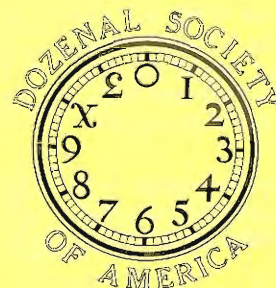
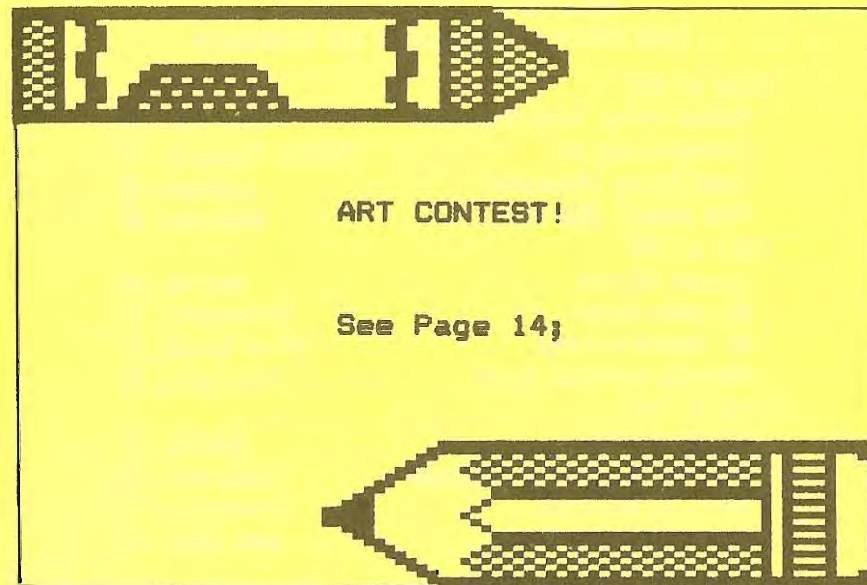


# THE DUODECIMAL BULLETIN 56;



DOZENAL SOCIETY OF AMERICA  
c/o Math Department  
Nassau Community College  
Garden City, LI, NY 11530



Volume 30;  
Number 1;  
Winter 1987  
1197;

## THE DOZENAL SOCIETY OF AMERICA

(Formerly: The Duodecimal Society of America)

is a voluntary, nonprofit, educational corporation, organized for the conduct of research and education of the public in the use of base twelve in numeration, mathematics, weights and measures, and other branches of pure and applied science.

Membership dues are \$12.00 (US) for one calendar year. Student membership is \$3.00 per year, and a Life membership is \$144.00 (US).

*The Duodecimal Bulletin* is an official publication of the DOZENAL SOCIETY OF AMERICA, Inc., c/o Math Department, Nassau Community College, Garden City, LI, NY 11530.

### BOARD OF DIRECTORS OF THE DOZENAL SOCIETY OF AMERICA

#### Class of 1987

Dudley George (Vice President)	Palo Alto, CA
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Dr. Angelo Scordato	Valley Stream, NY
Patricia McCormick Zirkel	West Islip, NY

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Dr. John Impagliazzo (Chairman)	Island Park, NY
Robert R. McPherson	Gainesville, FL
Gene Zirkel (President)	West Islip, NY



The DSA does NOT endorse any particular symbols for the digits ten and eleven. For uniformity in publications we use the asterisk (\*) for ten and the octothorpe (#) for eleven. Years ago, as you can see from our seal, we used X and O. Both \* and X are pronounced "dek". The symbols # and O are pronounced "el".

When it is not clear from the context whether a numeral is a decimal or a dozenal, we use a period as a unit point for base ten and the semi-colon, or Humphrey point, as a unit point for base twelve.

Thus  $\frac{1}{2} = 0.5 = 0;6$ .

