

THE MATHEMATICAL LOG

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PATTERNS

Mathematics is filled with patterns. Triangular numbers was one pattern that fascinated the Greeks, and they are found in numerous mathematical settings. Below are some patterns for you to explore. But beware, for some problems may have more than one correct answer. Look for patterns that will allow you to discover mathematics!

- ⊙ Using the following

$$1 = \frac{1 \times 2}{2} = 1$$

$$1 + 2 = \frac{2 \times 3}{2} = 3$$

$$1 + 2 + 3 = \frac{3 \times 4}{2} = 6$$

find the sum of each expression:

- $1+2+3+\dots+750$
- $1+2+3+\dots+n$
- $200+201+203+\dots+750$
- $2+4+6+8+\dots+2n$
- $1+3+5+\dots+53$
- $1+3+5+\dots+(2n-1)$
- $37+39+41+\dots+135$

- ⊙ If n points are collinear, how many different line segments are contained within the first and last points?



5 points 10 line segments

- ⊙ What is the smallest positive integer, n , such that the m^{th} and the $(m+n)^{\text{th}}$ Fibonacci numbers always have the same units digit?

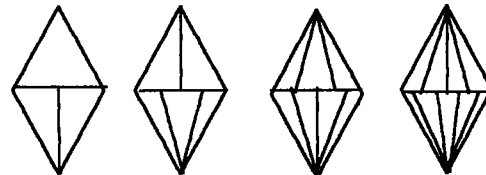
- ⊙ If n straight lines intersect in a point, how many straight angles are formed?



- ⊙ Six pairs of friends go to a conference. Each person shakes hands with everyone except who they came to the conference with. How many handshakes were exchanged?

- ⊙ How many rectangles are in a $n \times n$ checkerboard? Determine the number of rectangles in an $n \times (n-1)$ checkerboard.

- ⊙ Count the number of triangles in each diagram.



- ⊙ Compare the number of terms and the number of non-square terms of each expression.

$$a^2$$

$$(a+b)^2$$

$$(a+b+c)^2$$

$$(a+b+c+d)^2$$

$$(a_1+a_2+a_3+\dots+a_n)^2$$

News

• National Convention

Relax in the Rocky Mountains
attend the 31st Annual
Mu Alpha Theta National Convention
Denver, Colorado

Thursday, July 26 – Tuesday, July 31, 2001

- Speakers
- Workshops
- Various Competitive Testing
- Chapter Competitions
- Visits to local attractions
- Social Events
- Final Banquet

Hosted by Ponderosa High School (Colorado)
and Thomas Jefferson High School (Seattle, WA)

If you would like to receive a registration packet please
contact

Tom Kammerling at tkammerl@carbon.cudenver.edu

• Region IV Convention

The Region IV Convention is being hosted
by Lakota West High School in West Chester, Ohio
on December 1 & 2. They are expecting a record
breaking attendance as they have had responses from
schools who have never attended a Regional Convention
before and who plan on attending this year's convention.

• Tennessee State Convention

The Mu Alpha Theta Tennessee Convention
will be held during the weekend of April 7, 2001 at
Meigs County High School in Decatur, Tennessee.

For further information contact:

Bill Danner at rbdanner@usit.net

• Texas State Convention

The Texas Mu Alpha Theta Convention
will be held on Friday, February 16, and Saturday,
February 17, 2001 at Edinburg High School in
Edinburg, Texas.

For further information contact:

Texas Mu Alpha Theta President
Nicholas de la Garza at azrael@rgy.net

• MAΘ Student Delegate/Chapter President Mail List

Student Delegates and Chapter Presidents play a large role
in the success of Mu Alpha Theta, so they are asked to join
in on the discussion of important issues of the organization.
This mail list throughout the year will have an open
discussion of any topics related to Mu Alpha Theta.
Sponsors are also invited to join the list to provide some
additional suggestions/comments to members. To join the
discussion, please visit the list's home page at
<http://MUDelegates2000.listbot.com>

• “Calling all writers!”

The Mathematical Log is looking for members to submit
articles for publication. Whether it is a poem you wrote, a
theorem you proved, or something unique that your chapter
has done, send an article for publication to the National
Office at 601 Elm Ave., Room 423, Norman, OK 73019.

• *The Art of Problem Solving*

Paul Zeitz, former coach of the United States Olympiad team, referred to the texts
as a *must* for any serious math library.

The ART of PROBLEM SOLVING is a pair of texts for
those students involved in extracurricular mathematics.
The authors, Sandor Lehoczky and Richard Rusczyk are
former Mu Alpha Theta students and participants in Math
Olympiad Programs (students who pass the
AHSME/AIME/USAMO series of tests produced by the
Mathematical Association of America).

