

Add a Little Magic to Your Math Circle

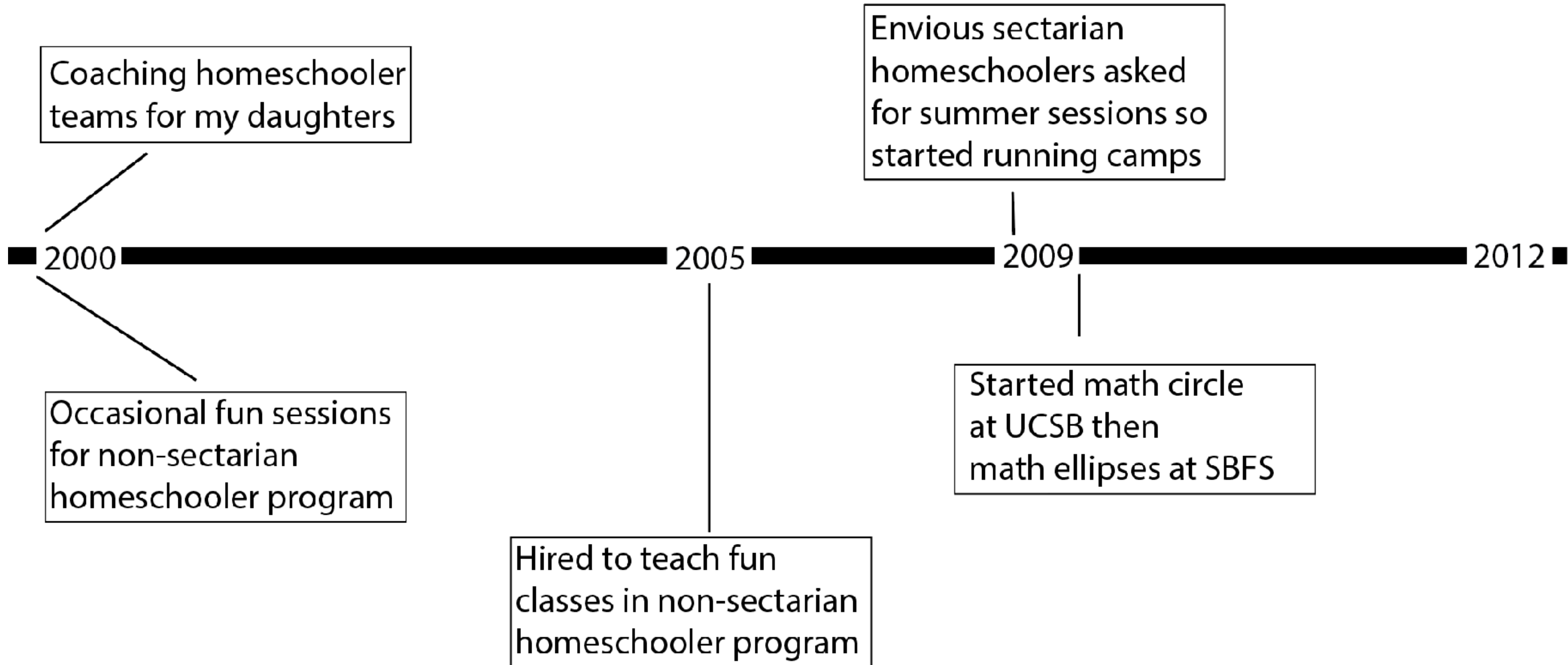


AMS Special Session on
A Showcase of Recreational Mathematics: Theory, Applications, and Engagement in Teaching and Research

