



Baltic Way Mathematical Team Contest

Programme and Information

**Oulu, Finland
November 3 to 7, 2016**

Welcome

The Baltic Way Mathematical Team Contest has been an annual event for over a quarter of a century. It originated in the three Baltic republics at a time when they were regaining their independence, but soon expanded to all shores of the Baltic Sea and a bit further.

Finland has been a member of the Baltic Way family since the exceedingly cold November days in 1993 in Riga. Twice we have been able to host the event: in 1996 in Valkeakoski and ten years later in Turku.

As another ten years have now elapsed, it is our turn again. We considered a few alternatives for the venue. It turned out that Oulu had several advantages: a rich Baltic history, a modern university, much high-tech oriented industry and the second busiest airport in the country.

There are things we cannot help. At the well established time of the Baltic Way, we cannot see very much of the Sun in Oulu, and the weather is unpredictable. Economic restrictions compel us to some compromises. Still, we hope that all our guests feel welcome!

Matti Lehtinen

Chairman

Organizing Committee

Baltic Way 2016 Organizers

Baltic Way 2016 is organized jointly by the Training Section of the Finnish Mathematical Society, The Oulu Chapter of MAOL, the Association of Teachers of Mathematics and Science in Finland, and the the LUMA (STEM) Centre of the University of Oulu.

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Thanks

Baltic Way 2016 organizers are grateful to several companies and organizations whose support has made the organizing of this event possible. We have received direct financial or other support from **Technology Industries of Finland Centennial Foundation, F-Secure, Nokia, Ilmarinen, Nordea Life Insurance, Ilmarinen, Tieto, Nordic Semiconductor, Elo, Oskar Öflunds Stiftelse, University of Tampere, Aalto University, University of Oulu, University of Turku, City of Oulu, Ruskon Betoni, City of Oulu, VTT Technical Research Centre of Finland, Nordea Bank, Kaleva, Painosalama and Otava.**

The organizers are also extremely grateful for the support we have received from several individuals, all of whom cannot be listed here. We acknowledge the substantial help from Alexey Kirichenko and Raimo Voutilainen in obtaining supporters and

the helpfulness and understanding of Kari Kumpulainen, the Principal of the Oulu University Teacher Training School, Mikko Karppinen, our contact person in the VTT Technical Research Centre of Finland, as well as Raimo Huhtala, our man in Rovaniemi.

Jury

The Jury of the contest consists of the leaders of the participating teams. Each team has one vote. The team deputy leaders may participate in the work of the jury, but they are not allowed to vote. The Jury will be chaired by Kerkko Luosto.

Scientific Committee

Antti Honkela, Kerkko Luosto (chair), Jouni Seppänen, Joni Teräväinen. The committee has prepared the set of proposed problems from the suggestions submitted by the participating countries.

Organizing Committee

Anne-Maria Ernvall-Hytönen, Eero Ijäs, Kati Kyllönen, Matti Lehtinen (chair), Maisa Spangar. The committee is responsible for all practical arrangements.

Coordinators

Antti Honkela (chief coordinator), Jorma Arhippainen, Anne-Maria Ernvall-Hytönen, Olli Hirviniemi, Jesse Jääsaari, Jukka Kauppi, Jari Lappalainen, Emma Leppälä, Neea Palojärvi, Louna Seppälä, Joni Teräväinen, Topi Törmä and Esa Vesalainen.

Teams

Denmark (DEN)

Contestants: Alex Villaro Krüger, Jonathan Tilling Niemann, Nicolai Sebastian Carstensen, Iustin Beldie, Marius Christian Fischer. **Team leader:** Jan Agentoft Nielsen, **Deputy leader:** Frederik Ravn Klausen.

Estonia (EST)

Contestants: Kaarel Hänni, Taavet Kalda, Joonas Jürgen Kisel, Richard Luhtaru, Hendrik Vija. **Team leader:** Oleg Košik. **Deputy leader:** Janno Veeorg.

