IMO POST 2015

THE 56TH INTERNATIONAL MATHEMATICAL OLYMPIAD
JULY 4-16, 2015 IN CHIANG MAI, THAILAND

DAILY NEWSLETTER JULY 13, 2015 ISSUE 05

GIFTED BY NATURE

Chiang Mai is blessed with great natural beauty and a wealth of natural resources. Its mountainous landscape and lush jungles attract both nature lovers and adventure seekers. If you are an outdoor person, there's no shortage of things you can do, from hiking and jungle trekking to kayaking, whitewater rafting and ziplining. You can also opt for leisurely nature walks or visit elephants in their jungle camps.

The province is home to Thailand's highest mountain, 2,565-meters-tall Doi Inthanon. With spectacular waterfalls, trekking trails, a bird-watching area and a nature boardwalk at the summit, the mountain is a very popular tourist destination. The weather up there is cool year-round and it can get foggy even in the summer. A few minutes in the mossy evergreen forest at the summit can make you forget you are in a tropical country.

The hot springs of San Kamphaeng offer a completely different experience. Hot springs can be found in many areas around Thailand, but Chiang Mai is gifted with a large number of them. San Kamphaeng's hot springs are set in a nice park-like area. You can buy eggs and cook them in the hot spring. There are also mineral pools that utilize the hot water and some visitors take a swim in them for therapeutic benefits.

A century ago, Chiang Mai became the center of a thriving teak industry. Many elephants were used to help clear trees. The Thai government imposed a nationwide logging ban in 1989, but Chiang Mai remains home to a large number of elephants.

There are several elephant camps around the province, two of the most popular being the Mae Sa and Mae Ta Man camps (both of which are on our group excursion itinerary). Both of these elephant camps offer a variety of activities including elephant shows, elephant riding and mahout training. You can see the elephants bathe and interact with them.

Nature has given Chiang Mai many gifts, but without conservation efforts, they would not have lasted this long. At another stop on our itinerary, Huai Hong Khrai Royal Development Study Centre in Doi Saket District, you will see how a unique conservation approach initiated by HM King Bhumibol has worked wonders in a once-denuded forest area. Today, Huai Hong Khrai is a wonderful place with tiered lakes and purpose-built nature trails. It is open to the public and there's even a camping area where you can pitch your own tent and enjoy the beautiful location.

Kew Mae Pan, Doi Inthanon, one of the best trails in Thailand

The Chinese Team consists of six students from Shanghai, Hunan, Liaoning and Beijing. Led by a student who had a perfect score in the last IMO, and a student who was ranked first in this year's Romanian Master, the Chinese team is looking forward to having a good performance and enjoying the IMO.

CHINA

Jambo! Greetings from Kenya.

Kenya is a country in East Africa and is famous for its wildlife and white sandy beaches. This is the first time that Kenya has attended the International Mathematics Olympiad and Dr. James Katende from the University of Nairobi will be Kenya's observer.

It is a great honour to be part of this prestigious competition and we look forward to participating in future IMO competitions. This is an activity that will improve performance and increase the interest in Mathematics in Kenya.

We sincerely thank Thailand for hosting this year's IMO2015 and for the assistance and hospitality provided at all the stages of preparation. Special thanks to the IMO Advisory Board for inviting Kenya and the IMO organizers at The Institute for the Promotion of Teaching Science and Technology, Chiang Mai University.

KENYA

South African team looks forward to

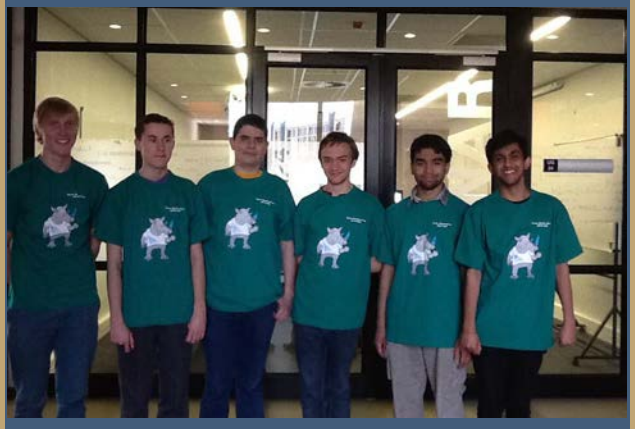
The 2015 International Mathematical Olympiad