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Santa Barbara Math Ellipse

JMM
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Washington DC

Background



SBFS Math Camps

MatheMagics

The Art of Math & the Math of Art

The Math of Sports & the Sport of Math

Infinity & Beyond

Money Matter\$

Prime Time

ST☆R of D☆VID M☆THEM☆TICS

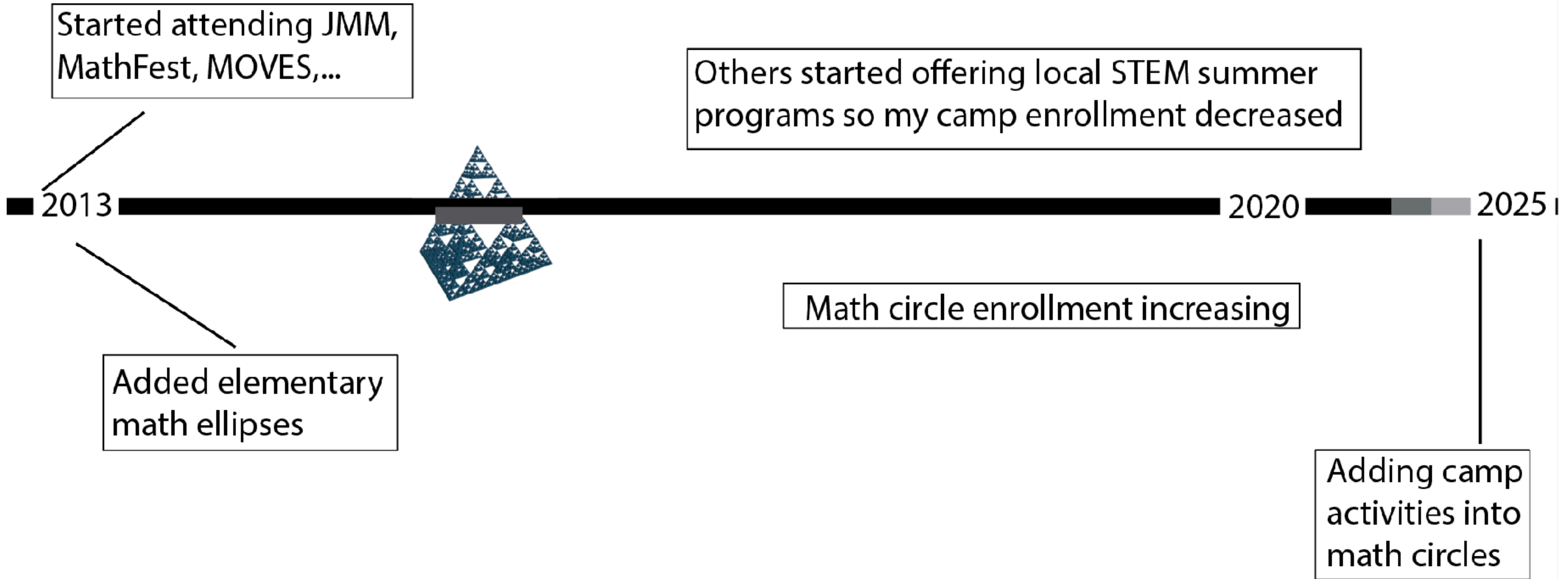
Cryptography

Game Design

Advanced MatheMagics

The Bees & the Birds

Foreground





Camps versus Circles



Different Structures and Motivation

- Goal-oriented
- Lots of crafts/construction
e.g. painting 7-color cups & 4-color saucer sets.
- Socializing for its own sake
- Lots of time for relevant games
- Limited tangents acceptable
- Mini-lectures every day
- Process-oriented, more exploratory
- Never any construction
(except for the Sierpinski Tetrahedron)
e.g. sketching on flat tori with # labels
- Socializing while doing math
- Games just for strategy analysis
- Unlimited tangents appreciated
- Mini-lectures maybe once per term

Both: Cooperative, work together or alone ...



Camps vs. Circles



Example: Number Card Magic Tricks

- I perform a trick, multiple times.
- The campers figure it out, making and testing conjectures, with as many hints as needed.
- We discuss the math behind it, including a mini lecture.
- The campers create their own cards.
- They practice performing the trick.
- I show the cards (not mentioning magic) and ask what they notice.
- The students analyze them, making and testing conjectures.
- I do a magic trick with the cards.
- The students analyze them more, with leading questions as needed.
- Some of them try performing the trick; some later make cards at home.

