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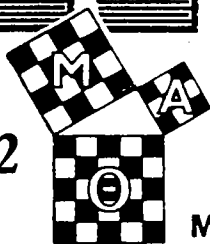
# AT THE ROOT OF IT ALL

Deborah Patonai ... SEE PAGE TWO

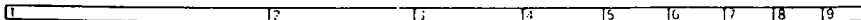
# MATHEMATICAL

# LOG

VOLUME 33, NUMBER 2  
APRIL 1989



MU ALPHA THETA



## New National Report Urges Greater Student Mathematics Commitment

By Don Allen

The Mathematical Log, as official publication of a national organization co-sponsored by the Mathematical Association of America and the National Council of Teachers of Mathematics, receives news releases and other communications from within the mathematics and education communities, and values and frequently shares items from such sources. Recently received from the Washington-based Joint Policy Board for Mathematics was an advance copy of Everybody Counts, A Report to the Nation on the Future of Mathematics Education, an outstanding report of the Mathematical Sciences Education Board, Board on Mathematical Sciences, and Committee on the Mathematical Sciences in the Year 2000 of the U.S. National Research Council (Washington: National Academy Press, 1989; xiv + 114 pages).

First reaction to the convincingly reasoned, thoroughly referenced, and rather sweeping recommendations of this milestone document was to consider, to commend to teacher-sponsors, and to reflect in editorial policy, and little more.

Further consideration leads us to urge that you, our Mu Alpha Theta family and national membership, become knowledgeable on matters being considered and recommended, and actively involved in considering what steps are needed and how you can, collectively and individually, respond. For of all the major reports and writings on American school and college mathematics of the past ninety years--yes, your Editor has read them all!--this Report is the first to direct recommendations and urgings to students and to their parents as well as to the professionals of mathematics education. Indeed, the Report makes pointed recommendations to business and industry, state legislators, congress, and the President of the United States, but it is those ideas which relate to your decisions and to decisions to be made in your home and your school community that we feature prominently in this Mathematical Log issue. Those concerned with the broader political issues should--and no doubt will--contact Washington for the full Report.

Presenting mathematics as "the key to opportunity"; arguing that "for lack of mathematical power, many of today's students are not prepared for tomorrow's jobs--"in fact, many are not even prepared for today's jobs"; the milestone Report underlines:

"Wake up, America! ... Three of every four Americans stop studying mathematics before completing career or job prerequisites. Most students leave school without sufficient preparation in mathematics to cope either with

on-the-job demands for problem-solving or with college requirements for mathematical literacy."

\* \* \*

What should students be doing? The Report urges four points:

1. Study mathematics every school year.
  2. Discover mathematics that is all around us.
  3. Use mathematics in other classes and in daily life.
  4. Study a broad variety of mathematical subjects.
- And their parents? Four actions are urged:
1. Demand that schools meet the new NCTM Standards.
  2. Encourage children to continue studying mathematics.
  3. Support teachers who seek curricular improvements.
  4. Expect homework to be more than routine computation.

\* \* \*

High school is where students begin to learn the mathematics that they will need for careers as well as the mathematics required for effective citizenship, the Report underlines. Contemporary society requires "much greater breadth" from secondary school mathematics than was the case when current "content" was established. Notes the Report:

"The focus of the secondary school curriculum remains ... on the transition from concrete to conceptual mathematics. As students' understanding moves from numbers to variables, from description to proof, from special cases to general equations, they learn the power of mathematical symbols."

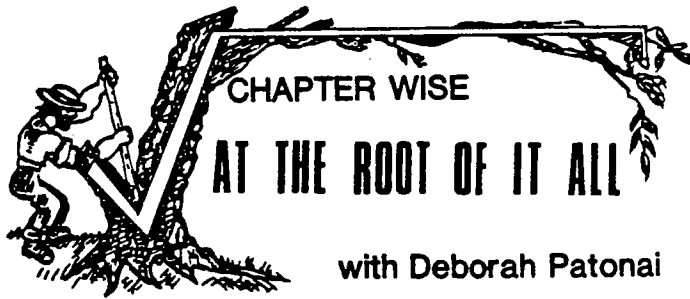
The Report sees the development of "symbol sense" as a major objective of secondary school mathematics.

