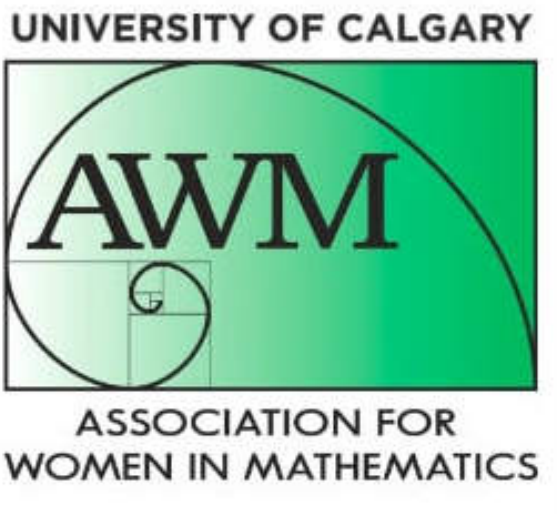
The University of Calgary Student Chapter of the Association for Women in Mathematics(AWM) Presents:

University of Calgary 2019 Sonia Kovalevsky Day (SK Day)

Event Sponsors: Pacific Institute for the Mathematical Sciences (PIMS),
University of Calgary Faculty of Science IDEAS Fund



1 Event Description

Sonia Kovalevsky Days have been organized by the Association for Women in Mathematics for more than 20 years across the United States. Sonia Kovalevsky Days have consisted of a program of workshops, problem-solving competitions for female high school and middle school students. The purpose of Sonia Kovalevsky Days are to encourage young women to continue their study of mathematics and to encourage colleges and universities to develop more extensive cooperation with middle schools and high schools in their area.

The University of Calgary 2019 Sonia Kovalevsky Day will focus on answering the question *where is math in the world*, *interdisciplinary mathematics*, and *communicating math*.

The students will start their day by collaboratively brainstorming about where they think math is in the world. Students will then engage in a workshop with Dr. DeDieu on how to communicate mathematics in a written form. Then, in teams of 5, students will be attending one of the eight following lectures:

- *Zeno's Paradox with Infinite Sums* (Algebra): Dr. Ryan Hamilton
- *Triangles that Hide on Spheres* (Topology): Dr. Kristine Bauer
- *Group Theory and the Internet* (Cryptography): Dr. Joel Reardon
- *Searching for Primes with Eratosthenes* (Number Theory): Dr. Jerrod Smith
- *Graph Theory and Euler's Formula* (Graph Theory): Mr. Ryan Morrill
- *Conquering Coding in Data Science* (Data Science): Ms. Katherine Burak
- *Discovering the Wind Patterns of Alberta* (Statistics): Dr. Deniz Sezer
- *Correcting Errors in Transmission* (Coding Theory): Mr. Randy Yee

Next, students will experiment on the problem presented in their lecture with student mentors. Students will then create trifolds and a small presentation on their mathematical exploration. Finally, the day will be open to parents of the students, and students will partake in a mini-research fair and present their findings.

2 Goal

The University of Calgary Sonia Kovalevsky Day will exist as an opportunity for professional mathematicians to collaborate with and mentor undergraduate and graduate students, as they run an event for potential female high school mathematicians, that will inspire a sense of belonging in the mathematics community, a greater appreciation for mathematics, and build written, verbal, and exploratory mathematics skills.

3 Participation

There will be a maximum of 80 female high school students participating in the University of Calgary Sonia Kovalevsky Day. The students will be invited from sixteen high schools across Calgary and in the surrounding areas.

4 Volunteer Description

4.1 General

General volunteers for the event will be helping out with general logistics of the event. General logistics includes but is not limited to the following: setting up food, creating lanyards, moving furniture, general information, running lost & found, and distributing crafting materials.

4.2 Student Mentor

Student mentors will be assigned to a specific lecturer before SK-Day in order to assist in the creation of material, learn the required content, and maintain content familiarity in preparation for the SK Day. During SK Day, student mentors will work with teams assigned to their lecturer, in order to assist in their exploratory math experience, and tri-fold creation.