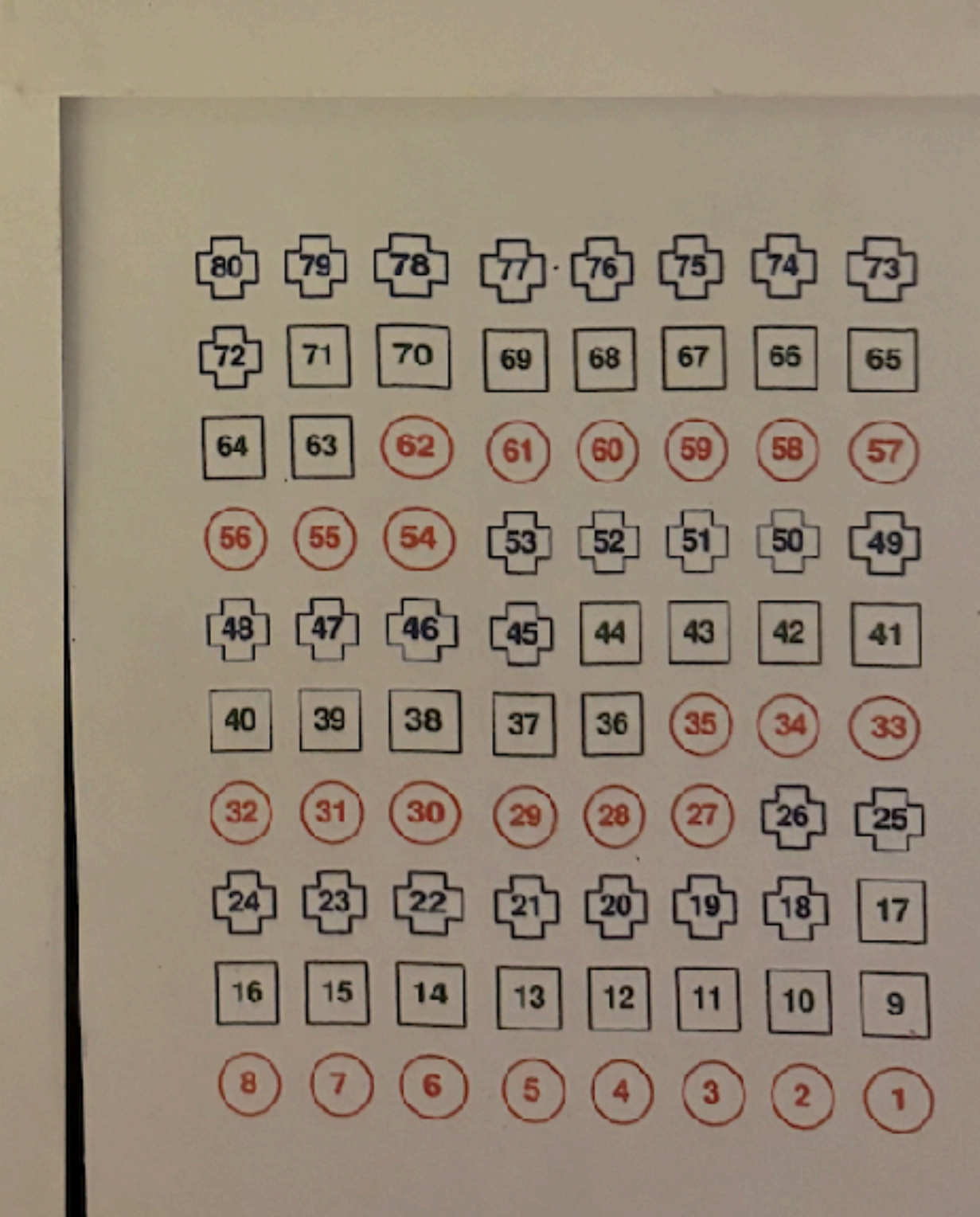
