American Institute of Mathematics

Math Teachers' Circle

Math Departments and MTCs

Brian Conrey

American Institute of Mathematics

Why do *I* like MTCs so much?

Why do *I* like MTCs so much?

- Chance to do fun math with fun and interesting people
- Sense of contributing toward building a larger community of mathematics professionals

Why should *you* be involved in a Math Teachers' Circle?

- *"I better appreciate that there is interesting mathematics that is accessible to all levels."*
- *"I'm more involved in my department - not directly because of Math Teachers' Circles, but as a side effect of being re-energized about math."*
- *"It helped me get my NSF grant by including my involvement in MTC in my broader impact statement."*

Why should math depts host MTCs?

1. It's a great way for mathematicians to interact with teachers
2. Math departments have lots of resources and so should share
3. It's fun to do math with teachers
4. It helps with our joint effort to make our country's populace numerate
5. You can learn a lot from working with teachers
6. You may find some good math problems that way
7. It's a good thing to do
8. It helps keep teachers engaged in their profession
9. The teachers you work with may someday teach your child
10. Common Core has presented a real challenge to some and MTCs can help
11. Math departments have a responsibility to help with the job of bringing math to the public
12. We want people to think that math is (cool, relevant, important) and this gives a direct way to influence things in this direction

Why should my math department host a Circle?

- Hosting a Math Teachers' Circle demonstrates that your department is involved with and committed to the local education community.
- You will maintain ongoing ties with local teachers who are department alumni or who have completed other programs through your department. Not only will you enjoy continuing to work with them mathematically, but they also may be able to help you with pre-service teacher placement or with guiding talented undergraduate students to your department.
- Faculty can share their enjoyment of mathematics with other professionals, while at the same time demonstrating a concrete commitment to the broader impacts of their mathematical work.
- Graduate students can develop their teaching and outreach credentials, positioning them well in a highly competitive job market.
- Pre-service teachers can observe a professional learning community in action and make connections with local practicing teachers, enriching their educational experience and potentially increasing their local employment opportunities.

What commitment is involved?

At a minimum, your department would commit to providing:

- Space for the MTC's meetings, which typically take place 6 to 8 times during each school year
- Faculty member facilitators to lead mathematical sessions for the MTC

Here are some other ways a host institution can support the work of a MTC:

- Host the MTC's website
- Donate copies and other supplies
- Provide dinner/refreshments
- Provide staff support or a student worker to handle administrative duties for the MTC

Rewards

- A department that commits to hosting an MTC should reward faculty that get involved.

My favorite MTC sessions involving 100!

- Joshua Zucker's 1-to-100 problem (on next slide)
- How many digits does 100! have?
- Take the product 1! X 2! X … X 100! Can you remove one of these factorials and get a perfect square?
- What is the last non-zero digit of 100!?

The 1-to-100 Problem

Someone writes the numbers from 1 to 100 on the white board.

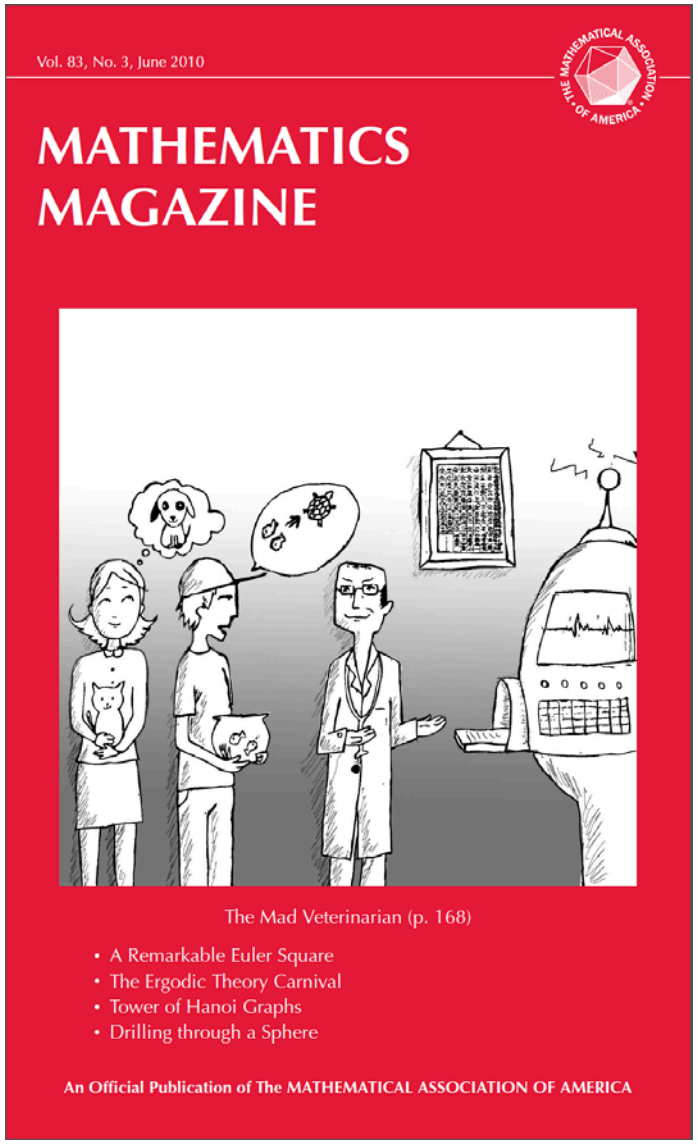
You select two of the numbers, cross them out, and write on the board the sum plus the product of the two numbers.

