

# Romanian Master in Mathematics, 2008

Geoff Smith, UK Team Leader

Feb 7–11, 2008

This competition was held in Bucharest. It has been constructed with a view to being rather like the IMO, but with no relatively easy questions at all. Each team consists of three students, and they have 5 hours to address 4 problems.

Clearly this competition is in the process of finding its feet, and it is sure that the rules and procedures will be refined over the next couple of years. The regulations stated that it was a team competition, but as it turned out, individual medals had been minted and were awarded broadly along IMO lines. However, unlike the IMO, the winning team was officially announced and a prize of a camera was awarded to each member of that team which was, interestingly enough, the United Kingdom.

Twelve teams participated this year, all national sides except for Yakutsk, Romania B, a Bucharest team and two teams from the elite mathematics and computing school which hosted the event. These teams were called Tudor Vianu A and B. The national sides participating were Bulgaria, Moldova, Poland, Romania A, Russia, Serbia and the United Kingdom.

The jury had Friday to inspect and approve an excellent paper which had already been constructed by the Romanian organizers. They also had spare questions in case any suggestions had to be rejected. However, the paper was so attractive that we did not have to resort to looking at the spares.

On Saturday the paper was sat throughout the morning. The papers were marked by the leaders that evening, and co-ordinated on Sunday morning. On Sunday evening medals were presented at the closing ceremony.

The four gold medallists were:

|                 |        |                      |   |
|-----------------|--------|----------------------|---|
| Jakub Konieczny | Poland | $7 + 7 + 7 + 7 = 28$ | G |
| Marija Jelic    | Serbia | $7 + 7 + 7 + 4 = 25$ | G |
| Jonathan Lee    | UK     | $6 + 7 + 4 + 7 = 24$ | G |
| Gleb Nenashev   | Russia | $7 + 2 + 7 + 7 = 23$ | G |

Prior to the competition, it was explicitly stated to be a contest between teams. The leading team scores were as follows.

|                  |     |     |    |   |    |
|------------------|-----|-----|----|---|----|
| 1 United Kingdom | 24+ | 15+ | 12 | = | 51 |
| 2 Russia         | 23+ | 18+ | 8  | = | 49 |
| Serbia           | 25+ | 21+ | 3  | = | 49 |
| 4 Poland         | 28+ | 7+  | 2  | = | 37 |
| Romania A        | 20+ | 16+ | 1  | = | 37 |
| 6 Bulgaria       | 15+ | 14+ | 6  | = | 35 |
| 7 Romania B      | 19+ | 3+  | 1  | = | 23 |
| 8 Moldova        | 13+ | 6+  | 1  | = | 20 |

The individual scores of the UK side were as follows

|              |                      |   |
|--------------|----------------------|---|
| Tim Hennock  | $7 + 7 + 0 + 1 = 15$ | S |
| Jonathan Lee | $6 + 7 + 4 + 7 = 24$ | G |
| Dominic Yeo  | $7 + 5 + 0 + 0 = 12$ | B |

This was a friendly, relaxed and congenial competition. I hope very much that the UK will continue to participate in this event.

## Leader's diary

**Wednesday Feb 6th** The team gather in Bath. They visit my house where my children provide the entertainment by sitting on my head, making fun of my bald patch and so on. I run a tight ship.

**Thursday Feb 7th** Dominic, Jonathan and Tim spend the night in University of Bath accommodation, and early in the morning we all pile into a large taxi for a cross country ride to Bristol Airport. On the way we pass a fox strolling across a field. At the airport we meet Jacqui, our Observer with students. We clamber onto a small plane with propellers, and possibly elastic bands, and hop across to Paris Charles de Gaulle. We change terminals via

an extraordinary bus route which seems to follow some sort of space filling curve. The second flight to Bucharest is in a larger plane. We are met at the airport by local organizers, and there are language issues. We learn that Jacqui is slated to stay at the leaders' hotel. Since this completely defeats the object of her being with us, we explain (in French) that we would like this arrangement changed. After a mobile phone call, suddenly the switch is made.

We are driven into town. En route we pass through Revolution Square where the crowd famously turned on Ceaușescu and then past the bloated People's Palace, now the Palace of Parliament, which the tyrant had constructed. It is the size of the Great Pyramid of Giza. The statistics given in Wikipedia are astonishing. Look it up. I say farewell to Jacqui and the students and drop my bag at the leaders' hotel.

Then I am whisked to a smoke filled restaurant which is set in the 1930s. We are entertained by a sequence of excellent singers and musicians. The saxophonist is particularly proficient, and the rendition of Kurt Weill's *Die Moritat von Mackie Messer* is remarkable.

Endless delicious courses of food arrive at intervals, and I am scanning the provisional exam paper and the associated reserve questions. To my surprise, the USA have not sent a delegation, which means that I am the only native English speaker present. This is an interesting situation, and I reflect on what it is like for people who speak isolated languages who go to the IMO. Conversation goes on in a mixture of Romanian, Russian and English.

**Friday Feb 8th** The jury meets to discover that the paper is a *fait accompli*. The Romanian organizers express a reluctance to vary the paper on any ground other than a question being known. The Russians make a half-hearted attempt to kick down the sand castle, but receive no support. It is an beautiful paper. So much for democracy.