Finland (FIN)

Contestants: Ella Anttila, Olli Järvineniemi, Joose Lehtinen, Jesse Nieminen, Antti Röyskö. **Team leader:** Lauri Hallila. **Deputy leader:** Otte Heinävaara.

Germany (GER)

Contestants: Kerrin Bielser, Christoph Börger, Male Hesse, Silas Rathke, Jonas Walter. **Team leader:** Uwe Leck. **Deputy leader:** Klaus Henning.

Iceland (ICE)

Contestants: Atli Fannar Franklín, Elvar Wang Atlason, Garðar Sigurðarson, Guðjón Helgi Auðunsson, Tómas Ingi Hrólfsson. **Team leader:** Marteinn Þór Harðarson. **Deputy leader:** Sigurður Jens Albertsson.

Latvia (LAT)

Contestants: Artem Ubaidullaev, Reinis Cirpons, Raitis Rūsiņš Kriķis, Ingus Jānis Pretkalniņš, Aleksandrs Zajakins. **Team Leader:** Māris Valdats. **Deputy leader:** Filips Jelisejevs.

Lithuania (LIT)

Contestants: Zigmās Bitinas, Aurimas Klimašauskas, Neringa Levinskaitė, Jonas Pukšta, Ernestas Ramanauskas. **Team Leader:** Romualdas Kašuba. **Deputy Leader:** Zina Šiaulienė. **Observer:** Aivaras Novikas.

Norway (NOR)

Contestants: Anna Lyubarskaja, Erik Mingjun Ma, Marius Stensrud, Oskar Vikhammar-Sandberg, Fredrik Meringdal. **Team Leader:** Dávid Kunszenti-Kovács. **Deputy leader:** Pål Hermunn Johansen.

Poland (POL)

Contestants: Damian Burczyk, Jan Fornal, Filip Gawron, Wojciech Mitros, Mariusz Trela. **Team Leader:** Tomasz Cieśla. **Deputy leader:** Filip Smentek.

St. Petersburg (STP)

Contestants: Nikita Karagodin, Mikhail Ivanov, Arsenii Virachev, Kirill Tyshchuk, Victor Migrin. **Team leader:** Konstantin Kokhas. **Deputy leader:** Dmitrii Rostovskii. **Observer:** Maksim Pratusovich.

Sweden (SWE)

Contestants: Hugo Eberhard, Nicole Hedblom, Arvid Lunne-mark, Björn Magnusson, David Wärn. **Team Leader:** Qimh Xantcha. **Deputy Leader:** Alex Loiko.

Practical Information

Accommodation

The contestants and leaders will be accommodated on the island Hietasaari. The distance to Oulu center is 3 km walking, somewhat more by car. City bus n:o 15 connects Hietasaari to Oulu center, twice an hour on weekdays at daytime, once an hour on weekends and evenings.

The contestants will be accommodated in the Nallikari Holiday Village, address Leiritie 10, FIN 90510 Oulu, Finland, telephone +358 44 7031353. The reception and cafeteria are open from 11 to 19 on weekdays, 11 to 16 on holidays. The leaders' accommodation is at Pohto Institute, Vellamontie 12, FIN 90510 Oulu, telephone +358 10 843 4500. The walking distance between the places is about 800 m, using Leiritie, Holstinsalmentie and Vellamontie.

Meals

Meals will be served at different restaurants, as indicated in the programme. **Ruffi** is the restaurant at Pohto Institute, in the leaders' accommodation. **Restaurant Nallikari** is on the seashore 200 m from the western gate of the Nallikari Holiday Village. **Ara** is the lobby restaurant of Break Sokos Hotel Eden, opposite to Nallikari Holiday Village. On Friday, the contestants will have their breakfast as breakfast boxes in the bus en route to Rovaniemi.

Contest Site

The contest will take place in the Oulu University Teacher Training School (*Oulun normaalikoulu*), Kaitoväylä 7, 90570 Oulu.

Contest Instructions

Any material not permitted in the test, e.g. cell phones, will be collected before the test and returned afterwards.

