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MATH
CAMP
REPORT

Canadian Mathematical Society

CMS.MATH.CA

ABOUT THE CMS MATH CAMPS & 2022 MATH CAMPS OVERVIEW

Since its inception in 2000, the CMS Math Camps program has captured the spirit of mathematics from coast to coast and to inspired young minds across the country. The program offers a unique opportunity for young Canadian students to explore a side of mathematics that is not accessible in a traditional classroom setting. Although the CMS gives local organizers the freedom to choose the topics and activities of their camps, the main goal of a typical camp is to engage students in an authentic learning environment in mathematics and its broad applications to Science, Technology and Engineering. This is achieved through stimulating presentations, hands-on activities, building projects and competitions. Students who attend the camps leave with new friends who share the same passion for the subject, new ideas to explore, and a fresh outlook on mathematics and the role it plays in our lives.

Many 2022 camps were cancelled or held virtually due to the COVID-19 pandemic. There were several successful virtual camps offered again this year. The number of camps offered in 2022 increased from 2021, with the CMS offering 9 Regional Camps, 1 National Camp, and 8 Specialty Camps. Due to the virtual nature of some of the camps and limited reporting capabilities, the current report will be quite brief.

There are already 13 Regional Camps, 1 National Camp, and 3 Specialty Camps confirmed for 2023.

REGIONAL CAMPS

There were 9 regional camps offered in 2022, some of which were held virtually. Please see below for a summary of the regional camp activities:

University of Alberta: CMS/PIMS Alberta Mathematics Summer Camp
The Alberta Mathematics Summer Camp was held from July 24th - July 31st, 2022, and included campers learning about topics such as Geomerty, Combinatorics, and computer programming. The campers also participated in Math Battles, a movie night, and a talent show. Some student feedback includes:

- According to the campers, some of the highlights (roughly in order of frequency indicated by campers) were Heaven and Earth Contest, Math Battle, Individual Contest, Computer Programming, Rook Polynomials, Algebraic Inequalities, Polyhedra, Excursions, Movie Night, Talent Show.
- *"The classes were informative but also more engaging and fun that any of my current classes. The students were really the best part, because I never felt so understood by people around me."*
- *"The math contests and battles were a fun way to compete and improve with your peers and gave an experience unable to be gained any way else."*
- *"This year's math camp was such an amazing opportunity and it was a ton of fun! I'm so thankful that math camp happened this year. Even though it's only been two days, I can't wait for next year's math camp."*

REGIONAL CAMPS

Université de Sherbrooke: AMQ Math Camp

The Université de Sherbrooke was honoured to host the AMQ Camp. It was with great pleasure that we welcomed twenty-three people to the main campus of the Université de Sherbrooke, from June 5 to 10, 2022, to experience a week of stimulating and memorable activities. All these people were winners of the AMQ provincial competition.

To launch the week of workshops, campers learned about an omnipresent tool in mathematics: permutations. Then, the presenters discussed the concepts of graphs and ribbon graphs. On Tuesday morning, a lecturer at the Université de Sherbrooke, captivated everyone by presenting different combinatorial games such as Tic-Tac-Toe (in 2D and 3D), chess and Hexapawn as well as Nim's game, to name a few. In the afternoon, those invited to the camp were able to attend a conference whose objective was to introduce information and quantum programming, formalizing the qubit and answering the famous question "What is linear algebra for?". The day ended with a visit to the Faculty of Engineering's Creation Studio, where various technological innovations and state-of-the-art equipment were on display. In the middle of the week, campers listened to a lecture on the history of logarithms and another describing Benford's law. Thursday was devoted to mathematical activities that encouraged analysis and reflection. In the morning, everyone to played a quantum version of the "pigeon in the lake" game, while the afternoon was devoted to solving mathematical riddles. Finally, the last day of the AMQ camp, camper listened to a lecture that attempted to answer the question "What is a black hole? by giving an accessible introduction to the theory of relativity. Then, campers listened to a presentation on the mathematics and the intuitive elements that allowed Abraham de Moivre to make the correspondence between binomial probabilities, Stirling's formula and the famous curve called normal law. In the afternoon, the campers closed the activities with an experiment involving the use of the Stirling formula.

REGIONAL CAMPS

Polytechnique Montréal: AMQ Math Camp

The AMQ was pleased, after a forced two-year hiatus due to COVID 19, to resume organizing its secondary school camp in 2022 from June 26 to July 2.

