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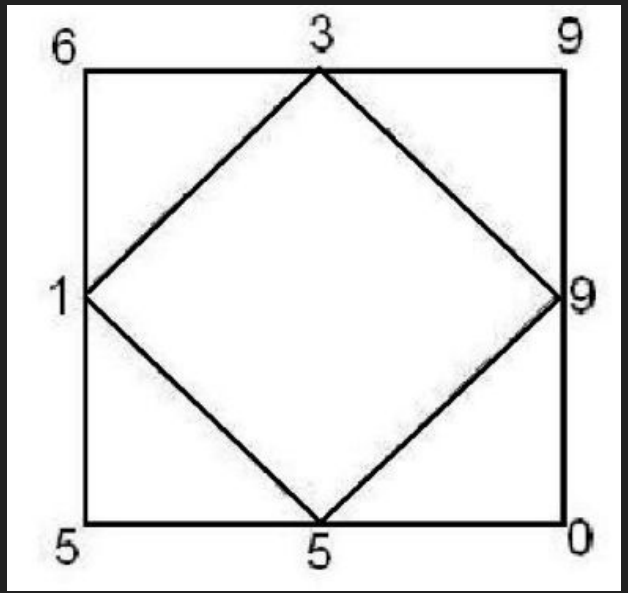
Q: How many rounds can you do?



http://www.math.kent.edu/~soprunova/64091s15/four_numbers_Prendergast

Bringing Math Circle Problem Solving into the Central Convergence REU

Dr. Brandy Wiegers
Now: College of Idaho

Previously: Central Washington University
Kittitas Valley Math Circle

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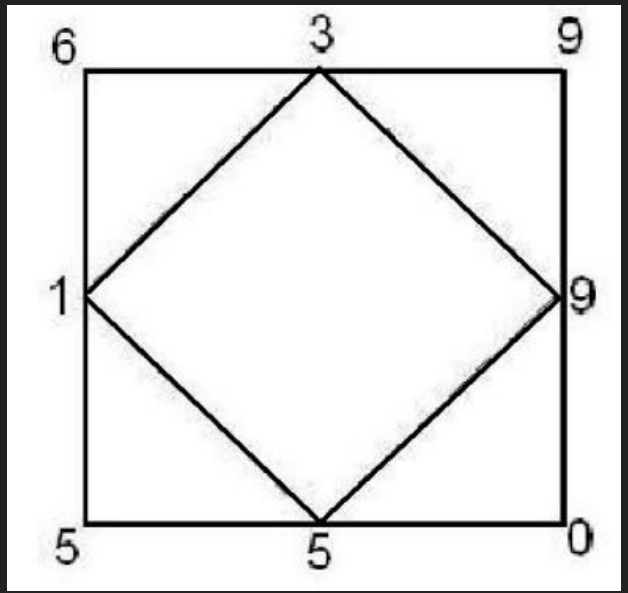

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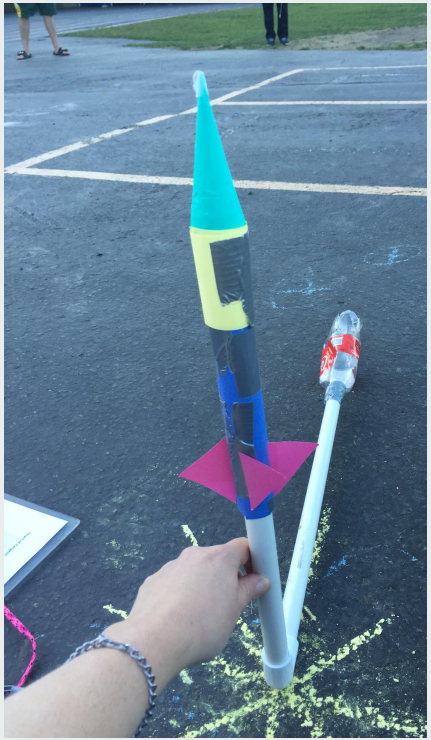
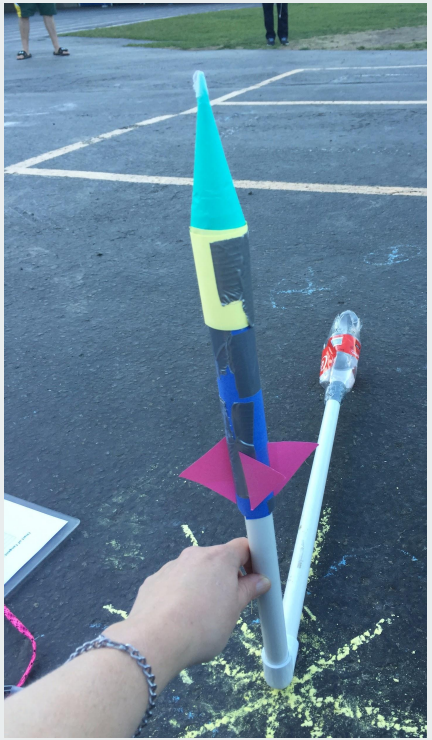
The feeling when having a thought and wondering if you're the first person to ever think it!

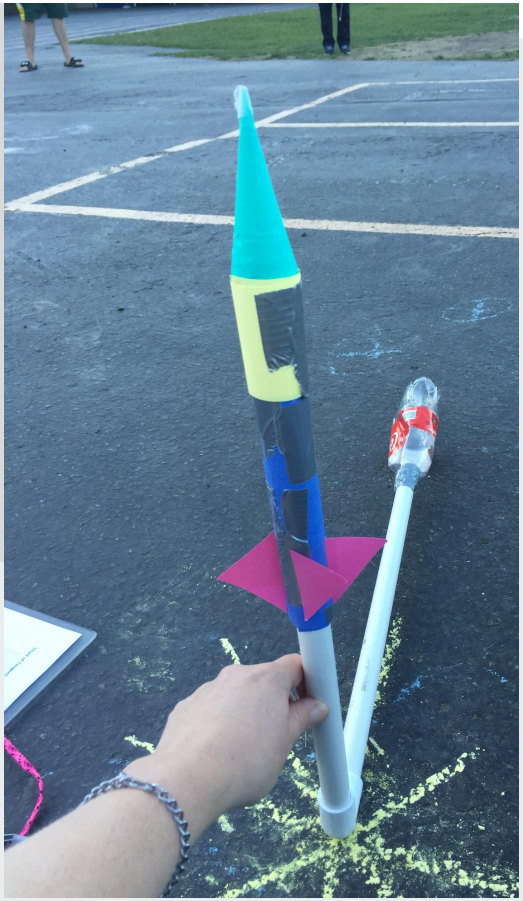


I lost this feeling in grad school.