Students "well prepared mathematically for leading intelligent lives as productive citizens" should be the goal of secondary mathematics education--"since even many of those who go on to higher education will take little or no further mathematics."

The Report argues convincingly:

"High school graduates need to know enough about chance to understand health and environmental risks; enough about change and variability to understand investments; enough about data and experiments to understand the grounds for scientific conclusions; enough about representation to interpret graphs; and enough about the nature of mathematics to be supportive parents to their children who will learn aspects of mathematics that their parents never studied."

(See "Mathematics Commitment," page 4)



Mu Alpha Theta chapters across the country often have unique stories to tell about their early beginnings, special sponsors, or crazy convention trips. For your activities feature, √At the Root of It All, I try to track down these interesting stories or unusual happenings. This issue's story begins in 1975 with a naive Annabelle Robinson driving her Lebanon High School math team to Memphis for Tennessee's first state Mu Alpha Theta convention. Little did she know that this first contact with Mu Alpha Theta would eventually lead her to represent her region on Mu Alpha Theta's national governing board.

Most new Mu Alpha Theta chapters gradually become acquainted with the national scope of Mu Alpha Theta, its activities and services. Accordingly, it's not surprising that the math team from Lebanon went to their state convention hoping to "check out" Mu Alpha Theta. At the conclusion of the convention, the time came for the election of the following year's officers. Because other schools had left, Lebanon's math team found itself deciding on a moment's notice who from the group could serve as state secretary and state president. Instead of just being introduced to Mu Alpha Theta, the team returned home as hosts for the second annual Mu Alpha Theta state convention--in Lebanon, TN!

Since this fascinating beginning, Lebanon's Mu Alpha Theta chapter has grown to an active membership of sixty to seventy. It has hosted another state convention and has yielded several state treasurers, two state secretaries, and two state presidents. Assuring continued interest, club organizers feature a range of usual--and unusual--activities. The chapter has organized Mu Alpha Theta barn bashes, arranged Escher art designing competitions, and scheduled math office painting and decorating marathons--and crammed in late-night study sessions at members' homes, complete with pizza and Coke.

In addition, as a service project, the Mu Alpha Theta chapter supports the local Beta Club in sponsoring and in organizing the Special Olympics. For fundraisers, the group has sold computer dating results. Its best money-maker, however, has been the School's infamous Mu Alpha Theta Faculty Feud. This contest has become a fun tradition at Lebanon High School, for students as well as for teachers. The Mu Alpha Theta chapter polls students about their lives, thus providing the survey questions for the Feud. The teachers dress outrageously to form "families," then attempt to respond to questions.

It's YOUR Log! Your editors stress that student submissions--queries, solutions, math insights, news and views--receive first consideration as each Mathematical Log and Tall Timbers goes to press. So, we're delighted that Activities Editor Deborah S. Patonai this issue draws on sharings of student member Robbie Ann Robinson, and glad to reproduce Joseph De Vincentis' fine "Math-Pack" submission. Let's have more of you writing to your Log! Ed.

When does this chapter find time to devote to mathematics? Every day, after school, sponsor Robinson's room is full of students either receiving assistance from Mu Alpha Theta tutors or readying themselves for forthcoming math competitions. Recently, the chapter has worked up a comprehensive and most successful tutoring program to aid math students at every level. Tutoring is one of the many ways in which a student can acquire points to maintain

local membership in Mu Alpha Theta. Student members also receive points by working on the chapter's computer, by organizing and participating in such club activities as designing and decorating a homecoming float, by studying for competitions, by attending conventions and regional meetings, and by preparing bulletin boards.

