My First SNAP Math Fair at the University of Calgary

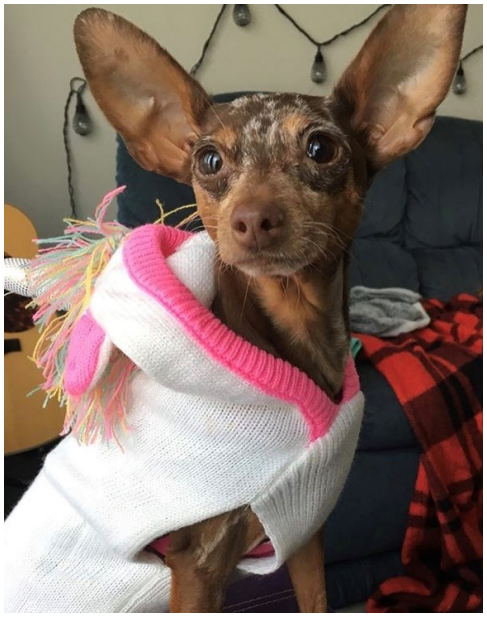
Lauren DeDieu
Associate Professor (Teaching)
University of Calgary

Ted Lewis SNAP Math Fair Workshop
BIRS
Apr. 28th – 30th, 2023

Introduction:

- Lauren DeDieu (she/her), Associate Professor (Teaching)

Originally from Cape Breton, N.S.



This is my dog, Trinity.

Introduction:

At the University of Calgary, I regularly coordinate:

- MATH 265: University Calculus I (~1200 students in Fall)

I regularly teach:

- MATH 265: University Calculus I (~350 students)
- MATH 311: Linear Methods II (~120 students)
- MATH 205: Mathematical Explorations (~100 students)
- MATH/EDUC 305: Inside Mathematics (~50 students)

MATH 205 – Mathematical Explorations

MATH 205 – Mathematical Explorations

Course Description:

- A mathematics appreciation course.
- Almost all students in the course plan on becoming elementary school teachers or junior/high school math teachers.
- A terminal course with no pre-requisites.
- Topics selected by instructor.
- ~100 students.

MATH 205 – Mathematical Explorations

Course Outcomes: I want students to…

- Leave the course with a new **appreciation** for the beauty and importance of mathematics so that they feel inspired to share their passion with their future students.
  - Positive feelings/attitudes about math.
  - Identify math in the 'real world'.
- Develop their **quantitative reasoning** skills.
  - Logic
  - Numbers
  - Data
  - Percentage Change
  - Probability
  - Cryptology

MATH 205 – Mathematical Explorations

Course Structure:

- Course Engagement (25% …in-class activities 15%; final reflection 10%)
- Homework (25% …best 6 of 7)
- Financial Project (25%)
- SNAP Math Fair (25%)

MATH 205
SNAP Math Fair

MATH 205 SNAP Math Fair

Overview:

- In this project, you and your partner will create an engaging math puzzle display and will present it to grades 4 - 6 students during our SNAP Math Fair event. Afterwards, you will create a Project Report that summarizes your display. These Project Reports will be compiled into a single document and shared with the class.
- Since students worked in pairs, we had about 50 projects.

MATH 205 SNAP Math Fair

Deadlines:

- Mar. 1st: Pick a Partner

SNAP Math Fair: Pick a Partner

Prior to the SNAP Math Fair, you'll present your puzzle to Lauren to ensure that it's ready to go. The group number you choose will correspond to the practice time in Column A. **Please ensure that you and your partner are available at that practice time.**

The SNAP Math Fair event will run from 11am - 1pm on **Wed. Mar. 22nd** in the **Gold Gym**. During this time, elementary school students will be visiting your projects. **At least one of you must be available from 12 - 1pm** so that there is someone at your table for the duration of the event. Please choose your partner accordingly.

We will begin setup at 10am. At 1pm, we will tear things down and put the tables away. Please indicate below which partners will be available each hour.
(*Note that 11am - 12pm is not listed, because this is our class time, so I know that everyone is available then.*)

Practice Session with Lauren	Group Number	Group Member 1 (Full Name)	Group Member 2 (Full Name)	Groups Members available 10am - 11am (Setup)	Groups Members available 12-1pm (Second Hour of Event)	Groups Members available 1-2pm (Tear Down)
#1 Wed. Mar. 15th 2-3pm MS 427	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					

MATH 205 SNAP Math Fair

Deadlines:

- Mar. 1st: Pick a Partner

If you don't have a partner, please complete this form so that I can match you with somoene.