Repeat this process of selecting two numbers and replacing them with their sum plus their product.

What are the possible outcomes?

MTCs and math research

- Mad Vet
- Smooth neighbors
- Intransitive dice
- SET-related



Abrams, G., & Sklar, J. K. (2010). The graph menagerie: Abstract algebra and the Mad Veterinarian. *Mathematics Magazine, June 2010,* 168-179.

Experimental Mathematics, 22(2):195–202, 2013

ISSN: 1058-6458 print / 1944-950X online
DOI: 10.1080/10586458.2013.768483

Taylor & Francis
Taylor & Francis Group

Smooth Neighbors

J. B. Conrey, M. A. Holmstrom, and T. L. McLaughlin

CONTENTS

We give a new algorithm that quickly finds z-smooth neighbors, where a number is z-smooth if none of its prime factors exceeds z, and if b is a solution of $p \mid b(b+1) \implies p \le z$, then the pair $(b, b+1)$ are called z-smooth neighbors.

1. INTRODUCTION

We say that a number is z-smooth if none of its prime factors exceeds z. In this paper, we search for solutions b of

INTRANSITIVE DICE

BRIAN CONREY, JAMES GABBARD, KATIE GRANT, ANDREW LIU, KENT MORRISON

ABSTRACT. We conjecture that the probability that a random triple of dice is intransitive is 1/4.

1. INTRODUCTION

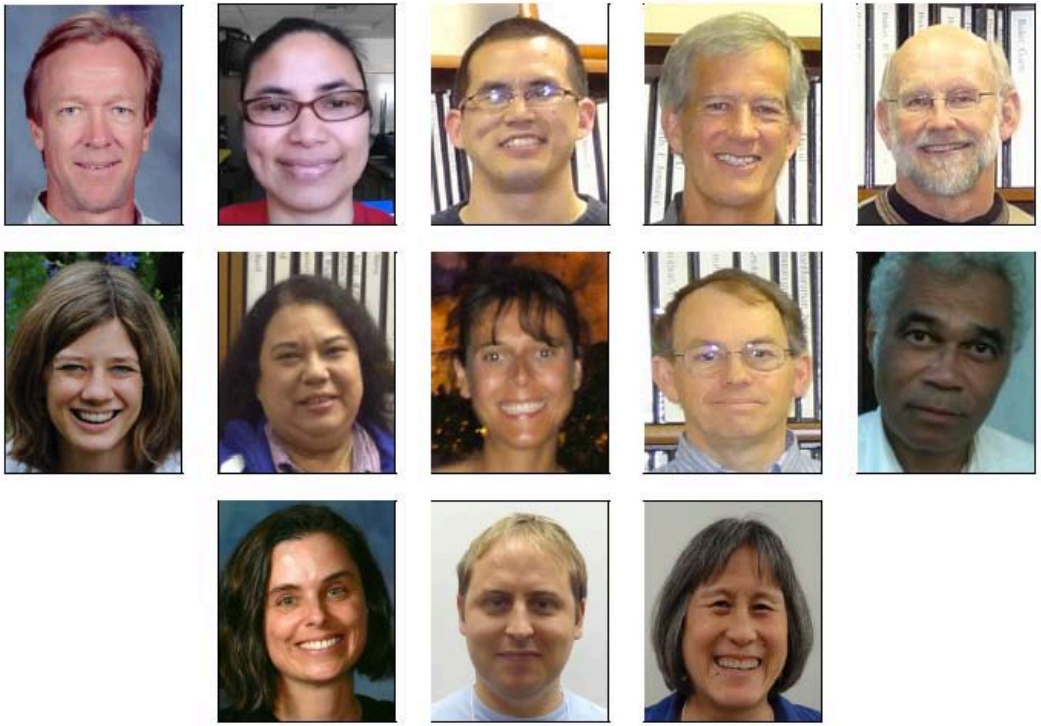
In 1970 Martin Gardner introduced intransitive (or non-transitive) dice in his *Mathematical Games* column. This is a set of four dice A, B, C, D invented by Bradley Efron with the paradoxical property that:

