

The

Mathematical Log

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What Do Those Numbers Mean ?

What is the significance of each of the numbers in the left column? Some hints [too many] are given in the right column.

33.7/53	cholesterol level
48823	tire size
0 43100 59878 7	television rating
I 635	product code
P185/70 R14	highway number
0-7167-2378-6	octane rating
1120	book identification number
	ZIP code
	AM radio frequency

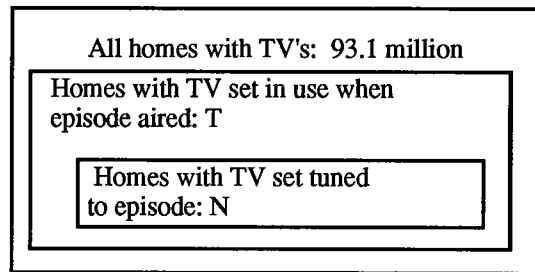
The television rating for the NFC Playoff game between the Dallas Cowboys and the San Francisco 49'ers was 33.7/53. All the other numbers are identification numbers for various kinds of objects. Most such identification numbers are examples of **codes** – a group of symbols that represents information. The Morse code, the genetic code related to DNA, and the numbers used in the VCR⁺ system are three examples.

We will "break the code" on a few of these now and encourage you to do some research on the rest and on other examples that interest you. Some references are given at the end of the article.

Example 1

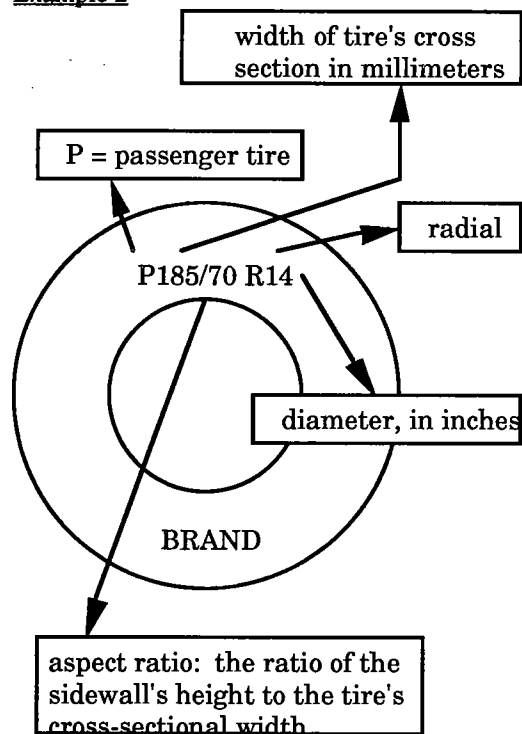
The Nielsen ratings for the NFC Playoff game were 33.7/53. The first number represents the percent of the 93.1 million homes with televisions tuned to this show. The second number represents the percent of these homes with TV sets in use [at the time the game aired] that were tuned to the game. The "33.7" is the **rating**; the "53" is the **share**.

In the drawing above, Rating = $\frac{N}{93.1}$ Share = $\frac{N}{T}$



Exercise: In how many homes were the TV sets in use when this game was aired? were tuned to the game?

Example 2



Example 3

I 635 is an interstate highway number. Some facts about such highway numbers:

- odd numbers [one or two digits] run north-south - most major routes end in 5 and increase from west to east [Locate I5, I15, I25, ... , I95]

[continued on page 6]

What famous Rhodes Scholar was a MAΘ member? See p. 5.

[Cones & Cuttings continued from page 5]

From Allen MacKenzie, Student Treasurer



Aloha! That's about all of the Hawaiian language that I remember. The convention seems so long ago, and this year's is still far away. I decided to talk about the Region IV convention in Akron, Ohio. It was one of the finest conventions I have ever attended! It was a weekend of

games, dances, competitions, door prizes, and fun. It provided a much-needed break from the first semester blues. My thanks to all the members of St. Vincent-St. Mary HS - you should consider hosting a national convention. If your region doesn't have a convention, contact your regional governor and the national student officer for the region.