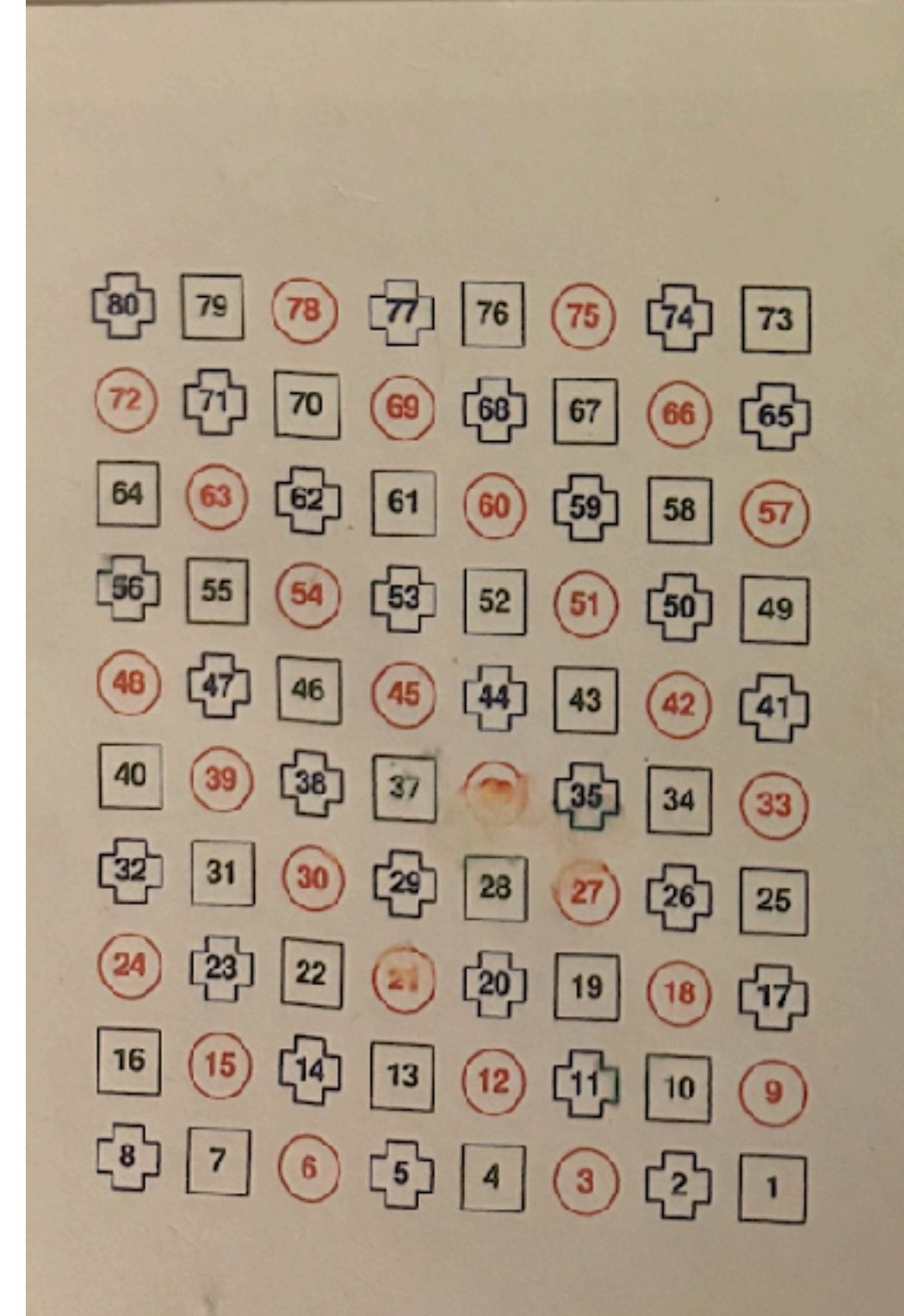
