

# 2023 Math Attack Summer Camp for Girls

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Friday, August 18th – Sunday, August 20th, 2023



## 1 Description

The 2023 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, August 13th - Sunday, August 20th. 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 graph theory, topology, data science, statistics, and actuarial science. They investigated how x-ray machines work using tomography techniques, explored the mathematics behind blockchains, and competed in a Crypto Hunt and math-based Escape Room. These sessions exposed students to 14 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, and karaoke.

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

## 2 Schedule

Time	Sunday August 13 <sup>th</sup>	Monday August 14 <sup>th</sup>	Tuesday August 15 <sup>th</sup>	Wednesday August 16 <sup>th</sup>	Thursday August 17 <sup>th</sup>	Friday August 18 <sup>th</sup>	Saturday August 19 <sup>th</sup>	Sunday August 20 <sup>th</sup>	
8 – 9am		Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Checkout + Breakfast	
9 – 10:15am		Cryptology (Lauren DeDieu)	Sharing Secrets (Tahera Fahimi)	Unleashing the Power of Computational Thinking: Empowering Girls in a Digital World (Mary Grant)	Callysto Hackathon	Finish Packing (9 – 9:45am)	Mathematical Communication (Lauren DeDieu)	Cryptology (Lauren DeDieu)	
10:15 – 10:30am		Break	Break	Break	Break		Bus to Banff (9:45am)	Break	Break
10:30 – 11:45am		Crossing Bridges (Ryan Hamilton)	A Quick Look at Blockchains (Sepideh Avizheh)	An Introduction to Tomography (Tracey Balehowsky)	Callysto Hackathon	Explore Banff (participants purchase their own lunch)		Mathematical Card Tricks (Lauren DeDieu)	Feedback + Closing Ceremony
11:45am – 1pm		Lunch	Lunch	Lunch	Lunch	Hike (Tunnel Mountain)	Group Photo + Lunch	Lunch	
1 – 2:15pm		Topology (Rachel Hardeman Morrill)	Walk the Line (Madeline Ward)	The Crypto Hunt (Taylor Markham)	Callysto Hackathon		Escape Room (Dami Wi)		Bus to Calgary (1pm)
2:15 – 2:30pm		Break	Break	Break	Break				Departure (International House)
2:30 – 3:45pm		Finite State Automata (Ryan Morrill)	Walk the Line (Madeline Ward)	The Crypto Hunt (Taylor Markham)	Callysto Hackathon	Feedback			
3:45 – 4pm		Break	Feedback	Feedback	Feedback				
4 – 5:30pm			Actuarial Science (Ella Charpentier)	Free Time	Free Time	Free Time	Check-in/ Free Time	Free Time	
	Feedback (5:15 – 5:30pm)								
5:30 – 6:30pm		Dinner	Dinner	Dinner	Dinner	Dinner	Dinner		
6:30 – 9pm	Arrival (6:30 – 7:30pm, International House)	Walk	Board Games	Sports	Movie	Origami (Dami Wi)	Walk (Bow Falls Trail)		
	Ice Breaker Activities (7:30 – 9pm, MS 431)								

## 3 BIRS Highlights

During the BIRS portion of the camp, the focus was on helping students develop their mathematical logic and communication skills. Sessions began on Friday night with a session led by Dami Wi where students explored the mathematics behind origami. The focus of Saturday morning was mathematical communication. Since many K-12 math classes do not emphasize communication, this concept was new to many students. We discussed the importance of communicating results precisely, using correct notation and prose to help the reader navigate. Students then broke into teams and went to the breakout rooms in the basement of BIRS to solve mathematical logic problems and write their solutions as elegantly as possible; students then ranked the other groups' solutions based on the quality of communication and Dr. Lauren DeDieu ranked them as well and provided feedback. At the end of the session, a winner was announced. Afterwards, students continued to develop their mathematical proof-writing skills by learning mathematical card tricks and working to explain why the tricks work.