What is Lebanon chapter's secret to success? The most important ingredient, we're convinced, is their hard-working sponsor, Annabelle Robinson. She has been active in all but one of the Tennessee State conventions and in ten national ones. She currently is serving a term as Mu Alpha Theta governor, Region Four. Annabelle Robinson has certainly devoted herself to Mu Alpha Theta!

Mu Alpha Theta's thousand-plus chapters are rich in stories of remarkable individuals and unusual, noteworthy events. We want to learn of them! This information this issue was related by Robbie Ann Robinson, daughter of Annabelle. Being her daughter, previous math student, Mu Alpha Theta member, and Mu Alpha Theta state treasurer, Robbie knows--and shares--the inside story of Mu Alpha Theta at Lebanon High School. We're grateful!

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# THE APRIL 1989 MATHEMATICAL LOG

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MU ALPHA THETA

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#### MU ALPHA THETA

**President:** Pamela J. Drummond, Department of Mathematics, Walton High School, 1590 Bill Murdock Rd., Marietta, GA 30062.

**President-Elect:** Dr. John Kenelly, National Science Foundation, 1800 G St. NW, Rm. 638, Washington, DC 20550.

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**M.A.A. Representative:** Katherine P. Layton, Beverly Hills High School, Beverly Hills, CA 90212.

**N.C.T.M. Representative:** Barbara Stott, Riverdale High School, 240 Riverdale Dr., Jefferson, LA 70121.

#### THE MATHEMATICAL LOG

**Editor-in-Chief:** Dr. H. Don Allen, 6150 Bienville Ave., Brossard, Québec, Canada J4Z 1W8.

**Activities Editor:** Deborah S. Patonai, Saint Vincent-Saint Mary High School, 15 N. Maple St., Akron, OH 44303.

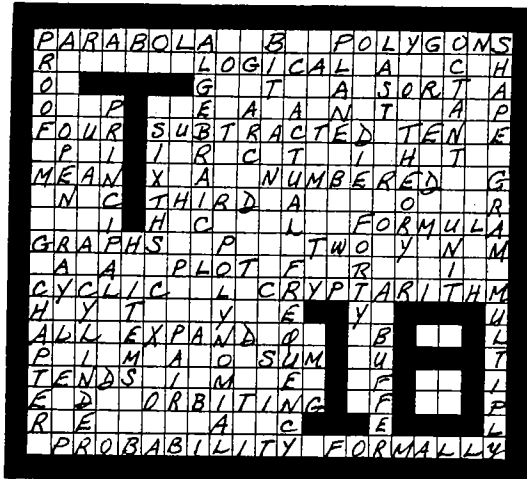
**Mathematics Editor:** Dr. Ali R. Amir-Moéz. Please address correspondence to Mu Alpha Theta National Office.

**19th NATIONAL CONVENTION, TAMPA, FL, AUGUST 3-8, 1989**  
**Sponsoring chapters:** King High School, Tampa, FL; Berkeley Prep School, Tampa, FL; Plant City High School, Plant City, FL. Registration particulars: Dave Steele, Plant City High School, One Raider Pl., Plant City, FL 33566 (school: 813 754-1541; residence: 754-8306).

# dia Log ue



with Log Editor Don Allen



Good contests produce winners, and our October "Math-Pack" challenge has a 1306 point winner in Joseph De Vincentis, Jr., of Corpus Christi, TX, whose "nationally best" contest entry is reproduced above.

Joseph, in a letter to the Log, shares his winning strategy: "The secret is in using enough short words--and in setting the game aside after an hour and waiting a day or two before returning."

Writes Joseph: "I didn't send my entries earlier because I figured someone would easily make 1300. After seeing preliminary winners in Tall Timbers [#21, February], I decided I must have figured wrong." Joseph, in submitting his 1306 point claim, notes: "I had been up to 1314, but in my frenzy my words had started to drift away from proper math words." Joseph has a point. If this were a major contest rather than a fun activity, "math words" would have to be "well defined," possibly in terms of a scientific or mathematical dictionary.