Prior to the SNAP Math Fair, you'll present your puzzle to Lauren to ensure that it's ready to go. The group number you choose will correspond to the practice time in Column A. **Please ensure that you and your partner are available at that practice time.**

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We will begin setup at 10am. At 1pm, we will tear things down and put the tables away. Please indicate below which partners will be available each hour.

Full Name	**Please indicate all "Practice Session with Lauren" times you're available** Note that the "Pick a Partner" tab has these times in Column A and each has an associated number (e.g., #1). List the numbers for the sessions you're available. i.e., If you're available for all, you'd write #1-6.	**Are you available 10am - 11am (Setup)?**	**Are you available 12-1pm (Second Hour of Event)?**	**Are you available 1-2pm (Tear Down)?**

MATH 205 SNAP Math Fair

Deadlines:

- Mar. 1st: Pick a Partner
- Mar. 8th: Pick a Puzzle

SNAP Math Fair: Pick a Puzzle

Note that we only want at most two groups doing the same puzzle, so please **check this list before you submit your preference to ensure that your puzzle isn't taken.**

Date *(Please include the date when you submitted your puzzle choice below.)*	**Group Number** *(Please double-check the "Pick a Partner" form to find your group number.)*	**Group Member 1 (Full Name)**	**Group Member 2 (Full Name)**	**Title of Preferred Puzzle**	**Puzzle Prompt**	**Link to the source wh**
Mar. 3	**1**			Magic Triangles	students to arrange the numbers one to six in a triangle wh	https://www.prodigygame.
Feb 25th	**2**			Cherry Glasses (renamed "Free	The toothpics in the picture form two glasses. Can you get the	https://www.mathfair.com/
	3			Sam's House	Sam, Ruff, and Lady are three dogs whose houses are inside a	https://www.mathfair.com/
	4			Bread and Butter Politics	Two factions are trying to get votes, with seats ranging from 1-7 each seat has as many votes. Determine a way for the seats to be divided that one side has more votes, but if they lose anyone of their seats the other faction will win, can be made harder with the inclusion of a third faction and adding the numbers 8&9	https://galileo.org/math-fai

MATH 205 SNAP Math Fair

Deadlines:

- Mar. 1st: Pick a Partner
- Mar. 8th: Pick a Puzzle
- Mar. 15th – 20th: Practice Session with Lauren
- Mar. 17th/20th: Dress Rehearsal in gym
- Mar. 22nd: SNAP Math Fair, 11am – 1pm
- Mar. 29th: Project Report due

Instructions Provided to Students

MATH 205 SNAP Math Fair: Instructions

The instructions I provided students were inspired by the "The college SNAP math fair" document that Sean Graves shared with me, and from the talks at the 2022 Ted Lewis SNAP Math Fair Workshop.

MATH 205 SNAP Math Fair: Instructions

What is a SNAP Math Fair?

A SNAP Math Fair resembles a science fair in appearance (e.g., tabletop displays), but each display offers an intriguing math-based puzzle for the visitors to try. This event aims to engage students in a meaningful, immersive, non-competitive problem-solving experience.

To learn more about SNAP Math Fairs, please see the SNAP Math Fair website.

MATH 205 SNAP Math Fair: Instructions

The outcomes of our SNAP Math Fair include:

- Fostering a sense of excitement and positive feelings about mathematics in our visiting elementary school students by offering immersive problem-solving experiences.
- Inspiring visiting elementary schools to hold a SNAP Math Fair at their own school one day.
- Providing the future elementary school teachers in our class with the resources and experience they need to successfully run a SNAP Math Fair in their future schools.

MATH 205 SNAP Math Fair: Instructions

Creating Your Puzzle & Display:

Puzzle Guidelines: Do some research (*e.g., in puzzle books, online*) to find a good problem. Here are some guidelines:

- The puzzle must be interesting, doable, and have a mathematical flavour. (*You may not choose Spoke Sums, since we already investigated this puzzle in Homework 4*.)
- It must be logic-based. (*No arithmetic*!)
- Your puzzle must be accessible to grades 4 - 6 students. (*You may need modify the puzzle so that it is*.)

MATH 205 SNAP Math Fair: Instructions

- The puzzle must have clear and easy instructions. (*Don't choose something that is complicated to explain*.)
- The puzzle must have a hands-on component that uses manipulatives. (*You may need to modify it so that it does*.)
- The puzzle prompt should be modified to align with our math fair theme: *Under the Sea*.