On Saturday afternoon, students engaged in a 3-hour-pirate-themed mathematical escape room designed by Dami Wi. Stations were set up at various outdoor locations at the Banff Centre (e.g., Shaw Amphitheater, outside of the TransCanada Pipelines Pavilion). At each station, students completed a mathematical puzzle then moved to the next station. The goal was to figure out the route to *Treasure Island*.

On Sunday morning, students engaged in a modern cryptology session led by Dr. Lauren DeDieu, where they learned about the RSA public-key cryptosystem and the number theory needed to understand why it works (e.g., multiplicative inverses, Euler's Theorem). The day wrapped up with a Closing Ceremony where students were awarded certificates and prizes.

Over the weekend, students also took some time to explore the town of Banff. On Friday afternoon we hiked up Tunnel Mountain, and on Saturday evening we went for a walk along Bow Falls Trail.

## 4 Outcomes of the Meeting

This camp helped inspire our female participants to pursue their passion for mathematics by making connections with female role models and peers who share similar interests. This is reflected in the following quotes from our participants:

- It was encouraging for me to meet more girls that excel in STEM. We really bonded over the course of this camp by working on challenges together and talking about similar interests.
- I really enjoyed attending this camp. I learned a lot, and my appreciation for mathematics grew beyond measure. Leaders were so amazing, impactful, inspiring and insightful. I wish I never had to leave, I had such a blast!
- I am extremely grateful for the opportunity to attend this camp. I was able to connect with people who I wouldn't have met otherwise as they came from all over Alberta and we attend different schools. I was able to make friends who I intend to keep in contact with even after the camp is over. After I complete high school, I would like to attend the University of Calgary, and this program allowed me to meet professors that I may meet again in a class a couple years down the road. Additionally, this has given me insight into what's in store for me in classes like this.
- Before I came to camp, I thought math was anything to do with numbers, if there were numbers it was math, if there weren't numbers, it wasn't math. But I realized that math is everywhere, even the smallest thing in the whole universe is math. Before I didn't know if I would be interested in math, but now I know even if I don't like one small thing about math, there are so many more things I can do in the math field.
- This camp reinforced the idea that mathematics is such a field of various areas, and ties in with so many different applications, pretty much anywhere within our world. We use mathematics to understand, describe, develop and sharing knowledge about our world, and it connects everyone no matter race, gender, religion, or sexuality, math is inclusive!



- Prior to this camp, I thought that math was only about numbers and performing complicated calculations. However, I learned that excelling in mathematics also requires good communication skills thanks to Dr. DeDieu. I also rarely connected math with the medical field, but I learned about how CT scans require geometry through our tomography session with Tracey Balehowsky.
- This camp has shown me that math extends beyond the classroom, and plays a vital role in many of my hobbies. From robotics to math puzzles, this camp has done a fantastic job of balancing the realistic applications of mathematics, with the recreational side that makes people fall in love with math to begin with.
- This camp provided an environment that was inclusive and open. All the chaperones and speakers were brilliant and encouraging, which definitely did inspire me to explore my own passions for STEM opportunities.
- Originally, I had no idea about the numerous branches under mathematics that we studied in this camp. Throughout this week, I was able to explore so many interesting topics that I would never have the chance to otherwise.
- At this camp, I met many likeminded peers with whom I have developed strong connections and relationships with, and will stay in touch with for many years to come. I will leave this camp better aware of the different areas of mathematics and possible applications. I believe that a good balance of these outcomes were met, as we learnt so much, and were encouraged to get excited about mathematics in a lighthearted real-world way.
- The people I met at this camp are just as passionate about math and I have formed many connections with my peers over the course of the week. Additionally, being able to enjoy math and excelling and studies without feeling embarrassed or ashamed was really nice.



## 5 Additional Information

Additional photos and information about the camp can be found in the *Final Report* that is available here: <https://science.ucalgary.ca/mathematics-statistics/engagement/educational-outreach/math-attack>.