Canadian Mathematical Society
Société mathématique du Canada

2021 MATH CAMP REPORT

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ABOUT CMS MATH CAMPS & 2021 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 2021 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 2021 increased from 2020, with the CMS offering 6 Regional Camps, 1 National Camp, and 5 Specialty Camps. Close to 210 students from 5 different Canadian provinces participated in the math camps this year. Due to the virtual nature of the camps and limited reporting capabilities, the current report will be quite brief.

There are already 15 Regional Camps, 2 National Camps, and 9 Specialty Camps confirmed for 2022.

REGIONAL CAMPS

There were 6 regional camps offered in 2021, some of which were held online. Please see below for a summary of Regional Camp activities:
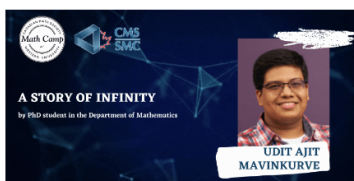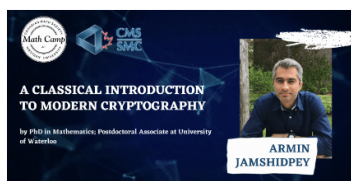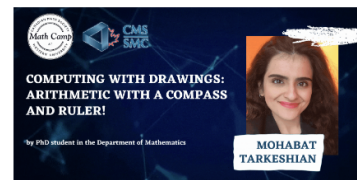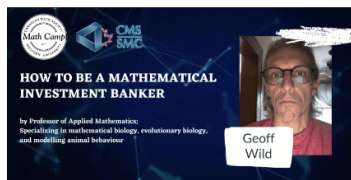
Science Rocks! Days at UFV:
The University of Fraser Valley created Science Rocks! Days, which is a number of one-day events throughout the year to provide youth in grades 6-8 with hands on scientific experiences. These events focus on STEM activities and mathematics is highlighted throughout the program. UFV offers 24 sponsored spots which allow Indigenous Youth to register for the activities at a greatly reduced cost. UFV held the camps in Chilliwack and Abbotsford, British Columbia.

Camps mathématiques UMCS:
The University of Moncton, Shippagan Campus held a successful virtual Math Camp for students entering grades 7 and 8 from July 5 to 9, 2021. A different mathematical theme was discussed each day, with several activities to put what was learned into practice. This camp was offered in French to students in New Brunswick.

CMS Math Camp at Western University:

This year, Western delivered the Math Camp virtually and organized the program from July 27-29. Over these three days, a series of talks were delivered by experienced academics, and individual and team Math competitions were held. Three contests were part of the competitions: enigmatic mornings, cryptographic challenge, and Indianapolis 900. A total of ten students were awarded prizes for their combined scores from all camp contests.

A JOURNEY THROUGH ONE PROBLEM

by Professor of Mathematics at University of Waterloo, Director of the Centre for Education in Mathematics and Computing (CEMC), 2008 recipient of the Distinguished Teaching Award from UW, and 2016 recipient of the Canadian Mathematical Society's Excellence in Teaching Award

IAN VANDERBURGH

HOW TO BE A MATHEMATICAL INVESTMENT BANKER

by Professor of Applied Mathematics; Specialising in mathematical biology, evolutionary biology, and modelling animal behaviour

Geoff Wild

COMPUTING WITH DRAWINGS: ARITHMETIC WITH A COMPASS AND RULER!

by PhD student in the Department of Mathematics

MOHABAT TARKESHIAN

AN INTRODUCTION TO GAME THEORY

by PhD student in the Department of Mathematics

MAYECXILIANA CARDENAS MONTOYA

A CLASSICAL INTRODUCTION TO MODERN CRYPTOGRAPHY

by PhD in Mathematics; Postdoctoral Associate at University of Waterloo

ARMIN JAMSHIDPEY

FOUR OF A KIND

by PhD in Mathematics; instructor in the Department of Mathematics and affiliated colleges

ALLEN O'HARA

A STORY OF INFINITY

by PhD student in the Department of Mathematics

UDIT AJIT MAVINKURVE

SCALABILITY: THE MATHEMATICS OF THE LARGE AND THE VAST

by the host of Data Skeptic, a podcast about data science, statistics, machine learning, and artificial intelligence, all through the eye of scientific skepticism

KYLE POLICH

EXTRAORDINARY

MATHEMATICIANS

LEONHARD EULER

1707 – 1783

He laid the foundation of modern mathematics and revolutionized the use of f(x) to denote a function, Σ to denote a sum, and π to denote the ratio of circumference to diameter in a circle. He was a prolific author with hundreds of published writings. Euler's Identity is described as the most remarkable formula since it connects 5 fundamental mathematical constants. He was also interested in astronomy, devoting considerable attention to developing a more accurate theory of lunar motion.

$$e^{i\pi} + 1 = 0$$

CARL FRIEDRICH GAUSS

1777 – 1855

Often called the "Prince of Mathematics", at the age of 7, he summed the integers from 1 to 100 by noticing that there were 50 pairs of numbers, with each pair sum equal to 101. By the age of 12 he was already analyzing (and critiquing!) Euclidean geometry. He famously noted that "mathematics is the queen of the sciences, and the theory of numbers is the queen of mathematics." He proved the Fundamental Theorem of Algebra and his seminal book laid the foundations for modern number theory.