# THE DUODECIMAL BULLETIN



Whole Number Five Dozen Six

Volume 30; Number 1;

Winter 1197;

FOUNDED  
1944

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Patricia McCormick Zirkel, *Editor*  
Editorial Office:  
6 Brancatelli Court  
West Islip, New York 11795

## DOZENAL SOCIETY OF AMERICA

## MINUTES OF THE ANNUAL MEETING - 1196;

Saturday, October 11, 1986  
Nassau Community College  
Garden City, LI, NY 11530

Administrative Tower

*The Chairman of the Board, Dr. John Impagliazzo, suggested reversing the usual order of the Board of Directors' and Business Meetings, so that we would have the option of installing the Officers elected at the Board Meeting at the subsequent Business Meeting.*

## I BOARD OF DIRECTORS MEETING

The meeting was called to order by Chairman Dr. John Impagliazzo at 10:20 A.M.

The report from the nominating committee proposed the following slate of officers:

Dr. John Impagliazzo (Chair)  
Gene Zirkel (President)  
Dudley George (Vice President)  
James Malone (Treasurer)  
Fred Newhall (Secretary)

The motion was made by Dr. Angelo Scordato to elect these as a slate; this was seconded by James Malone. The slate was elected unanimously.

## Remarks of the Chair:

Dr. Impagliazzo expressed his hope that this organization would increase the exposure of the idea of dozens through marketing campaigns. In line with this, he further reported that he had spoken recently at Hofstra College to a mathematics appreciation class on the tonalities of the twelve-tone scale in music. The talk was enthusiastically received, and the students asked for further information

## 1986 ANNUAL MEETING, Continued

about base twelve. He thus feels that there are many groups whose latent interest in dozens could be tapped.

Committee Appointments 1986-1987

Appointments to various committees were made as follows:

## Annual Meeting Committee:

Anthony Catania (Chair)  
Alice Berridge (Consultant)  
Anthony Razziano  
Barbran Smith

## Finance Committee:

Dr. Angelo Scordato (Chair)  
Dudley George  
James Malone  
Anthony Razziano  
Patricia Zirkel

## Awards Committee:

Dr. Angelo Scordato (Chair)  
Walter Berkmann  
Patricia Zirkel

## Constitution and By-laws Committee:

Gene Zirkel (Chair)  
Alice Berridge  
Dr. Angelo Scordato

## Video Committee:

Alice Berridge (Chair)  
Carmine Desanto

Parliamentarian: Patricia Zirkel

Editor: Patricia Zirkel

Continued . . .

## 1986 ANNUAL MEETING, Continued

## Reviewers for the Bulletin:

Anthony Catania  
 John Impagliazzo  
 Kathleen McKiernan  
 Fred Newhall  
 Gene Zirkel

A call was issued for further volunteers.

Dr. Impagliazzo suggested that the Society send letters of thanks to members of all the committees who volunteered their time and efforts for a successful year.

Dr. Scordato questioned The advisability of electing officers at a Board meeting which precedes a Business meeting. The officers elected at this present meeting were all members of the Board as of the prior year. What if an officer was elected and subsequently not re-elected to the new Board at the following Business meeting? Gene Zirkel said that the Constitution states that you must be on the Board to be elected, but not necessarily to serve as an officer. Dr. Impagliazzo asked the Parliamentarian for comments. In Article III, Section 3, the Constitution states:

The Board shall elect from its membership the officers of the Society, and may fill from the voting membership of the Society any vacancies in the Board until the next annual election.

Gene pointed out that many corporations have officers who are not members of their Boards, and that the founders of the DSA had their Board meeting the Friday night before the general meeting. The important point is to elect officers who have experience. Dr. Impagliazzo asked the Constitution and By-Laws Committee to pursue this question as their first order of business. Gene Zirkel phrased the key question as: "Should the officers of the DSA be limited to Board members"? Dudley George said that the officers should not necessarily have to come from the Board. In business, officers are appointed due to competence. Perhaps some officers should be on the Board, such as the

## 1986 ANNUAL MEETING, Continued

Chair, but not necessarily all. Gene Zirkel suggested that a majority of the officers should be from the Board. The Constitution mentions an Executive Committee (usually construed as an Executive Committee of the Board.) However, Article IV, Section 8 of the Constitution could be changed to read "Executive Committee of the Society".

