



Maths Challenges News

Issue 46 September 2014

Senior and Intermediate Maths Challenge

In this issue

Diary dates for 2014/15

2

Summer School for Girls

Celebrating Women in Maths

Senior Team Maths Challenge

3

Team Maths Challenge Facts

Mentoring Schemes

4

Publications Snippets

Poster Competition Result

Prize Sudoku

Have you entered the Senior Maths Challenge? The closing date is 20 October and approaching fast. Why not enter today?

The early-bird deadline for the Intermediate Maths Challenge is also not too far away, so please make sure your entry is with us by 8 December.

Keep your eye out for the entry forms arriving through the post this term, or download an entry form for all our competitions from www.ukmt.org.uk.

As well as awarding gold, silver and bronze certificates to the top 60% of students (SMC) and 40% of students (IMC) nationwide, and certificates for Best in School and Best in Year, from this year we will be producing a downloadable Certificate of Participation for schools to present to all students. High scoring students are invited to participate in follow-on competitions which could lead to representing the UK in mathematics competitions at international level (see the article below), or invitations to UKMT Summer Schools.



Certificate winners from Bedford High School, Lancashire.

IMO 2014

Our congratulations go to three young students who represented the UK and won silver medals at the world's most prestigious mathematics competition, the International Mathematical Olympiad (IMO). Joe Benton (Year 10, St Paul's School, London), Harvey Yau (Year 9, Ysgol Dyffryn Taf, Camarthenshire) and Warren Li (Year 11, Fulford School, York) competed against other mathematically gifted students from over 100 countries worldwide. Huge congratulations too, to the remaining three Year 13 team members who completed the UK's full haul of medals: Gabriel Gendler (Queen Elizabeth's School, Barnet, silver medal); Frank Han (Dulwich College, bronze medal), and Freddie Illingworth (Magdalen College School, Oxford, bronze medal).

Our thanks go to those accompanying the team: the newly elected Chair of the IMO, Dr Geoff Smith (University of Bath), Deputy Team Leader Dominic Yeo (Worcester College, Oxford) and Jill Parker (ex-University of Bath), and to our IMO supporters, Oxford Asset Management.

The 55th IMO took place in July in Cape Town, South Africa. The UK finished 20th out of 101 participating countries. Further details can be found at <http://www.bmoc.maths.org/>.

IMO Day 2, Problem 4 (NB each UK team member obtained full marks with this question)
Points P and Q lie on side BC of acute-angled triangle ABC so that $\angle PAB = \angle BCA$ and $\angle CAQ = \angle ABC$. Points M and N lie on lines AP and AQ , respectively, such that P is the midpoint of AM , and Q is the midpoint of AN . Prove that lines BM and CN intersect on the circumcircle of triangle ABC .

UKMT Contact Details

UK Mathematics Trust - a registered charity in England & Wales.
UKMT, School of Mathematics, University of Leeds, LS2 9JT
Tel: 0113 343 2339 Fax: 0113 343 5500 Twitter: @UKMathsTrust
Email: enquiry@ukmt.org.uk Website: www.ukmt.org.uk

Diary Dates for 2014-15

Maths Challenges and Follow-on Rounds

<i>Challenge</i>	<i>Date</i>	<i>Follow-on Round</i>	<i>Date</i>
Senior	Thursday 6 November 2014	BMO1 and Senior Kangaroo BMO2	Friday 28 November 2014 Thursday 29 January 2015
Intermediate	Thursday 5 February 2015	IMOK (Olympiad and Kangaroo)	Thursday 19 March 2015
Junior	Thursday 30 April 2015	JMO and new Junior Kangaroo	Tuesday 9 June 2015

Summer School for Girls

There has been much press in recent times about the loss of women from mathematics, particularly at the higher levels, and how this represents disadvantages, huge waste of talent and missed opportunities for the advancement of mathematics. The UKMT fully support and encourage girls to continue in their mathematical studies, through initiatives such as the very recent Mathematical Olympiad for Girls (held on 23rd September) and the development in 2012 of the first ever European Mathematical Olympiad for Girls (EGMO), which is now a permanent fixture. The 2015 EGMO will be held in Belarus in April, and the UK team is selected on the basis of BMO1 and BMO2 results.