Math Circles is what gave it back and made me feel like a mathematician



Meeting students where they are and supporting their progression and growth



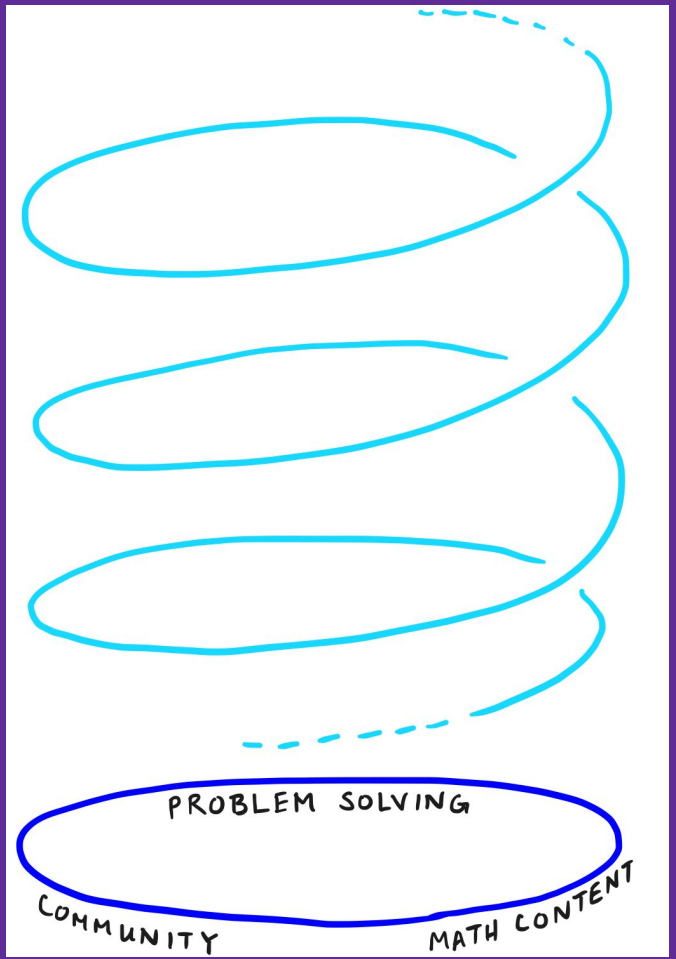
Giving students time to figure it out

In Math Circles
In Class
In Research

Math Circles across US

Math Circles...

- Exploring worthwhile mathematical tasks,
- Fostering problem-solving habits of mind
- Building communities of mathematical thinkers and problem solvers



When Ellensburg seems like a big city…

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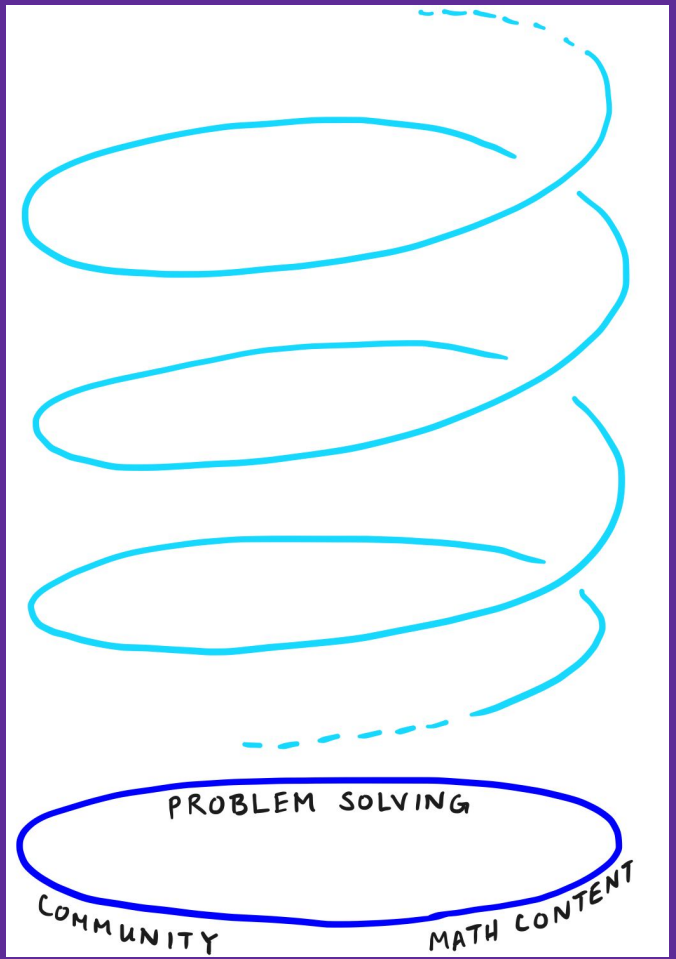
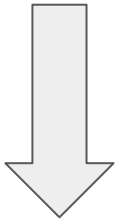


Let’s move from

What I think my community needs



Finding out what my community needs.

Creating KVMC- Using Resources Wisely

Small Rural Town (19,786)

- Sports
- Bible Study
- Other outreach projects
- Driving distance

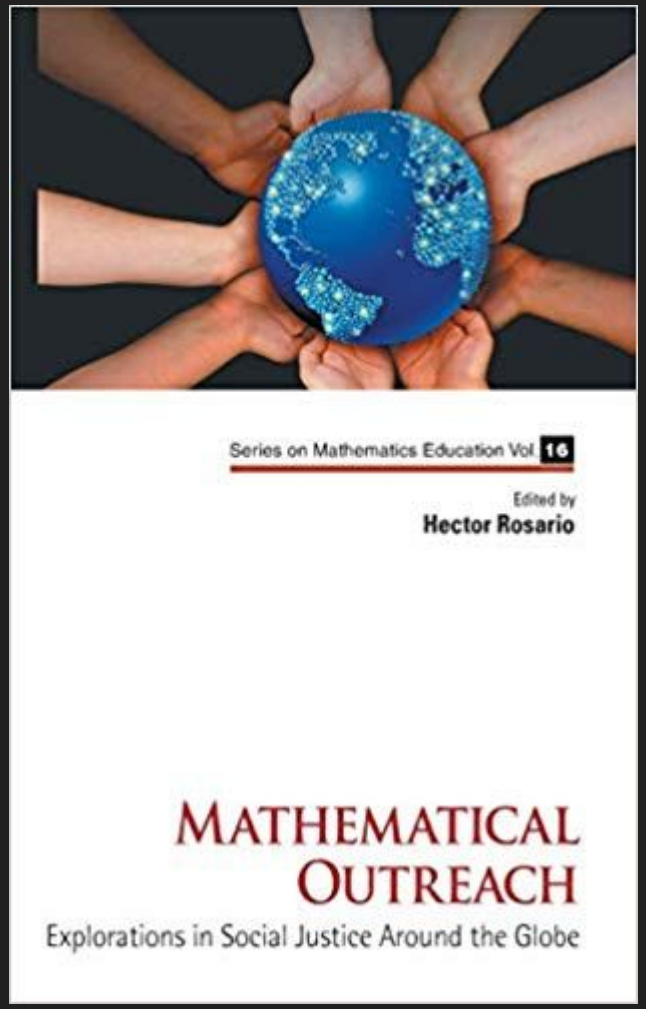
Comprehensive (non-R1) University

- Undergraduate Mentors
- Quarters (10 weeks)
- Supportive STEM outreach

Elementary Math Circle:
2nd- 6th grade students

Topic blocks
(5 weeks, one topic per quarter)

Parents/ guardians are invited to attend a specific adult session for the 1st two weeks of each topic block.