Eventual questions pertaining to the problems (i.e. suspected errors, misprints etc) should be made in writing during the first 30 minutes of the test. There will be messengers carrying the questions to the jury.

Answers to different problems should be written different sheets. Write your country code and problem number on every answer sheet. Because the answers will be copied, it is essential

to **only write on one side of the paper!** Place the answers in the four envelopes provided and marked with the country code and problem numbers. The envelopes will be collected at the end.

Excursions

On Friday, November 4, the Jury will set up the problem set for the contest. Meanwhile, the contestants will make an excursion to Rovaniemi, the capital of Lapland. As distances here are long, the excursion will start so early that breakfast will be consumed in the bus. Of the many interesting sights in Rovaniemi, the contestants will visit the *Arktikum* science center and *Santa Claus Village*, just on the Arctic Circle.

On Sunday morning, Nov. 6, the contestants and leaders will visit the Oulu premises *VTT, Technical Research Centre of Finland* to see a glimpse of high-tech Oulu.

Codes

The participants' name tags are coded as "CCC*n*" where CCC stands for the self-explanatory country code and $1 \leq n \leq 5$ denotes a contestant, $n = 6$ the team leader, $n = 7$ the deputy leader, and $n \geq 8$ an observer.

Programme

Contestants

Thursday Nov. 3	
9–23	Arrival, transfer to Nallikari, accommodation in Nallikari Holiday Village
11.30–15	Lunch in Ara
19	Dinner in Nallikari R

Friday Nov. 4	
7.45	Bus leaves from Nallikari for excursion to Rovaniemi, breakfast box in bus.
11.00	Arrival in Rovaniemi
11.00–11.45	Lunch in Lyseonpuiston lukio
12.00–13.30	Visit in the <i>Arktikum</i> science center
14.00–15.30	Visit in Santa Claus Village at Arctic Circle
15.30	Bus leaves for Oulu from Santa Claus Village
19.00	Dinner in Nallikari R.

Saturday Nov.5	
7.45	Bus leaves for Oulun normaalikoulu
8.15–8.45	Breakfast in Oulun normaalikoulu
9.00–13.30	Competition
13.30–14.00	Lunch in Oulun normaalikoulu
14.15–16.30	Oulu sightseeing with local guides
16.30	Bus to Nallikari from Oulu Market, Kaarlenväylä.
18–19	Dinner in Nallikari R.

Sunday Nov. 6	
8–9	Breakfast in Ruffi
9.30	Bus leaves for VTT, Technical Research Centre of Finland
10–11.30	Visit to VTT
11.30–12.30	Lunch in VTT
12.30	Bus to Nallikari
16.00	Bus leaves for Final Ceremony
17–18	Final Ceremony at Oulu City Hall
18.30	Bus to Pohto
19– 21	Final Dinner in Ruffi

Monday Nov. 7	
7.30–9	Breakfast in Ruffi
12	Lunch in Ara
4.30–14	Transfer to airport or railway station, departures

Leaders

Thursday Nov. 3	
9–23	Arrival, accommodation in Pohto institute, distribution of problem proposals
11.30–15	Lunch in Ara, Eden
19	Dinner in Ruffi

Friday Nov. 4	
7.30–8.30	Breakfast in Ruffi
8.30–12	Discussing the problem proposals
12–13	Lunch in Ruffi
13–15	Choosing the problems
15–15.30	Coffee break
15.30–16	Finishing the problem set in English
16–18	Translating the problems
18–19	Dinner in Ruffi
19.00	Jury meeting to approve the translations

Saturday Nov.5	
8.00–8.15	Breakfast in Ruffi
8.15	Bus leaves for Oulun normaalikoulu
9.00–9.30	Answering eventual questions by the teams
9.45–11.00	Oulu sightseeing en route from the school to Pohto
12–13	Lunch in Ruffi
14–16	Evaluating the teams' work. Coffee break 15–16
16–19	Coordination
19–19.30	Dinner in Ruffi

