Math Circles—Not for Squares

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Metro NY Section MAA

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What is a Math Circle?

Mathematical circles are a form of outreach that brings **mathematicians** into direct contact with **pre-college students**. These students, and sometimes their teachers meet with a mathematician or graduate student in an informal setting, **after school or on weekends**, to work on **interesting problems** or topics in mathematics. The goal is to get the students excited about the mathematics they are learning; to give them a setting that encourages them to become **passionate** about mathematics.

---Mark Saul (2006)

A **Math Circle** is . . .

a place where people motivate each other to learn mathematics by sharing their love and enjoyment of the subject.
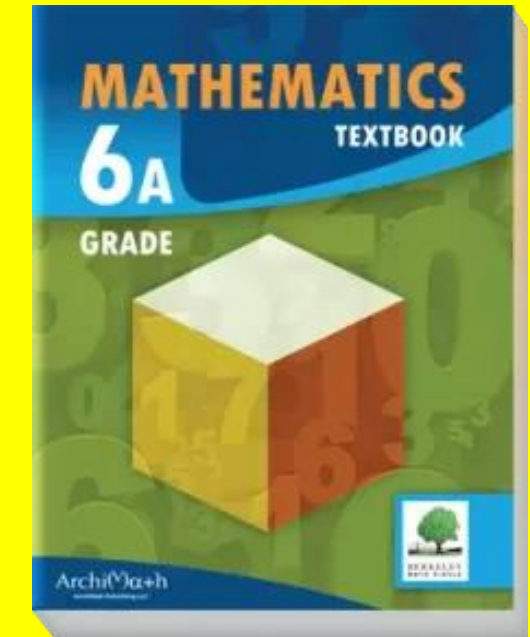
---Mark Saul (MSRI, 2009)

<u>Key Features</u>

- Problem-solving focus

- Collaborative learning

- Interactive sessions

- Advanced topics
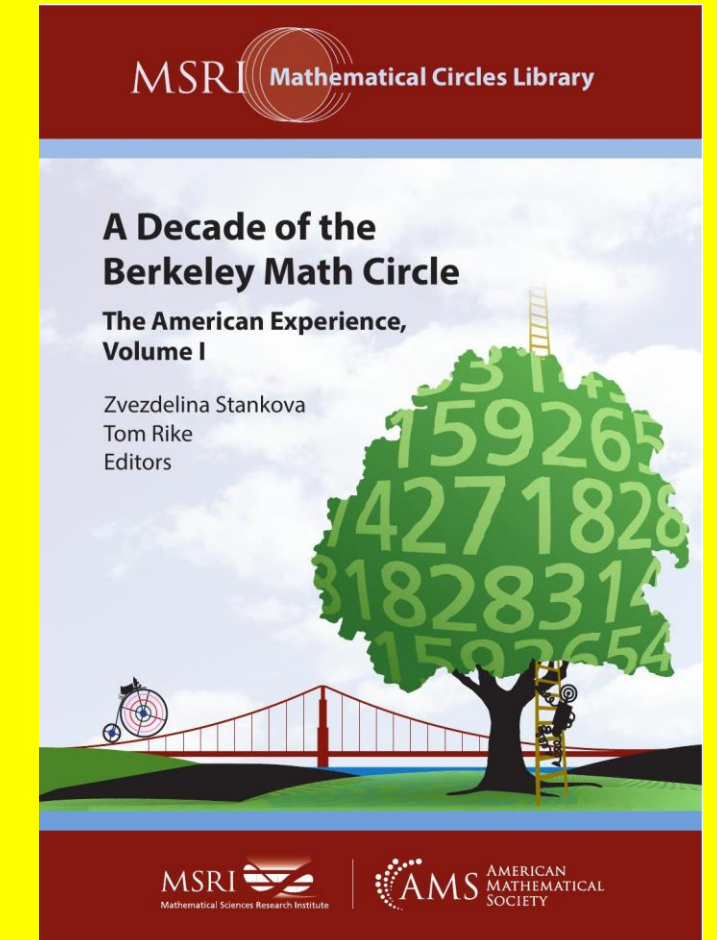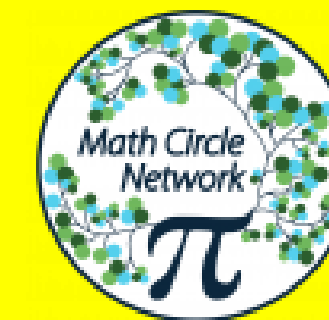
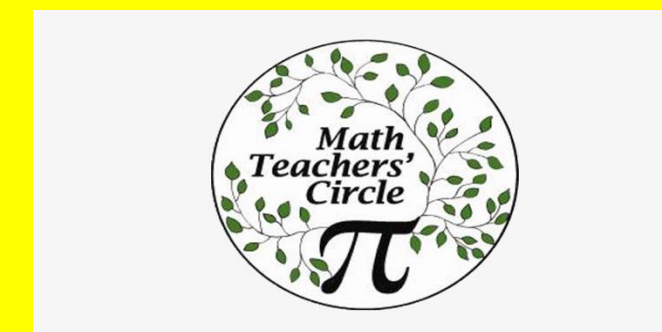- Encouragement of mathematical thinking