1. The Julia Robinson Mathematics Festival: An American Artifact in an International World
2. Math Unbounded: A Transcultural Experiment
3. The Global Math Project: Uplifting Mathematics for All
4. The International Mathematics Enrichment Project: Enhancing Teacher Preparation Through International Community Engagement
5 Creating Community-Responsive Math Circle Programs
6 The Alliance of Indigenous Math Circles: From Invitations to Partnerships
7 BEAM: Opening Pathways to STEM Excellence for Underserved Students in Urban Settings
8 Mathematics, Computational Thinking, and Coding for Middle and High School African American Girls in the Deep South
9 Math Instructors' Critical Reflections on Teaching in Prison
10 "No Fractions": Math in Prison for the Common Good
11 Advising Undergraduate Research in Prison

How to make a community responsive program.

1. Complete an assessment of strengths and areas of needs so you can use resources wisely.
2. Have hard conversations
3. Find community partners
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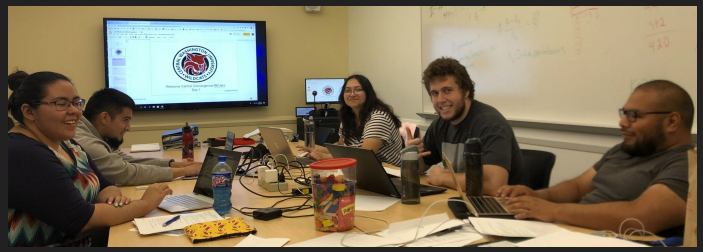
6. KEEP ASKING YOUR COMMUNITY HOW IT CAN GET BETTER

Central Convergence Research Experience for Undergraduates



The 2021–2023 CC-REU is currently funded by the NSF (DMS-2050692)

Creating Community Responsive REUs

CWU Student Needs

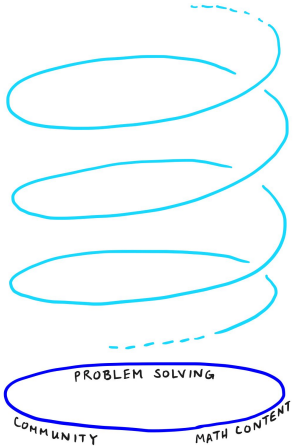
- Local programming
- First experiences to build confidence…

  UR students aren't typically doing research

Creating Community Responsive REUs

Strengths

- Problem-solving and math skills training
- UR experience
- Professional development training



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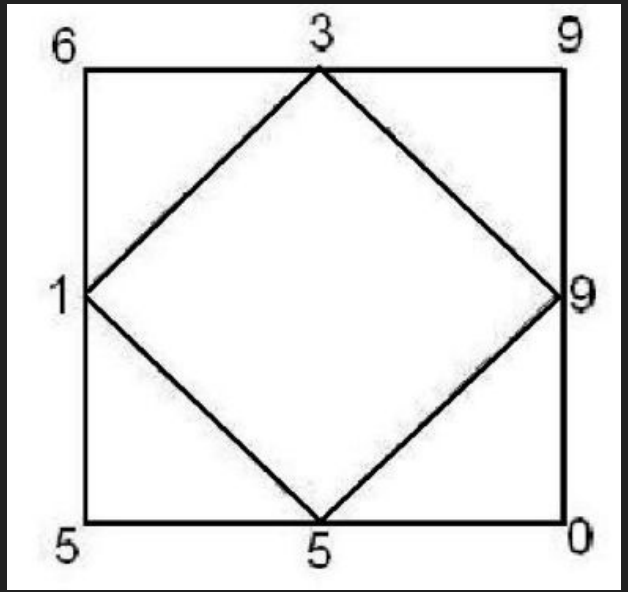

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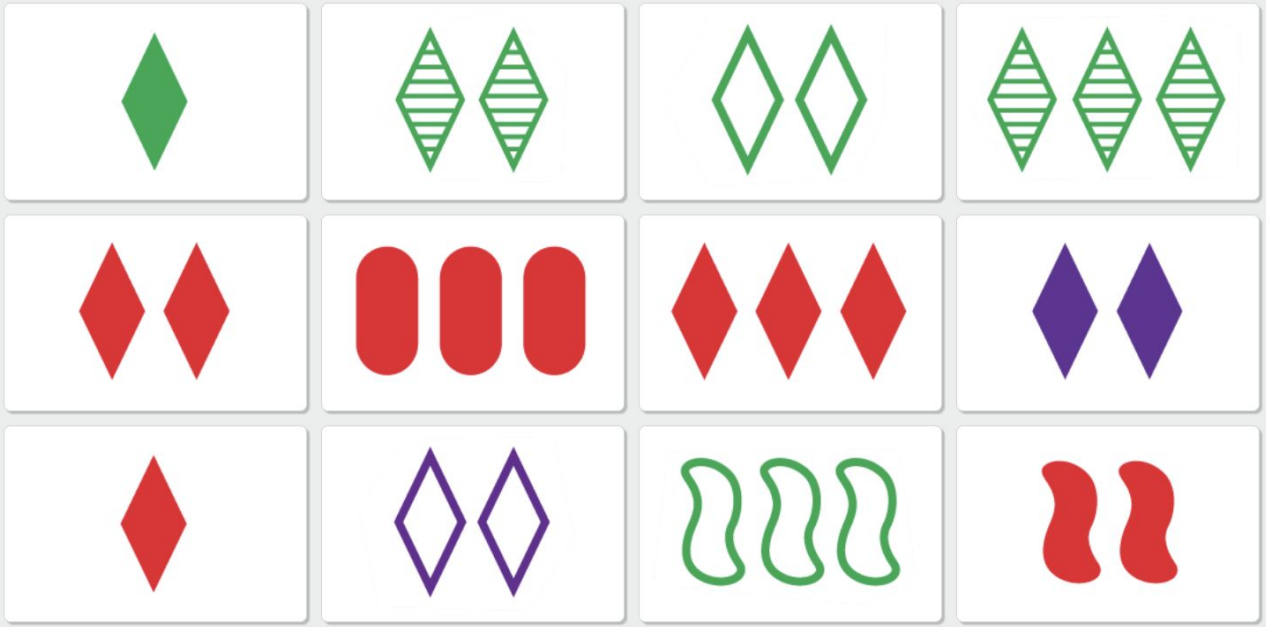
setgame.com/set/puzzle

SHOP | PLAY ONLINE | WEEKLY WINNERS

The puzzle is updated daily at 12:00 am PST.