A straw vote was taken to determine the mind of the general membership on this issue. It was unanimously agreed to refer the issue to the Constitution and By-Laws Committee, and the consensus of the group was that officers need not be restricted in all cases to members of the Board of Directors.

Adjournment was suggested by James Malone, voted, and the meeting ended at 10:55 A.M.,

## II ANNUAL MEMBERSHIP MEETING

The meeting was called to order by President Gene Zirkel at 11 A.M. In attendance were:

Larry Aufiero  
 Alice Berridge  
 Ellis Von Eschen  
 Dudley George  
 John Impagliazzo  
 Kay McKiernan  
 Jim Malone  
 Fred Newhall  
 Mary Newhall  
 Tony Razziano  
 Tony Scordato  
 Gene Zirkel  
 Pat Zirkel

The motion was made and seconded to accept the minutes of the last meeting. So voted.

Continued . . .

## 1986 ANNUAL MEETING, Continued

President's Report -- Gene Zirkel

Gene stated that a half-dozen years ago the society was dormant. The Treasurer, H.K. Humphrey, had in fact refused to bill anyone for dues, as he was embarrassed that there was no Bulletin being sent out to the Membership. At about this time, a regular meeting was held in Denver with only 5 members and 1 guest present, and 1 member attending by phone. When (then-President) Tom Linton passed away, Gene was Vice president, Jim Malone was Treasurer, and Pat Zirkel became Editor of the Bulletin. Gene wondered if there would be a DSA to govern going forward.

Since that time the Society has been growing! In the past year, for example, we have gained 8 new members. Two members have retired and continue to receive the Bulletin. We have had 8 dozen requests for literature - from teachers, school libraries, students in education majors, universities, and bulk shipments, including two conventions. The University of Florida subscribes to our Bulletin. University libraries are one of the best places to spread the word. Thus, Gene feels that we are moving in good directions to educate people.

We have agreed to exchange articles and Bulletins with the Colson News, a magazine about numbers which is particularly concerned with negative digits, an idea pioneered by J. Halcro Johnson. One new member came from an article about our Society which they recently published.

Gene gave special thanks to Jim Malone, for his work as Treasurer, and to Pat Zirkel, for her work as Editor. Thanks also to Tony Catania and Alice Berridge for their fine work in planning the current Annual Meeting, and for the fantastic entertainment program of last evening. Fred and Mary Newhall were thanked as unofficial archivists and for their help in moving the storeroom. Further thanks to Dr. Tony Scordato who served on the Constitution and Awards Committees. Thanks to everyone in attendance for their encouragement, particularly to Dudley George for coming 3,000 miles from California.

## 1986 ANNUAL MEETING, Continued

Concerning Society correspondence: Letters were received from England. Arthur Whillock commented about the Panda as a Society mascot. He also thinks the term "Fellow" is non-sexist; it is used in England without complaint. In addition, Mr. Whillock and Mr. Steele of New Zealand suggested that DSA membership rates be relaxed due to the present adverse rate of (monetary) exchange. This matter is to be referred to the Finance Committee at the suggestion of Alice Berridge.

In a related discussion which took place at this point, the Finance Committee was also asked to consider paying some traveling expenses for a featured speaker at the next Annual Meeting. The Annual Meeting and Finance Committees should confer about financing a speaker at their earliest convenience.

Fred Newhall here added that Arthur Whillock has forwarded to us a copy of a substantial bibliography of Dozenal subjects. This bibliography was compiled by Brian Bishop during his lifetime, and it will reside in the Archives collection for anyone's reference. It was suggested that an article be written for the Bulletin about that bibliography.