Origins

- Bulgaria & Russia (c. 1900, 1930, resp.)

- Cambridge/Boston Math Circle (1994)

- The Mathematical Research Institute (MSRI)
    - ---The Berkeley Math Circle et al. (1998...)
    - ---MSRI Mathematical Circles Library

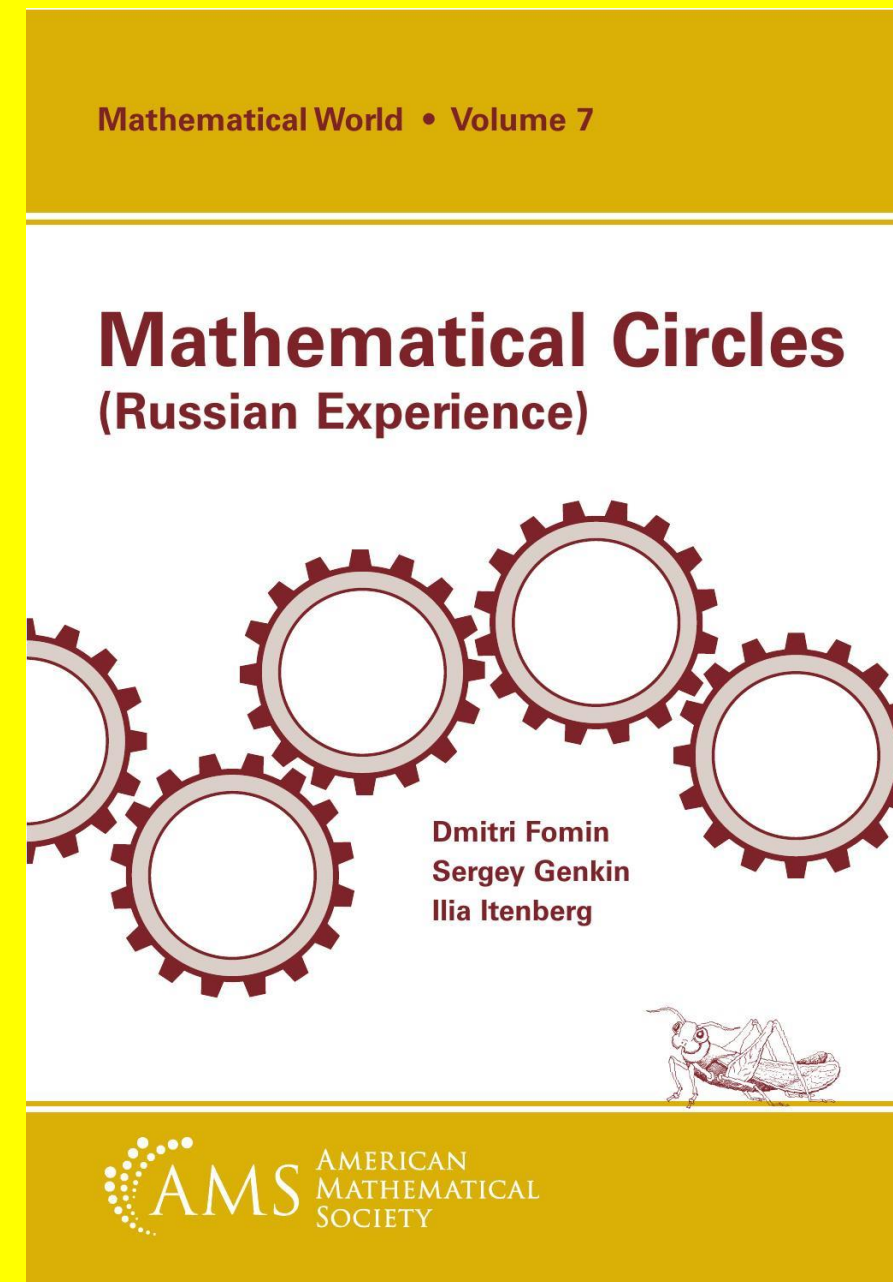- Math Teachers' Circles (c. 2006)