SETs Found:

Hover to Enlarge

Learn to Play

SET Puzzle Rules

Download our interactive flash tutorial

Denny's Hexagon

- Please get into groups of three and introduce yourselves.
- Distribute the white paper clue cards to group members, one at a time.
    - Do not show your clue to anyone.
    - If there are more cards then people in your group, a few people will need to take extras.

- You may now read the clue card as many times as you wish and share the information on the clue with your group. **You may not show the card to anyone else in the group.**
- The entire group must bring together all the cards to solve the problem.
    - Please be prepared to share your solution with the group.

Build Denny's Hexagon!

- The only pattern blocks your group is allowed to use in the problem are trapezoids, triangles, and diamonds.
- Denny's hexagon is made from a total of 9 pattern blocks, 3 of which are diamonds.
- Denny's hexagon uses twice as many triangles as it does trapezoids.
- Denny's hexagon is equilateral, but it is NOT equiangular.
- In Denny's hexagon, the diamonds are all arranged to form a hexagon, and so are the trapezoids.
- In this pattern, each triangle shares a side with another triangle. Triangles are allowed to share a side with non-triangles.

http://bfc.sfsu.edu/PRIME/DennysHexagon.pdf

Denny's Hexagon

Discussion Questions:

- Is there only one answer?
- What were effective techniques for working together?

From Get it together – Lawrence Hall of Science

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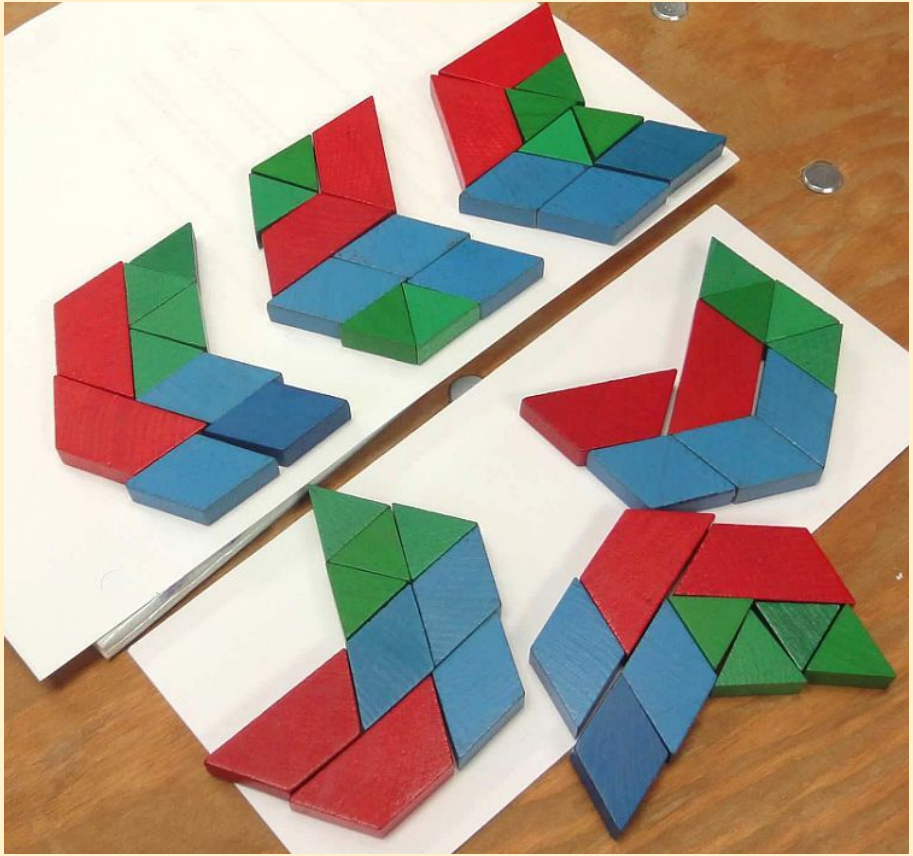

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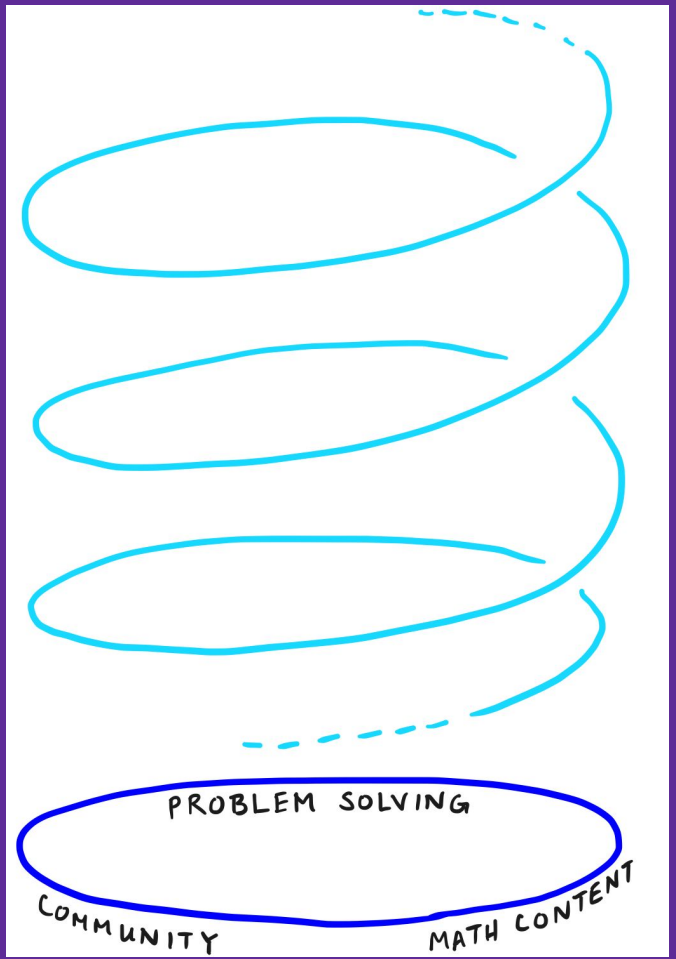
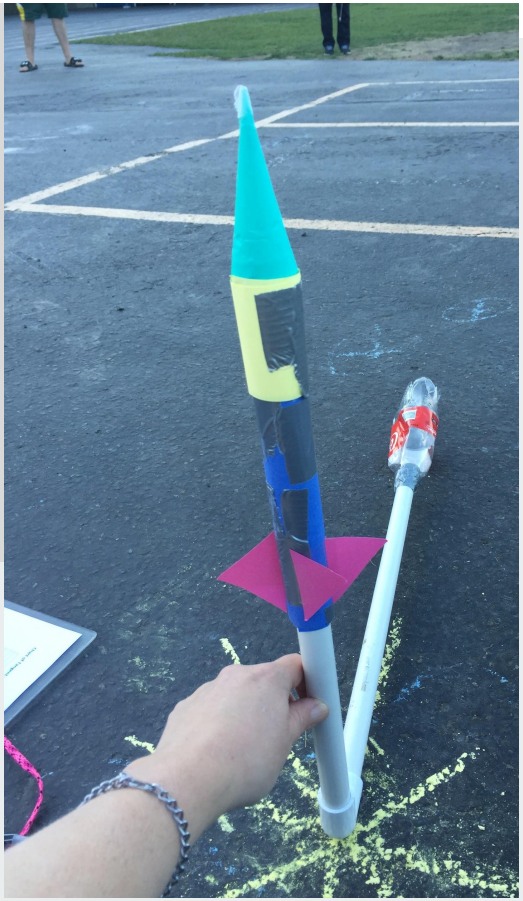


Meeting students where they are and supporting their progression and growth



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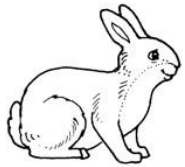


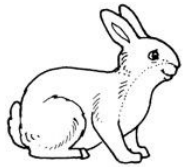
Initial Question...