South Africa has selected the best of the best for the 2015 IMO. The contestants who have been selected based on the results of the 2014 South African Mathematics Olympiad are:

- Nicholas Kroon
- Andrew McGregor
- Mohammed Yaseen Mowzer
- Sanjiv Ranchod
- Bronson Rudner
- David Broodryk

Four out of our six contestants are veterans from previous IMOs, so this year's team will have experience and years of hard work to their advantage. Bronson Rudner, Yaseen Mowzer and Sanjiv Ranchod represented South Africa at last year's IMO and Andrew McGregor represented the country in 2013 in Colombia. The team leader is Dirk Basson and deputy leader is Melissa Kistner.

The South African team looks forward to their trip to Thailand and hopes to bring home a few medals!



SOUTH AFRICA

Hi, this is team Cyprus.

We are what we would call mentally diverse: the team includes old people, soldiers, the info guy, the social geek, the card games maniac, even a shepherd. We are good people, but you'll have to endure the lame jokes with us. We are here to do well, or at least the best we can do, and to have fun with Maths and new people. We're looking forward to getting to know Thailand and live to the fullest experience that an IMO is. May we all go back home full of unforgettable memories. Good luck and good stay to everyone. #IMO #greetings

CYPRUS

IMO POST 2015 NEWS

The second and last day of contest mirrored the first in many ways. Anticipation filled the air as exam time drew near. Then contestants sat down and, for the next 4 hours, put their mathematics knowledge and skills to the test. We hope you spend the next few days getting the rest and relaxation you deserve, as we all await the contest results.

At 9 am on July 11, contestants got ready for their second day of exam. Most appeared relaxed and some were even smiling broadly as they waited outside the exam room. Some teams boomed out the name of their country as one. Others came wearing their team shirt. Morale seemed high everywhere we looked.

Contestants appeared confident and unworried as they waited for the exam to begin, a testament to their preparation.

As the exam drew to a close, the liaison staff got in position to give contestants any help they might need.

A member of Team China, which ranked top overall at last year's competition, said after the exam that he was proud to represent his country and happy to be part of IMO 2015.

Jiyang Gao, who achieved perfect score at IMO 2014, said that he had not done anything special to prepare for this year's contest. Regardless of what score he receives, the more important thing is that he has been given an opportunity to represent his country, said Gao.

Deputy Leader *Qiusheng Li*, who is serving on the Chinese team for the third consecutive year, said: "My greatest expectation is that my team members are happy. I believe that when you are happy, you don't feel pressured and success will follow. Progress happens with every new experience. Winning a prize is simply a bonus."

Contestants left the exam room looking relaxed and happy.

Introduction to Muay Thai

To introduce contestants to an important part of Thai culture, a Muay Thai (Thai boxing) class was offered to all who were interested.

Mirza Arrnaut of Bosnia and Herzegovina, who has over 5 years' experience in competitive karate, said: "I have long heard about Muay Thai, but this is the first time I have experienced it first-hand. I had a great experience, even if it was for a short time. If possible, I'll try to learn more about it."

Muay Thai trainer *Prasit Silaphai* of P. Silaphai Gym said he was proud to be part of one of the world's top academic competitions. "I wanted to use my 30-year experience to give contestants a taste of Muay Thai, a sport that relies on swift, subtle yet decisive movements and which has a beauty all its own," said Prasit. The time he spent with his new "students," all of whom are young scholars, showed Prasit that underneath that seriousness of purpose, they all have a cheerful side. Prasit wished all contestants success and said he was proud for all their countries to have such promising young people represent them at IMO 2015.

Thai team thanks compatriots for support

Commenting after the exam, members of the Thai team said that all had gone well. Although a little tired from 4 hours of intense concentration and mental exertion, they were happy to have given their best efforts. "We would like to thank POSN" (The Promotion of Academic Olympiads and Development of Science Education Foundation under the Patronage of Her Royal Highness Princess Galyani Vadhana Krom Luang Naradhiwas Rajanagarindra) "as well as our team leaders and coaches for the coaching, guidance and care we received during three months of intensive preparations," said one member on behalf of the team. "We'd also like to thank our parents for their support and, last but not least, the Thai people for supporting and rooting for us."

