



**United Kingdom  
Mathematics Trust**

## **British girl awarded gold medal at International Mathematical Olympiad**

Yuka Machino, a pupil at Millfield School, Somerset, has earned a gold medal at the International Mathematical Olympiad (IMO). Yuka, 17, came first amongst all female participants at this prestigious competition involving over 100 countries, and was the only female gold medallist.

The UK team was also awarded four silver medals and one bronze. This fantastic all-round performance, with each member receiving a medal, meant the UK finished in 9th place out of 105 participating countries. This is the third time in five years that the UK has placed in the top 10 at the 'world championship of mathematics'.

Yuka said "I'm pleased with my results at this IMO. The questions suited me, and I was happy to see my favourite topic, combinatorics, come up on Problem 3. I'm also happy with our team placing 9th overall, which is one of the best results we've had in the past few years."

IMO 2020 was scheduled to be held in St. Petersburg in July, but was postponed and rearranged into an online format. The competition consisted of two papers on 21 and 22 September, each with three problems of increasing difficulty, targeting the strongest school-aged mathematicians. 49 students out of 616 were awarded gold medals. Yuka earned her gold medal for significant progress on the following problem:

*IMO 2020 Problem 3* (proposed by Hungary)

There are  $4n$  pebbles of weights  $1, 2, 3, \dots, 4n$ . Each pebble is coloured in one of  $n$  colours and there are four pebbles of each colour. Show that we can arrange the pebbles into piles so that the following two conditions are both satisfied:

- The total weights of both piles are the same.
- Each pile contains two pebbles of each colour.

The Team Leader was Dr Dominic Yeo (University of Oxford), and the Deputy Team Leader was Kasia Warburton (Trinity College, Cambridge). Dominic Yeo said "These problems would be found challenging by any mathematician of any age, and we're very proud of the UK team, and especially of Yuka, for the creativity and breadth of their solutions. They have all worked hard for IMO 2020 through a difficult locked-down summer, and a top ten finish is richly deserved. We hope that the skills they've learned, and the confidence gained from this super performance at IMO 2020 will set them up well for future progress in mathematics and beyond!"

Yuka had already participated twice at the European Girls Mathematical Olympiad (EGMO), earning two gold medals. Dr Ceri Fiddes, Head of Mathematics at Millfield School, was also the Director of the inaugural EGMO, held in Cambridge in 2012. She writes: "It is wonderful to see a member of the UK team as the top scoring female student at the IMO. Whilst Yuka deserves full credit for this amazing result, I am pleased that EGMO provided her with experience of international competitions to help her prepare for this big event and I hope that in future it will continue to support others in their Olympiad journeys. Yuka is already a great role model to others here at

Millfield, where we are all very proud of her achievements. I hope that, through her success at the IMO, she will now inspire others beyond our school."

The 61<sup>st</sup> IMO took place from 20 – 28 September 2020, and was organised by Russia. The UK team sat the papers in Birmingham on 21<sup>st</sup> and 22<sup>nd</sup> September. The UK team entry was organised by the UK Mathematics Trust and supported by Oxford Asset Management. The UK team was identified through a rigorous selection process, which included the British Mathematical Olympiad, a competition held over two rounds in UK schools, and organised by the UKMT, who commented: "Congratulations to all the UK team on their performance at this challenging IMO, and to Yuka for her gold medal! For the UK to once again finish in the top ten is a fantastic achievement. We thank all those involved, from the teachers supporting our work in schools, to the mathematicians who volunteer to run the academic preparation for IMO, for inspiring the country's most enthusiastic young problem-solvers."

The six students representing the UK team were:

Samuel Liew (The West Bridgford School) – Silver Medal  
Yuka Machino (Millfield School) – Gold Medal  
Benedict Randall Shaw (Westminster School) – Silver Medal  
Aron Thomas (Dame Alice Owen's School) – Silver Medal  
Tommy Walker Mackay (Stretford Grammar School) – Silver Medal  
Sherman Yip (Tonbridge School) – Bronze Medal

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**Notes**

1. The UK Mathematics Trust is a registered charity whose aim is to advance the education of children and young people in mathematics. It organises national mathematics competitions and other mathematical enrichment activities for UK secondary school pupils. Further information about the Trust and its activities is available at [www.ukmt.org.uk](http://www.ukmt.org.uk). Information about selection and training for the IMO can be found at the British Mathematical Olympiad Subtrust website <https://bmos.ukmt.org.uk/>

2. The IMO is the world championship of mathematics for students in secondary education. It is a problem-solving contest for high school students, held in a different country in July every year. The first IMO was held in Romania in 1959, with seven countries taking part. Today, more than 100 countries participate, representing over 90% of the world's population. The IMO is the oldest, biggest, and most prestigious of all the international science Olympiads and the problems of the IMO are notoriously difficult. More details can be found at <http://www.imo-official.org/>.

3. The problems from this year's IMO can be found at <https://www.imo-official.org/problems.aspx>.