Tomorrow you are graduating from high school.

You open one of your graduation cards from a friend and find that they have given you a gift of rabbits from Heifer International.

This is what your card says:

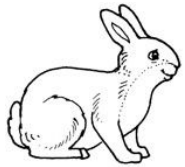
Rabbits Get Results



A gift of rabbits to a family with little land and few resources yields remarkable results. From Chicago to Haiti to North Korea, families with Heifer rabbits are raising them on the back porch -or even in the kitchen. So long as they are warm and dry, rabbits thrive, and they love to eat leftover vegetables. In turn, families get nitrogen-rich manure to use on gardens or to sell as fertilizer. And since rabbits have up to 40 offspring a year, they provide families with steady sources of protein and income.

If you're tired of spending a lot for gifts that don't mean much to the recipient, think about a gift of Heifer rabbits that multiply many times over. You'll be making a statement that will capture the imagination of your friends and family.

Rabbits Get Results



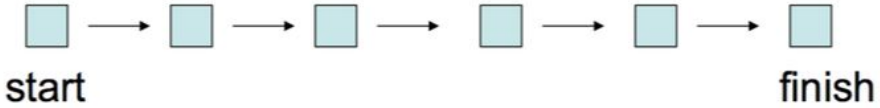
My Question: Let's think about how a high school graduation gift of rabbits will grow by the time you graduate from college. How many people will benefit from the single gift?

To start… How would we model the growth of the rabbit population from a single gift from Heifer International?

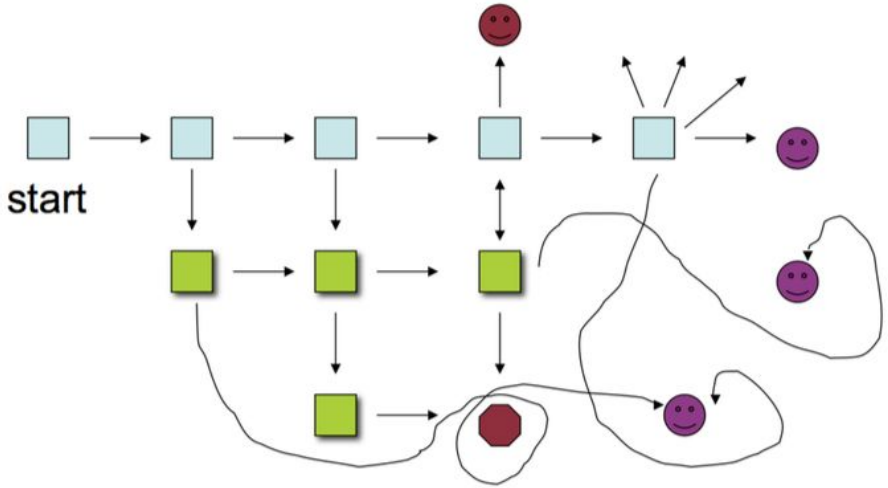
State any assumptions that you make and provide a visual.

Math

Lesson Plan A



Lesson Plan B



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CC-REU Problem Challenge Due: Friday, July 2, 2021

Your mission is to work in a group to address the following challenge problem:

Disease Challenge [1]

Problem Contact: Dr. Brandy Wiegers, brandy.wiegers@cwu.edu
The World Medical Association has announced that their new medication could stop Measles and cure patients whose disease is not advanced. Build a realistic, sensible, and useful model that considers not only the spread of the disease, the quantity of the medicine needed, possible feasible delivery systems (sending the medicine to where it is needed), (geographical) locations of delivery, speed of manufacturing of the vaccine or drug, but also any other critical factors your team considers necessary as part of the model to optimize the eradication of Measels in Northern America, or at least its current strain. Reference Resource:
https://www.maa.org/press/periodicals/loci/joma/the-sir-model-for-spread-of-di

Optimizing the Passenger Throughput at an Airport Security Checkpoint [2]

Problem Contact: Dr. Loke, SooieHoe.Loke@cwu.edu
Following the terrorist attacks in the US on September 11, 2001, airport security has been significantly enhanced throughout the world. Airports have security checkpoints, where passengers and their baggage are screened for explosives and other dangerous items. The goals of these security measures are to prevent passengers from hijacking or destroying aircraft and to keep all passengers safe during their travel. However, airlines have a vested interest in maintaining a positive flying experience for passengers by minimizing the time they spend waiting in line at a security checkpoint and waiting for their flight. Therefore, there is a tension between desires to maximize security while minimizing inconvenience to passengers.

Kafka Inc.

Problem Contact: Dr. Montgomery, Aaron.Montgomery@cwu.edu
Welcome to your new position as an efficiency expert with the Kafka Inc. (infor- mally, KafInc®). KafInc® is a company employing the finest bureaucrats, each with a devotion to the completion of paperwork. Each of the bureaucrats at KafInc® has equal authority (this is a completely egalitarian system). Upon being hired at KafInc®, each employee is assigned an office along the infinite hallway. At any given time, these offices form a sequence of consecutive integers. For example, if KafInc® currently has 5 employees, they could be in offices -2, -1, 0, +1, +2 or -5, -4, -3, -2, -1, but they could not be in offices -2, -1, +3, +5, +6.