The texts have been used by successful students, teams,
and clubs in grades 7-12 since 1994. Volume 1 covers
mathematics commonly occurring in MATHCOUNTS and
the AHSME, as well as many local and state math contests.
Volume 2 covers more advanced topics found on the
AHSME, as well as the AIME and USAMO. Included in
the texts are hundreds of challenging problems from
national tests such as ARML, MathCounts, the national
Mu Alpha Theta conventions, and the MAA series of exams
which determine the national math team. If you have
further questions about the texts, contact the national office
at matheta@ou.edu or 405-325-4489. Prices are shown
below; make checks and purchase orders payable to Mu
Alpha Theta. Discounts for bulk orders are available.

Volume 1 text	\$26
Volume 1, text and solutions	\$34
Volume 2, text	\$28
Volume 2, text and solutions	\$37
Volume 1 and 2, text	\$50
Volume 1 and 2, text and solutions	\$64

$\sqrt{\textit{At the Root of it All}}$

Deborah Patonai, Activities Editor

In numerous high school gyms across the country, sports banners herald the accomplishments of the schools' various sport teams--football, basketball, baseball, track. But, how many high schools boast the success of their math team with banners in their gym? Well, Bellevue High School in Bellevue, Washington, does! The Math Team's state championship banners now hang right alongside with all the other state championship banners in their main gymnasium. Working very hard to have the Bellevue High School Math Team's accomplishments recognized with the same spirit and attention as winning sport teams, their sponsor, Ms. Dorothy Martin, has put academic achievement on the same level as athletic accomplishments. Because this Mu Alpha Theta advisor gives so unselfishly and passionately to her Mu Alpha Theta members without even the slightest expectation for personal recognition or reward, she was chosen as this year's recipient of the Huneke Distinguished Sponsor Award. $\sqrt{\textit{At The Root Of It All}}$ is honored to spotlight this exceptional lady.

A MA θ sponsor for over sixteen years at Bellevue, Dorothy has taken on many roles--teacher, mentor, coach, friend. Often going beyond the average expectations of a club advisor, she encourages students to further pursue their interest in mathematics through participation in Mu Alpha Theta. Because of the special way she treats everyone, the MA θ membership has increased from five MA θ members to about twenty members since 1996 when she took over as the main advisor of the club. In addition to handling the basic meetings and the regular paperwork, "she motivates everyone to join the club with her kind personality and willingness to help" explains a former vice-president of her club.

Dorothy contributes innumerable hours to making the Math Team a fun activity for a diverse group of students. Team events are widely publicized, and anyone is invited to come to her room for team meetings. In her math classes, she spots students who have not yet found in school a place to belong and personally invites them to the Math Team. Combining her enthusiasm with her willingness to help both the experienced and the inexperienced team members, she prepares her team for competition. As one student recalls, "She helps out no matter how hard or easy the problems seem.... When I ask her a question, ... she would personally help me out."

Rehearsing her Math Team for competitions, Dorothy, like the best sports coach, encourages vigorous practice. Besides the weekly after-school practices, she also holds weekly Sunday practice meetings. When a competition is

near, she often holds four practices during a week. Even during the summer, she holds practice at the homes of officers or at the library. Dorothy really invests a lot of time turning her students into great athletes!

However, Dorothy is more than just their math coach, she is their own personal cheerleader. Spending time to know each member of her team, she manages to develop close relationships with her students. She is someone her students can always talk to and turn to for advice. Often during math competitions, she encourages her students by giving them snacks and extra batteries for their calculators. Once, when the team was in Eastern Washington for a competition, "She took the members to a specialty ice cream shop and treated everyone," remembers one of her students. Another student commented, "Personally, she has helped me improve my math so much that-- from not winning a single award in my freshman year--my team came in second place."

Focusing her life on her Math Team, Dorothy puts her personal life on hold and sacrifices her personal time for her students. In order for her Math Team to raise money to attend these contests and competitions, she oversees the concession stand at over 40 home football and basketball games. "Anyone who has fulfilled this duty knows that the couple of hours of concession sales is just the tip of the iceberg of the workload for the advisor," Dorothy's principal S. Phillips noted. She continues, "By example, Dorothy has taught students that you can accomplish anything you're willing to work for and that earning a privilege makes it all the more worthwhile."

Several years ago, an unavoidable personal conflict looked as if it would prevent Dorothy's Math Team from participating in a much-anticipated competition. Most advisors would have apologized to their team and canceled the trip. Not Dorothy! She tapped all her resources to find a substitute advisor and finally turned to her new principal. Because of her impassioned plea, the principal braved the icy Snoqualmie Pass and drove into snowy Spokane with a van full of Math Team members. The van resounded with laughter and jokes as the students worked practice problems during their long drive. Amazed, the principal exclaimed, "Until this trip, I didn't realize that math could be so much fun.... The students were as pleased with solving a problem that initially seemed beyond their skill level as they were with the armful of 'hardware' collected at the awards ceremony."