Many state conventions are scheduled this spring. There are many members, however, who never get a chance to attend a convention. One of my jobs as a national officer is to encourage participation from those schools. To enable small chapters to attend, try a "bus pool". Share a bus with another small chapter near you or try to "tag along" with a larger nearby chapter. It's a great way to meet some new friends.

The national officers are excited about the New Orleans Convention. We want to make it the best convention ever. If you have any suggestions, send to the officers in care of the national office. See you in "The Big Easy".

[√ At the Root of It All , continued from p. 3]

Since so many people were coming, we were able to order some great awards. We found statues of famous mathematicians such as Gauss, Pythagoras, and Archimedes to use as first, second, and third prizes. We ordered over forty ribbons and provided the registration fee to the national convention to the top student in each level.

The weeks just before the convention whirled by. Running, stapling, and checking test; filling grab-bags; typing the program; organizing the committee heads; assigning the non-competing members to various jobs; classifying the door prizes; counting T-shirts; and coordinating the food were just a few of the last minute details. The list kept growing as the time diminished.

At last December 3 was here. Students were moving tables into the gym, posting signs, cleaning rooms, setting up the registration booth, and arranging the "Guess-the-Number" jars. Mothers were bringing food. People were driving to the airport to pick up unexpected arrivals. ... The first school arrived. ... The tests began. ... Had we thought of everything?

I had run a convention -- and survived!

The next two days passed quickly. I remember running everywhere. I thought I would have time to visit with all the sponsors, but I did not. Governor Jim Aiu flew in to handle the disputes for me. I barely saw him. The opening ceremony, the chess tournament, the meals, all came and went ... quickly. Then it was over. Now I had time to enjoy the convention and there was no one to enjoy it with me. I had run a convention -- and survived!

The convention was a success because of the support and cooperation of many groups. To all the Math Team members, MAΘ members, administrators, faculty, parents, and friends, a heartfelt thank you for a job well done.

Congratulation to all the winners:

	Interschool Test
1.	Beavercreek
2.	Paul G. Blazer
3.	Farragut

	Alpha Relay		Theta Relay
1.	Beavercreek	1.	Lakota
2.	Paul G. Blazer	2.	Beavercreek
3.	Farragut	3.	Dobyns-Bennett

	Alpha Bowl		Theta Bowl
1.	Beavercreek	1.	Farragut
2.	Paul G. Blazer	2.	Beavercreek
3.	Farragut	3.	Dobyns-Bennett

	Alpha Written Test	
1.	H. Yalamanchili	Paul G. Blazer
2.	D. Schepler	Beavercreek
3.	G. Choung	Beavercreek

	Theta Written Test	
1.	C. Shen	Farragut
2.	B. Bliss	Beavercreek
3.	B. Gross	St. Vincent-St. Mary

	Alpha CIPHERING	
1.	D. Schepler	Beavercreek
2.	G. Choung	Beavercreek
3.	H. Yalamanchili	Paul G. Blazer

	Theta CIPHERING	
1.	R. Renfrew	Lakota
2.	R. Brooks	Farragut
3.	D. Beaver	Lakota

The top Theta student was Rob Renfrew and the top Alpha student was Hareendra Yalamanchili, who has won this award at the last three regional conventions.

Pythagoras Award [to an outstanding sponsor]:
Mary Rhein, Lakota HS

If you have ever thought of convention, do! It is the experience of a lifetime.

1994 $\sqrt{\text{At the Root of It All}}$

Deborah Patonai Phillips, Activities Editor

St. Vincent-St. Mary HS, 15 North Maple Street, Akron, OH 44303

Have you ever thought about hosting a MA Θ convention? The thought had run through my mind many times, but I was always able to push it out. I had never even organized a small Saturday morning contest. How could I ever host a major convention? Well, I did! This column is dedicated to all those sponsors who have hosted conventions – and survived. It is also for those [thinking about] planning one, but ...

I always wondered what it would be like to have students who wanted to do math problems for fun. Now I had them!

Let me tell my story. I have been taking students to the national MA Θ convention for the past seventeen years. My students have always enjoyed mathematics but they never had the "killer instinct" necessary to succeed at nationals. However, the group of five students I took to Princeton two years ago was different. Even after doing problems at the convention for almost a week, they wanted to do more! At the airport and on the plane home, they worked math problems. I must have been dreaming. I always wondered what it would be like to have students who wanted to do math problems for fun. Now I had them!