MATH 205 SNAP Math Fair: Instructions

- You must create several versions of your puzzle so that you can scale the difficulty up or down.

  For example, your prompt may communicate the "hard" version of the puzzle and then you have hints prepared to bring it down to a "medium" or "easy" level. Or, perhaps you create several versions of your puzzle that vary in difficulty (*e.g., 4x4 vs. 8x8 checkerboards, versions of a puzzle where several pieces are already in place which makes it easier, etc*.)

MATH 205 SNAP Math Fair: Instructions

- Important: In your display, do NOT identify the puzzle versions as easy/medium/hard and do NOT indicate a grade level. (*Using such labels can lead to students experiencing negative feelings if they, for instance, have trouble solving the "easy" puzzle*.)

- Don't underestimate the students!

- Here are some potential resources for finding a puzzle. (*Please note that you may use other resources, but you are not permitted to create your own puzzle from scratch*.)

  SNAP Math Fair: Puzzles, Galileo: Math Fair Problems, Think Fun, SNAP Math Fair Booklet

MATH 205 SNAP Math Fair: Instructions

Display Guidelines: Your display will communicate your intriguing math-based puzzle and provide space for visitors to try it.

It should be highly interactive so that both you and the visitors can enjoy!

Your display should consist of a poster and a playing board that can both fit on a 2.5 x 6 foot table.

(Note that we may have space for a few larger displays such as floor displays. If you would like to request more space for your display, please email Lauren.)

MATH 205 SNAP Math Fair: Instructions

Display Guidelines: Your **poster** should be

- colourful and eye-catching (*the intention is to draw students in*)
- decorated to align with the theme (*Under the Sea*)
- the printing on your poster should be large, clear, and easy to read. (*Avoid using too much text. See here for an example of an effective and less effective poster.*)

Image from "The college SNAP Math Fair" document.

MATH 205 SNAP Math Fair: Instructions

Display Guidelines: The **playing board** component of your display should

- explain the puzzle with clear and easy instructions.
- involve manipulatives (*e.g., puzzle pieces, tokens*). Please note that these manipulatives should be appropriate in size/durability (*i.e., nothing too small/intricate/flimsy, nothing dangerous*).
- have several copies of your puzzle so at least four students can attempt it at the same time.

MATH 205 SNAP Math Fair: Instructions

Display Guidelines:

- Your display should NOT contain the solution to your puzzle.
- Your display may not include prizes and should not include anything that can make a mess (*e.g., no food/water/glitter*).

MATH 205 SNAP Math Fair: Instructions

Presentation Guidelines:

- You should be able to explain the problem verbally to visitors so that it is clear and easy to understand.
- You should be actively engaged with visitors.
- You should offer visitors the scaled up or scaled down version of your puzzle based on their engagement (*see Puzzle Guidelines above for more information*).

MATH 205 SNAP Math Fair: Instructions

Project Report:

In your Project Report you will summarize your display.

These Project Reports will be compiled into a single document and shared with the class. (*If you do not feel comfortable having your report shared with the class, please email Lauren*.)

We hope that the future teachers in our class may find this document useful if they choose to host a SNAP Math Fair at their own school one day!

MATH 205 SNAP Math Fair: Instructions

Project Report Structure: Your report should be structured as follows (in this order):

- Name of Puzzle (*in big font; this is the title. If you modified the original title to align with the theme, use this modified title and note the original title in the "Puzzle Source" section below.*)
- Names of Group Members (*leave this blank if you'd like to remain anonymous in the shared report*)
- Puzzle Prompt (*Include the prompt you actually used at the math fair. e.g., if you modified the original prompt to align with the theme, use the modified prompt. Your prompt may include an image, if the image is part of the instructions. e.g., The puzzle Spoke Sum contains two images in the prompt: Spoke Sum.*)

MATH 205 SNAP Math Fair: Instructions

- Puzzle Source *(cite the original puzzle title and where the puzzle was found)*
- Puzzle Solution
- Scaling the Puzzle Up and Down

  Describe how you scaled the puzzle up and down for various age groups and abilities. Please be specific. (e.g., If you gave hints or had different versions of the puzzle, describe these in detail here.)

