Report on the 49th International Math Olympiad

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The International Mathematical Olympiad (IMO) is one of the oldest and most respected worldwide mathematical contests. Held annually in a different location each year, each country sends a team of six secondary students to write a nine-hour long contest over two days. Each day of the contest, the contestants are presented with three proof-style questions. These questions require no “advanced” math – all problems can be solved without any calculus – but they do require considerable ingenuity and cleverness. This year the IMO was held in Madrid, Spain, and was also the largest IMO to date, with 97 countries and over five hundred contestants.

Each country decides who they are going to send to the IMO. The Canadian team is traditionally chosen in mid-May based on the results of three other Olympiads similar to the IMO: the Asian-Pacific Mathematical Olympiad (APMO), the United States of America Mathematical Olympiad (USAMO), and our own Canadian Mathematical Olympiad (CMO). Our team was exceptionally talented, with four out of the six of us having previously attended IMO 2007 in Hanoi, Vietnam.

Before we headed to the IMO site in Spain, we spent two weeks at Wilfrid Laurier University in Waterloo, training for the competition. The training was organized by Laurier math professor Dr. Wang. There, several previous Canadian IMO medalists and university professors gave us plenty of lectures, problems and mock contests for practice.

Officially, eight hours per day at the training camp are spent doing math, with a mock Olympiad or lecture in the morning, another lecture in the afternoon, and a problem session in the evening. Realistically, however, most of our team spent a large portion of our free time working on problems too, with several members working through recreational time, excursions, and even meals!

Our accommodations at Laurier were excellent, with each of us having a single room to ourselves. Plus, since the cafeteria was closed most days, being the summer, for most meals we ate at restaurants and got to see Waterloo. Also, on several days we had excursions: these included going to a parade on Canada Day, watching fireworks, a movie night, and an outing to Stratford.

After the second week, we finally headed to the IMO site in Spain. Like several teams, we went a few days before the actual competition, to adjust to the different time and culture. There we met the Swedish team, and together we did some last-minute training.

More teams started to arrive as the days went on. The day before the contest, the IMO officially started with the Opening Ceremony. While the Opening Ceremony is usually held in an auditorium or the like, we were greeted with a pleasant surprise – the Spanish organizers decided to hold the Ceremony in the Circus Price Theater. So, after speeches by the regional and national authorities and a parade of the countries’ flags, we were treated to several amazing and unbelievable circus acts. After the Opening Ceremony, we had a nice lunch outside, where we went around and met the other teams. We spent the rest of the day relaxing, in anticipation of the contest the next day.

The next morning, we woke up early and ate (or tried to eat) a good breakfast, nervous about the upcoming contest. We forgot about our anxiety, though, when we received the problems and started

devoting all our energy towards solving them. Problem 1 was an interesting but fairly standard Euclidean geometry problem. We were well trained for such problems and all the Canadians got full marks on this question. Problem 2 was a two-part problem examining a certain inequality and its equality case. While the solution required nothing more than algebraic manipulation, it was very tricky to see. Nevertheless five out of the six of us solved at least the first part of this problem, with two of us getting full points on it. Problem 3, the hardest problem of the contest that day, was to prove a certain number theoretic result. The solution was deceptively short and simple, but unfortunately none of our team found it.

The same process repeated the next day. Problem 4 was a functional equation that we were all able to solve, although two members forgot small cases in their solutions. Problem 5 was an interesting combinatorics problem. Here the value of our training became most evident to me – using a trick I learned during a lecture on generating functions, I was able to solve the problem in just a few minutes. Two other members found bijective solutions. Finally, Problem 6 was the last problem of the day and the hardest problem of the entire contest, a very hard Euclidean geometry result. Only twelve out of all of the competitors managed to get full points on it. None of the Canadian team were able to make significant progress on it. (For those interested, the contest in 52 different languages is available at http://www.imo-2008.es/contest.html , the official IMO 2008 website.)

After the contest was over, we could finally relax. Over the next few days, while our Team Leader and Deputy Leader would be discussing and arguing for our solutions with the problem coordinators, the organizers showed us the sights of Spain. Among other places, we visited the Castilian city of Segovia, the Royal Monastery of El Escorial, El Retiro park, the Prada Museum, and the city of Toledo. There were also lots of fun events organized, including a rock concert, a soccer tournament, several banquets, and a “gymkhana” (which was a many-event tournament in El Retiro park). We also spent much time with the other teams, whether we were just talking or playing games.

Eventually all the scores were decided on and we got to see our medal standings. In the IMO, half the contestants get medals, and the numbers of gold, silver, and bronze medals are roughly in the proportion 1:2:3. Our team received four bronze and two silver medals, making it the third time in history everyone on Team Canada received a medal. Moreover, we placed twenty-second in the unofficial country rankings. We were all very happy with our performance. We received our medals at the Closing Ceremony that evening (which the Prince and Princess of Spain attended) and were treated to a farewell banquet afterwards. We flew back to Canada the next day.

Despite being a lot of work, being a member of the Canadian IMO team has been one of the most enjoyable experiences of my high-school career. This would not be possible without the support of the Canadian Mathematical Society and sponsors like the Samuel Beatty Fund. Also, thanks go to the leaders, coaches, and teachers who helped us succeed to the extent which we did.