ÉVARISTE GALOIS

1811 – 1832

He singlehandedly developed group theory, a subfield that underlies all of modern algebra. He did this as part of his proof that there are no analytic solutions to a quintic polynomial equation. Sadly, Galois died in a duel at the age of 20. The night before, he wrote notes connecting what is now called group theory and polynomial roots. This later became known as Galois theory, which fundamentally turns a question about polynomials into a question about symmetries, that is, a question about geometry.

BERNHARD RIEMANN

1826 – 1866
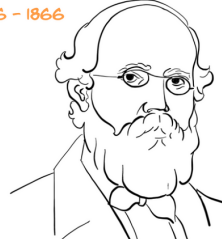
He proposed arguably the most important unproved conjecture in mathematics, the Riemann Hypothesis, that the roots of a special function determine a pattern in the distribution of prime numbers. Although all calculations support this hypothesis, there is no proof of the statement. Much of present-day mathematics relies on its truth. He also introduced ideas in differential geometry, later becoming the mathematical basis for Einstein's theory of general relativity.

SOFYA KOVALEVSKAYA

1850 – 1891

She was the world's first female mathematics professor. Her exposure to mathematics began with access to her father's old calculus notes papered in her nursery. She wanted to study at the University of Berlin, which did not admit female students. After seeing her abilities firsthand, mathematician Karl Weierstrass privately tutored her. She obtained a degree after groundbreaking work. Much of her results led to future discoveries.

DAVID HILBERT

1862 – 1943
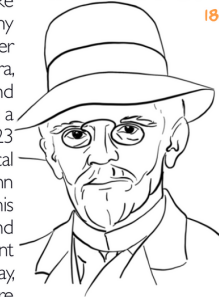
His mathematical genius spoke for itself, with many mathematical terms named after him in commutative algebra, algebraic number theory, and integral equations to name a few. In 1900, he proposed 23 unsolved mathematical problems, including the Riemann hypothesis. He also outlined his philosophy of mathematics and problems that were important to this philosophy. As of today, only 3 of these problems are completely unresolved.

EMMY NOETHER

1882 – 1935

Unable to be a formal student as females were not admitted, she audited her classes. Her fundamental theorem (Noether's theorem) describes how symmetry is at the centre of physical law. She was the first female plenary speaker at the International Congress of Mathematicians (ICM). She devoted her career to seeing math in terms of structures instead of objects. That is, emphasizing the relations between an entire set of objects instead of the objects themselves. Her work continues to influence mathematics research.

PAUL ERDŐS

1913 – 1996
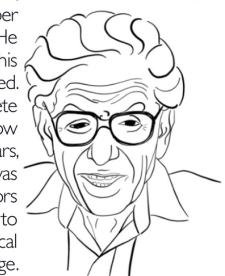
Nicknamed a "freelance mathematician", he was known for his work in number theory, set theory, and combinatorics. He published a whopping 1500 papers in his lifetime, a record that remains unmatched. He championed the idea that complete disorder is impossible: no matter how haphazard a random scattering appears, certain patterns must exist. He was famous for having so many collaborators and posing many questions to collaborators and the mathematical world at large.

ALEXANDER GROTHENDIECK

1928 – 2014

He was a leading figure in the creation of the field of algebraic geometry. His research extended many other areas, including category theory. He is considered (by many) to be the greatest mathematician of the 20th century. He was unique and known for his ability to dive deeply into an area such that its inner workings and patterns would reveal themselves and solutions to old problems would become straightforward.

MARYAM MIRZAKHANI

1977 – 2017

She was the first female recipient of the Field's medal, the most prestigious mathematical award. She contributed significantly to the theory of dynamics and Riemann surfaces. She was known for her ability to push a field in a new direction with a different perspective. She continues to inspire young female mathematicians, an underrepresented group to this day.

SPECIALTY CAMPS

There were 4 specialty camps offered in 2021, some of which were held online. Please see below for a summary of Specialty Camp Activities:

Yukon University Kids Program Math Camps:
In 2021, 815 youth participated in YukonU Youth Moving Mountains STEM programs aimed at 6 to 16-year-olds, including after school clubs and 43 different week-long camps at spring break and summer in Whitehorse and communities beyond Whitehorse. An aspect of the mission of YukonU Youth Moving Mountains is to bring Science, Technology, Trades, Engineering and Math (STEM) to underserved populations. Last year, YukonU youth programs had 40 per cent participation by Indigenous youth overall. This is largely due to camps delivered in partnership with Yukon First Nations across the territory. For the Whitehorse summer camps, Indigenous youth participation was 18 per cent.

Connecting Math to Our Lives and Communities (CMTOLC) Summer Math Camp:
Connecting Math to Our Lives and Communities is organized by St. Francis Xavier University's Faculty of Education and Mathematics Department in cooperation with local Mi'kmaw and African Nova Scotian communities. Topics covered included Math in Nature, Mazes and Labyrinths, and Wayfinding.

NATIONAL CAMPS

CMS National Math Camp:
The CMS National Math Camp was held virtually by the University of Toronto for students in grades 8-10. This camp prepares students for the Canadian Mathematical Olympiad and the International Mathematical Olympiad. The majority of time was dedicated to practicing higher level concepts in Mathematics which are relevant to the contests.

EGMO Training Camp
This camp is focused on training the European Girls Mathematical Olympiad Team. Most of the learning time was dedicated to higher level concepts in Mathematics relevant to the contests. This year's camp took place virtually.