Concerning the DSA Brochure: We are running out of our standard Brochure and will need a new printing. Should we redesign a more attractive format? The Business and Marketing Department of Nassau Community College teaches ideas for making brochures, and perhaps could offer assistance. (See: ATTENTION ART TEACHERS, in this Bulletin.) Gene asked for a Committee: Tony Scordato, Pat Zirkel, and Tony Razziano were interested, and Tony's wife is skilled at that sort of thing. The need is urgent.

Concerning Speakers' Aids and Materials: Gene suggested the purchase of a permanent exhibit-stand, which could be easily transported by any speaker and used to display DSA materials. This could also be used to supplement expositions, and museum or library exhibits. Pat moved to refer this to the Finance Committee.

Continued . . .

## 1986 ANNUAL MEETING, Continued

A question about expenses concerned with the Annual Meeting was also referred to the Finance Committee.

Gene reminded us that we need guest speakers and articles for our Bulletin. These may involve any ideas to do with numbers or with teaching dozenals.

A motion was made and seconded to present some DSA awards at this time rather than at lunch. Acting for the Awards Committee, Patricia Zirkel presented the title of "Fellow" to two members:

To Dudley George, who has been a member since the '40s and who faithfully comes the greatest distance to our meetings.

To Fred Newhall, who has been quite active preparing indices and inventories, and speaking and writing for the Bulletin.

Also acting for the Committee, Chairman of the Board Dr. John Impagliazzo presented the Annual Award:

To Gene Zirkel, who has been a long and hard-working member of the Society, and who has spent dozens and dozens of hours promoting the idea of dozens.  
(See related article, this issue.)

Treasurer's Report -- James Malone

Liquid assets from October 12, 1985 to October 11, 1986 were \$3,742.56 with expenses of \$2,518.38. Revenue from investments was approximately \$1,100.00. Total assets exceed \$18,000.00. A full Treasurer's Report was submitted and accepted.

Editor's Report -- Patricia Zirkel

We publish three issues a year, fall, winter, and summer. (An aside: member Bruce Moon from New Zealand wrote that

## 1986 ANNUAL MEETING, Continued

our "summer" issue arrives three months prior to their "summer", which points out the relativity of our dating system! Our Bulletin truly is distributed world-wide.)

The cost of publishing has remained relatively the same. Any nominal rise is due to inflation. Circulation is up slightly to 153. We have had 89 additional requests for issues.

We can use reviewers for articles. We can also use brief articles on any subject dealing with number bases or instructional topics.

Pat suggested that the appointment of an Assistant or

*Continued . . .*



Fred Newhall  
(left) and  
Dudley George  
were named  
Fellows of  
the Dozenal  
Society of  
America at  
their recent  
Annual

Meeting. Fred is a frequent DSA speaker and has done extensive cataloging and inventory of archival materials for the Society. Dudley has been active in the DSA since the 1940's, and regularly travels great distances from his home on the west coast to attend the Annual Meeting.

## 1986 ANNUAL MEETING, Continued

Associate Editor be considered, so as to encourage new ideas and to prevent deterioration in the quality of the Bulletin.

We are still entertaining suggestions for a name for our Panda.

New Business

(1) It was suggested that the date of the 1987 Annual Meeting should be chosen so as not to conflict with meetings of other Societies which are of import to some of our members. (Ed. -- The date of the meeting was later determined as October 16 to 18, 1986.)

(2) The Nominating Committee has recommended that the Class of 1986 be reelected as the Class of 1989. These are:

Walter Berkmann



Chairman of the Board, Dr. John Impagliazzo presents the 1986 Annual Award of the Dozenal Society of America to Gene Zirkel. (See related article, this issue.)

## 1986 ANNUAL MEETING, Continued

Dr. John Impagliazzo  
Robert R. McPherson  
Gene Zirkel

The group was elected unanimously.

