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12th Middle European Mathematical Olympiad
27.8-2.9.2018 ■ Bielsko-Biała ■ Poland

MEMO

MEMOLETTER

www.memo2018.abel.bielsko.pl • 30 August, 2018

The first day of the competition

3... 2... 1...

Let the show begin!

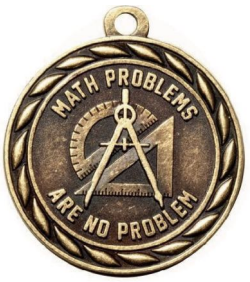
Almost ready!

I've solved everything!!! :D

MEMO 2013
Team competition

Consider finitely many points in the plane with no three points on a line. All these points can be coloured red or green such that any triangle with vertices of the same colour contains at least one point of the other colour in its interior. What is the maximal possible number of points with this property?

Can you solve it?



Interview with MEMO contestants

Lydia (Austria)

Do you think you did well in the individual part of the competition?

I competed last year as well and I actually did a lot more than last year, so... I guess, I did well.

Which team is, in your opinion, the strongest one?

I think it's never possible to say that there's one strongest team. I mean, of course, Poland and Slovenia and Hungary always have very good results, but it always depends on the problems.

Ola (Poland)

Do you think you did well in the individual part of the competition?

Yes, I feel good about what I did.

Which team is, in your opinion, the strongest one?

It's hard to say because I don't know people from other teams well enough. Last year the team from Slovenia was the strongest one.

Karyna (Ukraine)

How long have you been preparing for MEMO?

I think I've been preparing all my life! As a rule, before some olympiads we have one month without school, but now it's summer and we had a two-week math camp before this competition.

Do you prefer the individual competition or the team one?

I don't know. For me, when I'm alone, it's easier to concentrate, to do the task, but you have so much responsibility. And you're in the team competition you're all together and sometimes it's easier to have new ideas, so I don't know which is better.

Bálint (Hungary)

How long have you been preparing for MEMO?

Firstly, there are a lot of math competitions in Hungary, so we prepare for math competitions the whole year round so our preparation for this competition was just like for the others. Secondly, we had a camp.

Do you prefer the individual competition or the team one?

I prefer the individual one. I particitated in MEMO last year and the team competition didn't go so well as the individual.

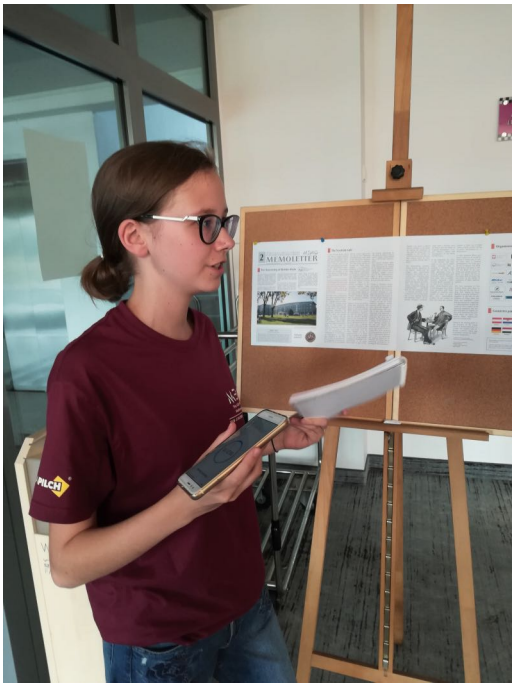
Aleksandras (Lithuania)

How long have you been preparing for MEMO?

Two years.

Do you prefer the individual competition or the team one?

I prefer the team competition.



The interview was conducted by Aleksandra Haberny a student of High School No 3, Bielsko-Biała