- the probability that A beats B is $2/3$
- the probability that B beats C is $2/3$
- the probability that C beats D is $2/3$
- the probability that D beats A is $2/3$

The typical reaction to learning about intransitive dice is one of surprise, and that is indeed the reaction that we first experienced, but it is the goal of this article to offer a conjecture and supporting

Sets, Planets, and Comets

Mark Baker, Jane Beltran, Jason Buell, Brian Conrey, Tom Davis, Brianna Donaldson, Jeanne Detorre-Ozeki, Leila Dibble, Tom Freeman, Robert Hammie, Julie Montgomery, Avery Pickford, and Justine Wong



The College Mathematics Journal, 44(4), 258-264. Currently available for free download on the journal's homepage.

News
MAA Math Alert
MAA Social Media
RSS
Math in the News
On This Day

The Game of Set Expands into Outer Space

How could contemplation of four-dimensional space and the introduction of "number comets" not make an already fun game yet more enjoyable?

In their article "Sets, Planets, and Comets," which appears in the puzzle-themed September issue of *The College Mathematics Journal*, members of the American Institute of Mathematics Math Teachers' Circle conceive of sets in the game of Set as lines in a certain four-dimensional space.

Running with this geometric characterization, they introduce planes into the game, and, from there, devise a variation of Set (which involves the number comets mentioned earlier). The authors promise that the new game—Planet—"proceeds at a more leisurely pace than the typical frenzy of a Set game."

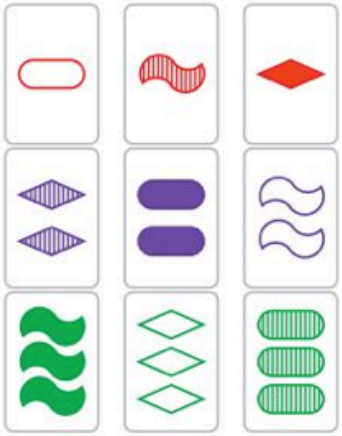


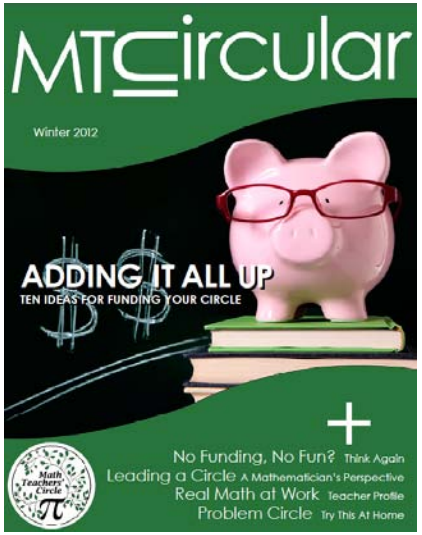
Figure 3. A plane.

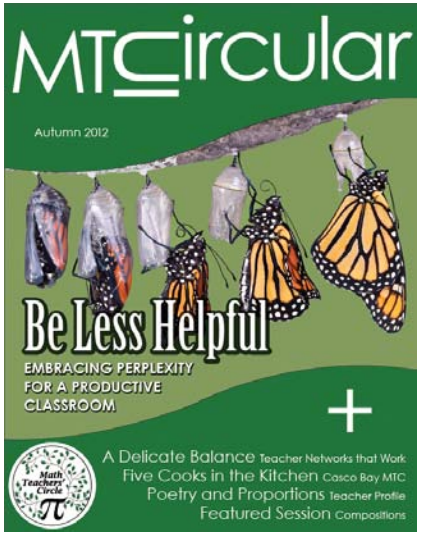
So, what are you waiting for? Read the paper and get playing!