During the last few days of the convention and on the trip home, my students talked about having a MA Θ Regional. I figured that by the time school started in a week or so, they would have forgotten about it. Wrong! In those few days, they had contacted other MA Θ members, convinced their parents to help, and checked the school calendar for possible dates. On the first day of school, they came to me with numerous plans, names of people willing to work, and a lot of enthusiasm. Armed with this information, I walked slowly, ever so slowly, to the principal's office. Part of me was really excited about doing the convention; the other part was scared to death. My only hope was for the principal to say "no", but, of course, she was thrilled and gave me all her support. From that moment my life became a blur. The Third Annual Region IV Convention, hosted by St. Vincent-St. Mary High School in Akron, Ohio was born.

Where to begin? With the convention 18 months away, I thought I had plenty of time. My first concern was to reserve the school for two days to do mathematics. Following several weeks of negotiation with the athletic director, December 3-4, 1993 became the weekend.

My students had definite ideas about the type of contests they wanted. After many meetings, we decided on two levels: Theta level for those in Algebra I, II, or Geometry; Alpha level for advanced students. There would be nine different tests including an Interschool test, and written tests, ciphering rounds, relays, and Math Bowls for each group. I contacted a dozen people who agreed to furnish test questions by the end of May.

Several months passed. We were preparing for the regional in Knoxville. By contacting the Akron Convention Bureau, we were able to distribute buttons and brochures at Knoxville. At the closing ceremony, our vice-president had invited everyone to Akron in December, 1993.

The next few months passed swiftly. Parents and faculty members volunteered to head committees involving meals, computer typing, proctoring, audio-visuals, grading, and publicity. The students were busy planning the activities. They wanted

- everyone to receive a grab-bag of goodies including pencils, pens, pads of paper, blimp erasers, and a magnifying glass.
- everyone to apply their estimation skills to guess the number of objects in various jars [M \$ M's, animal crackers, lollipops]
- both students and sponsors to win door prizes such as T-shirts, caps, watches, calendars, stuffed animals, games, and activity books.
- students to engage in various mixer activities including a chess tournament, a dance, and a number mixer. [Each student received a special number at the opening ceremony. The first one to find his/her "match" won a prize.]

Putting the contests took more time than I anticipated - I was half done when I went to Hawaii.

In early May, a mailing went out to all Region IV schools. Each day the students eagerly checked the mail. By the end of school, over thirty schools had expressed an interest in coming. It was now the end of May, I was ready to start making up the contests, but I had not received many questions! Only one of the dozen people who agreed to send them had responded. After contacting everyone again, I did receive enough questions to get started. My goal was to have all the contests ready by the time I went to the national convention in Hawaii. There I hoped to have people check them for clarity and accuracy. Putting the contests took more time than I anticipated - I was half done when I went to Hawaii.

Once school began in the fall, the time flew by. The contests had to be completed, the registrations packets mailed, and many other details had to be checked. After deciding to add a speaker session, we received confirmations from ten speakers from John Carroll University, Kent State University, The University, and a few sponsors. Their topics included, "Finding Out Where You Are Out in Nowhere", "The Boojums of Logic", and "Bet You Won't Win".

As the registration deadline approached, I grew very nervous. What if no one came? Two days before the deadline, only one school had registered. Then the phones began to ring and the fax machines to hum. They were coming – 240 students and sponsors from thirteen schools in five states.

[continued on page 2]

PLAYING GAMES

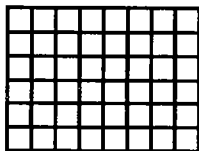
Many people love to play games and therefore problems involving games can be interesting and enjoyable. Martin Gardner's column "Mathematical Games" appeared for many years in *Scientific American* and served as the basis for many best-selling books. *Games* is probably the most popular of the magazines devoted to games and puzzles. Several stores that sell nothing but games have opened in recent years.

This column contains material from a book on games by Fomin, Genkin., Ittenberg, and Kirichenko that has been translated by Mark Saul. Readers are encouraged to send information about your favorite games to the editor.

