

Observations on EGMO 2018

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Introduction

The seventh European Girls' Mathematical Olympiad (EGMO) was held in Florence, Italy, between 9 and 15 April 2018.

I participated in this event in my usual role of IT, travelling with the UK team but not as part of the UK delegation. The UK team consisted of Emily Beatty, Melissa Quail, Alevtina Studenikina and Naomi Wei, with the leader being Jo Caisová and the deputy leader being Jenny Owladi. More about the EGMO 2018 experience from the perspectives of participating teams and leaders may be found in other reports, when available. These observations should be read as a supplement to those reports, in the spirit of Geoff Smith's Observations on IMO 2011 and IMO 2012.

Diary

6 April The EGMO team and reserve are in Cambridge at the annual UK training and IMO selection camp. The team fleeces are distributed, in time for photos to be taken for an article to appear in *TES*. The fleeces have the correct logo, the correct sizes, and good contrast between the white text and the blue fleece.

9 April While most of the students at the Cambridge camp are sitting the second Team Selection Test this morning, the EGMO team sat it yesterday. As in 2013, most of the UK EGMO delegation, including Geoff Smith (EGMO Advisory Board and Coordinator), is travelling direct from Cambridge to EGMO, and we leave on a minibus to Stansted while the other students are still in their exam. Unlike in 2013, Geoff does not have news of any olympiad-related romantic comedies being made. Jenny meets the rest of us at Stansted.

We fly to Pisa, to catch a train to Florence. First we need to get from the airport to the city centre. Just as we are boarding the PisaMover to get there, Geoff finds he has left his suitcase behind and needs to go back to locate it before it is disposed of as unattended luggage.

Our train to Florence is not for some time, so we go to have dinner at a pizza restaurant. While there, Geoff and I confirm the IMO squad selection for Tonbridge camp with Dominic back in Cambridge, and duly congratulate Emily on being chosen.

Arriving in Florence, we are met by EGMO guides, led to our bus and taken to the Grand Hotel Mediterraneo, where we check in and receive EGMO bags and name badges. Tasty biscotti in the bags are a nice touch. The Jury meeting is at 8:30 the next morning and some people are keen to sleep.

10 April The day starts with a Jury meeting to approve the problems, followed by work on the English versions. The US leader says her students can handle a paper referring to a queue, so no separate “English (US)” version will be needed where contestants form a line instead.

We go to an entertaining opening ceremony at the Teatro Verdi. The teams come on stage in a mysterious order. The organisers reveal that this is not the order of how late travel details were registered, or that of how many emails each country sent them, but that of the average age of team members. The leaders and those accompanying them get a parade on stage as well.

EGMO is now a huge event and a few administrative oddities are inevitable. Certain flags on name badges have colours in shades that make them look like the flags of other countries, while the assignment of flags to the badges of international EGMO staff is not entirely consistent. One female leader was surprised to find her room originally assigned to be shared with a male leader, and corrections needed to be made.

After lunch, work on the English papers continues. Some leaders are concerned about the humour in problem 3, and whether future readers will understand that there is not actually a corrupt Jury extracting money from contestants, but it makes the problem much more memorable than a suggested alternative of rearranging numbers on a blackboard, and so that version of the problem is approved with only minor changes. Work on translations continues late into the evening, with an interlude for candidates for election to the EGMO Advisory Board to introduce themselves. The papers are printed and the Jury room turned into an exam room.

11 April The restaurant used by leaders for breakfast turns into the Jury room to handle queries from students about the meanings of the problems. 53 queries are processed in an hour and a half. There is confusion about the use of “unique” in problem 1 (meaning that only cases where two lines are not the same or parallel are to be considered), and about the overall nature of that problem, which is about a locus. The set notation in problem 2 confuses some people, as does counting the factors in a product whose factors may

not all be different, and the quite complicated formulation of problem 3. Standard answers are agreed to some common queries. The first day's mark schemes are discussed and approved.