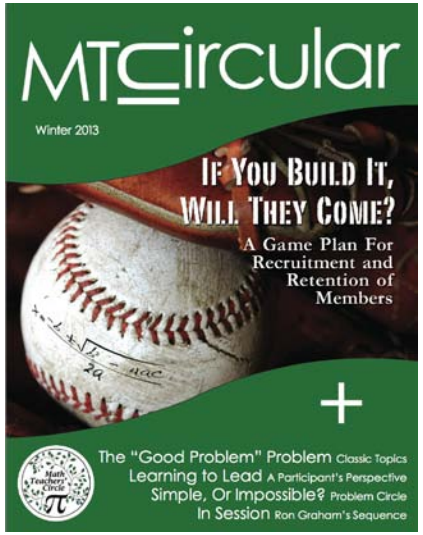
Resources for MTCs

- Stockpile of tried-and-true problems
- Seed funding
- Network of MTCs (72 in 36 states)
- Newsletter
- SIGMAA on Circles
- National Association of Math Circles
- Discussion group
- Exchanges with nearby MTCs

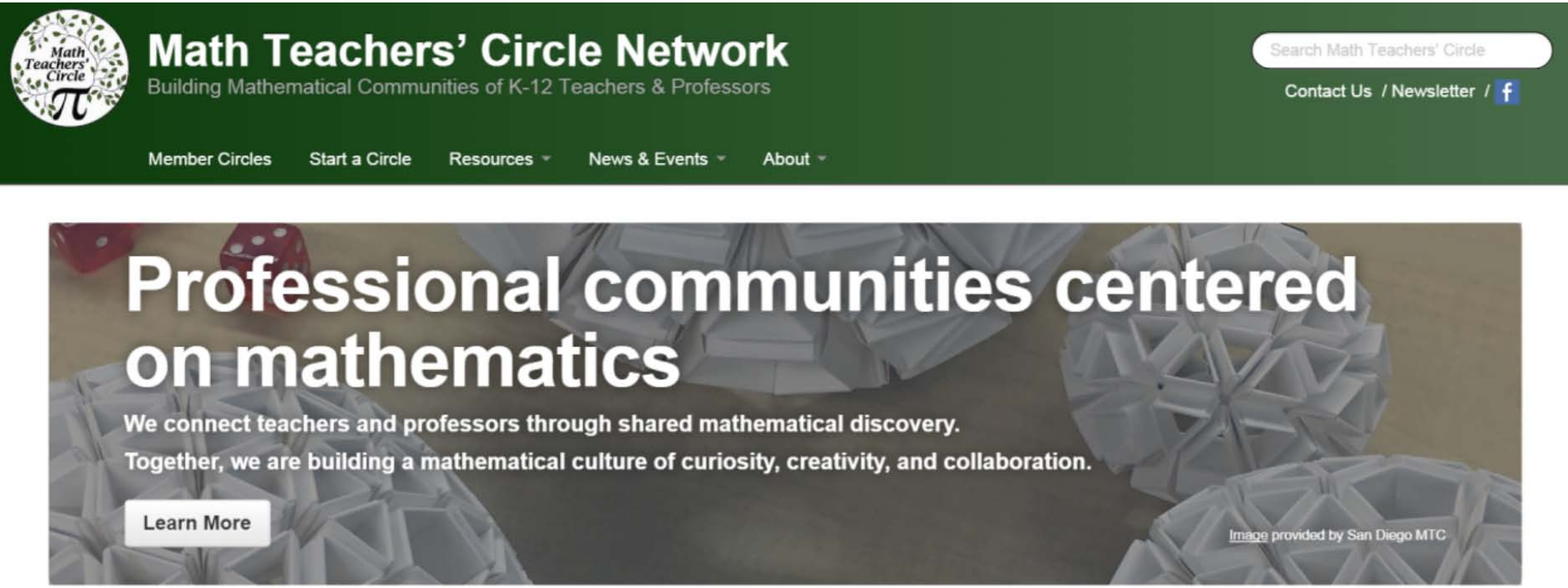
MTCs around the U.S.







MTCircular, a semi-annual newsletter



http://www.mathteacherscircle.org

Plans for ramping up MTCs

- 300 MTCs by 2019
- Regional networks
- Circle Mentors
- Centralized online resources
- Consulting with MTC staff
- Seed funding

Contact Brianna Donaldson (brianna@aimath.org) if you are interested.




Thank you!