In each game discussed below, we assume there are two players, that the players take turns making moves, and that a player cannot decline to move when it is his turn. The problem is: Which player [the first or the second] has a winning strategy.

The first class of games are not really games at all since the outcome of the game does not depend on how the play proceeds. The solution of such a "pseudo-game" is not a winning strategy but a proof that one of the two players will always win [regardless of how the play proceeds].

Example 1 Two players take turns breaking up this 8 by 6 chocolate bar. They make break the bar only at divisions between squares and they keep breaking the pieces until only individual squares remain. The player who cannot make a break is the loser. Who will win?



Solution: After each move, the number of pieces will increase by 1. At first, there is only one piece; at the end of the game there are 48 pieces. Thus there must have been 47 moves. The last move, as well as all odd-numbered moves, was made by the first player. Therefore the first player will win, no matter how the play proceeds.

Example 2 There are three piles of stones: one with 10 stones, one with 15 stones, and the third with 20 stones. At each turn, a player chooses one of the piles and divides it into two smaller piles. The loser is the player who cannot do this. Who will win, and how?

Solution: After each move, the number of piles increases by 1. At first, there are 3 piles; at the end of the game there are 45. Thus there must have been 42 moves and the last and winning move was made by the second player.

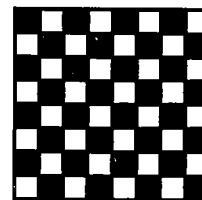
Here are a few for you to analyze.

Game 1 The whole numbers 1 through 20 are written in a row. Two players take turns putting plus signs and minus signs between the numbers. When all the signs have been placed have been placed, the resulting expression is evaluated [the additions and subtractions are performed]. The first player wins if the sum is even, and the second wins if the sum is odd.

- Who will win, and how?

- Can you change the numbers in the game so the other player will win? How?

Game 2 Two players take turns placing rooks on a chessboard so they cannot capture each other. The loser is the player who cannot place a rook? Who will win?



Game 3 The numbers 25 and 36 are written on a chalkboard. At each turn, a player writes, on the chalkboard, the positive difference between two numbers already on the chalkboard -- if this number does not already appear on the board. The loser is the player who cannot write a number.

- Who will win and why?
- Can you change the numbers in the game so the other player will win? How?

Symmetry

In the next set of games, a certain player can win if she uses a particular strategy. The problem is to determine the player and the strategy.

Example 3 Two players take turns putting pennies on a round table without piling one penny on top of another. The player who cannot place a penny is the loser. Who should win and why?

Solution: The first player can win by placing the first penny at the center of the table. After this, he responds to each move of his opponent by placing his penny in a position symmetric to the penny placed by the second player, with respect to the center of the table [a half turn from his opponent's penny].

Example 4 Two players take turns placing bishops on a chessboard so they cannot capture each other [the color of the bishops is not significant]. The player who cannot place a bishop is the loser.

Solution: There is no center square on a chessboard, we use a line of symmetry. The second responds to each move of his opponent by placing his bishop on the square symmetric to the one used by his opponent. Since these two squares have different colors [why?], a bishop on one square cannot capture a bishop on a symmetric square. Using this strategy, the second player wins.

Analyze these following games using symmetric strategies.

Game 4 There are two piles of 15 stones each. At each turn, a player takes as many stones as he chooses from one of the piles. The loser is the player who cannot move.

- Who should win and why?
- Can you change the numbers in the game so the other player should win? How?

Game 5 Two players take turns placing knights on a chessboard so they cannot capture each other. The player who cannot place a knight is the loser.

[To be continued in future issues.]



Cones

&

Cuttings

**Bulletin Board****• STATE AND REGIONAL MEETINGS in 1994 •**

March 1994: Tennessee State Meeting. Contact Carol Swindell, Cookeville High School, 230 Cavalier Drive, Cookeville, TN 38501

March 3-4 1994: Louisiana State Meeting. Contact Ms. Barbara Stott, Riverdale HS, 240 Riverdale Ave., Jefferson. LA 70121.

