



United Kingdom
Mathematics Trust

UK Mathematics Trust News

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First perfect score since 1994!

Agnijo Banerjee (pictured), a student at Grove Academy, Dundee, achieved a perfect score of 42 out of 42 at this year's International Mathematical Olympiad (IMO), which was held in Cluj-Napoca, Romania, in July.

He was one of only two out of 597 contestants from over 100 countries to do so. This is the UK's first perfect score at the IMO in 24 years!

Agnijo's stunning performance earned him a gold medal. The UK team were also awarded four silver medals, and an honourable mention (for solving at least one problem perfectly).

This fabulous performance meant the UK finished in 12th place, out of 107 participating teams.

Our congratulations go to the team of six students:

Agnijo Banerjee *Grove Academy* — Gold Medal;

Sam Bealing *Bridgewater High School* — Honourable Mention;

Tom Hillman *St Albans School* — Silver Medal;

Benedict Randall Shaw *Westminster School* — Silver Medal;

Aron Thomas *Dame Alice Owen's School* — Silver Medal;

Harvey Yau *Ysgol Dyffryn Taf* — Silver Medal.

The team was accompanied by the Team Leader and President of the IMO Board, Dr Geoff Smith (University of Bath) and the Deputy Team Leader, Dr Dominic Yeo (Technion).

Dominic Yeo said "The questions on this IMO would be found hugely

demanding by any mathematician of any age and to have solved all of them perfectly under time pressure is a remarkable achievement from Agnijo. We know how enthusiastically he and his team mates have prepared over the past



year, sometimes individually but often collaboratively too, to arrive at a level where they can thrive at an event dominated by countries whose education systems focus much more towards this sort of competition. This performance is a richly-deserved reward for all their hard work on our training programme, and sets them up well for all their future progress in mathematics and beyond."

The UK will host the International Mathematical Olympiad in 2019. See www.imo2019.uk for more information.

The first step on the path to representing the UK at the IMO is the Senior Mathematical Challenge.

See www.ukmt.org.uk for information about how to enter this year's competition.

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Au revoir from Nicky Bray

Time flies when you're coordinating a national team maths competition. In fact, I'm now twelve years into a six-month maternity cover post (mother and daughter are both doing fine, I hasten to add) and have decided the time has come to bid UKMT a temporary farewell and to spend the next twelve months channelling more time and energy into other projects. So what better excuse to revisit some memories from the last decade-and-a-bit of the Team Maths Challenge (TMC), now approaching its seventeenth year and happily still not exhibiting any signs of teenage angst.

The TMC has developed significantly since UKMT celebrated its tenth anniversary in October 2006, the same month I joined the ranks. The previous year's competition had attracted entries from 1209 teams to participate at 43 Regional Finals; by 2016 the corresponding figures had grown to 1770 and 70. We are fully aware of the financial and administrative obstacles that make it far from easy for teachers to take students out of school to attend UKMT events, and we greatly appreciate the fact that many manage to do so, with the result that entry numbers remain high.

The team of volunteers who eagerly and expertly perform a range of TMC roles (including producing the materials, hosting and running the events, and making sure the competition meets its aims) has expanded correspondingly. The 2006 competition involved 39 TMC volunteers, including Steve Mulligan in his first year as TMC Chair. The current team, with Steve still at the helm, is 75-strong and includes many of the same personnel. Calculating how much time they have so generously contributed to the TMC between them would present a formidable mathematical challenge!

Following the expansion of the TMC to Scotland in 2008, the need to involve Scottish specialists in the creation of the materials became clear, and the current team includes Curriculum Consultants who check compatibility with the curricula in Scotland, Northern Ireland and Wales.