Polytechnique Montréal hosted the camp this year, after having organized it in 2019, and continued to encourage the young participants to keep an important place for mathematics in their studies, and to recognize its growing role in our contemporary society. Under the theme of security, students were treated to a few presentations on security, lock-picking, encryption, and information theory. In addition, participants were treated to presentations by experienced teachers and outreach workers on a variety of topics: from the more formal, such as proof techniques, to the more playful, such as juggling.

Organizers were surprised by the enthusiasm with which young people quickly accepted their invitation, indicating a desire to learn in community after those difficult years, so Polytechnique Montréal underestimated the rate of positive responses and ended up with 27 participants, rather than the traditional target of 25. The majority of the schools participating in the AMQ High School Math Competition were from the greater Montréal area, but 6 students from outside of Montreal joined the camp. The students came from 12 different schools, mostly private.

REGIONAL CAMPS

University of Manitoba: 2022 Math Camp

The Department of Mathematics conducted its nineteenth Mathematics Camp, August 21–24, 2022 after 2 years off due to the COVID-19 virus. Twenty students from grades 9 and 10, who stayed in residence at St. John's College, were immersed in an intensive program of mathematics and its applications. Eighteen students were from Winnipeg. Two students were from Brandon. There were ten girls and ten boys.

The schedule of each day's activities is attached. Topics covered were arithmetic in different bases, combinatorics, sequences and series and linear Diophantine equations. The students were very passionate and eager to learn. They participated throughout and improved as the sessions went on. We found their passion inspiring and delighted in conversations with the students about mathematics. Some of the students talked with us about theories they had on their own. It was a rewarding experience for both the students and the faculty members running the workshop.

Recreational activities included playing soccer and frisbee, and going to IQ's, the pool hall on campus where students played pool and foosball.

We had three guest speakers, and there was also a games night.

In order for us to assess the value of the camp, from the students' point of view, students were asked to fill out a survey which is attached to this report. Results indicated that:

- *In general the student enjoyed the activities but most wished there were more organized group activities (games, sports, walks around campus) as opposed to giving them more freedom to form their own groups and activities.*
- *A few students wanted the camp to be longer, but the median fell at 5 days. Given the camp in 4 days, it seems like they preferred a little longer, but not much.*
- *The students thought the topics were appropriate and balanced what they were doing in school with an extra challenge.*
- *Nearly all students said they were considering a career in STEM. Whether it increased their interest was mixed as those who said no, mentioned it was because they already knew they were going into that area.*
- *Most students gave the camp a rating in the 7-9 out of 10 range with the majority giving 8 or 9 out of 10.*

SPECIALTY CAMPS

There were 8 specialty camps offered in 2022, some of which were held virtually. Please see below for a summary of the specialty camp activities:

University of Calgary: 2022 Math Attack Summer Camp for Girls

The 2022 Math Attack Summer Camp for Girls was an 8-day overnight camp that was held at the University of Calgary and the Banff International Research Station (BIRS) from Sunday, July 10th - Sunday, July 17th. The camp brought 21 grades 6 - 10 students who identify as girls together to engage in fun mathematical activities and build connections. Students stayed in the university residence for the first five nights of the camp and stayed at the Banff Centre for the last two nights.

The camp aimed to encourage girls to pursue their passion for mathematics and make connections with peers who shared similar interests. Throughout the week, students engaged in mathematical sessions that explored topics such as cryptology, data science, probability paradoxes, and actuarial science. They investigated the spread of disease by modelling a zombie outbreak, learned what you can do with a math degree at a Women in Math Panel, and competed in the Amazing (Math) Race. These sessions and panels exposed students to over 20 female role models, including recent high school graduates, undergraduate math students, graduate math students, mathematics faculty, and mathematicians in industry.

During the camp, there was also plenty of time for friendship building and physical activity. Evening activities included sports, swimming, board games, karaoke, and a walk along Bow Falls Trail. On Friday, students also took some time to explore the town of Banff and hiked up Tunnel Mountain.