Fields Medal

Also referred to as the "Nobel Prize of Mathematics", the Fields Medal is given for a significant contribution to the advancement of mathematics. It is given once every four years during the International Congress of Mathematicians. The man behind its idea was the president of 1924's Congress - a Canadian Mathematician, John Charles Fields. Made of gilded metal, the medal with Archimedes' likeness is given along with an award of 2 thousand dollars to a mathematician who, in the moment of commendation is younger than 40 years old. More than a few times the age threshold rid promising mathematicians of the medal. Also, the medal wasn't awarded during the Second World War. During the first Congress after its end in 1945 the renowned creators of the Lviv School of Mathematics: Stefan Banach, Wacław Sierpiński and Stanisław Mazur, whose mathematical achievements aspired to the prize, were no longer young enough. In 1981 the Congress was to be organised in Poland. However, due to the introduction of marshal law the organisers called the Congress off. It was postponed and scheduled for 1982, but many scholars cancelled their arrival as a sign of protest against communism. Felix Klein and Georg Cantor are credited with putting forward the idea of an international congress of mathematicians in the 1890s. It took place in 1897 in Zurich and 208 scholars from 16 countries took part. Its organisers were world-renowned mathematicians such as: Felix Klein, Andriej Markov or Magnus Gustaf Mittag-Leffler. During the Congress in 1900 David Hilbert presented his famous list of 23 problems. The Last Congress took place in 2014 in Seoul, South Korea. Then the medals were given to four mathematicians. For the first time ever it was given to a woman, an American of Iranian origin - Maryam Mirzakhani (Stanford University) for her contribution to dynamics and geometry of Riemann surfaces and their moduli spaces. Others, who were given the medal that year were: Artur Avila (CNRS France and IMPA Brazil) for his contributions to dynamical systems theory, using the renormalization as a unifying principle, Manjul Bhargava (Princeton University, USA) for developing new methods in the geometry of numbers and applying them to count rings of small rank and to bound the average rank of elliptic curves, and Martin Hairer (University of Warwick, UK) for his contributions to the theory of stochastic partial differential equations and for the creation of the theory of regularity structures for such equations. The next International Congress of Mathematicians is taking place in Rio de Janeiro in September this year.

Text comes from:
https://kawiarniaszkocka.matmatic.pl.
It was translated by Jakub Goryl
a student of High School No 5, Bielsko-Biała

Picture of the Fields Medal comes from:
http://wikipedia.org

The Extraordinary Effectiveness of the Mathematical Description of the World II

In modern science, the goal was to describe reality in a way that is verifiable and allows for correct predictions. Simplicity was also striven for, and it was likened to operational functionality. Mathematical models that failed to meet these criteria gave way to more effective and simple models. This way, the heliocentric system superseded the geocentric system, and the mathematical descriptions of natural phenomena became a reliable tool to provide information about the world. As a result of this process, a model of describing the world using differential equations emerged. This model entailed the belief that the world is deterministic. And despite impressive mathematical achievements a certain order of the world was observed, there were still multiple phenomena outside of this order. Scientists could not describe, for example, the movement of gas particles in a given volume. They were aided, however, by the science of chance, which is measured by probability. In this way, science gained another important stand-

ard of mathematical modelling, the statistical probabilistic model. It seemed that the differential equation system for simple phenomena and probabilistic with statistics for complex phenomena cannot have a common model. It turned out that work that began with H. Poincaré and M. Smoluchowski and continued in the 1960s by topologist Stephen Smale resulted in the qualitative theory of differential equations. Smale proposed to replace the analytic methods of the contemporary theory of differential equations by geometric and qualitative methods. He reached this conclusion by researching the topology of phase processes. Observing a system for long periods of time, he concluded that it can disappear from the phase space, remain in the phase it reached at a specific point in time, move towards the attractor or behave chaotically. The most interesting behaviour was the chaotic ones that were described mathematically, thus making it possible to formulate the chaos theory. In this way, the commonly accepted reductionist trend in science was undermined. The analyses, consisting in dismantling a whole into its constituent parts, paved the way to holistic perspective and constituted a science concerned with the whole. Thus, non-linear processes became subject to mathematical description.

dr hab. Krzysztof Śleziński prof. UŚ

The Mathematical Bridge

On the grounds of Queen's College in Cambridge - on the river Cam - there is 'The Mathematical Bridge'. It was built in 1750 by James Essex in accordance with William Etheridge's project.

Legends

The only material used to build the brigde was wood. According to the legend the remarkably precise construction was assembled without any bolts. A different legend says that some time after the bridge was built, some curious students took it apart to discover the details of the construction. Unfortunately, they failed to put it back together, and hence the iron bolts keep it together nowadays. Having been repaired and enhanced more than once, the bridge connects the buildings of the campus to this day, and at the same time it is a charming place for a stroll for English students.

The Name

The name 'The Mathematical Bridge' was first published in 1803 in a guidebook around Cambridge. It refers to its shaped like an arc and a truss, impressively precise construction.

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