ANNOUNCING THE IMO 2015

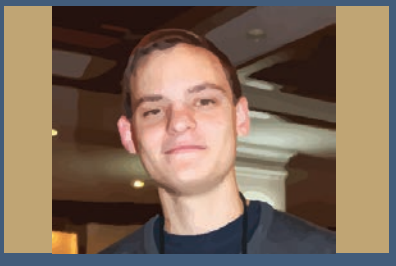
FRIENDSHIP PRIZE!

IMO 2015 brings together participants from around the world. To encourage everyone to get to know each other, we hereby invite all to nominate your favorite new friend for **THE FIRST-EVER FRIENDSHIP PRIZE.** Each participant can nominate 1 person, the only condition being that your nominee **CANNOT BE YOUR OWN TEAMMATE.** The person who receives the most votes will be our Friendship Prize Winner. We also have prizes for 3 lucky voters (to be decided by a lucky draw). Nominate your favorite new friend by email to IMO2015newsletter@gmail.com by July 13. Be sure to include your nominee's name and country. The list of winners will be published in the July 15 Issue.

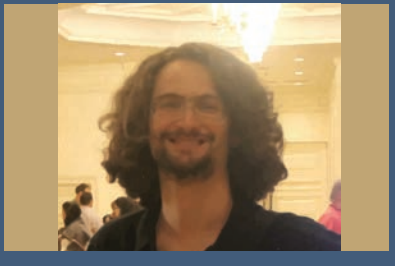
If you have an announcement to make, we'll be happy to print it. It can be about a program of study, an important day in your country, or anything else that you think will be of interest to other readers. Email your announcement to IMO2015newsletter@gmail.com. We reserve the right to edit your submission for length and style.

HAPPY BIRTHDAY

Given Name: Rudi Adha
Family Name: Prihandoko
Country: Indonesia (IDN)
Date of Birth: 13/07/1989
IMO role: Observer



Given Name: Andres
Family Name: Fabrega
Country: Panama (PAN)
Date of Birth: 13/07/1997
IMO role: Contestant



Given Name: Dan
Family Name: Carmon
Country: Israel (ISR)
Date of Birth: 13/07/1990
IMO role: Leader

Given Name: Dinh Thanh Phong
Family Name: Vo
Country: Ukraine (UKR)
Date of Birth: 13/07/1998
IMO role: Contestant

MATH IS FUN

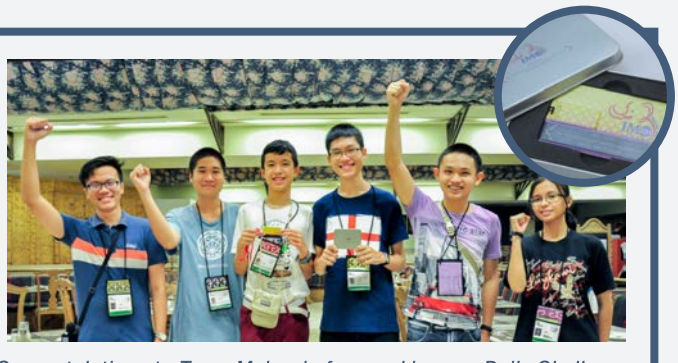
If $u_n = \cos^n\theta + \sin^n\theta$ then prove that $2u_6 - 3u_4 + 1 = 0$.

Email your answer to: imo2015newsletter@gmail.com.
You'll be eligible to win a fabulous prize!

QUOTE FROM GREAT MATHEMATICIANS #5

"Mathematical reasoning may be regarded rather schematically as the exercise of a combination of two facilities, which we may call intuition and ingenuity."

Alan Turing (1912 - 1954), a British mathematician and World War II codebreaker hailed as the father of computer science. The top award in computer science, the Turing Award, is named after him.



Congratulations to Team Malaysia for cracking our Daily Challenge problem#1! They collected their prize, a 16GB IMO thumb drive. Don't forget to send in your answer to today's Challenge.