The issue of the English language committee arises. I am informed that I am the English language committee and that my decisions are final. This is superficially a satisfactory state of affairs, but since no attempt is made to make translations conform to one another, the English version has no special status.

In the afternoon we are taken to a wood panelled dining room of the Romanian Academy of Sciences, and a magnificent lunch is served all afternoon. The meal finishes just in time for the opening ceremony. This is well judged and low key. We are allowed to mix with the students, unlike at the IMO.

They seem to get on with Jacqui very well.

Bidding farewell to the students, I return to my hotel still in *Mr Blobby* mode after the giant lunch. It is time for dinner to start. Mr Blobby is not too bad, but my thoughts turn to *Mr Creosote* in the Monty Python film *The Meaning of Life* – “And finally, monsieur, a wafer-thin mint” – and I decide to go to bed early. The telephone rings, and I am reminded that I am missing dinner. That is the whole idea.

**Saturday Feb 9th** We gather at the Tudor Vianu school for the exam. Students are allowed to ask written questions of clarification for the first 30 minutes. No UK student troubles to do so. A tour of Bucharest is scheduled, but none of the other leaders seems to care, and the organizers certainly don't. I wonder what went on at dinner?

I meet the students when they leave the exam. Dominic and Tim nervously claim 1 and 2, and Jonathan claims all four questions, with 3 and 4 solved in the final 15 minutes of the 5 hour exam. I repair to my room to inspect the scripts. As far as I can see, all is well. At dinner the conversation turns to who has done well. The Polish leader thinks he has a student who has solved all four questions. So do I. He is right and I am wrong. I go back to my room for more analysis, and find the flaw in Jonathan's Problem 3. He has assumed that a certain pair of numbers are coprime but they need not be. The overall structure of his proof is correct, but he has side-stepped a technical difficulty. He will be punished for this.

**Sunday Feb 10th** Co-ordination goes on all morning. It is more relaxed and more civilized than at some IMOs. I have a busy time because the UK (personified by Dr Christopher Bradley) is the author of Problem 1, submitted to the organizers in advance. This means that I have to co-ordinate all five Romanian teams. I am assisted, or is it led, by Radu Gologan. Radu is hard but fair, and shows no favouritism towards the Romanian students.

The co-ordination of the UK is reasonably quick. They have all solved Problem 1. Tim and Dominic have perfect solutions so I ask for 7s and get them. Jonathan's script contains a minor technical oversight, so I only ask for 6. This is agreed. Problem 4 is easy because Jonathan's solution is magnificent, and beautifully written up. Tim has managed to earn 1 mark by looking intelligently at small cases, and Dominic has a 0. In Problem 3, only Jonathan has made progress. As I mentioned, he has a hole in his argument. The co-ordinator has a number in mind but won't tell me. He insists that I tell him what I think it is worth. I say either 2 or 3. He smiles and says that it had been discussed at length and offers 4. Who am I to argue further?

Finally we get to Problem 2, and the poor guys co-ordinating this are earning their non-existent salaries. It has many different correct but highly technical solutions, and it also has lots of apparent solutions which are, alas, flawed. Tim's solution is perfectly straightforward, because it is very much like the one supplied by the organizers. Dominic has found functions which definitely work, but his proof of correctness contains elements of mysticism. I have been awake half the night with this script. It is awarded 5. I breathe more easily. Then comes the big shock. The co-ordinators think they have found a flaw in Jonathan's solution. I call a time out because I was not expecting this at all. I reread his solution, and indeed it is perfect, and we lock horns again. This time I am able to convince the co-ordinators that the proof is correct by pointing out relevant details of Jonathan's explanations. He gets his 7.

All in all we have scored 51. I know that this is a good score, but I don't show any excitement to the students. During lunch the results come in. A Polish boy has won the individual competition with a perfect score, and the United Kingdom has won the team competition, two marks ahead of Russia and Serbia tied in second place. I call for vodka, since I am sitting opposite the Polish leader and we must celebrate. The waiter refuses. I am bemused by this, until I think of the magic words "I am prepared to pay". The vodka appears and we have a toast.

I send an e-mail back to the UK to alert BMOS and UKMT to the good news, and then walk over to the students' hotel. They have not heard the news. When they hear that they have won, there is a protracted disbelieving silence.

That evening we have a medal ceremony, and our students are given cameras as a prize for their team performance. Jonathan is one of only four students to get a gold medal. Tim gets a silver and Dominic a bronze. There is a farewell dinner, followed by a brief meeting with the team, Jacqui and our guides, and then we try to get some sleep.

**Monday Feb 11th** My alarm is on for 3am Romanian time (that is 1am British time). We arrive at the airport at 4am, the plane takes off at 6am, and after changing planes in Schiphol we arrive home by 10am.

The fox has gone, but we see a family of four buzzards strolling in a field. Dominic spots one and identifies it as a pheasant. He should stick to mathematics and stay in London where he belongs.

Thanks to everyone, especially to Jacqui for staying with the students and looking after their interests so well.