March 1994: Wisconsin State Meeting. Contact Kenneth Steege, Lincoln HS, 1433 S. 8th St., Manitowac, WI 54220

April 1994: South Carolina State Meeting. Contact the national office for details.

April 24-25 1994: Mississippi State Meeting, Jackson, MS. Contact Pat Dye, Ocean Springs HS, P.O. Box 7002, Ocean Springs, MS 39564

May 1994: Florida State Meeting. Contact the national office for details.

• FUTURE NATIONAL CONVENTIONS

1995 - Bowdoin College, Maine
1996, 1997, 1998 ?????

Send in information about your state or regional meetings to the national office.

MAΘ is proud to recognize **Alexander Hartemink**, the 1990 Kalin Award winner, who has recently been awarded a Rhodes Scholarship. Some excerpts from

√ At the Root of It All [Feb. 1991] about Alex:

... recipient of the Kalin Award is Alexander Hartemink, a graduate of Fort Myers High School in Fort Myers, Florida. Active in MAΘ since eighth grade, he served as treasurer, vice-president and president of the club during his high school years. Not many students can say they have attended FIVE national conventions!

Alex worked many hours with the various math teams, his favorite being the calculus team. As captain, he worked with five other students, "drilling them on concepts, preparing materials for study, and inspiring them to do their best." He has been quite successful in various competitions including earning first place in Calculus, Functions, and Theory Topics tests at the Chicago national, and first place overall Alpha Division Champion at the Tampa national.

"the best portions of a good man's life are his nameless unremembered acts of kindness and love."

He feels that, "MAΘ is a close-knit group of interested people who all serve to urge each other to new levels of mathematical understanding ... and promote a greater love for mathematics." Janet Marderness, his sponsor and teacher, sums up: "There is a 'love of learning' attitude that Alex exudes, a quality that so refreshing and comforting to teachers who rarely see that thirst

for knowledge in today's students." Each local valedictorian was asked to make a statement concerning his philosophy of life by the Fort Myers News Press. Alex's statement was true Alex: "the best portions of a good man's life are his nameless unremembered acts of kindness and love."

Congratulations, Alex!

Another MAΘ alumnus was also a Rhodes Scholar who went on to achieve many other distinctions.

Hot Springs High School			Oct. 31, 1961
.....			
Vera	J. Cook	217 N. Patterson	1963
William	J. Clinton	1011 Park Avenue	1964
Richard	Courtney	115 Prairie View	1964
...			
Sue Smitherman, Secretary; Doyle Coe, Faculty Sponsor.			

Our laurels are showing

• Congratulations to the MAΘ sponsors who received the Presidential Award for Excellence in Mathematics for 1993:

Doris Calhoun Cowan, Auburndale HS, Auburndale, FL
Lee [Pete] Travis Pedersen, Vinalhaven HS, Vinalhaven, Maine
Jetta Ellen Burton, West Mid HS, Norman OK
Robinette Evangeline Bowden, Northridge HS, Layton, UT
Pam M. Newberry, George Wythe HS, Wytheville, VA

Several other sponsors were honored with state awards:

Corrie Cooley, Alexandria HS, Alexandria, AL.
Ann H. Cade, Natchitoches Central HS, Natchitoches, LA
James Martin McLean, Kamiakin HS, Kennewick, WA

SPONSORS:

• The MAΘ breakfast at the NCTM Annual Meeting in Indianapolis will be held on Friday, April 15, 7:30 a.m., at the Courtyard by Marriott. Cost ≈ \$7. For reservations, write the national office. Also stop by Booth #419 and say "hello".

• Elections: You'll be receiving your ballots during the first week of March. Please vote!

President Elect:

Lee (Pete) Pedersen, Vinalhaven HS, Vinalhaven, Maine
Barbara Stott, Riverdale HS, Jefferson, LA

Secretary-Treasurer

Stanley B. Eliason, University of Oklahoma, Norman, OK

Governor, Region III

Randy Long, Grisson HS, Huntsville, AL
Ann Singleton, Majorie Stoneman Douglas HS, Parkland FL

Governor, Region IV

Grace Mutz, Farragut HS, Knoxville, TN
Mary Rhein, Lakota HS, West Chester, OH

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