WE ARE ON THE WEB, TWITTER AND FACEBOOK!

To get the latest IMO 2015 news and updates, go to our WEBSITE: HTTP://WWW.IMO2015.ORG/
follow us on TWITTER: HTTPS://TWITTER.COM/IMO2015THAILAND
or Like us on FACEBOOK: HTTPS://WWW.FACEBOOK.COM/IMO2015CHIANGMAITHAILAND

MATHEMATICS IN EVERYDAY LIFE

THE KOCH SNOWFLAKE

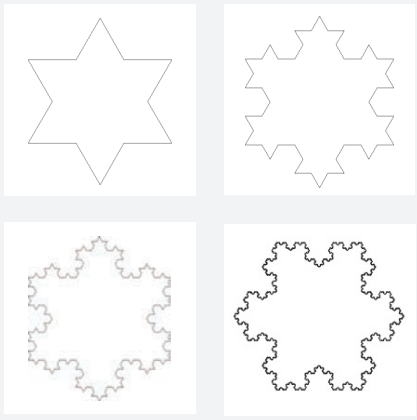
THE KOCH SNOWFLAKE

Many objects in nature are very complicated and we cannot always model them as basic geometric shapes or patterns. Take snow, for example. We tend to think of it as being soft and white and fluffy, but when we carefully examine a snowflake, it quickly becomes apparent that there's more to it than meets the eye.

Mathematically speaking, a snowflake is a fractal. Defined as natural phenomena showing repeating patterns, fractals can be described as mathematical sets.

Natural snowflakes have very beautiful geometric designs, each of which can be mathematically expressed as a fractal curve. The concept was introduced by Swedish mathematician Helge von Koch in 1904 and became known as the Koch snowflake (aka the Koch curve, Koch star or Koch island).

The Koch snowflake can be constructed by a number of iterations. Starting with an equilateral triangle, you divide each side of the triangle into thirds. Then you replace each middle third with an equilateral triangle. Each iteration gives four times as many line segments as the previous iteration. After n iterations, the length of the curve is $\left(\frac{4}{3}\right)^n$ times the initial triangle perimeter.



Now let's get down to the math. Suppose that s is the length of each side of the original (equilateral) triangle, and n is the number of iterations. We can prove that

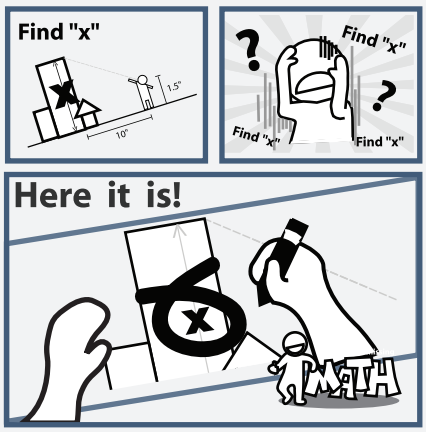
$$\text{Area} = \frac{\sqrt{3}}{4}s^2\left(1 + 3\sum_{k=1}^{n}\frac{4^{k-1}}{9^k}\right) \qquad \text{Length} = 3s\left(\frac{4}{3}\right)^n$$

Interestingly, the length of the curve is unbounded when n tends to infinity. The area of the curve, however, is a finite value. The Koch snowflake, therefore, is an object that has a finite area but is bounded by an infinite boundary.

References:
1. Snow Days, The Koch Snowflake, and God, by Steven Pomeroy
http://mathtricks.org/fractals/snow-days-the-koch-snowflake-and-god/
2. Simple Iterative Fractals
http://www.miqel.com/fractals_math_patterns/visual-math-iterative-fractals.html
3. https://wallpaperscraft.com/download/snowflake_grass_surface_frost_form_43340/

AGENDA	DAY 5, MONDAY JULY 13

LEADERS and DEPUTY LEADERS		CONTESTANTS	
7:00 am	Breakfast	7:00 am	Breakfast
9:00 am	Coordination	8:30 am-5:00 pm	Excursion
12:00 am	Lunch	5:30 pm	Dinner
1:30 pm	Coordination		
6:00 pm	Dinner		



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