(3) Next year's Nominating Committee was selected as:

Anthonia Catania (Chair)  
Alice Berridge  
Dudley George

All were approved unanimously.

At 12:15 the meeting was recessed for lunch.

Continued . . .



Fred Newhall (Secretary) takes the minutes of the Business Meeting, while Gene Zirkel (President) listens to Committee reports at the 1986 DSA Annual Meeting.

1986 ANNUAL MEETING, Continued

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(4) When the meeting resumed at 2 P.M., Dr. Scordato explained the proposed revisions of the DSA By-Laws. Copies were distributed to those present. The new By-Laws were generally approved, with the following changes:

It was proposed to delete Section 2.2 with reference to Student Members and all associated references. The motion was passed.

Alice Berridge proposed we delete Section 4.2 about delinquent members also. This was passed.

Discussion of the revised DSA Constitution was tabled until the next Annual Meeting.

(5) It was proposed that the installation of officers be deferred to the banquet this evening: So carried.

The Business meeting was adjourned at 2:10 P.M. to open the math conference.

Respectfully submitted,

Fred Newhall, Secretary

### III AFTERNOON PRESENTATIONS

(1) Fred Newhall

The first presentation reviewed the evolution of number systems and compared various systems of numeration and counting: Egyptian, Babylonian, Roman, Chinese and Hindu-Arabic. Fred went on to contrast several number bases which use Hindu-Arabic numerals.

(2) Gene Zirkel

The second presentation was entitled "Another Set of Symbols: Binary Coded Dozenal Digits". It reviewed a method of constructing digits that is both arithmetically accurate and compatible with a seven-segment display.

1986 ANNUAL MEETING, Continued

---

(3) Ellis Von Eschen

The third presentation dealt with methods of progressing from an additive to a multiplicative magic square, and with patterns in multiplicative magic squares. A key question entertained by the speaker was: What group of nine consecutive numbers, arranged into a multiplicative magic square, will produce the smallest product?

(4) Dudley George

The final speaker addressed the issue of factoring in the decimal and duodecimal systems, and used a bar graph which depicted frequency and clustering of factors. He also reviewed the digits of the duodecimal system, noting even and odd numbers and squares, in addition to factors.

### IV EVENING BANQUET

DSA members and guests gathered in the evening on October 11, 1986 for the annual banquet.



Tony Scordato, Jeanne Horn and Ellis Von Eschen at the annual banquet. Jeanne was in New York from her new home in Florida.



Attention: ART TEACHERS - ART STUDENTS



December 1196;

A Brochure Design Contest with cash prizes

The Dozenal Society of America, a non-profit, educational association, invites you to design their new brochure.

It should be both attractive and informative. The resulting item will be used to inform others of who we are and tell them some of the advantages of joining us. We imagine a 3 or 4 page fold-out measuring 8 1/2 by 11 inches or 8 1/2 by 14 inches.

We are a mathematical society dedicated to the advantages of Twelves over Tens in both measuring and counting. For example:

You may have noticed that practical people almost never measure in tens:

Bakers use dozens,



Carpenters divide the foot  
into 12 inches,

We have a 12 hour day and a 12  
hour night on our clocks,

Grocers (gross-ers) use twelve  
dozens,

Druggists and jewelers divide  
the pound into 12 ounces.

With twelve based counting, arithmetic  
and fractions are easier.

$$1/3 = 0.333333... \text{ in tens,}$$

but

$$1/3 = 4/12 = 0.4 \text{ in dozens.}$$

Three prizes will be offered:



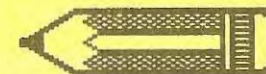
1st prize: one gross of dollars (\$144)

2nd prize: six dozen dollars (\$72)

3rd prize: three dozen dollars (\$36)

And at least one dozen (what else?) honorable  
mentions.

