Life After MATHCOUNTS

Richard Rusczyk
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Why **MATHCOUNTS** is Important

- Rewards excellence
- Encourages students to go above and beyond the classroom
- Introduces subjects of vital importance at an early age to the next generation of engineers, scientists, and mathematicians
MATHCOUNTS prepares students for the future by...

• presenting challenges like the ones students will face in college
• preparing students for the intellectual challenges of many different careers
Thank you to all the teachers, coaches and parents!

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Why Problem Solving Matters

• Knowledge is no longer scarce
• Computers beat humans in all computational tasks
Standard Curriculum ≠ Problem Solving education

“I certainly wish your website and materials existed when I was in high school. I went through junior high and high school without ever missing a question on a math test, and then took [Math] 103 and 104 at Princeton, which was one of the most unpleasant and bewildering experiences of my life and poisoned me on math for years.”

-Princeton University alum

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The standard curriculum is not enough, and that is not going to change anytime soon.

- Problems aren’t hard enough
- Tests mimic homework
- Emphasis on memorization

The standard curriculum is not enough, and that is not going to change anytime soon.
While challenging and improving the mathematical problem-solving skills of high-performing students are surely every-day objectives of those who teach such students, it is not a problem, relatively speaking, of major import in American education.

-Department of Education Grant Reviewer

So what do you do?
Three Strategies for High-performing Middle and High School Students

• Extracurricular Programs
• Independent Study
• Curriculum Overhaul
Benefits of a Math Club

• Offers more challenging mathematics
• Signals the importance of math to students
• Establishes a culture of excellence
• Provides social interaction among students with common interests
Merits of Independent Study

• Structured more like college and careers
• Removes the ceiling of the standard curriculum
• Allows students to use more appropriate materials
• Creates more mature learners
• Gives students time to indulge their academic passions
Recommendations for Curriculum Overhaul

- More Discrete Math
- Harder Problems
- Abandon Traditional Grading
- Less Emphasis on Calculus
Challenges to Serving the Top Students

• Convincing schools there’s a problem
• Equity issues
• Convincing students there’s a problem
• Calculus!  Calculus!  Calculus!
Contests

American Mathematics Competitions

www.unl.edu/amc

AMC 8

AMC 10 and AMC 12

American Invitational Math Exam (AIME)

USA Math Olympiad (USAMO/USAJMO)

Math Olympiad Summer Program (MOSP)

China Girls Math Olympiad

International Math Olympiad (IMO)
Many colleges ask for AMC scores and some even offer scholarships.
Contests

American Regions Math League       www.arml.com
Mandelbrot Competition       www.mandelbrot.org
Math Prize for Girls       mathprize.atfoundation.org
Purple Comet       www.purplecomet.org
USA Mathematical Talent Search       www.usamts.org

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Contests at Universities

• Harvard - MIT
• Princeton
• Stanford
• Rice
• Duke
• Johns Hopkins
• University near you! (Lehigh, Univ. of MD, UNM, UCSD, UNCC, ...)

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Math Circles

Local opportunities for students to learn outside their schools

Cities with Math Circles include:

Albany, Berkeley, Boston, Boulder, Charlotte, Dallas, Los Angeles, Mobile, Palo Alto (Stanford), Salt Lake City, San Diego, San Francisco, San Jose, Seattle, Tucson
Summer Programs

Factors to consider when choosing a program:

- Age
- Location
- Structure
- Emphasis
- Length
- Cost
- Does your child want to go?
Other Programs

- Siemens Competition (www.siemens-foundation.org)
- Intel Science Talent Search (www.intel.com/education/sts)
- Davidson Fellows Scholarship Program (www.ditd.org)
- International Science & Engineering Fair (www.sciserv.org/isef/)
Science & Computing Programs

- USA Computing Olympiad (www.usaco.org)
- USA Physics Olympiad (www.aapt.org/Contests/olympiad.cfm)
- USA Chemistry Olympiad (url too long to list)
- USA Biology Olympiad (www.cee.org/programs/usabo)
- North American Computational Linguistics Olympiad (www.naclo.cs.cmu.edu/)
The first step to succeed in science programs is to...

