2020 IMO Report

Competitions

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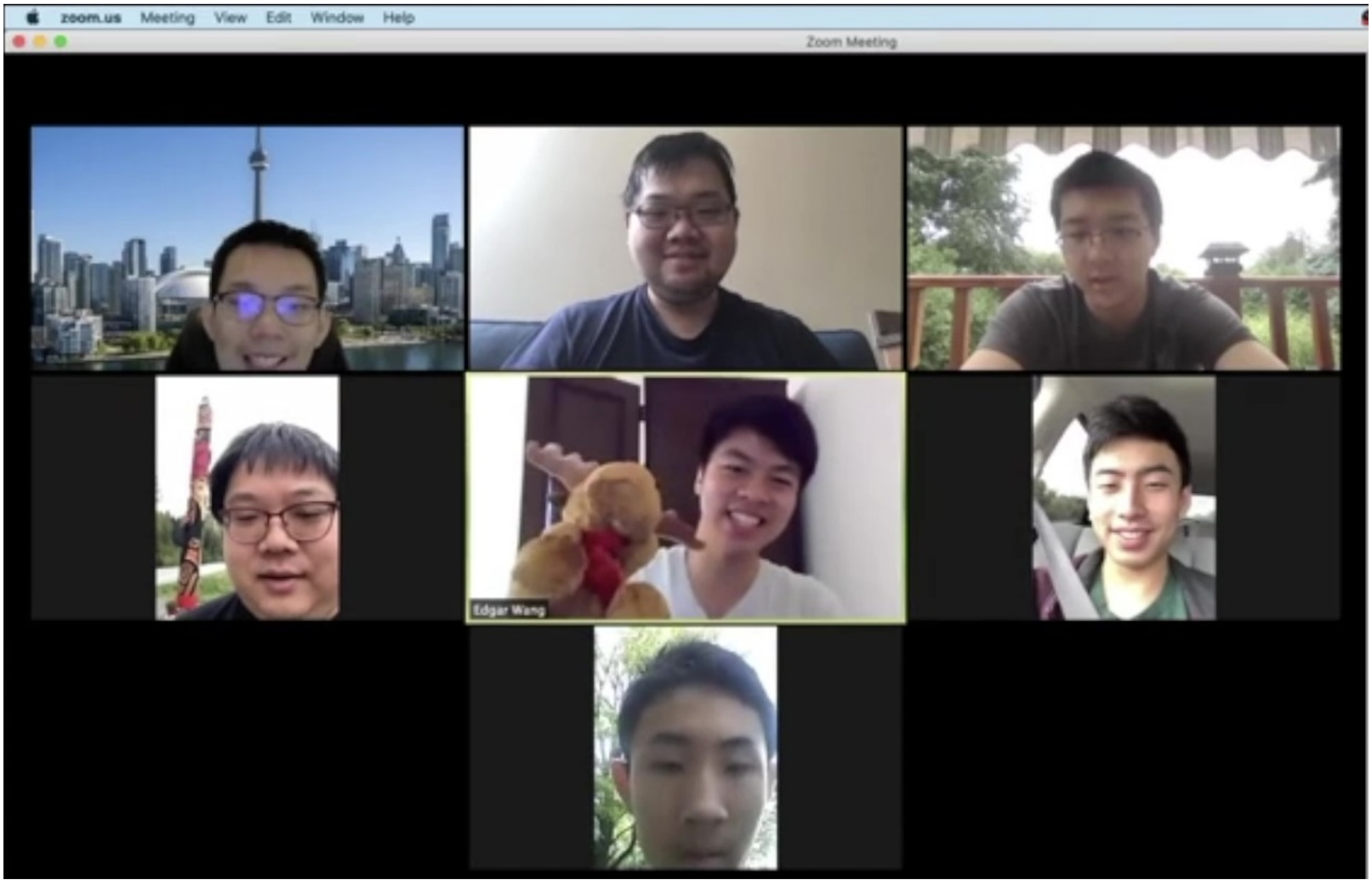

Annually, Canada participates in the International Mathematical Olympiad (IMO), the premier math competition for young mathematicians in high school. The competition spans two consecutive days, and the students are tasked with solving three questions on each day. This year, the IMO is hosted by Russia, and was originally scheduled to be held in Saint Petersburg in July. However, due to the coronavirus outbreak worldwide, the IMO was rescheduled to be a remote competition, and it was held September 19 to 28, 2020, with the contest itself being held on September 21 and 22.

In advance of the competition, we had selected our team of students through our national mathematical olympiad (CMO), the Asia-Pacific Math Olympiad (APMO), and a final team selection test held for the top students after the first two competitions. This year, the team consists of Thomas Guo, Michael Li, Eric Shen, David Tang (of the Greater Toronto Area), Edgar Wang (of Montreal), and Zixiang (Peter) Zhou (of London), and in addition to myself, Byung Chun is the deputy leader for the team.

After having selected the team in June, we had a couple months of online preparation, where the students attended problem-solving sessions and did practice tests hosted by Victor Rong (a contestant for Team Canada at IMO 2017-2019) and myself. We covered many topics that are likely to appear on the exam, including ample preparation in each of the IMO problem categories, algebra, combinatorics, geometry, and number theory.

Typically, the leaders from each country first select the test democratically, but due to the exam being remote, the host country has selected the test before the IMO. Then, leaders form committees to translate the test to the languages in which their students are taking the test. Fortunately for me, everyone on the team opted to take the test in English, which is one of the languages already provided by the host country. The students then gather at national testing sites to take the tests; Edgar took the test in Boston, one of the testing sites in the United States, while our other team members took the test in Toronto. Ed Barbeau and Dani Spivak hosted our Toronto testing site, coordinating with the IMO organizers and invigilators to maintain a fair and monitored testing situation for the students.

After the test, the students would typically go on excursions and attend mathematical talks by top mathematicians, organized by the host country. This year, the IMO organizers invited Timothy Gowers, Lisa Sauermann, Jozsef Pelikan, Stanislav Smirnov, Grant Sanderson, and Nikolay Andreev to speak to the students remotely; the students would submit questions ahead of time for the speakers to answer in addition to the mathematical talk. In place of excursions, the IMO organizers hosted video tours of varous landmarks in Saint Petersburg, and also hosted a chess tournament among other fun events.

While the students were participating in the events post-competition, the leaders and IMO coordinators grade the students' papers. Unlike a typical exam, each paper is graded both by the contestants' leaders as well as the host country's coordinators, and if the proposed scores disagree, a discussion ensues where the leaders make their case to the coordinators, who then revisit the paper to decide on the final score. This year, such discussions were hosted online on the IMO website, with the option to move to video software if preliminary discussions were inconclusive. This year, coordination for the Canadian team went extremely smoothly, in part due to the precision of the rubric in covering various approaches to the problems on the tests.

The Canadian team placed 12th, achieving three gold medals (Thomas, Michael, Eric), one silver medal (Zixiang), and two bronze medals (David, Edgar). The top team this year was China, and the top score was achieved by Jinmin Li of China.

Here is Problem 3, the hardest problem of the first day of the test: There are $4n$ pebbles of weights 1, 2, 3, …, $4n$. Each pebble is coloured in one of n colours and there are four pebbles of each colour. Show that we can arrange the pebbles into two piles so that the total weights of both piles are the same, and each pile caontains two pebbles of each colour.