All Dorothy's extra work and dedication has paid off. Her team now wins at local, state, and national competitions. In fact, they have won several state awards, including first

place in the Northwest Math Championship two years in a row.

Not only does Dorothy contribute to her own MA θ chapter but she is also very committed to the MA θ organization. At every math competition, Dorothy helps proctor contests, correct tests, and assists with all of the other behind-the-scene operations during the convention. Oftentimes, her team would not even see her until after the competition ended. While she always has an eye out for her team, she can be counted on to help with the myriads of detailed tasks that make a competition run smoothly. Her goal is to make the competition a great experience for all students. In addition to helping at competitions, Dorothy has been instrumental in advising other schools in the start up of competitive math teams. In fact, she helped Mt. Rainier High School start its own math club and MA θ chapter.

Dorothy's Math Team believes that the recognition offered by the Huneke Distinguished Sponsor Award is the finest way they can thank her for all that she has given them over the years. Her knowledge of mathematics has contributed to their success, but her motivational powers have contributed to their willingness to work long hours to improve their skills. On behalf of the Bellevue Math Team and Mu Alpha Theta, we thank you, Dorothy Martin, for what you have accomplished for the students of Mu Alpha Theta!



He saw a row of bath tiles
On the wall which loomed ahead;
He counted the tiles from the floor up—
Stored the figure in his head.

And then he began to ponder:
"If each tile were one inch less
The count from floor to ceiling
Would be six tiles more, I guess."

If each tile from floor to ceiling
Were one inch more than it is;
There'd be four less tiles in each row---
And that creates a quiz!

So how many tiles were actually
In every vertical row?
In that mathematical scholar's bathroom
Put on your thinking cap, and go!

From *Verses to reckon with The Fun-damentals of Mathematics*
by Sidney R. Levine
Answer: 24 tiles

Word Search Answers:

BACHET, BERNOULLI, BOOLE, BRAHMAGUPTA,
CANTOR, DEMORGAN, DESCARTES, DIOPHANTUS,
ESCHER, EUCLID, EULER, FERMAT, FIBONACCI,
GALILEO, GAUSS, HERON, HYPATIA, LAGRANGE,
LAPLACE, LEIBNIZ, MANDELROT, MOBIUS, NAPIER,
NEWTON, PASCAL, PEACOCK, PLATO, PYTHAGORAS,
SIERPINSKI, SPINOZA, WHITEHEAD

Did you find any more? If so, send them to *The Mathematical Log* for publication.

The Mathematical Log

Volume 44, Number 4, December 2000

The *Mathematical Log* is the official publication of Mu Alpha Theta, national high school and junior college mathematics honor society and mathematics club federation. Founded in 1957 by Richard and Josephine Andree, Mu Alpha Theta is co-sponsored by the Mathematical Association of America (MAA), the National Council of Teachers of Mathematics (NCTM), and the Society of Industrial and Applied Mathematics (SIAM). Correspondence may be directed to Mu Alpha Theta National Office, 610 Elm Ave., Room 423, Norman, OK 73019, email: matheta@ou.edu or to Log editor Pat Bowler Johnson, New Trier High School, 385 Winnetka Avenue, Winnetka, IL 60093, email: bowlerjp@newtrier.k12.il.us

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A Letter from...

- **Claudia Carter,**
National MA Θ President

Hi to all you Mu Alpha Theta enthusiasts! As President I am excited to share with you a new addition to the web site. MA Θ now has a **problem of the month contest** sponsored by Hewlett Packard! At the end of a month's duration, all winning entries will have a chance to **win a new HP graphing calculator**. At the end of this school year, Hewlett Packard has a "bigger" surprise for the winner. So get yourselves to the web site and develop your mathematics and writing skills to win a prize! Let me hear from you with suggestions or great ideas for National MA Θ or from your local chapters!

So be sure to logon to

the National Office website at
www.mualphatheta.org
for the problem of the month contest
and the latest information from
the national office.

A Math Song

I Love To Learn Mathematics

WORDS BY: Dane R. Camp
SUNG TO THE TUNE OF:
"TAKE ME OUT TO THE BALLGAME"

I love to lean math-e-ma-tics
Like sol-ving e-quations with x
And all of the shapes in ge-o-me-try
Or graph-ing a func-tion with tech-no-lo-gy
For it's roots and pow-ers I live for
Or a log-rithm now and then
And with sine, co-sine and tan-gent
I'm in math Hea-ven!

Create your own math song and send it to
The Mathematical Log for publication.

What Can You Do to Save Your MA Θ Club?