Develop strong math problem solving skills!
Resources for a Mathematical Problem Solving Education

Books

Classes

Website
Resources for a Mathematical Problem Solving Education

**Books**

*Art of Problem Solving Volume 1 and 2*
by Richard Rusczyk and Sandor Lehoczky

- Emphasis on problem solving and contest preparation
- Used by top MATHCOUNTS and AMC students and teams for over 18 years
- Authors earned the only perfect scores on the AIME in 1989 (Rusczyk) and 1990 (Lehoczky)

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[www.artofproblemsolving.com](http://www.artofproblemsolving.com)
Resources for a Mathematical Problem Solving Education

Books

Art of Problem Solving Introduction Series

- **Prealgebra** by Richard Rusczyk, David Patrick, and Ravi Boppana
- **Introduction to Algebra** by Richard Rusczyk
- **Introduction to Counting & Probability** by David Patrick
- **Introduction to Geometry** by Richard Rusczyk
- **Introduction to Number Theory** by Mathew Crawford

- Modern mathematics curriculum for high-performing math students
- Integrates problem solving with the mathematics curriculum
- Includes thousands of problems, many from prominent contests

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Books

Art of Problem Solving Intermediate Series

Intermediate Algebra by Richard Rusczyk and Mathew Crawford
Intermediate Counting & Probability by David Patrick
Precalculus By Richard Rusczyk
Calculus by David Patrick

- Modern mathematics curriculum for high-performing math students
- Integrates problem solving with the mathematics curriculum
- Includes thousands of problems, many from prominent contests

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Resources for a Mathematical Problem Solving Education

Books

Awards won by the authors of Art of Problem Solving textbooks:

• National MATHCOUNTS Test Champion
• National MATHCOUNTS Team Champion
• Two perfect scores on the AMC exam
• Three perfect scores on the AIME exam
• Two USAMO winners
• 9 invitations to the Math Olympiad Program
• 6-time National MATHCOUNTS parent distraction
Art of Problem Solving Resources

Books

New! Beast Academy

- Math Curriculum for Grades 2-5
- Common Core Standards plus Problem Solving
- 4 Guide Books and Practice Books per grade level
- Comic Book style

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Resources for a Mathematical Problem Solving Education

**Classes**

School isn’t the only option!

- Math Circles
- After School Programs
- Math Teams
- Online Classes
Resources for a Mathematical Problem Solving Education

Classes

Art of Problem Solving Online Classes

Curriculum: *Middle School and High School*

Contest Preparation: *MATHCOUNTS, AMC, AIME*

Specialty: *Computer Programming, Group Theory*

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Resources for a Mathematical Problem Solving Education

Classes

Art of Problem Solving Online Classes

WOOT: Worldwide Online Olympiad Training

• 7-month Olympiad preparation and testing program
• Includes practice AIME and USAMO tests, problem sets, articles, online classes, message board
• DE Shaw, Two Sigma, and GETCO sponsorship allows MOSP students to enroll for free

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Resources for a Mathematical Problem Solving Education

**Classes**

Other online programs include:

- EPGY
- CTY
- TIP
- Belin-Blank
Resources for a Mathematical Problem Solving Education

WEBSITE

www.artofproblemsolving.com

- Books
- Classes
- Articles on problem solving topics
- LaTeX tutorial for typesetting mathematical writing
- AoPSWiki
- Lists of and links to many other resources, such as books, programs, contests, scholarships, and more!

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Resources for a Mathematical Problem Solving Education

WEBSITE

www.artofproblemsolving.com

A FREE online multi-player game. Thousands of MATHCOUNTS and AMC problems. Countdown Round format.

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Resources for a Mathematical Problem Solving Education

WEBSITE

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ALCUMUS

An Online Adaptive Learning System

Thousands of problems from major national contests

π Over 7500 problems with solutions

An intelligent learning system

Detailed progress reports

FREE!

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Resources for a Mathematical Problem Solving Education

WEBSITE

www.artofproblemsolving.com

Largest online community of problem solvers in the English-speaking world

Over 100,000 members

Over 2.5 million posts

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Developing Problem Solving Skills
Strategies for Parents

Organize
Agitate
Contribute
Technology now allows us to leverage the efforts of a few to the benefit of the many.
Our tomorrow is in the hands of the best students today.