



United Kingdom
Mathematics Trust

UK Mathematics Trust News

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Mathematical Challenges

It's always great to hear about the success of the Challenges within schools and colleges; how students enjoy tackling the questions and problem-solving, having their achievements recognised widely with certificates and invitations to follow-on activities, and using the extension material provided post-Challenges to provide further mathematical stimulation.

We were particularly pleased to hear how one school was using our Mathematical Challenges and our other resources to develop closer links with a local school, as well as stimulating interest within their own school.

Pauline Spence, of Barnwood Park Arts College, Gloucester, said: "Our school made a great visit to New College, Worcester, which is a school for the visually impaired. The two schools had great fun joining together to tackle mathematical problems. They first showed our students how to use the braille typewriters and how to do simple calculations in braille, which they thoroughly enjoyed. The climax of our time in the school was a UKMT maths session, working through a recent Junior Challenge paper, their students using the large copy and braille versions that you provided, and ours using the standard paper copies. Well done to UKMT in making it accessible to everyone."

Pauline goes on to say "We also want you to know just how much we are getting out of the UKMT materials, they are excellent in preparing students for the new style GCSE maths paper, in addition to having so much fun. What started as a maths club for just four students three years ago is now a thriving club of 25 students from Years 7 to 11 who meet each week to solve problems, work together in teams, and eat biscuits!"



Whilst we can't provide the biscuits, the Challenges provide a great starting point for mathematical discussion in class (or indeed the staff room). Please do share with us your own Mathematical Challenges successes and how you use the material in class to aid discussion, or if there is anything further you feel we could do to support your teaching within the classroom.

Download past questions and an entry form from
www.ukmt.org.uk

Junior Mathematical Challenge 2017, Question 15

What is the remainder when the square of 49 is divided by the square root of 49?

A 0 **B** 2 **C** 3 **D** 4 **E** 7

Adding up the benefits of the Team Maths Challenge

As we approach the sixteenth year of the Team Maths Challenge (TMC), we remain hugely grateful for the continuing support and enthusiasm of those colleagues in schools who are involved in taking their students to our events. We also recognise that for many teachers, already juggling a myriad of other roles and responsibilities, the time and organisation needed can often represent as much of an obstacle as the cost of teacher cover or transport.

The buzz which pervades the room at a typical Regional Final and the positive feedback received suggest that, on the day, the benefits become clear. But how to convey these to someone who has never participated and is wondering if the event is really worth contemplating yet more admin and paperwork?

We spoke to some volunteers who have experienced these competitions both as teachers attending with their team and event coordinators, running Regional Finals.

"Seeing the pleasure the students get from participating is one of the special parts of teaching," says Lin McIntosh, who has involved her students in the TMC for many years. "They learn so much from working together at a real live event as opposed to just against their classmates at school. It's these experiences they remember for their whole lives. My Year 13 (Eng) students often refer back to their days in Year 8 and 9 at TMC events and how it helped fuel their love of mathematics and their confidence in their abilities."

Participating at a Regional Final enables students to spend a

whole day working on engaging mathematical activities outside the classroom environment, in a room of young mathematicians doing exactly the same. Emphasis is placed on teamwork and communication skills, with most teams comprising students from two different year groups who might never have worked together before. There is also a 'no calculators' policy which leaves students entirely dependent on their grey matter.

"TMC gives an opportunity for bright maths students to be encouraged that others also find maths fun," says Matthew Miller. "There are a number of different rounds which use various elements of maths knowledge in a different way from how they are usually used in the classroom and which give the opportunity to work with others to share

mathematics in a fresh and lively manner which is often praised on schools' feedback forms.

Penny Thompson has been involved in running TMC Regional Finals since the early days of the competition, including one at her own school. Along with the numerous opportunities for networking, she observes how the events can inspire and encourage teachers as much as their students: "You have the opportunity to see your pupils in a different light, to be exposed to a range of materials and ideas which you can use later within your own schools, and to share the pride in your school competing in a unique national competition. All the thanks and comments at the end of the day, from pupils and teachers alike, reflect their enjoyment."

Andrina Inglis, who runs the events in Scotland and is also responsible for ensuring the materials are compatible with the Scottish maths curriculum, offers this summary of the benefits: "I'd say that seeing your team doing maths, laughing and clearly enjoying themselves, whilst interacting with pupils from other schools who are just like them, no matter what their



strategies and ideas." Although it is a competition, with a place at the National Final up for grabs, each student receives a participation certificate and gift, and there is also a careful effort to design materials suitably diverse for a range of ability levels. "The main aim is to enjoy different areas of maths and get the pleasure of solving challenging maths questions," adds Matthew, who has previously written questions for the Relay, in which students dash across the hall to collect questions and then deliver their answers for marking, presenting

score is, is what makes taking a team worthwhile."

She also spares a thought for those who await the team members on their return home from the events: "And parents would say how great it is to have them come home happily exhausted from a day of maths!"

Entries are now being taken for both the Team and Senior Team Maths Challenges Regional Finals.

Enter the Team and Senior Team Maths Challenges at www.ukmt.org.uk/team-challenges/

British Congress of Mathematics Education

The four-yearly British Congress of Mathematics Education (BCME) takes place in Warwick from 3 – 6 April 2018. BCME is the largest mathematics conference in the

UK. It brings together teachers, researchers, teacher educators, CPD providers, policy makers, examiners and professional and academic mathematicians.

To help support those who wish to attend, the UKMT is offering some bursaries.

See www.goo.gl/eGmHBY to apply.

