

## 2017 Samuel Beatty Report by Steven Yang

The International Mathematical Olympiad is the annual champion competition in mathematics for high school students, and has been since 1959 when only seven countries participated in the first IMO held in Romania. However, after 58 years, the International Mathematical Olympiad 2017, held in Rio de Janeiro, Brazil was a truly international event with more than 600 contestants from 110 countries. Even though the contest difficulty has also increased significantly over the years, the format of the competition remains unchanged. The IMO is held over two days, and is comprised of four and a half hours and three challenging mathematical questions each day. The questions are composed of four categories, Algebra, Combinatorics, Geometry and Number Theory. Leaders from more than 100 countries propose various questions on these topics, the best eight questions of each category become the IMO Shortlist; the IMO jury then votes to determine the six questions from the shortlist that will comprise the competition questions. The Canadian IMO Team leader, James Richards had to leave early from the training camp in Mexico to travel to Brazil to participate in the jury deliberations.

This year, the Canadian IMO Team was composed of Qi Qi (from Vancouver, B.C.), Ruizhou Steven Yang (from Vancouver, BC), Thomas Guo (from Toronto Ontario), Max Xiong (from Calgary Alberta), Victor Rong (from Toronto Ontario) and William Zhao (from Toronto, Ontario). Members of the Canadian Team are chosen based on scores in the Asian Pacific Mathematical Olympiad (APMO), the Canadian Mathematical Olympiad (CMO) and United States of America Mathematical Olympiad (USAMO). Furthermore, the Canadian Open Math Challenge serves as the main qualifier for the three major Olympiads. James Richards from McGill University, Sarah Sun from the University of Waterloo, and Matthew Brennan from MIT volunteered to be the leader, deputy leader, and the observer respectively. The six team members and the leaders met each other on 29th June 2017 at the IMO Sendoff Ceremony, held at the Faculty Club of the University of Toronto. Math Team Canada 2017 gained the chance to meet former math Olympians and government officials, and dignitaries. We discussed how the math competition has changed over years and how honored we were to gain such a chance to represent Canada in a prestigious international event.

The Training Portion in Toronto lasted only three days from 28th June to 1st July 2017, and we filled most of the time with fun activities. After the sendoff ceremony, we had a mock Olympiad at the University of Toronto on 30th June. On July 1st, we went to see the fireworks for Canada day and joined the celebration of Canada's 150th birthday! All of us enjoyed the festival and went to sleep at midnight although we had to depart early the next day for Mexico.

2017 is the second year for the Canadian Team to train in Oaxaca, Mexico. In fact, most of the Canadian team members have never been to Mexico. The training camp in Mexico was extremely interesting; lectures from both teams gave talks on Algebra, functional equations, polynomials, complex numbers, graph theories, Euclidian Geometry, Projective Geometry, inductions, elementary number theory, and algebraic number theory. These lectures definitely helped the team to warm up before the final Olympiad and improve their mathematical skills in relevant areas. I personally favoured the Classical Geometry Figure talk by Matthew Brennan the most, as the talk covered over 25 classical diagrams in Euclidian Geometry.

The six team members from Mexico all spoke English well and were very friendly in translating Spanish to English whenever we had trouble understanding Spanish. I was the only person on the Canadian team including the leaders who speaks Spanish, so the Mexican Team organized

both teams to play basketball and soccer in the park nearby to burn off the extra energy after lecture talks and mock exams. Eventually, we became friends with each other. We went to excursions on famous historical sites in Oaxaca Mexico and participated in the cultural programs, which included visiting a 500-year-old palace built with stone. We enjoyed the nature in Mexico, Our leader James left early on 12th July for Rio de Janeiro, so we had a karaoke on the night before and danced Gangnam style together to celebrate our last moments in Mexico!

After several days, Sarah Sun, Matthew Brennan and the six team members left for the IMO in Brazil. We had to transit to Houston again and took the only overnight flight to Rio from there. Since the flights were not frequent, we had a 12 hour layover in the Houston Airport. We played cards and discussed a set of Mathematical Olympiad questions, All the team members were excited despite the long but exhausting flight.

Rio de Janeiro is a fabulous city- with mild temperature, the friendly people, and an endless coast surrounding the region. We were lucky enough to live in Hotel Windsor Oceania, a four-star hotel just beside the beach. Unfortunately, several team members got sick after the long flight and food in Mexico, including me. I was pulled into the hospital after the first day of the IMO with a fever of 38 degrees, which noticeably influenced my performance in the IMO. The 2017 IMO is regarded as the hardest IMO ever, with a surprisingly hard second question on both days. The second question in IMO day one was a functional equation that required a tricky substitution with very little motivations; the second question on day two needed new forms of grouping. The 2017 IMO now holds the record for the lowest high score: only 35 out of 42. Interestingly, only six contestants received points on question three.

After the nine-hour Olympiad exam, the contestants visited the 2014 World Cup Stadium, Christ the Redeemer Cathedral, and the Sugar loaf Mountain, the most famous tourist attractions in Rio de Janeiro. Canada ranked 29th out of 112 countries with one gold medal, two silver medals, two bronze medals, and one honorable mention.

The 2017 IMO is officially over after the Closing Ceremony, yet the three weeks' experience remains precious in my memory- it helped me to strengthen my mathematical skills and develop as a person. I am very grateful to the Canadian Mathematical Society and Samuel Beatty Fund for making my dream of IMO come true. I sincerely hope the Canadian team continues to succeed in the coming years at the International Mathematical Olympiad.