One significant change to the competition format was the replacement of the original Head-to-Head round, which involved students taking turns with those from an opposing team to guess the next number in a sequence after identifying the pattern and, unlike the other rounds, placed individual students in the spotlight. It became increasingly tricky for question setters to find imaginative new sequences without making them inappropriately difficult, so the round was replaced by the Shuttle (initially known as the Mini Relay) in 2008. At the events, witnessing the buzz of the students eagerly devouring the questions is all the more fulfilling with the knowledge of how much love and labour has gone into their creation.

From a behind-the-scenes perspective, there have been various highlights and challenges involved in coordinating the competition. Emerging from the office to run a handful of Regional Finals each year is always a joy, providing a welcome opportunity to meet some of the inspirational teachers who are more usually at the end of an email: those who put in place all the arrangements to bring their team and then create such a warm and supportive atmosphere on the day, and also those who kindly offer their school as a TMC venue and invest considerable time and effort into organising and hosting their heat.

One of the biggest challenges faced in my role at UKMT also serves to demonstrate one of the greatest pleasures: working with our incredible volunteers. The unprecedented snowfall earlier this year coincided with the early

stages of the 2018 competition, with almost 40 heats scheduled during the period affected by the adverse weather. Managing the subsequent disruption involved a series of intense and exhausting 12-hour days in the office trying to ensure events went ahead where at all possible, while keeping all parties informed and making difficult daily decisions regarding cancellations, in close liaison with host venues (to whom huge thanks are also due for re-scheduling their cancelled events) and other regional contacts. I cannot speak highly enough of the volunteers who went the extra mile to reach venues... indeed several miles over snow and ice in some cases. One particular individual spent a week away from home travelling across the south coast, single-handedly running one event (usually a job for at least two people) and leading another at short notice when a fellow volunteer was snowed in, and all with her usual cheer and enthusiasm.

It seems apt that a competition designed to develop students' teamwork skills should be driven by the collaborative powers of a wonderful team of volunteers, who have also inspired me in the voluntary pursuits to which I'll be devoting more time during this academic year: organising a programme of activities for students from other European countries who spend a year supporting language teaching in local schools, and running community music events. There have been rumours that I might even run one or two TMC 2019 Regional Finals in a voluntary capacity, in which case I look forward to seeing some of you again sooner rather than later!

Visit www.ukmt.org.uk for information about entering this year's TMC.

Entries are also being accepted for the Senior Team Maths Challenge.

Welcome to new UKMT staff

We are really pleased to welcome new staff to the UKMT office!

Anja Komatar has started with us in a brand new position as Volunteering Manager. Our activities and events couldn't happen without the immense amount of work from our dedicated volunteers, so it is fantastic that we now have a

member of staff to support the work of our volunteers and to expand the volunteer base so we can continue to increase our activities and reach. Anja was a member of the Slovenian IMO team, graduated from Cambridge with a degree in Mathematics, and is currently completing a PhD in logic at the University of Leeds.

If you email or phone us, **Liam Cook** is likely to be the person to answer your query. Liam has

recently graduated from the University of Brighton with a degree in philosophy. In his free time, he enjoys watching live comedy and producing electronic music.

Helen Forsyth will shortly be joining us as Events Administrator to ensure the smooth running of the team events in Nicky Bray's absence.

Paul Erdős Award

It was with great pleasure that we heard that Dr David Monk had received a Paul Erdős Award from the World Federation of National Mathematics Competitions (WFNMC) in recognition of his outstanding contributions to mathematical competitions, notably the International Mathematical Olympiad (IMO), over a period of almost 50 years. The citation for David can be found at wfnmc.org

David received his award on 1 August at a ceremony in the International Centre for Mathematical Sciences in Edinburgh. Representatives from WFNMC, IMO and UKMT were joined by some of David's former colleagues at the University of Edinburgh where he taught for many years. To open the proceedings, Professor Peter Taylor, Past President of WFNMC, read the citation before presenting David with a framed certificate and medal. Geoff Smith, the President of the IMO Board, described how David held the record for the number of

problems chosen for IMO papers. This number is either 13 or 14, depending on whether you count one problem which had input from R C Lyness. Since well over



Prof. Peter Talyor (left) and Dr David Monk (right)

100 problems are now submitted every year but only 6 are used, David's achievement is truly remarkable.