4.3 Co-curricular Credit

The University of Calgary Co-Curricular Record (CCR) is an official document which recognizes a student's out-of-classroom experiences that are still connected to the university. When coupled with the academic transcript of a volunteer, the CCR will provide a holistic view of the overall student experience at UCalgary that can help set a volunteer apart from the competition when they graduate.

Students volunteering for SK Day in excess of 20 total hours will qualify for co-curricular credit. Co-curricular credit will be tracked by the AWM executive, and reported to the Students' Union (SU) before April 30, 2019.

5 Lecturer

5.1 General

General lecturers will be providing a 30 min. introductory lecture to the domain and problem that student teams will be working in. Lecturers should have enough material for students to work with for a period of 120 minutes, and present a problem that students will be able to create a write-up and presentation for hands on experimentation or discovery activities for roughly two hour sessions.

5.2 Plenary Math Education

The plenary written math workshop will be a 30 minute workshop with the high school students on how they should approach communicating mathematics in a written and verbal format.

6 Schedule

0900 Check-in
0930 Opening Remarks & Ice-Break Activity (Where is Math in the World?)
1015 Plenary Written Math Workshop - Lauren Dedieu
1045 Coffee Break
1115 Workshop:
1. Kristine Bauer (Toplogy): *Triangles that Hide on Spheres*
2. Ryan Hamilton (Algebra): *Zeno's Paradox with Infinite Sums*
3. Randy Yee (Coding Theory): *Correcting Errors in Transmission*
4. Jerrod Smith (Number Theory): *Searching for Primes with Eratosthenes*
5. Ryan Morrill (Graph Theory): *Graph Theory and Euler's Formula*
6. Deniz Sezer (Statistics): *Discovering the Wind Patterns of Alberta*
7. Joel Reardon (Cryptography): *Group Theory and the Internet*
8. Katie Burak (Data Science): *Conquering Coding in Data Science*

1200 Lunch
1300 Group Work
1430 Coffee Break
1500 Create Presentations & Build Tri-folds
1600 Mini Research Fair (Parents welcome)
1630 Presentations & Closing Remarks
1730 Conclusion of SK Day

7 Participation Items

All students will be provided with a custom SK Day shirt, pen, and notebook as a reminder of their participation in the University of Calgary 2019 SK Day. All lecturers and volunteers will be provided with a custom SK Day shirt to help identify them as University of Calgary SK Day volunteers, and to express gratitude for their assistance in creating the event.

8 Photo Release Forms

Students and volunteers for the University of Calgary 2019 SK Day will be provided with a photo release form prior to their participation in the event that requests SK indication of their individual photo consent or the consent of their parental guardian for usage by the AWM.

9 Tangible Outcomes

Knowledge

- Students will learn about domain-specific applications of mathematics.
- Students will learn about Sonia Kovalevsky and other women in mathematics.
- Students will learn technical skills pertaining to their domain-specific problem.

Skills

- Students will improve their written mathematical communication skills.
- Students will improve their verbal mathematical communication skills.
- Students will learn how to approach a mathematical problem with an exploratory methodology.

Attitudes

- Students will develop the attitude that mathematics is inclusive.
- Students will see mathematics as intrinsically valuable and fun.
- Students will see mathematics as a useful pursuit for their career and life.

10 How to Measure Outcomes

Students will be provided a survey at the end of their tri-fold and presentation creation. Qualitative questions will include:

- What did you think of mathematics before attending SK Day?
- What did you learn about verbally communicating mathematics?
- What did you learn about communicating mathematics in a written form?
- What did you learn about where math is in the world?
- Did you enjoy your time at SK Day?
- Did this experience alter your perspective on women in mathematics? Explain.

11 Technology/Materials

The data science and statistics workshops will be conducted in computer labs within the mathematical sciences building. The students working in the computer labs will be working with RStudio, and all students will be using computers to print materials for their tri-folds. In addition to aforementioned participation items, students will be provided with materials for building tri-folds, team lanyards, and any additional materials deemed necessary by workshop leaders.

12 Diversity

All 80 student participants invited to SK Day will identify as female, the majority of student mentors identify as female, and $\sim 40\%$ of the lecturers are female identifying. Participants will be invited from a wide variety of socioeconomic, cultural, and educational backgrounds.