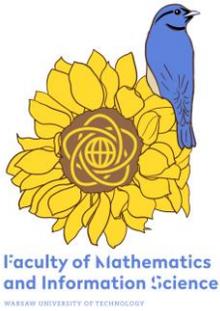


MINI BLUEBIRD MATH CIRCLE



Issue 5: Storytelling and Modeling

Share your problems, solutions, models, stories, and art:

<https://akademia.mini.pw.edu.pl/pl/ukraina>

Now I know that I have the potential to problem-solve without having a strict rule on how to do it. I can still do it another way and still get the same answer.

—Cheyenne Bedonie
Tsaile, AZ

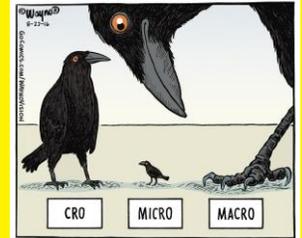
NEWSFLASH Join LIVE the MiNI Bluebird Math Circle to work on these activities together with friends and family. The math circle is in English and Ukrainian with live translation.

Monday September 26th, 18:30-20:00 Warsaw, Poland time, online.

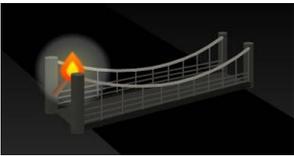
Sign up at <https://akademia.mini.pw.edu.pl/pl/ukraina>

MATH JOKE

by
WaynoVision



Family Math Circle: Bridge and Torch Action/Adventure Stories



PROJECT—WRITE AN ACTION/ADVENTURE STORY There is an old math story about people crossing a rickety dark bridge with a single torch. Like any other media, math stories only live to a ripe old age if they grow popular. This one is. You can find many versions under the name *Bridge and Torch Puzzles*. Now is your turn to tell stories in your own way! (Image by r27.jp)

STARTER STORY Person A takes 1 minute to cross a bridge, Person B takes 2 min, Person C takes 5 min, and Person D takes 8 min. It is dark, and they must carry a torch to cross. Two people can walk close together if one carries the torch, but the bridge will break if more than two people step on it. All four people must cross with just *one torch*, and take *no more than 15 minutes* to cross. Can they cross, or will they fail?

Storytellers build worlds, develop characters, and plot events. Grab these storytelling tools as your *mathematical modeling tools*.

CHARACTER PROMPT Make up your *characters*. *Who* is in your story? You and your friends, or talking animals, or someone from your favorite book or movie, or...? Why are some faster walkers and some slower walkers?

WORLDBUILDING PROMPT Make your story world come alive. *Why* must your characters hurry to cross, what's their urgency? Will they be late for something, or is someone chasing them, or...? Your world will motivate your characters—and your math.

ALTERNATIVE UNIVERSE PROMPT This is where it's at: change your story's elements! What happens to the crossing time if you have fewer characters, or more? What if you change their speeds? (Hint: make everyone walk at the same speed if you aim to write a less exciting story or an easier puzzle.) Any little thing you change can lead to a storytelling disaster or a brilliant plot twist; a boring exercise or a math thriller. Maybe that's the moral of the story?

Storytelling scenarios by Christalyn, Jaelynn, and their teacher Mr. Craig Young Arrowhead Math Circle and Thunderbird Academy, Arizona

1. On a hill, there is a veterinarian's building. Five veterinarian doctors, named Christalyn, Jaelynn, Alex, Xavier, and Pete were helping 5 animals (a dog, a bunny, a chicken, a cat, and a rat). People took their animals in for check-ups, but the animals received the wrong shots and started fighting. The doctors ran out of the building and wanted to cross the bridge. Christalyn and Jaelynn both took 1 min to cross, Alex and Xavier both took 2 min to cross and Pete took 3 min to cross.

- There is one character who crosses the bridge, a shepherd saving three members of their flock who wandered off from the herd. They are trying to get away from a coyote (Ma'ii) and need to cross the bridge to safety. As soon as they all cross the bridge, the shepherd needs to cut the bridge down before the coyote tries to cross.

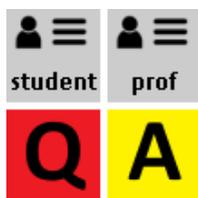
To make these scenarios into puzzles, pose questions about particular times or the shortest possible time.

Card Selection Task, Now With More Drama!



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?

Fewer than one in ten grown-ups solve that classic puzzle, called Wason Selection Task. At least, the abstract version above. But the majority do solve it correctly once we retell the puzzle as a dramatic story about people and their conflicts, as we do below. Try the card puzzle first, then the story puzzle. Does your answer to the card puzzle change after you solve the story puzzle?



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 got answer keys?

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.

WRITING PROMPT Write your own dramatic version of the Wason Selection Task, to try on friends and family. 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)?



Ask Bluebird

QUESTION—How long is a light year?

BLUEBIRD SAYS—It is quite long, and maybe not in a way you asked. It's a measure of *distance*. Take a mile. Now replace each *inch* in your mile with the distance from the Earth to the Sun. That will make about a light year of length! More precisely, a light year is the distance light travels in a year: around 9.46 trillion kilometers or 5.88 trillion miles. It takes light 8 minutes to travel from the Earth to the Sun. The nearest known star, Proxima Centauri, is a bit more than 4 light years away. (See also: Kessel Run in

**FUN FACT
OF THE
FORTNIGHT**

What is the oldest story-puzzle people still retell? It's about four thousand years old and comes from North Africa! Archeologists found it on an ancient Egyptian papyrus. It had a story-puzzle about grain, mice, and cats to practice multiplying by 7. Why 7? That's because back then, as it is for students even now, multiplying by 7 was the hardest of the time tables $\times 2$, $\times 3$, $\times 4$... $\times 10$. Here is a version from 18th century.

*As I was going to St. Ives,
I met a man with seven wives,
Each wife had seven sacks,
Each sack had seven cats,
Each cat had seven kits:
Kits, cats, sacks, and wives,
How many were there going to St. Ives?*