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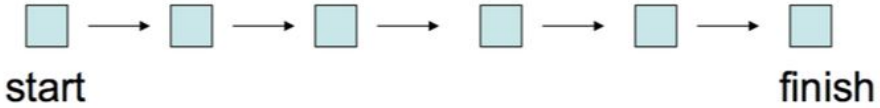

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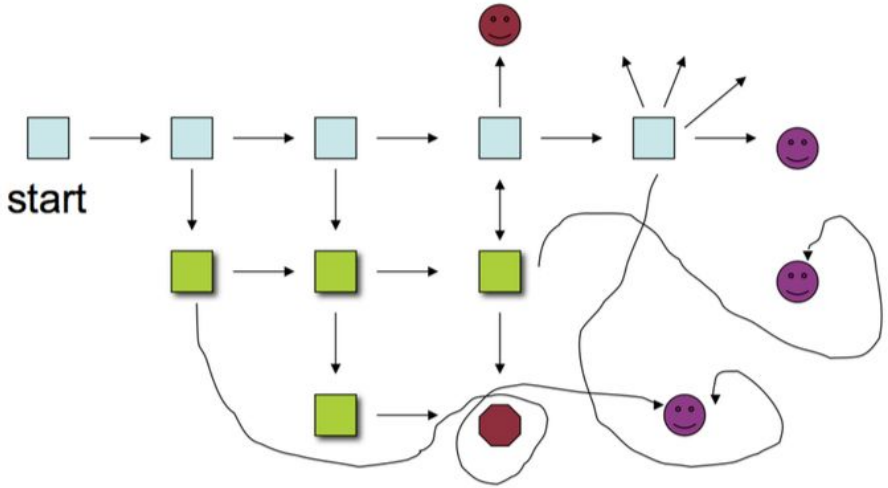

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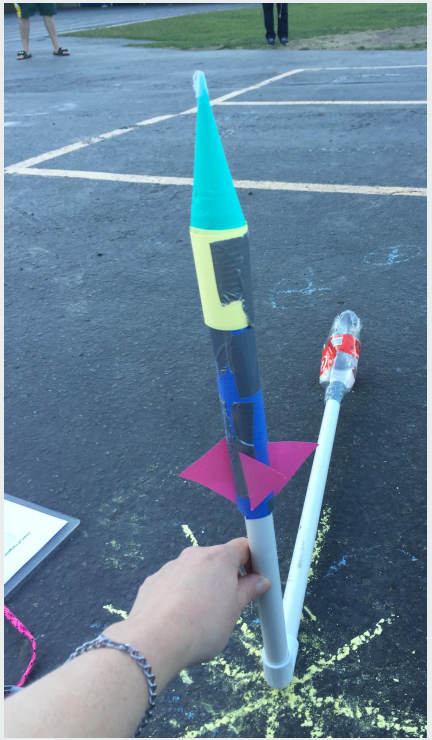
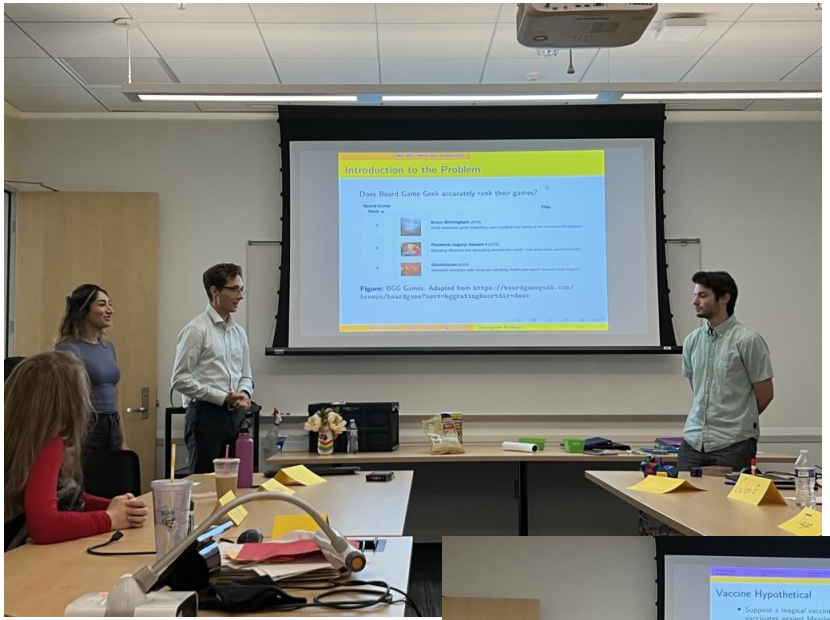
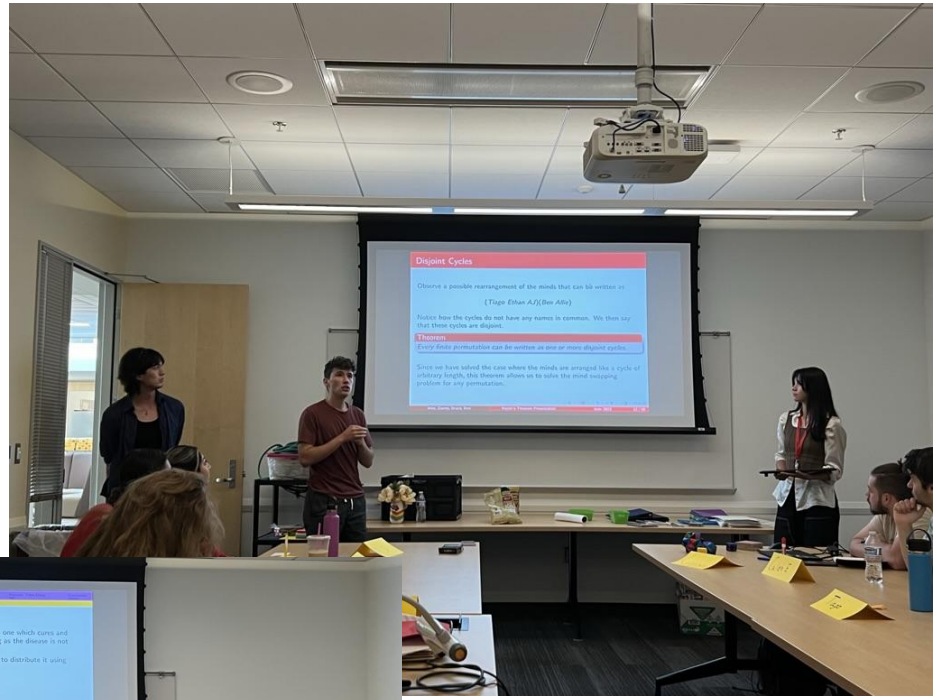
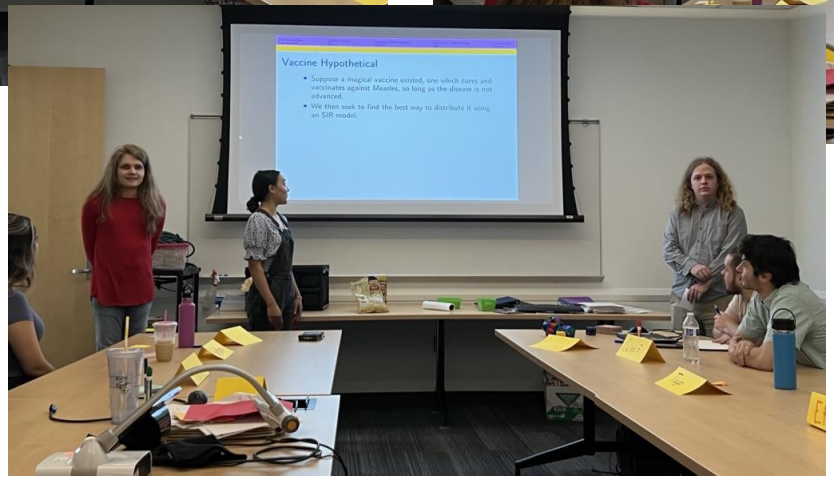
I didn’t tell you… YOU FIGURED IT OUT




Introduction to the Problem
Does Board Game Geek accurately rank their games?
Figure: BGG Games. Adapted from https://boardgamegeek.com/browse/boardgame?sort=bggrating&sortdir=desc


Disjoint Cycles
Observe a possible rearrangement of the minds that can be written as
(Tiago Ethan A)(Ben Allie)
Notice how the cycles do not have any names in common. We then say that these cycles are disjoint.
Theorem
Every finite permutation can be written as one or more disjoint cycles.
Since we have solved the case where the minds are arranged like a cycle of arbitrary length, this theorem allows us to solve the mind swapping problem for any permutation.