Successful applicants will be contacted before the end of January 2018.

More information about the event can be found at www.bcme.org.uk.

Top of Europe finish at IMO 2017

Three students representing the UK have won gold medals at the world's most prestigious mathematics competition, the International Mathematical Olympiad (IMO), which took place in July in Rio de Janeiro. This stunning performance meant the UK finished in ninth place, out of 111 participating countries, and top of all European nations for the first time ever.

The team's medal haul was 3 golds, 2 bronzes and one honourable mention (for solving at least one problem perfectly). This is the first time that the UK has won three gold medals at an IMO since the team sizes were reduced from 8 to 6 in 1983. Our congratulations go to the team!

The six students representing the UK were:

Joe Benton, Gold Medal (St Paul's School)

Rosie Cates, Bronze Medal (Hills Road VI Form College)

Jacob Coxon, Bronze Medal (Magdalen College School)

Neel Nanda, Gold Medal (Latymer School)

Alexander Song, Honourable Mention (Westminster School),

Harvey Yau, Gold Medal (Ysgol Dyffryn Taf)

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

The first girl to be included on the team since 2008, Rosie won a bronze medal with 18/42, placing her in the top half of contestants.

Joe was ranked 7th in the whole competition, which was regarded by many as the most difficult IMO ever.



Could your student successfully tackle IMO problems? The search for the team to represent the UK at the 2018 IMO in Romania begins with the Senior Mathematical Challenge, taking place on 7 November 2017.

Our thanks go to the sponsors, Oxford Asset Management.

Very few IMO students managed to solve question 3. Can you attempt this?

A hunter and an invisible rabbit play a game in the Euclidean plane. The rabbit's starting point, A_0 , and the hunter's starting point, B_0 , are the same. After $n-1$ rounds of the game, the rabbit is at point A_{n-1} and the hunter is at point B_{n-1} . In the n^{th} round of the game, three things occur in order.

- The rabbit moves invisibly to a point A_n such that the distance between A_{n-1} and A_n is exactly 1.
- A tracking device reports a point P_n to the hunter. The only guarantee provided by the tracking device to the hunter is that the distance between P_n and A_n is at most 1.
- The hunter moves visibly to a point B_n such that the distance between B_{n-1} and B_n is exactly 1.

Is it always possible, no matter how the rabbit moves, and no matter what points are reported by the tracking device, for the hunter to choose her moves so that after 10^9 rounds she can ensure that the distance between her and the rabbit is at most 100?

Mentoring Schemes

"Thank you for these excellent resources – we are always grateful to find challenging material to test our students."

"This is an absolutely brilliant service – and I know that teachers look forward to it as much as students."

"I think that the scheme is excellent. We have 4 Olympiad qualifiers this year, all of whom benefitted from the scheme directly. Many others benefitted from the problems in terms of their maths learning and developing problem solving skills. Some problems are also useful in demonstrating that the maths

world is much bigger than their current curriculum(!)"

Find out more about how students and teachers can get involved in the Mentoring schemes at www.ukmt.org.uk/mentoring/

Publications snippets

Did you know that our books are grouped into several series?

The **Challenges** series is aimed at students who are interested in tackling stimulating problems such as those in the UKMT Mathematical Challenges.

The **Handbooks** series is aimed at students in secondary school and colleges interested in

acquiring the knowledge and skills to tackle challenging problems.

The **Excursions in Mathematics** series focus on a particular topic of interest in detail. They are aimed at students who are prepared to pursue a subject in depth but do not require specialised knowledge.

The **Pathways** series aims to provide classroom teaching material for use in secondary school. Each title develops a

subject in more depth and detail than is normally required by public examinations or national curricula.

The **Problems** series consists of collections of high quality and original problems of Olympiad standard.

Find out more about books in each series at www.shop.ukmt.org.uk/ukmt-books/

Issue 54 Prize Sudoku winner

Well done to Josh Edwards (Brookfield Community School) who wins a book and a megaminx!

Prize Sudoku

In Sudoku, every digit from 1 to 9 must appear in each of the nine rows, each of the nine columns, and each of the nine outlined boxes.

Enter our prize Sudoku!

Please send entries (photocopies accepted) by the closing date of Friday 1 December 2017 to:

Sudoku,
UK Mathematics Trust,
School of Mathematics,
University of Leeds,
Leeds LS2 9JT

Don't forget to include your name, school name, and full school address!

4				1				
			3	9		4		
	7			5				9
				6			2	1
		4		7		6		
1	9			5				
9			4				7	
	3		6	8				
				3				6

Entries are accepted from students, teachers and UKMT volunteers. A draw from the correct entries will take place after the closing date and the winner will receive a book with a mathematical theme and a UKMT Megaminx. The winning name and affiliation will be published in a future edition of UK Mathematics Trust News.

Diary dates for 2017-2018

Mathematical Challenges

Senior

Tuesday 7 November

Intermediate

Thursday 1 February

Junior

Thursday 26 April

Follow-on Rounds

Senior Kangaroo

Friday 1 December

Intermediate Kangaroo

Thursday 15 March

Junior Kangaroo

Tuesday 12 June

British Mathematical Olympiad Round 1

Friday 1 December

Intermediate Mathematical Olympiad

Thursday 15 March

Junior Mathematical Olympiad

Tuesday 12 June

British Mathematical Olympiad Round 2

Thursday 25 January

Other events

Senior Team Maths Challenge

National Final
Tuesday 6 February

Team Maths Challenge

National Final
Monday 18 June

Mathematical Olympiad for Girls

Thursday 5 October