Congratulations, Joseph--and our gratitude for sharing your best efforts. A Logmaster patch will be in the mail.

A mathematician's idea of an evening out may be to attend a public lecture by a fellow mathematician, so when "Life"-inventor John Conway was in town recently, we made a point of looking in. Conway, a superb showman whose ideas can span age 8 to graduate school with a wave of the hand, was relating game properties to structure of the number system (which we'll not go into here), and shared a simple--but hardly trivial--two-player game which he calls Domineering. Players take turns to place standard dominoes (2 x 1 rectangles, the spots don't matter) on a chessboard (Conway sketched a 5 x 5), the first player orienting his pieces vertically on unoccupied pairs of squares, the second player horizontally. The first player unable to make a move, loses.

Conway also challenged his audience to reduce the familiar game of dots and boxes ("all moves join two adjacent dots by a horizontal or vertical line [segment]") to its smallest version "that is reasonably interesting," a 3 x 3 [rectangular] array. Conway suggested someone try ten consecutive games: "You decide who goes first: I usually win all ten." That is, winning strategy is tricky for a new player to pick up.

Conway had no takers.

The match "has some kind of psychological problem built in," he suggested.

10 <sup>6</sup> phones	=	1 megaphone
2 <sup>3</sup> puss	=	1 octopus
10 carts	=	1 Descartes
10 dents	=	1 decadent
2000 mockingbirds	=	two kilomockingbird

Much has been said about mathematics, and said rather well, over the past couple of millenia, as a small book which recently came to our desk serves to attest.

The book was Mathematical Maxims and Minims, compiled by Nicholas J. Rose, illustrated by John de Pillis (Rome Press, Inc., Box 31451, Raleigh, NC 27622, pp. vii + 169, \$13.95, paper). It contained the above "units," a remarkable "Universal Grade Change Request Form" (permuting every possible student request for a higher mark), and much more--from serious insights into the nature of mathematics by leading philosophers and mathematical practitioners to the light verse of the like of Richard Armour. We were to review it briefly for the Mathematics Teacher, which we did. But before we set it aside we wanted to recommend it most heartily to Mu Alpha Theta members and their teacher sponsors, which we now do.

To underline the recommendation we've selected an even dozen of the most provocative quotations, and ask you to ponder them--and to try to identify the speaker or writer in each case.

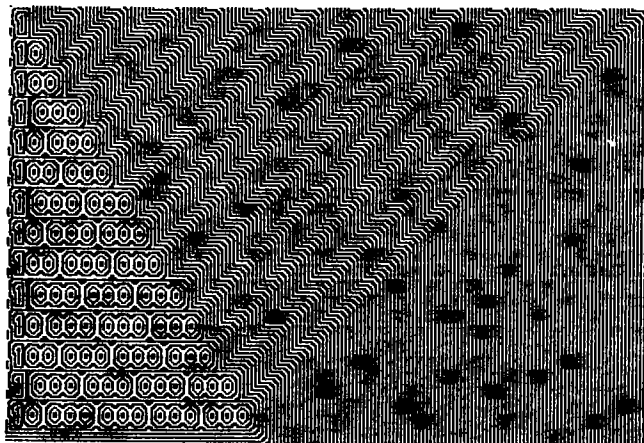
Here they are:

1. What science can there be more noble, more excellent, more useful for men, more high and demonstrative, than mathematics?
2. Number rules the universe.

(See "dialogue," page 5)



ART AND DESIGN. "Contemplations of Reason" is the title of this free-form sketch by Mathematical Log Mathematics Editor Ali R. Amir-Moëz--reflecting imaginative insight into the possibilities of space and swirling curvature.



ART AND DESIGN. Student Danial Schecter, who had been fascinated by powers of 10 and names for the related larger integers (quadillion, quintillion, ...) recently presented the Editor with this piece of computer graphics which eloquently reflects this special interest.