Summer School for Girls, 2014

The second Summer School for Girls was run in partnership with Clay Mathematics Institute, and was held at the University of Oxford in August. Forty girls aged 14 - 16 joined five senior students for an intensive week of mathematics including sessions on geometry, polynomials and group theory. The programme was full, reflecting the fact that the purpose of the summer school is to explore mathematics in the company of others who share an interest in maths. There was also time for relaxation, with events such as a concert and boat trip. The week was run by Dr Elizabeth Kimber (Cambridge Mathematics Education Project). Next year's Summer School for Girls will once again be held in Oxford in August 2015. Selection of students to attend the Summer School for Girls, and other UKMT summer schools, is on the basis of performance in the IMC and its follow-on rounds, so do ensure your students are entered!



It All Adds Up: Celebrating Women Across the Mathematical Sciences

Do you teach female school students who enjoy mathematics? Then this is the event for you!

The first day, Tuesday 14th April, is for mathematically inclined girls in Year 9 to 11 while the second day, Wednesday 15th April, is for girls in Year 12 or 13 studying A-level Further Mathematics or equivalent. Each day will feature inspiring talks by female mathematicians as well as workshops for the students to tackle some stimulating mathematics themselves, and the students will have opportunities to chat to undergraduates and others about mathematical possibilities beyond school level.

This event is part of the London Mathematical Society's 150th anniversary celebrations, and will be held at the Oxford Maths department's new Andrew Wiles Building (which itself features mathematics in its design). The two days for school students will be followed by a further two days for slightly older mathematicians (undergraduate and above), which will feature lectures, panel discussions, and opportunities to meet others.

More details will appear on <https://www.maths.ox.ac.uk/events> from early October.

Expanding the Senior Team Maths Challenge

Entries to the Senior Team Maths Challenge (STMC) are now being taken, and regional events will be taking place across the UK during November and December. An entry form is enclosed with this newsletter and further details including venues and dates can be found at <http://www.furthermaths.org.uk/stmchallenge>.

The STMC is run in partnership with the Further Mathematics Support Programme (FMSP), and we are pleased to be running additional regional events this year. The National Final has also moved to a larger venue, which means that along with the winning team from each regional event, we hope to have the capacity to invite a small number of runners up.

Correction: Our apologies go to Hampton School and Alton College for the incorrect information in the hard copy edition of the June 2014 Newsletter. We reported the STMC winning team as Alton College, when it was in fact Hampton School.

Team Maths Challenge Facts!

After a year which saw another record number of Team Maths Challenge (TMC) entries, we congratulate City of London School for lifting the 2014 trophy at the National Final, and the Poster Competition winners, Tonbridge Grammar School. Many thanks to all of you for taking part.

As we approach the thirteenth year of the competition, here are thirteen TMC facts you may or may not know:

- 1) The TMC was established following a pilot event "Enterprising Maths in the UK" organised as part of the outreach programme of the International Mathematical Olympiad held in Glasgow in 2002.
- 2) Australia and Scotland provided initial inspiration for the rounds, based on their own team competitions. The early rounds, the Group Round, Crossnumber and Relay still feature today, while the Head-to-Head was replaced by the Shuttle (previously called the Mini Relay) in 2008-2009.
- 3) The number of Regional Finals has grown from 26 (in 2002-2003) to 68 (in 2013-14) and the number of teams invited to the National Final has doubled from 40 to 80.
- 4) At the 2014 Regional Finals we gave out 6,372 student participation prizes, 7,965 student and teacher pens, and 92,394 sheets of mathematical questions...or 93,987 if you count the warm-up questions!
- 5) 2007-2008 saw the addition of a version of the competition for older students, with the pilot of the Senior Team Maths Challenge (STMC) organised in conjunction with the FMSP.
- 6) The TMC has seen an ongoing increase in the number of participating schools except for a dip in 2009-2010 after the introduction of the 'rarely cover' policy in state schools. We are hugely grateful for the continuing support and dedication of all schools and teachers who enable their teams to participate despite the costs and administrative work involved in taking students out of school for the day.
- 7) While the majority of heats are held in schools, there are a few exceptions. These include the Knott Memorial Hall in Northumberland, also used by local community organisations such as the WI, scrabble group and knitting circle, who have been known to pop in to ask "Who's in the lead?" during the lunch break!
- 8) The TMC costs significantly more to run than it recoups in entry fees and is subsidised by income from other UKMT activities in order to keep the cost of entry down.
- 9) The TMC is also made possible by the involvement of over 60 volunteers (mainly current and retired teachers and academics) who carry out a variety of crucial tasks including the production of the competition materials and the running of the Regional Finals. One stage in the rigorous process of writing, checking and trialling the questions involves 40 TMC volunteers taking part in a mock Regional Final, including the running in the Relay!
- 10) The National Final has been held at King's College London, the City of London Guildhall, the Camden Centre and the Royal Horticultural Halls in Westminster (the current venue).
- 11) Three schools have lifted the TMC winners' trophy twice: Queen Mary's Grammar School (Walsall), St Paul's School (London) and City of London School.
- 12) There has only once been a tie for first place at the National Final: between St Paul's School and Sir Roger Manwood's School (Kent) in 2008.
- 13) In 2012, UKMT launched its first set of Primary Team Maths Resources intended for use by secondary schools running events for their feeder schools.



Some of the many Team Maths Challenge Volunteers

Entry details and regional final dates for the 2015 TMC will be available from our website in early October.

UKMT Mentoring Schemes

Does your school take advantage of the UKMT Mentoring Schemes? Our mentoring schemes provide via email a series of challenging mathematical problems, requiring full written solutions, to stretch and inspire the most able and willing secondary school pupils. Participants have a mentor who will be able to discuss the problems and other mathematical ideas, and read and return their solutions with helpful comments.

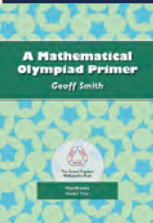
These monthly problems sheets, ideal for any students that need stretching mathematically, will start to be sent out again to those registered for the schemes in October. At the Junior and Intermediate levels, most students are mentored by their teachers using material supplied each month by UKMT. Students in the Senior scheme are usually mentored by an external volunteer.

To find out more about registering your students or volunteering as a mentor, please see www.mentoring.ukmt.org.uk or email mentoring@ukmt.org.uk. Previous problem sheets and solutions can also be downloaded from the website.

Our thanks go to Oxford Asset Management for their ongoing support of the mentoring schemes.

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ASSET MANAGEMENT

Publications Snippets



Do you have any students planning to enter the British Mathematical Olympiad (BMO) Round 1, taking place on Friday 28 November? If so, *A Mathematical Olympiad Primer* provides an excellent guide for young mathematicians preparing for competitions such as the BMO. The book contains theory including algebra, combinatorics and geometry, and BMO1 problems and solutions from 1996 onwards.

To order online or find out about our other publications, see <http://www.publications.ukmt.org.uk/>

Poster Competition Winner!

Congratulations to Sophie Charlton, Wigmore High School Herefordshire, for her imaginative and colourful winning poster. Her design has been recreated by Arbelos and the stunning poster is included with this mailing.

The judges were once again impressed with the standard of entries this year, and a special mention must go to Robyn, Alice and Katie, from Meadowhead School, Sheffield, and Bethan Crouch of Wigmore High School, whose designs were highly commended! Thank you to all who participated and look out for the annual poster competition in the February Newsletter.



Prize Sudoku

Medium – warm up on this one!

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

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.

A draw from the correct entries will take place after the closing date and the winner will receive a book with a mathematical theme.

Please send entries (photocopies accepted) by the closing date of Friday 24 October 2014 to:

Sudoku, UKMT, School of Maths Satellite, University of Leeds, Leeds LS2 9JT.

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

PRIZE puzzle - a little harder!



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

Winner of Sudoku 45:
Melissa, Ben and Ellie from Tower College,
Merseyside.