Then it was time for David to reminisce. He was Leader at four IMOs (and also in 1980 when there was an alternative competition) and Deputy Leader at five. He particularly remembered his first IMO as Deputy Leader in 1968. The star-studded team that year included a future Chief Mathematician at GCHQ, the current Provost of

King's College, Cambridge and one of the authors of the ATLAS of Finite Groups.

Finally Adam McBride spoke of his long association with David dating back to October 1964. He had brought along a range of artefacts in David's fair hand, including a complete set of first year tutorial sheets, material from correspondence courses in the late 70s, and some of the Background Problems used at Trinity Training Sessions over the years. Adam concluded by selecting his favourites from David's IMO

problems which illustrated three of his favourite areas of composition, namely functional equations, number theory and, perhaps above all, geometry.

To enjoy David's creative geometry problems, you should obtain a copy of **New Problems in Euclidean Geometry** available from shop.ukmt.org.uk

Publications snippets

Senior Problems by Andrew Jobbings has recently been published.

This book contains problems used in the Senior Mathematical Challenge over the past 20 years, grouped together by difficulty and by topic.

Our full range of books can be purchased via Amazon or on our website at shop.ukmt.org.uk

National Mathematics Summer Schools 2018

Sunday 15 July saw 48 students, eight senior students and a large group of volunteers descend on Woodhouse Grove School near Leeds for the first of four consecutive weeks of National Mathematics Summer Schools.

Directors Dominic Rowland, Dot Winn, Robin Bhattacharyya and Sue Cubbon, and their staffing teams, introduced students to new and exciting maths, espoused the joys of problem solving and conducted numerous evening activities to keep everyone involved and engaged from dawn to dusk.

Students took in a range of mathematical topics, from courses on geometry and number theory, to shorter sessions on *Squaring the Square*, *The Pigeonhole Principle* and *Birthday Magic*, *Josephus* and *Nim* while seniors had their own afternoon sessions on topics ranging from *Cyclotomic Polynomials* to *Boolean*



Algebra. The evening activities included braiding bracelets (and learning some of the underlying mathematics) and the traditional ten-pin bowling trip.

Feedback was excellent, with students enjoying the food, the company and, most importantly, the mathematics. Everyone went home exhausted, but having made new friends, learned new things and been just that little bit more inspired than they felt when they arrived: a great success.

"This was the highlight of my summer holidays."

"There was a great sense of community and a very positive atmosphere."

"All the staff were brilliant and there were so many new and interesting ideas to be explored with an amazing group of people."

Huge thanks go to everyone who made the events so memorable.

If you'd like the opportunity to be invited to a National Mathematics Summer School, the first step is to enter the Intermediate Mathematical Challenge. Certain top-scoring students are selected by lot and invited to attend one of our summer schools.

Full details can be found at www.ukmt.org.uk

Issue 57 Prize Sudoku winner

Congratulations to R. Poulton from Cwmbran High School.

Diary dates for 2018-19

Mathematical Challenges

Senior

Tuesday 6 November

Intermediate

Thursday 7 February

Junior

Tuesday 30 April

Follow-on Rounds

Senior Kangaroo

Friday 30 November

Intermediate Kangaroo

Thursday 21 March

Junior Kangaroo

Tuesday 11 June

British Mathematical Olympiad Round 1

Friday 30 November

Intermediate Mathematical Olympiad

Thursday 21 March

Junior Mathematical Olympiad

Tuesday 11 June

British Mathematical Olympiad Round 2

Thursday 24 January

Other events

Senior Team Maths Challenge

Team Maths Challenge

Mathematical Olympiad for Girls

Regional Events

November-December

Regional Events

February-April

Tuesday 2 October