## Mathematics Commitment

... FROM PAGE ONE

Proposing that all high school students study a common core of broadly useful mathematics, the Report looked to needs of those who would enter the work force directly and those who would proceed to postsecondary studies. For the former:

"Students who enter the work force directly from high school will be expected to read documents replete with technical language--computer guides, shop manuals, financial reports. They need to be able to comprehend three-dimensional images (assembly diagrams) and logically intricate instructions (tax code); they need to be able to read symbol-laden text (computer manuals) and to plan complex systems (purchasing property). They need enough mathematics and enough confidence to be able to learn what they need as they need it."

Most students who "go on" to postsecondary education will study further mathematics. "In this regard, vocational-technical institutes, community colleges, continuing education, and adult education programs are no different from four-year colleges and universities," the Report points out. Further:

"Over three quarters of the degree programs at most universities require courses in calculus, discrete mathematics, statistics, or other comparable mathematics. These subjects are required because they introduce stu-

## Individualizing Mathematics

Creativity in the mathematics classroom came under review at recent Pennsylvania meetings organized by the National Association of Independent Schools and the Friends Council on Education [Quaker]. Mathematical Tall Timbers for April reports to Mu Alpha Theta sponsors. --Ed.

dents to functions, to relations among variables. The language of change and chance is conveyed by the symbolism of functions."

\* \* \*

"If you want to understand nature, you must be conversant with the language in which nature speaks to us." Nobel laureate Richard Feynman, quoted in Everybody Counts.

Says the Report: "To understand with precision the mathematical ideas that form the foundations for science, business, and engineering," there is need for this level of mathematical literacy.

Further, "To cope with a technological age, all students should study mathematics every year they are in school," the Report urges.

\* \* \*

"I approach each problem as if I didn't already know the conventional solution. The students are much more involved and excited. They become creators. It's as described by Felix Klein: The mathematician himself does not work in a rigorous, deductive manner, but rather uses fantasy."

An insight into mathematics learning by Kenneth Cummins of Kent State, quoted in Everybody Counts.

\* \* \*

Everybody Counts looks to seven areas of "transition" in school mathematics, "difficult transitions which will dominate the process of change during the remainder of this century" ... "in order to meet the challenges of our time." These "transitions," which merit careful reflection, are:

1. The focus of school mathematics is shifting from a dualistic mission--minimal mathematics for the majority, advanced mathematics for a few--to a singular focus on a significant common core of mathematics for all students.

As the Report underlines, the needs of industry for a quantitatively literate work force compel boards to provide more mathematical education to more students than ever before.

2. The teaching of mathematics is shifting from an authoritarian model based on "transmission of knowledge" to a student-centered practice featuring "stimulation of learning."

The Report suggests that teachers encourage students to explore mathematics, help students verbalize their mathematical ideas, show students that many mathematical questions have more than one right answer, provide evidence that mathematics is alive and exciting.

3. Public attitudes about mathematics are shifting from indifference and hostility to recognition of the important role that mathematics plays in today's society.

"In other nations where more is expected, more mathematics is learned," the Report points out.

4. The teaching of mathematics is shifting from preoccupation with inculcating routine skills to developing broad-based mathematical power.

Students should be able to "discern relations, reason logically, and use a broad spectrum of mathematical methods to solve a wide variety of nonroutine problems," the Report maintains. Ability must extend to:

Performing mental calculations and estimates with proficiency;

Deciding when an exact answer is needed and when an estimate is more appropriate;

Knowing which mathematical operations are appropriate in particular contexts;

Using a calculator correctly, confidently, and appropriately;

Estimating orders of magnitude to confirm mental or calculator results;

Using tables, graphs, spreadsheets, and statistical techniques to organize, interpret, and present numerical information;

Judging the validity of quantitative results presented by others;

Using computer software for mathematical tasks; Formulating specific questions from vague problems; Selecting effective problem-solving strategies.

5. The teaching of mathematics is shifting from emphasis on tools for future courses to greater emphasis on topics that are relevant to students' present and future needs.

(See "Mathematics Commitment," page 6)