Vaccine Hypothetical
Suppose a magical vaccine existed, one which cures and vaccinates against Measles, so long as the disease is not advanced.
We then seek to find the best way to distribute it using an SIR model.

CCREU virtual program schedule/experience

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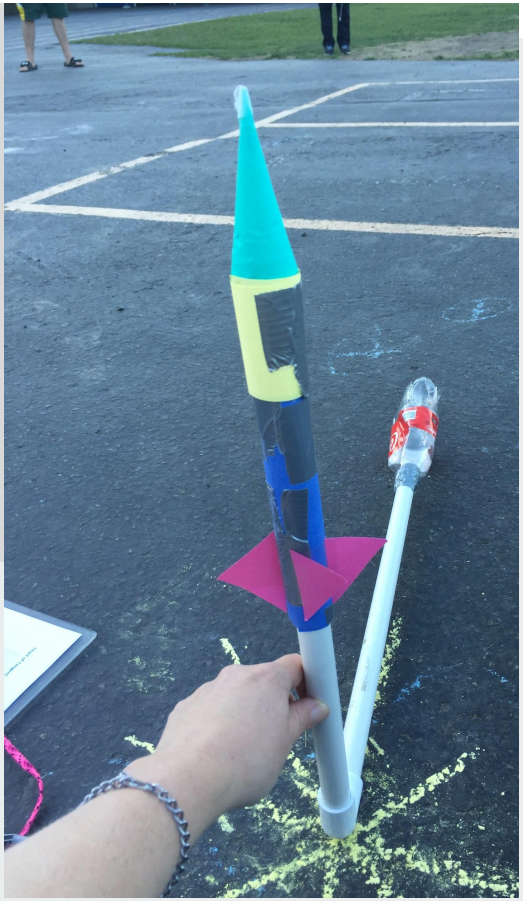

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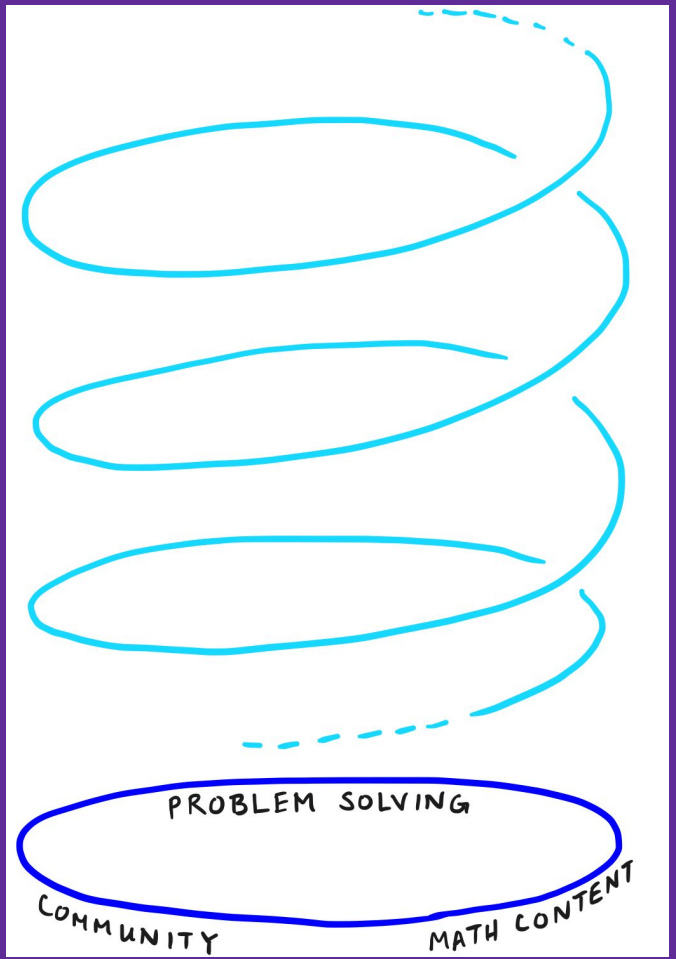

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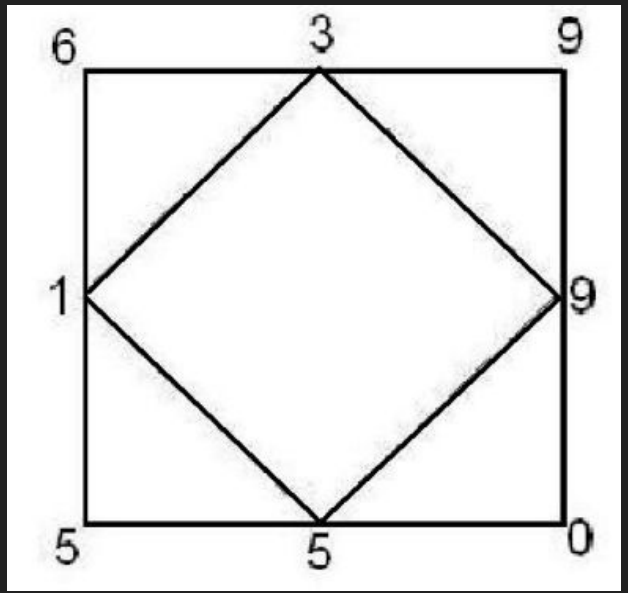

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How to make a community responsive program.

1. Complete an assessment of strengths and areas of needs so you can use resources wisely.
2. Have hard conversations
3. Find community partners
4. Cycle through this until you CAN DO IT RIGHT
5. Run the program
6. KEEP ASKING YOUR COMMUNITY HOW IT CAN GET BETTER

Creating Community Responsive REUs

How were we ready to do this?