MATH 205 SNAP Math Fair: Instructions

- Puzzle Display

  Include a picture of your display (*poster, puzzle board*). The picture should adequately capture the entire display, but if the picture is missing something, please complement it with a description. *(You and/or your partner may be in the picture if you're comfortable with it. Please ensure that no one else is in your photo.)*

- Reflection

  Reflect on how your puzzle worked as a math fair project. What aspects worked particularly well? If you had it to do over, what would you change?

MATH 205 SNAP Math Fair: Instructions

Please do NOT include the following in your report:

- Student ID *(...these reports will be compiled into a single document and shared with the class, so your student ID shouldn't be on the document*).
- Page Numbers

MATH 205 SNAP Math Fair: Instructions

Submission Instructions:

- Your report should be 2 - 3 pages (*not including pictures*).
- Please organize your report using the following subheadings: Solution, Scaling the Puzzle Up and Down, Display, Reflection. *(The title, group members, prompt, and source occur at the beginning and should not be under subheadings.)*
- Submit to Gradescope by Wed. Mar. 29th, 11:59pm MDT. Only one group member should submit and must add their partner to their group.

MATH 205 SNAP Math Fair: Instructions

Rubric:

Attribute	Criteria	Exceeds Expectations (10 points)	Meets Expectations (8.5 points)	Partially Meets Expectations (7 points)	Needs Improvement (5 points)
Puzzle	The puzzle is logic-based, accessible to gr. 4-6 students, has clear and easy instructions, and aligns with theme. There are several versions of the puzzle so that the difficulty can be scaled up/down.	The attribute criteria are **fully** addressed, and the puzzle **exceeds** expectations.	The attribute criteria are **fully** addressed, and the puzzle **meets** expectations.	The attribute criteria are **mostly** addressed, and the puzzle **partially meets** expectations.	The attribute criteria are **somewhat** addressed, and the puzzle **needs improvement**.
Display	The poster is eye-catching, aligns with the theme, and has large/clear printing. The playing board involves manipulatives, has clear/easy instructions, and contains several puzzle copies so that at least four students can engage simultaneously. The display does not contain the solution, prizes or anything messy, and does not identify the difficulty of the puzzle versions.	The attribute criteria are **fully** addressed, and the display **exceeds** expectations.	The attribute criteria are **fully** addressed, and the display **meets** expectations.	The attribute criteria are **mostly** addressed, and the display **partially meets** expectations.	The attribute criteria are **somewhat** addressed, and the display **needs improvement**.
Presentation	Presenters are prepared to scale puzzle up/down, are actively engaged with visitors, and can clearly explain the problem verbally.	The attribute criteria are **fully** addressed, and the presentation **exceeds** expectations.	The attribute criteria are **fully** addressed, and the presentation **meets** expectations.	The attribute criteria are **mostly** addressed, and the presentation **partially meets** expectations.	The attribute criteria are **somewhat** addressed, and the presentation **needs improvement**.
Project Report	The Project Report follows the submission guidelines (e.g., 2-3 pages, order, subheadings) and all components are clearly and accurately communicated with an appropriate amount of detail (e.g., name, prompt, source, solution, scaling, display, reflection).	The submission guidelines are **fully** addressed and the clarity, accuracy, and detail ***exceed*** *expectations*.	The submission guidelines are **fully** addressed, and the clarity, accuracy, and detail ***meet*** *expectations*.	The submission guidelines are **mostly** addressed, and the clarity, accuracy, and detail ***partially meet*** *expectations*.	The submission guidelines are **somewhat** addressed, and the clarity, accuracy, and detail ***need improvement***.

Setting the Stage for the SNAP Math Fair

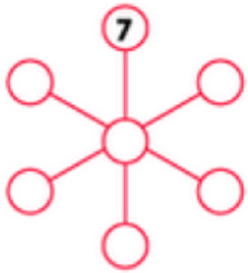
MATH 205 SNAP Math Fair: Setting the Stage

To prepare for the SNAP Math Fair and to help communicate expectations, I created the following homework set. Take a few minutes to give it a try.

Homework 4 – due Mar. 1st (*three weeks before fair*)

For the questions below, please consider the following SNAP Math Fair Problem[1]:

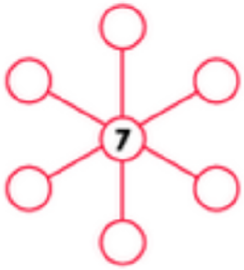
Spoke Sums

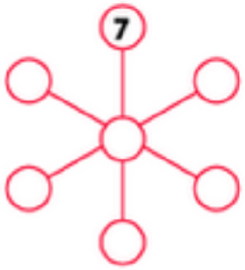


Place the numbers from 1 to 6 in the circles so that every three numbers in a straight line have the same sum.

