canada.

Needless to say, the 66th IMO has been an amazing experience for all of us. Anybody who does math olympiads dreams of competing at the IMO and I am incredibly honoured to have represented Canada on the world stage. I am super grateful to our team leaders, trainers, event organizers, the Canadian Mathematical Society, and our generous sponsors such as the Samuel Beatty Fund and Jane Street for making this wonderful opportunity into a reality for us. Without their hard work and support, none of this would have been possible. A special shoutout to my teammates for being such amazing and encouraging friends. My journey to the IMO has been truly unforgettable and I hope that many other students will have the same opportunities in the future.