There was no registration fee for the camp and all meals and accommodations were provided.
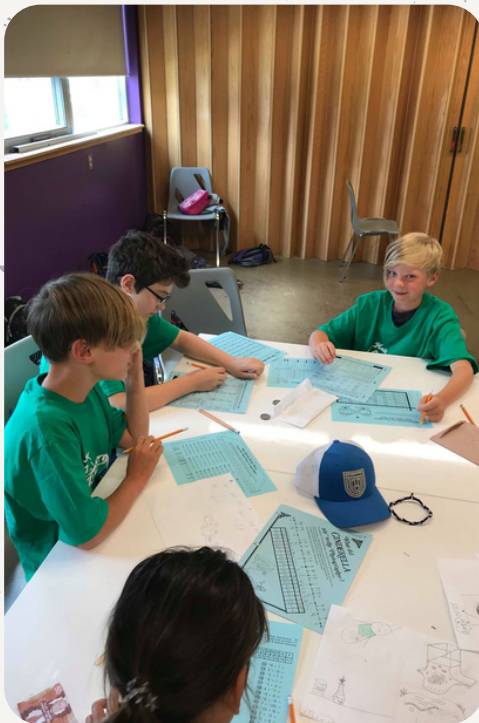
SPECIALTY CAMPS

Yukon University: 2022 Kids Program Math Camp

Last year, Yukon University agreed to do a Math after-school club instead of a summer camp. They had a dedicated Math Camp for 12 participants that ran from September 2022 – December 2022. There was an equal number of boys and girls in the club, aged 8-11 years of age, and the theme of this club was board game design.

Each week, youth explored how math is essential in creating great board games. For example, youth learned about different sided dice can the statistical frequency a player may land on an ideal square. Youth learned about scale, geometry, and measurement when designing the hardware for their games. These lessons helped the youth each week refine their games, and helped them realize that an understanding of math makes a game more fun and challenging.

Overall this club was an incredible success with parents and youth asking for additional resources so that they could continue to design games, after the club was over.

NATIONAL CAMP

University of Toronto: 2022 Canada Math Camp (virtual)

The Canada Math Camp 2022 had 24 students participating in the camp! They invited students from all across North America, including USA, British Columbia, Nova Scotia, Quebec, and Ontario. They had 1 student join from China. There were 4 female students and 19 male students and 1 unspecified gender in total.

The instructors had extensive experience working with aspiring Math Olympians and has been the instructor for the Canada Math Camp for a number of years, giving students a rewarding and inspiring week of learning!

Like 2021, they continued to offer a social component to the virtual camp. They hosted an orientation/welcome session on Sunday over Zoom for students to get to know the camp instructor, assistant and their peers. They did ice-breakers for students to introduce themselves and worked in groups to find the best strategy for various mathematical games. This room also acted as a math lounge for students to network with the other campers throughout the week and work on math problems posted during the camp.

The official lectures started on Monday and various themes were covered including proof writing, modular arithmetic, combinatorics, polynomials and many more. Throughout the day, camper were given small breaks between each topic to reduce Zoom fatigue. Sessions were taught using Zoom and allowed students to work on problems outside of the classroom using Gather Town. There were problem solving sessions every day throughout the week to ensure students get to work on challenging problems individually and in groups.

The week-long camp ended with a few closing remarks and invited all the students to the Gather Town. They ended the camp by playing online board-games with one another and having casual conversations. This social component of the virtual camp is definitely a great way to end off the camp! This allowed students to connect with one another after class and even after the camp ended. Some remarks from students:

- *Really enjoyed the camp! Got great handouts that enriched my math knowledge, and made lots of new friends! :) I would like to do it again, but I'm in Gr. 11 next year :(.*
- *Overall, the structure of the camp was very well organized, however I think an in-person format (assuming it is safe) would have a better effect since more students would speak up and share their ideas.*

FULL CAMP LIST

University of Toronto | 2022 Canada Math Camp

University of the Fraser Valley (Abbotsford) | Math Camp, Science Rocks!

University of the Fraser Valley (Chilliwack) | Science Rocks! Summer Camp: Cryptography, Codes, and Crime Scenes!

Université de Moncton, Campus de Shippagan | Échecs et mathématiques : une partie de plaisir!

Western University | CMS Math Camp @ Western

l'Université de Sherbrooke | Camp collégial de l'Association mathématique du Québec (AMQ)

École polytechnique de Montréal | Camp de mathématique au secondaire de l'AMQ

York University | Math Experience at York

University of Alberta | Alberta CMS Regional Camp

University of Prince Edward Island | CMS-UPEI-AARMS Math Camp 2022

University of Manitoba | Math Camp 2022

Yukon University | Kids Program Math Camp

University of Calgary | Math Attack Summer School for Girls

Saint Francis-Xavier University | Connecting Math to Our Lives and Communities (CMTOLC) Summer Math Camp

Queen's University | Math Quest: Queen's Math Camp for Girls

Dalhousie University | Black Educators Association Camp

University of Victoria | Imagining UVIC: Inspiring Mathematical Growth and Intuition in Girls