MATH 205 SNAP Math Fair: Setting the Stage

Spoke Sums





Place the numbers from 1 to 6 in the circles so that every three numbers in a straight line have the same sum.

1. (2 pts) Find a solution for each wheel.

2. (5 pts) Are your solutions unique? If yes, then fully explain why. If no, then explain what the other solutions are and explain why these are the only solutions. *(Hint: A lot of explanation is required to answer this question fully.)*

MATH 205 SNAP Math Fair: Setting the Stage

3. (7 pts) Before attempting this question, please carefully read through the *Creating Your Puzzle and Display* section of the SNAP Math Fair page on D2L.

   (a) Note that in the *Display Guidelines* for our SNAP Math Fair, we say:

   > *The playing board component of your display must involve manipulatives (e.g., puzzle pieces, tokens). Please note that these manipulatives should be appropriate in size/durability (i.e., nothing too small/intricate/flimsy, nothing dangerous).*

   If *Spoke Sums* was your puzzle for the SNAP Math Fair, explain what your display (poster and playing board area) would look like. How would you incorporate manipulatives into your display?

MATH 205 SNAP Math Fair: Setting the Stage

(b) In the *Puzzle Guidelines* for our SNAP Math Fair, we say:

> *You must create several versions of your puzzle so that you can scale the difficulty up or down. For example, your prompt may communicate the "hard" version of the puzzle and then you have hints prepared to bring it down to a "medium" or "easy" level. Or, perhaps you create several versions of your puzzle that vary in difficulty (e.g., 4x4 vs. 8x8 checkerboards, versions of a puzzle where several pieces are already in place which makes it easier, etc.)*

For this *Spoke Sums* puzzle, how would you scale the difficulty up or down? Describe in detail the several versions of the puzzle you would have if this were your SNAP Math Fair puzzle, and how you would introduce these puzzle versions during the fair. What would you do if a student was having a difficult time with your puzzle? What would you do if a student easily solved your puzzle right away? How would you keep them entertained?

Practice Sessions/ Dress Rehearsals

MATH 205 SNAP Math Fair: Practice Sessions

I wanted to see every project before the event, so I had students signup for a practice session with me in the week leading up to the event.

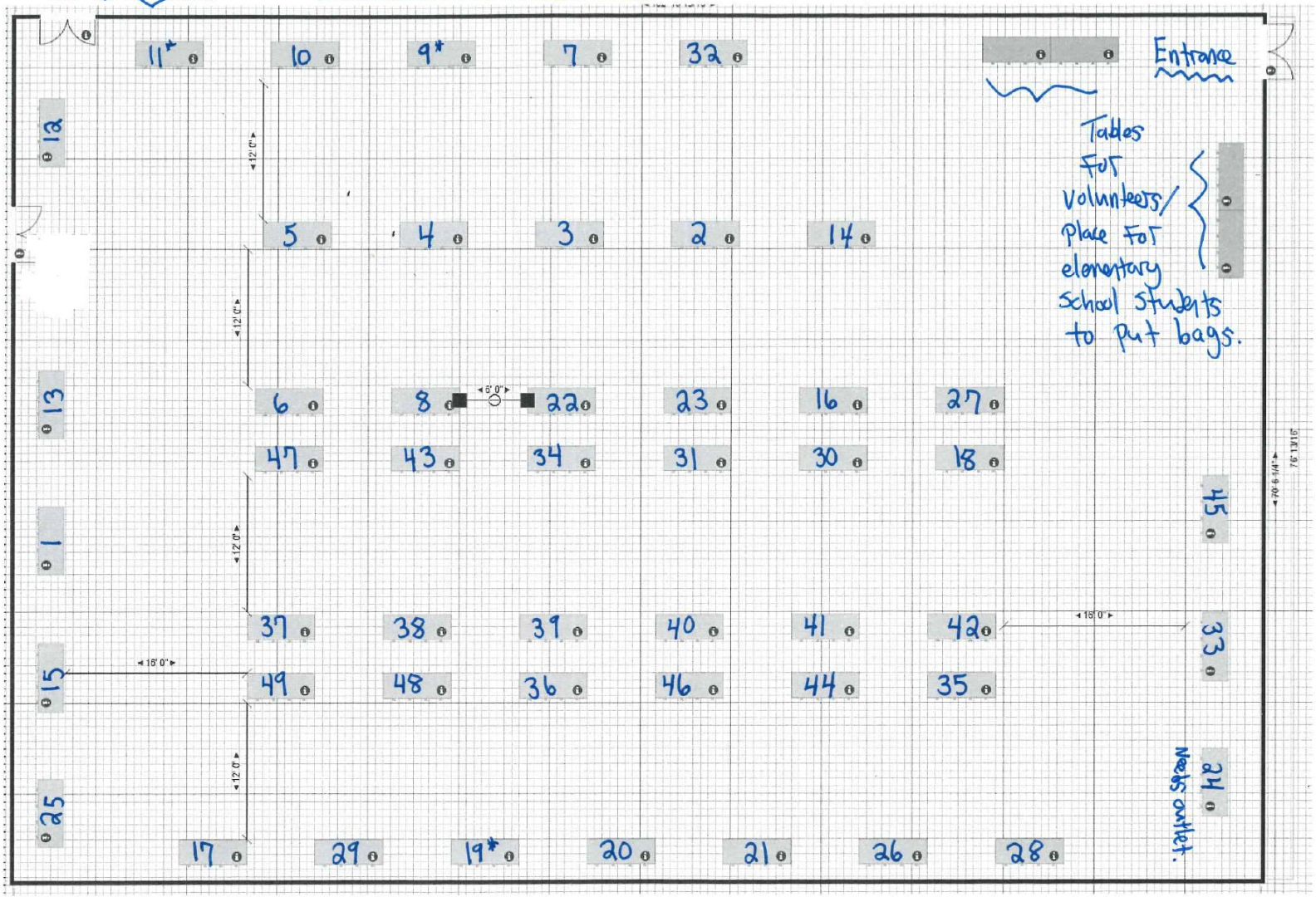
- 6 one-hour sessions
- each session had 8 groups
- aimed to spend ~6 minutes per project
- would have 4 groups presenting and the others visiting/providing feedback. Halfway through we'd switch.
- students were told that their projects should be complete by this session.