- **Steven Berkman,**
National MA Θ Sargent at Arms

It's that time of year again. By now almost all of you have finished accepting applications, handing in recommendations, and paying your dues. But as you peruse your membership list for new names and familiar friends, something catches your eye: Wow, this is one short list!

With almost 800 students attending last year's National Convention, it seems impossible that schools could have problems recruiting members, but it's happening. The "nerdy" image is plaguing academic clubs, and a lack of interest has put a stranglehold on membership numbers in many areas. This has stifled the chance of success in many schools where Mu Alpha Theta is just an infant organization. Fighting back is imperative for survival and necessary for growth. So what can we do to battle this seemingly unstoppable decay of membership?

Incentives.

Sure, it's painful to accept, but giving students something in return for membership is the easiest and fastest way to increase membership. If given, a few bonus points here and there, kids will flock to meetings. Despite the fact that they are given the opportunity to make new friends, meet people from other schools, and see some of the country in the process, "extra" and "credit" are the two magical words.

Don't completely neglect mentioning all the extra-curricular bonuses, though. Lure them with extra credit; but remind them about the friends they make, the fun they have, and the places they see. Other "extras" could include tutoring sessions, competitions, and conventions. Some chapters even have scholarships that go out to the most dedicated members at the end of their senior year.

So in the end, don't build an organization that revolves around its impact on students' GPA's. If you've got kids just showing up for the bonus points, it's hard to be an effective club. Remember: a club isn't judged by how many members it has, it's judged by what its members accomplish. Good luck in the recruiting, and I wish you all success from your members.

What would you like to see in the Mathematical Log?

Articles written by Mu Alpha Theta Members/Sponsors? Math Applications? Technology Articles? Interesting Math Concepts? Puzzles? Articles about chapters? Let me know what you'd like to see! Send your comments and any topics you would like to see in the Mathematical Log to:

Pat Bowler Johnson
email: bowlerjp@newtrier.k12.il.us

Word Search...

Hidden below are the names of individuals who influenced the history of mathematics. How many can you find?

B T U Q T D A O Y N E C I A D I T S L C I B Z U M Y N E O D
P R G D F I S A R O G A H T Y P K A P C D I E A P V J C T E
A Q A F Q O G L B R R N B X S S G S C I N I N R O S L A A M
S W S H B P M Z A E Z O E U N R S A N B N D L T N V U L M A
C J E J M H R R C H O C I W A S N U I I E O A C N O T P R R
A Y T L X A F V H L A B G N T O K E A L P L Z I U H U A E G
L C R C D N G L E N O B G K B O L B B G P R L A T E T L F A
G X A D M T E U T M B E X I J A N R W H I T E H E A D D L N
Z L C C I U O O P T M I F F X U O E L I L A G I N A P I E R
M Y S R Z S R X Y T R E L U E T Z M J Y E Q V T S J K Y S Z
G R E H C S E A C E A Z L K V J M F E P E A C O C K I N H F
V S D P R U C E A R A X N I O Z P P V F V E E C X D C E D D

WELCOME

Newly Chartered Chapters

Pickens Academy, Carrollton, AL
Sponsor: Thomas D. Russell

Lynn High School, Lynn, AL
Sponsor: Everett Cockrell

John T. Morgan Academy, Selma, AL
Sponsor: Kitty R. Williamson

Felix Varela Senior High School, Miami, FL
Sponsor: Eileen Allen

Oak Mountain Academy, Carrollton, GA
Sponsor: Gary Smith

Munford High School, Munford, IN
Sponsor: Kristina M. Whicker

Ackerman High School, Ackerman, MS
Sponsor: Susan R. Woods

Madeira High School, Cincinnati, OH
Sponsor: Steve Phelps

Harrisburg AREA Community College, Harrisburg, PA
Sponsor: Ellen Shatto

Cordova High School, Cordova, TN
Sponsor: Pamela Franklin

Carroll High School, Southlake, TX
Sponsor: Loyce Ann Engler

Reactivated Chapters

Mars Hill Bible School, Florence, AL
Sponsor: Joe Brewer

Russellville High School, Russellville, AL
Sponsor: Tabatha Smtih

Melbourne High School, Melbourne, FL
Sponsor: June Billings

Crowley High School, Crowley, LA
Sponsors: Joy Michor
Linda Stemplewski

Richland R-IV High School, Richland, MO
Sponsor: Lynetta Marcellus

Starkville Academy, Starkville, MS
Sponsor: Deanna Henson

Kenston High School, Chagrin Falls, OH
Sponsor: Greg Koltas

Houston High School, Germantown, TN
Sponsors: P. Hayes
L. Packard

Oliver Wendell Holmes High School, San Antonio, TX
Sponsor: Deidre Dressen

Southwest High School, San Antonio, TX
Sponsor: Oscar Castaneda