- National Association of Math Circles

- Foreign Math Circles

Topics

Discrete Mathematics---Problems, not exercises

- Number theory
- Combinatorics
- Graph theory
- Games
- Puzzles
- Inequalities
- Invariants
- Geometry
- Set theory, logic
⋮

Mathematical World • Volume 7

Mathematical Circles
(Russian Experience)

Dmitri Fomin
Sergey Genkin
Ilia Itenberg

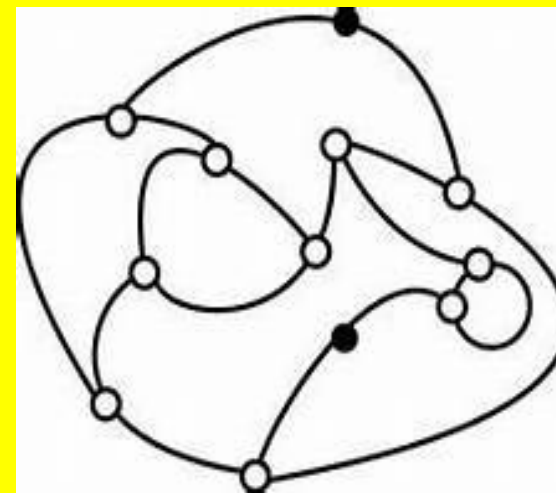AMS AMERICAN MATHEMATICAL SOCIETY

Examples of Activities

Preschoolers

--Möbius strip

--Tower of Hanoi

--Wolf, goat, and cabbage

--Euler's formula: $V - E + F = 2$

Examples of Activities

Middle School
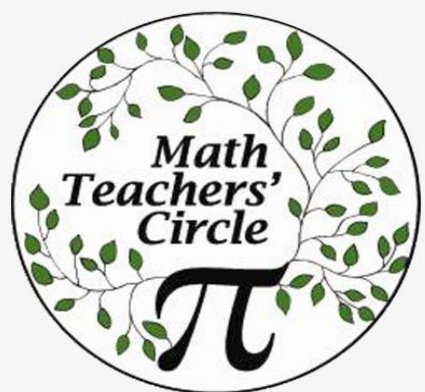
--Triangular numbers

--Pascal's triangle

--Rock, paper, scissors

--Sprouts

High School

--Visualization and symmetry
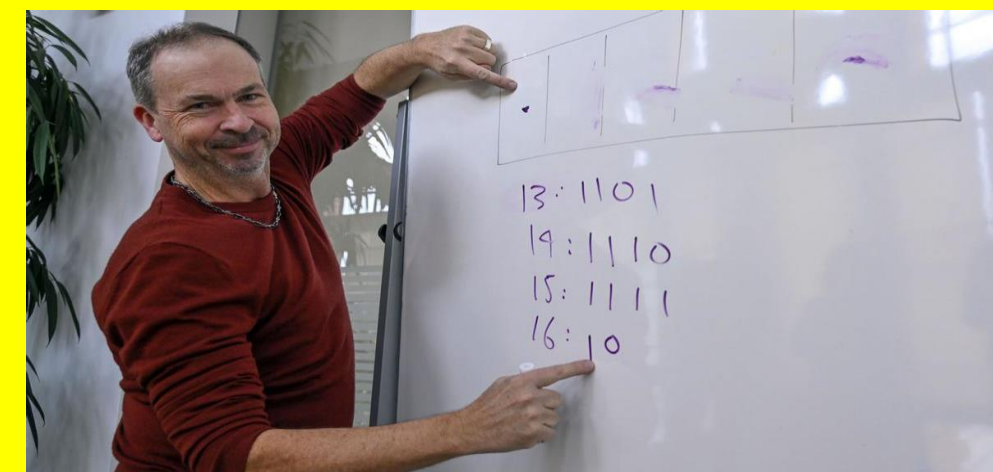
--NIM

--Wythoff's game

Teachers' Math Circles

Developed in the San Francisco Bay area (early 2000s)

---AIM (2006)

These circles

- Increase teachers' mathematical knowledge for teaching
- Support productive teacher mindsets
- Increase inquiry-oriented classroom practices
- Contribute to greater professional engagement

The New York Math Circle (Courant Institute)

https://www.nymathcircle.org

- Competition preparation
- Talks
- Summer High School
- Courses for teachers
  - ---Math & Dinner
- Girls in Math workshop
- Newsletter
- Volunteers and paid staff
- Funded by donations, grants, and registration fees