At this point, there are no official excursions listed on the timetable for non-contestants, but EGMO guides are taking teams round Florence, and some other people are going out on their own or with teams. I join Jo, Jenny and the UK team on a walk. Jo's guidebook has had an accident with a water bottle and only opens at certain pages. We go up the hill to the Piazzale Michelangelo, then visit some churches and a cemetery. Then we come to a gold- and silver-smith's with an alchemical bent. The guidebook explains that this is a good place to buy rings of invisibility, and we realise that the UKMT risk assessment for EGMO failed to consider risks of contestants becoming invisible. After visiting a gelateria we return to the hotel in increasingly heavy rain. Jo and Jenny will start work on the day's UK scripts, while I print the papers for the next day.

12 April Many questions about problem 4 ask whether the dominoes are required to cover the whole board. There is also confusion about what a "configuration" is in that problem, and some questions seek confirmation that a domino entirely in a row or column contributes 1 to that row or column's value rather than 2. For problem 5, many queries ask whether the order of P and Q is significant.

During the mark scheme discussion, the French-speaking leaders discover that problem 6 in French was asking about *integers* t with $0 < t < \frac{1}{2}$, requiring a correction to refer to real numbers to be sent to affected contestants, none of whom had raised a query about this issue.

Emily comes out of the exam reporting having solved all three problems. As she solved all three problems on the first day as well, things are looking very good for her.

In the afternoon, I join Jo, Jenny and the UK team again, this time for a visit to the Uffizi. Some of the tickets purchased are discounted or free, requiring proof of age and nationality. On the way to the gallery, we find that Alevtina does not have her passport with her, so Jo and Alevtina run back to the hotel to fetch it. At the gallery, no-one makes any identity checks after all.

13 April Today coordination takes place, and I am doing data entry for the scores, while the online scoreboard sustains around a hundred hits a minute.

Coordination of problems 5 and 6 progresses rapidly, while problems 1 and 4, and especially problem 3, become bogged down. The UK completes coordination, with spectacularly good results: third in the world as a team, and with Emily having the first perfect score of a UK contestant in an

international maths competition since Katy Maclean at IMO 1994. The team is duly congratulated at dinner.

The final Jury meeting is announced as happening at 21:00, then pushed back to 22:15. Eventually a postponement to the next morning is announced, but a majority of leaders wish to do as much as possible this evening. Business not depending on scores takes place first, including elections to the EGMO Advisory Board.

Seven coordinations are disputed and taken to the Jury, which goes through them one by one. Past 02:00, they are all resolved, but changes voted for by the Jury now require the coordinators to go through scripts on problem 4 to identify other scripts whose marks should be changed for consistency; this process continues past 05:00.

The Jury will meet again at 08:30 to approve the final scores and decide medal cut-offs. This disappoints people who had hoped to take part in the planned morning activities (including the opportunity to make a trip to Pisa, leaving before 08:30), but is unavoidable given the importance of consistency in scoring.

14 April The Jury meets and approves the final scores and medal cut-offs. People wanting the trip to Pisa catch a later train, while the Jury meeting finishes before the team competition starts, but the Anglo-Dutch team drops out of the team competition anyway as everyone is too tired.

In the afternoon we head to the closing ceremony at the Teatro Verdi. As well as the usual prizes, there are awards for the most paper used by a contestant, the most water drunk and the most toilet breaks taken. From there we head to the closing dinner at the Palazzo Borghese. We are all tired, and Geoff and I head back to the hotel early from there with the team (disappointing people who later seek selfies with Geoff at the dinner), leaving Jo and Jenny there for a while longer.

15 April After some confusion about which minibus outside the hotel is for us, we get a minibus to the station, a train to Pisa, and a flight to Stansted, which lands half an hour early. There are then long delays in immigration for non-EU citizens, and some people are being met by parents using short-stay parking, so people start to go their separate ways. I meet Jo again on the platform for the Cambridge train once she gets the affected team members safely into the country.

Thanks

The Italian organisers did a splendid job. Thanks to them and the EGMO AB for putting on such a friendly event in the beautiful city of Florence. Thanks to Jo, Jenny, Emily, Melissa, Alevtina and Naomi for being great

representatives of the UK and travel companions as we came to and explored Florence. Thanks to the EGMO 2018 organisers and the UK Mathematics Trust for sponsoring my involvement in EGMO and arranging travel and Man Group for sponsoring the UK EGMO team. Thanks to Geoff for his enormous ongoing contributions to EGMO; his term on the EGMO Advisory Board has now ended, but he remains heavily involved.