- Start smaller
  - McNair students
  - NREUP
- Training
  - UR-SIGMAA
  - CUR MCS
  - CURM
- Use our regional network

Ideas for community support

Communities:

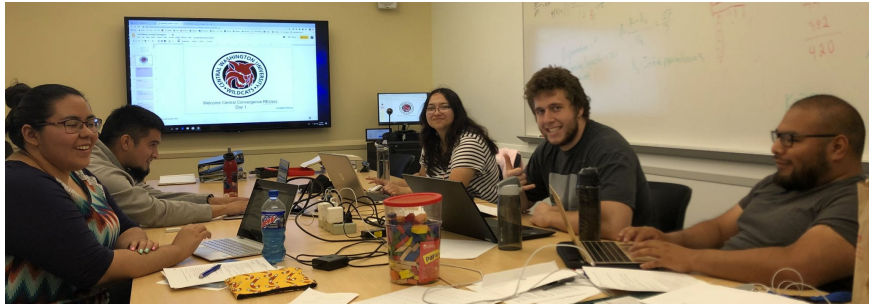
- UR-SIGMAA, http://sigmaa.maa.org/ur/
- CUR MCS, https://curmcs.org/
- CURM, http://urmath.org/curm/
- NREUP, https://www.maa.org/programs-and-communities/outreach-initiatives/nreup
- REU Leadership, REULeadership@listserv.csufresno.edu

Networks:

- MAA
- Math Alliance, https://sites.google.com/view/the-pacific-math-alliance
- OURFA^{2}M^2: Online Undergraduate Resource Fair for the Advancement and Alliance of Marginalized Mathematicians

Central Convergence
Research Experience for Undergraduates

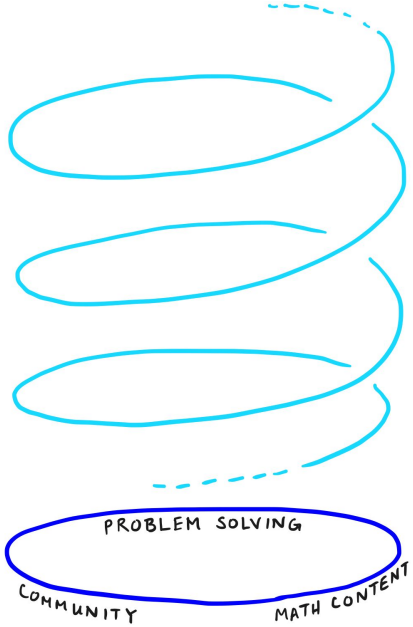
Brandy S. Wiegers
College of Idaho
Department of Mathematics
bwiegers@collegeofidaho.edu
@drbrandymath



email: reu@cwu.edu

The 2021–2023 CC-REU is currently funded by the NSF (DMS-2050692) and will expand on the previous programs funded by the MAA National Research Experience for Undergraduates Program (NSF DMS–1652506). CC-REU program is directed by Dr. Brandy Wiegers and Dr. Sooie-Hoe Loke.

Journal of Math Circles



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Write for us!

Double-blind peer review process

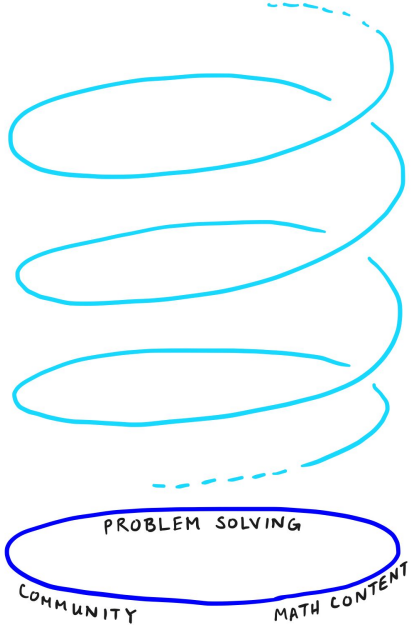
- 4 weeks per round of reviews (min. 2 reviewers)

Evidence-based reflective commentary

- Take attendance
- Collect written artifacts
  - Participant mathematical work
- Document observations
  - Pictures/videos of participants in action
  - Keep a journal observation notes
    - Session implementation, participant reactions
- Interview, survey participants
- Obtain consent/assent

TeX template, Overleaf link, article samples on website

- Please use TeX!



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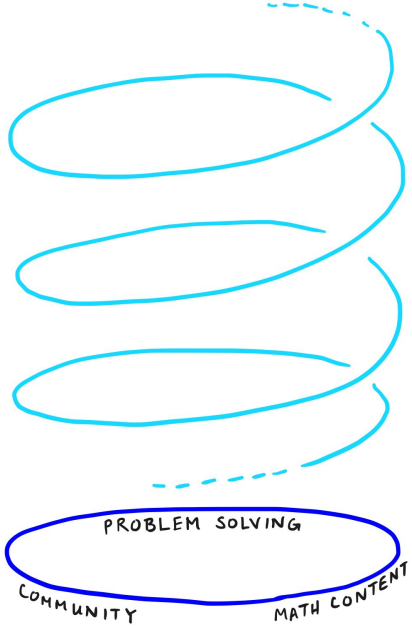
3 article types

Lesson Plans. These papers are intended to support leaders of a Math Circle session or progression of sessions.

Outreach Programs. These papers are intended to support individuals or organizations in starting or sustaining Math Circle outreach programs.

Professional Development. These papers are intended to support leaders of K-12 Math Circle teacher professional development



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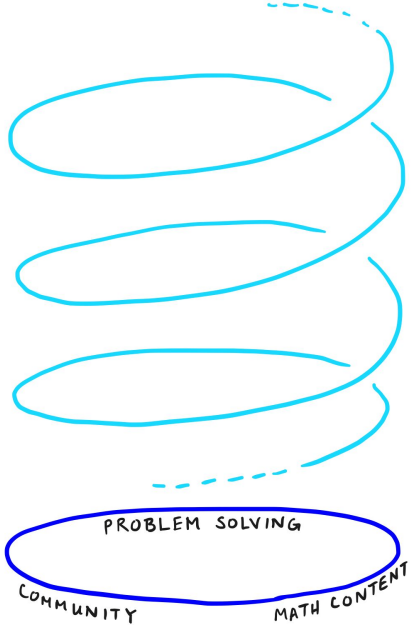


Special Issue Call for Papers
Honoring Robert and Ellen Kaplan

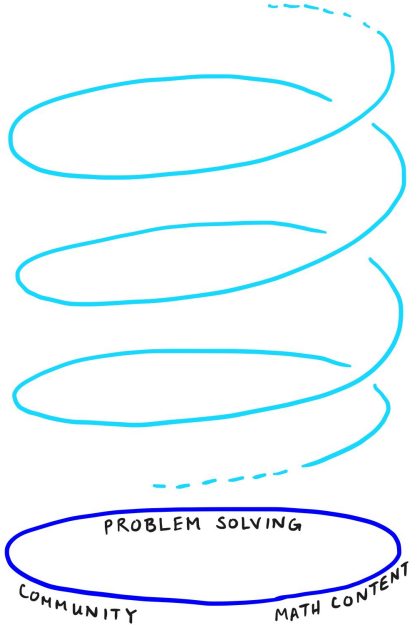
Special Issue Editors: Amanda Serenevy, Rodi Steinig

https://digitalcommons.cwu.edu/mathcirclesjournal/aimsandscope.html

The Journal of Math Circles is pleased to announce a call for papers for a special issue honoring Bob and Ellen Kaplan.

This special issue will appear in Spring 2024

Journal of Math Circles



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