Westchester Area Math Circle (WAMC)
(Manhattanville University)
**https://sites.google.com/site/westchestercountymathcircle**

- Competition preparation
    ---free workshops at different levels

- Recreational math seminars

- Parents, volunteers

- Funded by donations

Bard Math Circle   (Bard College)
https://bardmathcircle.org

- Competition preparation
- Tutoring
- Weeklong summer program (CAMP)
  - ---three AMS Epsilon awards
  - ---MAA Dolciani Math Enrichment grants
- Family math afternoons
- Parents' math workshop
- Rubik's cube activities
- Volunteers and paid staff
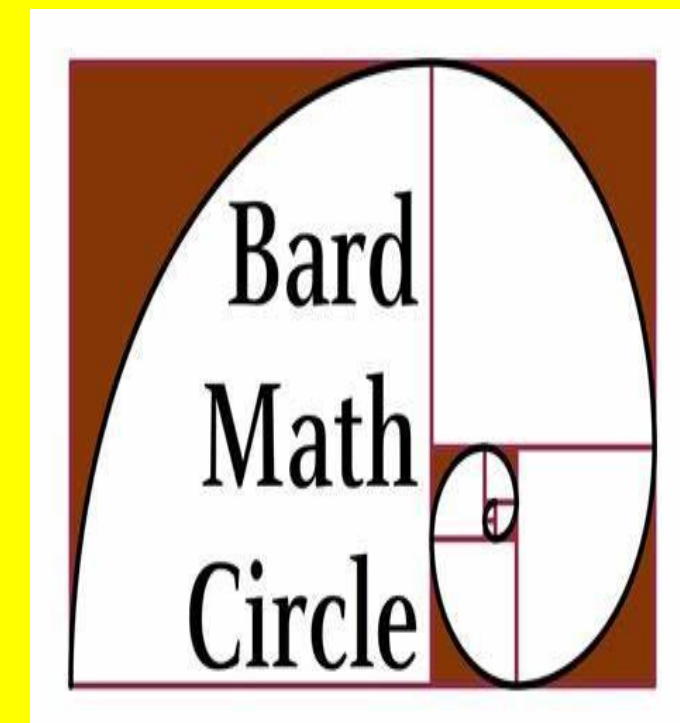
Resources

- **Wikipedia article**: "Math circle" (https://en.Wikipedia.org/wiki/Math_circle)

- **Math Circle Network** (www.mathcircles.org, www.mathteacherscircle.org)
  - ---*MathCircular magazine* (AIM) (www.mathcircles.org/math-circular-magazine)
  - ---*Journal of Math Circles* (https://digitalcommons.cwu.edu/mathcirclesjournal)

- **The Global Math Circle** (www.theglobalmathcircle.org)

- **SIGMAA MCST** (sigma.maa.org/mcst)

Articles

L. Rose and B. Wiegers, "Rubik's Cubes, Pirate Treasures, and Mathematical Joy," MAA *FOCUS*, February/March 2023, 34-35.

T. Shubin, "Math Circles for Students and Teachers," *Mathematics Competitions 19, No. 2 (2006)* [available at www.wfnms.org/journal.html]

J. Tanton, "Math Circles and Olympiads, MSRI Asks: Is the U.S. Coming of Age?'' *Notices of the AMS* **53**, No. 2 (2006), 200-205.

S. Kennedy, "The Math Circle," *Math Horizons* **10**, No. 4 (2003), 9-10, 27-28.

R. Kaplan, "The Math Circle," *Notices of the AMS* **42**, No. 9 (1995), 976-978.

Books

Mathematical Circles (*Russian Experience*) -- D. Fomin, S. Genkin, I. Itenberg (AMS, 1996)

A Decade of the Berkeley Math Circle: The American Experience, Vol 1 – Z. Stankova, T. Rike, eds. (AMS, 2008)

Circle in a Box – S. Vandervelde (AMS, 2009)
   …and any of the other volumes in the MSRI Mathematical Circles Library
   …https://bookstore.ams.org/mcl

Out of the Labyrinth: Mathematics Set Free – R. Kaplan and E. Kaplan (OUP, 2007)

Solve This: Mathematical Activities for Students and Clubs – J. Tanton (MAA, 2001)

5 Fabulous Activities for Your Math Circle – S. Coskey, P. Ellis, J. Wood (Natural Math, 2022)

Thanks for listening!

Henry Ricardo

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