MATH 205 SNAP Math Fair: Dress Rehearsals

The fair was held in the Red Gym on campus. We held two dress rehearsals during class time.

- During the first dress rehearsal, all groups set up their table to ensure that the floor plan worked.
- Half of the groups presented at the first dress rehearsal, and the other students tried their puzzles and provided feedback. For the second dress rehearsal, they swapped roles.
- I had my TA there during the dress rehearsals to help get things set up.

Gold Gym Tables are 2.5 x 6 ft.



In each row, the spacing between tables is 6ft (one table length).

SNAP Math Fair: Event Day

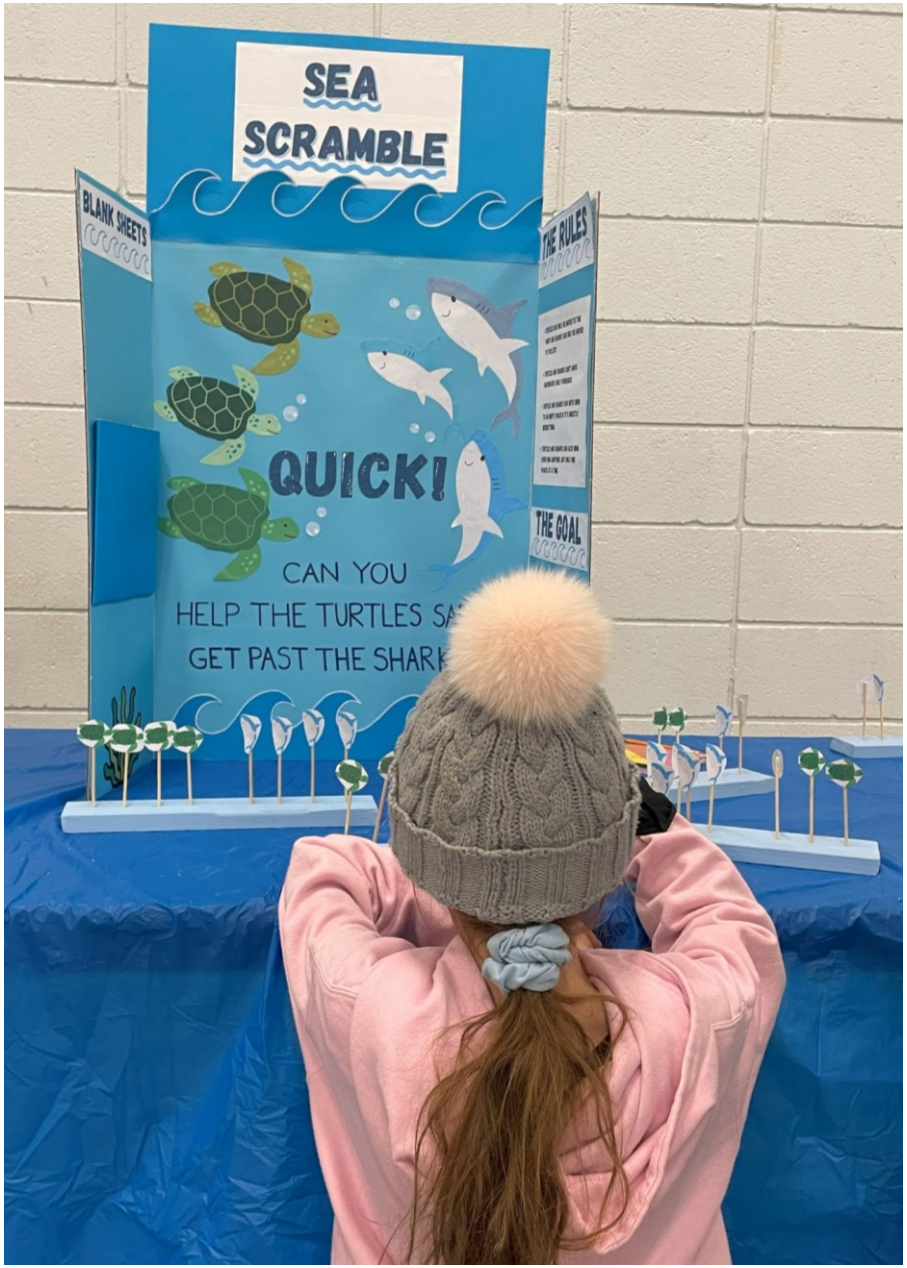
MATH 205 SNAP Math Fair: Event Day

I invited ~200 grades 4 – 6 students from four Calgary elementary schools to participant in the event.

