



BLUEBIRD MATH CIRCLE Alliance of Indigenous Math Circles

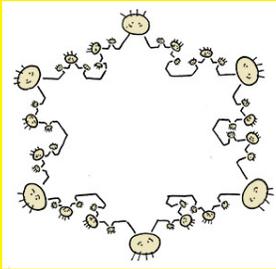
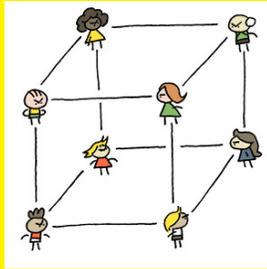
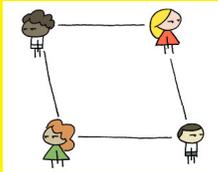
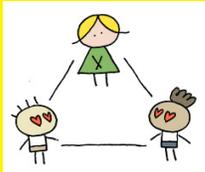
Issue 15

Share your problems, solutions, models, stories, and art:
<https://aimathcircles.org/Bluebird>

Creative thinking is one of the most important skills to possess—whether that creativity is used to come up with an alternative theory, devise a new way of testing an idea, or look at old data in a new light.

—J.C. Elliott High Eagle,
Osage and Cherokee, AISES co-founder,
NASA physicist, writer, and musician

MATH JOKE Emotional Geometry, by PieComic.com



Love triangle, indifference rhombus,
spite cube, and anxiety fractal

NEWSFLASH Join LIVE Bluebird Math Circle to work on these activities together with friends and family.

Monday Nov. 1, 5-6 PM MDT online.

Sign up at
<https://aimathcircles.org/Bluebird>

Warm Up: Card Selection Task, Two Ways

Serene version

We often write math problems as neutrally as we can. Even if the problem springs from life, we remove personalities and dramas. We make objects as generic as possible. Here is one such *abstract* problem, a classic called Wason Selection Task:

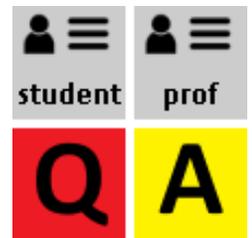


Cards can have numbers on the front (1 or 2) and colors on the back (red or yellow). You see four cards on the table: 1, 2, red, and yellow. A note says, "If a card on the table has 1 on one side, then it should be red on the other side." Is the note a lie? How many cards do you need to turn over to find out?

Puzzle this out and write your solution. Then move on to the dramatic version.

Dramatic version

We can write math problems as dramatically as we can. Even an abstract problem can become a story, a drama about characters in conflict. To solve the problem, you decide who is right. For example:



Students get envelopes with questions. Professors get envelopes with answer keys. You can't tell who's a student and who's a professor at a glance, but everyone wears college ID cards on campus. You see four people. You recognize a student and a math professor you've met before, who have not opened their envelopes yet. You do not know the other two people, who already opened their envelopes. One is holding the questions, and the other is holding the answer key. You can look into envelopes and check IDs. Whose envelopes and IDs do you check to make sure no students accidentally (or sneakily) got answer keys?

Fewer than one in ten grown-ups solve the abstract card puzzle right on their first try! (See the solution on the next page.) But the majority do solve it correctly once we make it about cheating. Something in stories where characters misbehave helps us to figure out the logic. Try it yourself: solve both versions, one after the other. Did your answer to the abstract card puzzle change after you solved the dramatic version?

Note: A version of this topic appeared in Bluebird Flyer Issue 2, but we didn't have time to investigate it.

Solution to the card puzzle: You need to turn the card with 1 over to see if it's red on the other side. If not, the note is a lie. You also need to turn the yellow card over. If it has 1 on the other side, the note is a lie. The note says nothing about 2, so you don't need to check that card. The red card is the trickiest. If the other side has 1, the note is not a lie. If the other side has 2, the note is also not a lie. So you can let the red card be. Answer: you only need to turn over two cards, 1 and yellow. You can search for Wason Selection Tasks to find more puzzles in this style.

Family Circle: Logic Takes a Dramatic Turn

Why do these little dramas help many of us solve logic problems? Mathematics and psychology researchers have been trying to figure this out for decades. We don't know, not yet! Some researchers believe that familiar context clues boost our logical, abstract reasoning. Others disagree: they think the brain boost comes from the drama, from our powerful social and interpersonal reasoning. We do know one thing from the past experiments. Different stories that come from the same exact abstract puzzle can either confuse many people, or help them find correct solutions.

Try your own experiments, and join this ongoing math psychology research!

Experiment 1: Card selection and context

Write your own dramatic puzzle based on the abstract puzzle in the warm-up. How?

- Pick two types of characters (such as students and professors);
- Come up with an action only one type of people should do (e.g. only professors should see the test's answer keys);
- Come up with the second action everyone can do (such as seeing the test's questions); and
- Pose the question: What do we check to find out if your characters misbehave (such as envelopes and badges)?

Check one another's problems to see if their logic still works. Afterwards, try the abstract version on your friends and family. Then give them your story version, where they need to judge the characters. How many people get each version right?

Experiment 2: More logic and drama

Another abstract logic problem is below. Just like the card selection task, this problem stumps many people on their first try.

Rewrite it into a scenario with drama, conflicts, or cheating on social rules. Then solve both versions, and see how others do.

Cards have letters on them, and come in piles. If a pile has A, then it has Z; or else, if a pile has no A, then it has Z. Do all piles have Z?

Hint: You might be tempted to write stories such as, "The evil king made heroes solve this abstract puzzle, or else." Don't. That story isn't drama, it's a tragedy! That type of story does not help to solve the abstract problem.

Keep experimenting with abstract and dramatic versions of tricky problems you run into. Send Bluebird your finds and stories!

Ask Bluebird

QUESTION—*Why is it important to relate math and art?* From Lila A.

BLUEBIRD SAYS—Beautiful question! This flyer's opening quote comes from the article *When Art + Science Meet: Exploring Creativity as a Path to Innovation*, in *Winds of Change*, the journal of American Indian Science and Engineering Society. Check out the full article here:

https://read.nxtbook.com/aises/winds_of_change/fall_2021/when_art_science_meet.html

The article's title answers the question. Art gives us a toolkit that boosts our math reasoning. As we saw with logic problems and storytelling, art can help our problem-posing and problem-solving. Visual arts and movement arts such as dance give us powerful, inspiring methods for mathematical modeling. All art gives us fresh metaphors and new points of view for our mathematical creativity.

When things get tough, and math gets hard... Make art!



FUN FACT OF THE FORTNIGHT

One of the sweetest parts of mathematical logic? Paradoxes! Like these:

- Nobody goes there anymore. It's too crowded.
- The village barber shaves all those, and only those, who do not shave themselves. Who shaves the barber?