19.30–22.00	Coordination, Coffee break 21–21.30
22.30	Final Jury meeting to confirm the result, time depending on the progress of coordination

Sunday Nov. 6	
8.00–9.00	Breakfast in Ruffi
9.30	Bus leaves for VTT, Technical Research Centre of Finland
10–11.30	Visit to VTT
11.30–12.30	Lunch in VTT
12.30	Bus to Pohto
16.00	Bus leaves for Final Ceremony
17–18	Final Ceremony in Oulu City Hall
18.30	Bus to Pohto
19–21	Final Dinner in Ruffi

Monday Nov. 7	
7.30–9	Breakfast in Ruffi
12	Lunch in Ara
4.30–14	Transfer to airport or railway station, departures

Regulations

1. The competition takes place in Oulu, Finland, on November 3–7, 2016. Participation is by invitation only.
2. The participating teams consist of five contestants, a leader and a deputy leader. The contestants must be secondary school students or possible candidates for IMO 2017. They must not have formally enrolled at a university or any other equivalent post-secondary institution.
3. The Organizing Committee covers the costs of the participating teams in Oulu during the time of competition.
4. The contest consists in solving 20 mathematical problems selected by the Jury. The time for the contest is 4 hours 30 minutes. Each team works together and the contestants are free to discuss the works between them. Only writing and drawing materials are allowed during the contest; in particular calculators, computers and telecommunication devices are not allowed. The solutions — at most one for each problem for each team — are to be written on the paper provided by the organizers. Each problem should be answered on a separate sheet and only one side of the paper should be used. The teams can use their own language.
5. During the first 30 minutes of the contest, the teams may present written questions about the problems. The Jury decides how the questions should be answered.
6. The Jury consists of the team leaders and a chairman appointed by the Organizing Committee. A motion shall be carried by a simple majority of votes. Only the leaders can vote, but in the event of a tie, the chairman shall have a casting vote. The deputy leaders may

participate in the work of the Jury, but they are not allowed to vote. If the team leader is unable to participate in the meetings of the Jury, her or his rights and duties may be transferred to the deputy leader.

7. The Jury shall:

- choose the 20 contest problems from the problems submitted by the participating countries before the contest (modifying or editing the problems is thereby allowed);
- prepare and approve the translations of the problems to the languages used by the teams;
- consider and answer questions raised by the contestants during the first 30 minutes of the contest and pertaining to the problems;
- resolve any dispute on scoring between the individual team leaders and the coordinators;
- approve the final scores of the teams;
- decide on possible Special Mentions awarded to teams for solutions of singular merit;
- discuss general matters concerning the Baltic Way contests, particularly the schedule of hosting in the following years.

8. The solutions of single problems are marked by integers on a scale from 0 to 5 points. A preliminary marking is done by the leader and deputy leader of each team, and the final marking is done by the leader in collaboration with coordinators appointed by the Organizing Committee. If the leader and the coordinators cannot agree on the marking, the problem is considered by the Chief Coordinator. If there is no agreement between the leader and the Chief Coordinator, the matter is decided by the Jury.

9. Ranking of teams will be decided by the sum of the marks of individual problems. In the case of a tie for the first, second and third prize, teams with a higher number of fives will be ranked above teams with a lower number of fives. If there is still a tie, the number

of fours will decide the ranking. Then one counts the number of threes, and then the number of twos. If there is still a tie, the team having scored the most on the hard problems will be ranked above. This is determined in the following way: Let $P(k)$ be a team's score on problem k , and let $T(k)$ be the total score of all the teams on problem k . Let Q be the sum of $P(k) \times T(k)$ taken over all 20 problems. Teams with a lower Q will be ranked above teams with a higher Q . If there is still a tie, the Jury decides if and how the tie should be broken. In the case of a tie for the fourth place and lower, no action will be taken to resolve the tie.

10. The results (i.e., both partial and total scores, as well as rankings) are kept secret until the moment when they are officially announced at the closing ceremony of the competition.


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