(…I advertised to schools through the math specialists and accepted on a first-come-first-served basis. There are over 2000 students from 34 schools on the waitlist.)

- Event: 11am – 1pm
- Students/Volunteers arrived at 10am to begin setting up.

… it went great!


SEA SCRAMBLE
BLANK SHEETS
THE RULES
QUICK!
CAN YOU
HELP THE TURTLES SA
GET PAST THE SHARK
THE GOAL


HELP OUR
FISHY FRIENDS
Help!!!
There was a big storm and these fishy friends lost their accessories
Instructions
Help our fishy friends collect their accessories throughout the maze
You must only go through each door once
FINN PATRICK SHELLY
PATRICK
SHELLY

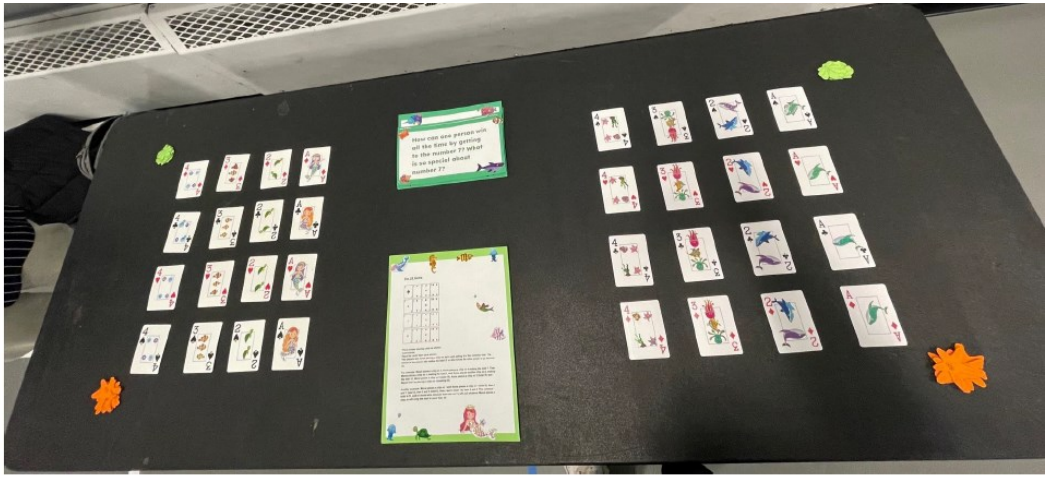

ARIEL'S
SEASHELLS
Puzzle Instruction


THE
PILLARS
OF
ATLANTIS
RULES!