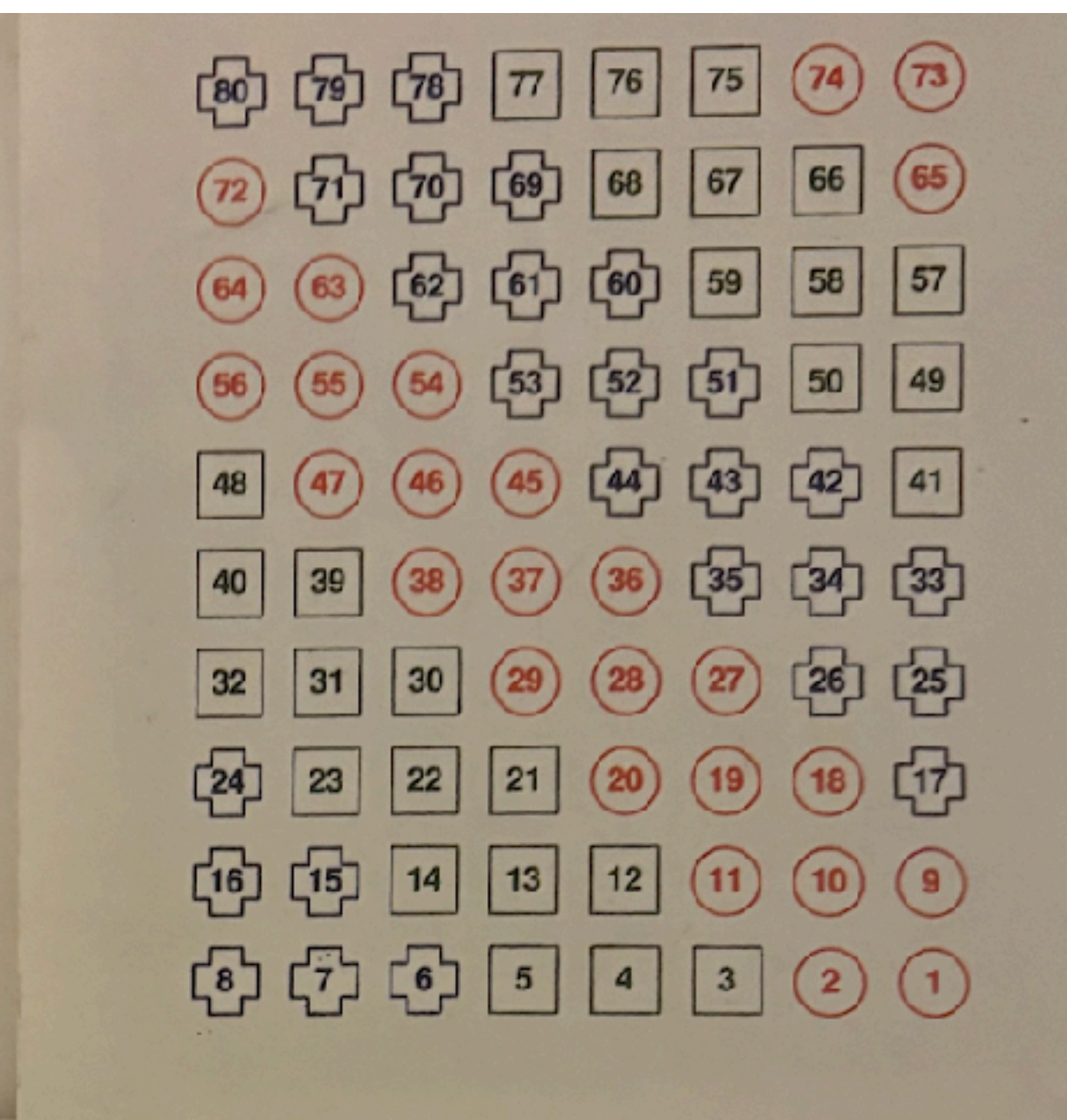
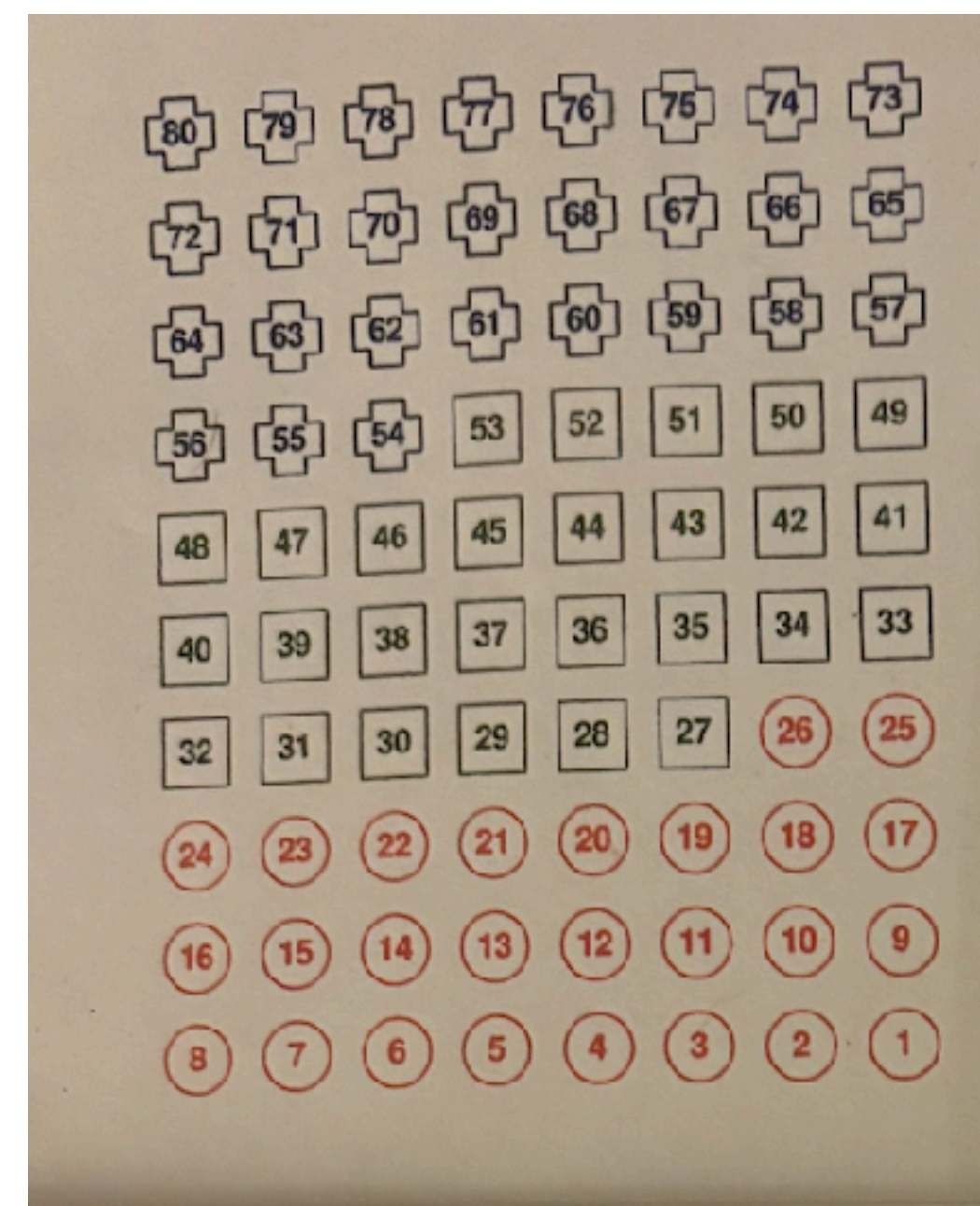
Number Card Magic Trick #1

- Well-known but not well understood by elementary school kids.
- Before: Some notice they all have consecutive numbers and gaps, and the lengths had a pattern, which gives them a visceral feel for binary numbers.
- After: “This card tells you whether it’s even or odd”, “...big or small” but no more.



Number Card Magic Trick #2

- Even kids who understood #1 get stumped by this trick.
- Works similarly from the audience's viewpoint.
- Cuter version by Nancy Blachman: jrmf.org/puzzle/cat-dog-mouse-magic/



Number Card Magic Trick #3

“Liar’s Bingo”

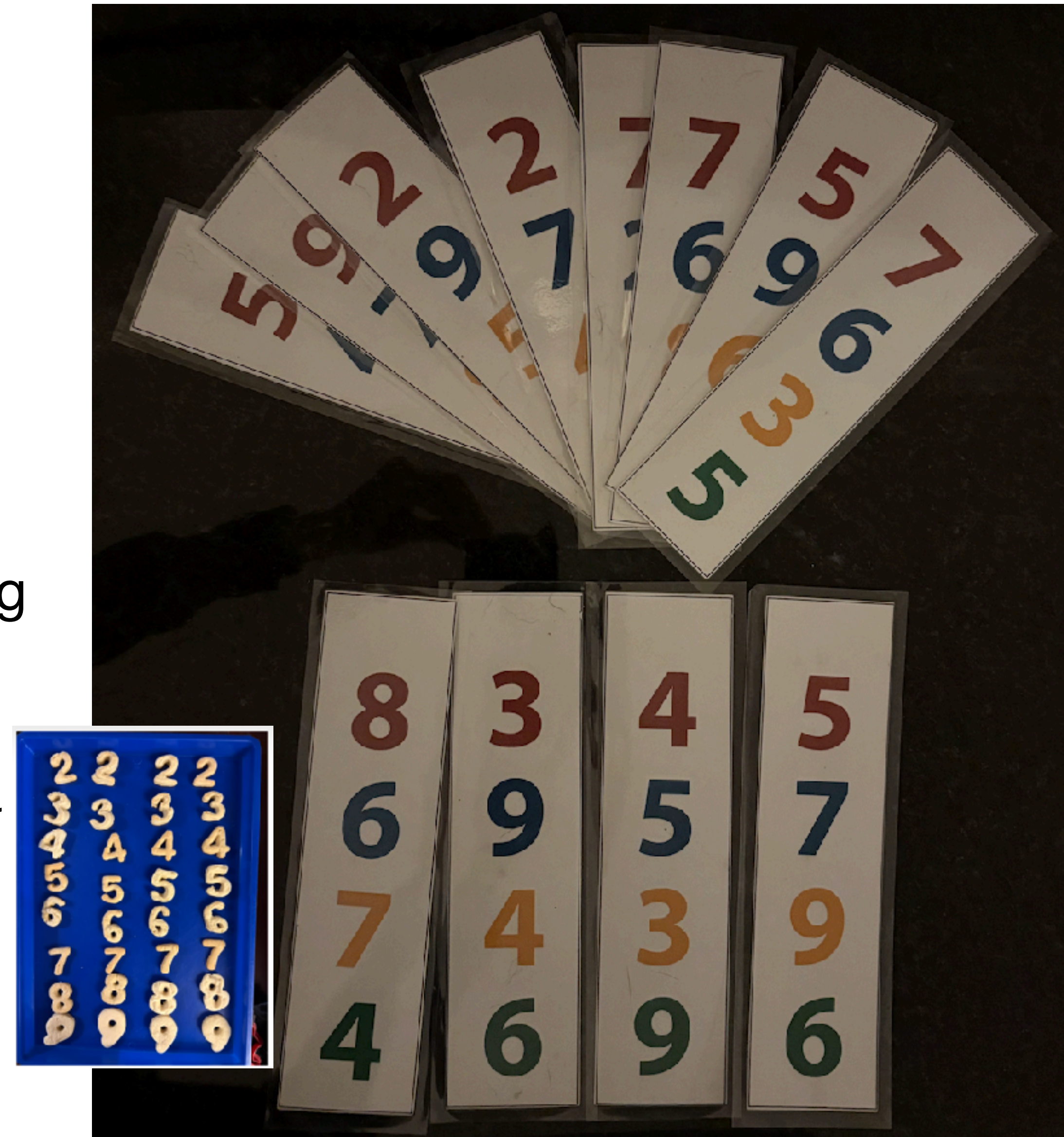
- For middle school, high school and adult math circles.
- Middle schoolers notice lots of shared properties and their variations.
- Some adults think to put them “in order”.



Number Card Magic Trick #4

diff m.o.

- Only math trick in science magic kit, only trick not explained: ...matrices...beyond the scope...
- Never seen elsewhere, never met anyone who had
- Exactly one month ago, Art Benjamin at MoMath hosted online the fastest human calculators, including 14-y.o. Aaryan Shukla. (Broke 6 records in 1 day.)
- The next week at my 4th-8th grade circles, I showed a short video of that, claimed I'd been practicing with these cards and then raced them. (rare activity)
- Did smaller version for 2nd-3rd graders.



Many Other Magic Tricks

- “1089 and All That”
- Knot and not Knots
- Playing Cards
- Calendars
- Geometric Rearrangements
- Fibonacci

and incorporating ideas from other camps

Engagement Magic vs. Games

- Capture attention
- Appeal to more people
- More engaging for younger kids
- Non-competitive
- Hold attention
- Appeal more to people
- Deeper connections
- Work well as people arrive at different times.

I still always try to include a game related to the math circle topic