1 km
DO YOU HAVE CORAL REEFS THAT ARE _ KM APART?


JELLYFISH JUMP
Can you help the jellyfish swap places and get to the other side of the reef?
23
Jenna & Sierra


The 22 Card Game




Join our underwater adventure in
BUBBLE TOWN
Help Ariel deliver invitations!
Rules
No sharp turn or U turn
Smooth turns are allowed

Reflection/ Thoughts for Next Time

Challenges

My most significant challenge was finding a space for the event.

- I started inquiring about it in early December.
- Needed to receive special permission from the Dean… Undergraduate Science Centre weren't able to book space.
- Conference space was $2,200 - $3,000 to book.
- Didn't get a response back about the gyms until Jan. 25th… booking wasn't confirmed until Feb. 3rd.

…I was very stressed for these two month about whether or the fair would happen… then about whether or not the space was big enough.

Challenges

- Another challenge was being completely unfamiliar with all of the math fair puzzles.

- It was a large time investment to design the SNAP Math Fair Assessment (e.g., instructions, rubric, etc.), advertise to schools, figure out logistics (e.g., risk management, bus parking).

  …all of these things would be a lot easier the second time around.

Challenges

- Difficult to grade… students were so proud of their projects, which made me feel bad about deducting marks.

Attribute	Criteria	Exceeds Expectations (10 points)	Meets Expectations (8.5 points)	Partially Meets Expectations (7 points)	Needs Improvement (5 points)
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Changes for Next Time

- When picking a puzzle, I think that I would restrict them to SNAP Math Fair website/booklet and Galileo, and would tell them to use the name as it appears on the website/booklet in the signup form.

- There were some puzzles that I didn't like, because they were too easy and groups didn't do a great job at scaling them up (e.g., Fox, Goose & Grain, Nine Men in a Trench). I would probably tell groups that they can't choose these next time. *(…I'm willing to have my mind changed about this if you have strong feelings about these puzzles!)*

Changes for Next Time

- Dedicate more time to discussing what it means for a puzzle to be "logic-based" and not "arithmetic-based". (Give examples and non-examples…no puzzles should just be a game… there should always be a strategy that involved logic.)

- Mention on the course outline that the SNAP Math Fair has a presentation component, and that students will need to buy supplies for this course component.

- I would schedule one or two extra hours of practice sessions, because some took longer than expected.

Changes for Next Time

- Students didn't know what "Puzzle Prompt" meant, and so many Final Reports did not include the full prompt. Would elaborate on this next time.

- I'd ask students to include the picture of their puzzle at the top of their reflection.

- Although I shared that SNAP Math Fairs are non-competitive, many groups built competition into their projects to keep students entertained. Some shared that some students independently would time themselves and compete. …what are your feelings about this?

Reflections from MATH 205 Students

Reflections from MATH 205 Students

In terms of what students said that they'd do differently:

- They found that students arrived at their table in large groups; they wish that they had even more playing boards so that more than 4 students could engage at one time.
- Some wished that they made an even harder scaled up version, because many of the elementary school students surprised them by how quickly they figured out their puzzle.

Reflections from MATH 205 Students

Student feedback about the fair was overwhelmingly positive.

Several comments on how they haven't even got to interact with kids in their education classes, and that this experience reaffirmed their desire to be a teacher.

"I loved every moment of the fair and it made me excited about my future career."

"I had never experienced teaching elementary school students before. This Math Fair gave me a thrilling sense of what to anticipate in my next fieldwork."

Reflections from MATH 205 Students

- Found the project extremely meaningful, because they plan on becoming elementary school teachers someday. Many said that they'd like to do a fair at their future school.

"The SNAP Math Fair was definitely the most memorable experience of the course! As a future math teacher, it was really cool to see young students get excited about math and want to solve everyone's puzzles. I will definitely do some variation of a Math Fair when I am a teacher."

Reflections from MATH 205 Students

- Many students appreciated the opportunity to express themselves creatively in a math class through the SNAP Math Fair Project.

- Many students commented on how the project helped to improve their communication skills.

"It became a learning experience that enabled both my partner and I to critique our explanation skills. We realized that it was important to adjust to the crowd we were speaking to."

Thank You

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Questions?