All entries become the property of the DSA and may be  
printed in whole or in part by the Society. The decision  
of the judges is final.



Deadline - all entries must be received by June 1, 1987.

## TERMINAL DIGITS OF PENTAGONAL NUMBERS

Charles W. Trigg  
San Diego, California

Pentagonal numbers have the form  $P(n) = n(3n - 1)/2$ . The first 20 pentagonal numbers in the duodecimal system are shown below.

<u>n</u>	<u>P(n)</u>	<u>n</u>	<u>P(n)</u>	<u>n</u>	<u>P(n)</u>	<u>n</u>	<u>P(n)</u>
1	1	7	5*	11	187	17	384
2	5	8	78	12	1##	18	412
3	10	9	99	13	236	19	463
4	1*	*	101	14	274	1*	4#7
5	2#	#	128	15	2#5	1#	552
6	43	10	156	16	339	20	5#0

The terminal digits of consecutive pentagonal numbers form a repetitive sequence with a period of 20 digits. This period can be divided into equal lengths in six different ways. In each case, the sub-periods can be written consecutively in separate lines to form a rectangular array with distinctive properties.

The period written in two rows is

```

1 5 0 * # 3 * 8 9 1 8 6
7 # 6 4 5 9 4 2 3 7 2 0

```

The sums of the elements in the top and bottom rows are 60 and 50, respectively. The sum of the elements in each column is even. The absolute value of the difference of the digits in each column is 6 or 10/2.

From here on in this discussion, all sums will be reduced modulo 10.

## TERMINAL DIGITS, Continued

With the period written in three rows, the digits in each column form a cyclic arithmetic progression with a common difference,  $d$ , reading upward, of 4 or 10/3.

```

1 5 0 * # 3 * 8      (0)
9 1 8 6 7 # 6 4      (4)
5 9 4 2 3 7 2 0      (8)

```

$$\Sigma = 3 \ 3 \ 0 \ 6 \ 9 \ 9 \ 6 \ 0$$

The sequence formed by the sums,  $\Sigma$ , of the columns consists of two palindromes convertible into a single palindrome by one step cyclic permutation. The sums of the rows (in parentheses) form a cyclic arithmetic progression.

When the period is written in four rows, the digits in each column form a cyclic arithmetic progression.

```

1 5 0 * # 3
* 8 9 1 8 6
7 # 6 4 5 9
4 2 3 7 2 0

```

$$\Sigma = * \ 2 \ 6 \ * \ 2 \ 6$$

Alternating in reading the columns up and down, each common difference is 3 or 10/4. Otherwise, the common differences of 9 and 3 alternate when reading down the columns. The sequence formed by the sums of the columns is a repeated cyclic arithmetic progression with  $d = 4$ . The sum of each row is 6.

The distribution of the digits of the period when writing the period from left to right in six rows and then rotating the array about its principal diagonal, is the same as when

Continued . . .

TERMINAL DIGITS, Continued

---

writing the period downward in six columns. Thus

1 # 9 7 5 3

5 3 1 # 9 7

0 \* 8 6 4 2

\* 8 6 4 2 0

$$\Sigma = 4 8 0 4 8 0$$

Reading from the right, each row is a cyclic arithmetic progression with  $d = 2$  or  $10/6$ . The first two rows are two different aspects of the same progression, as are the last two rows. The sums of the columns form a repeated cyclic arithmetic progression with  $d = 4$ .

Continued . . .

IN MEMORIAM: WILLIAM C. SCHUMACHER

---

Member number 84; William C. Schumacher of Cherry Hill, NJ, died suddenly on October 3, 1986. He is survived by his wife, Genevieve (nee Sillman), daughter Mary E. Barno (MA), and sons William W. (NY), Paul M. (NJ) and Walter H. (NJ). He had been a member of the Society since 1955, once serving as Chairman of the Nominating Committee.

Bill had been working most recently on a set of new numerals with Gene Zirkel. This concept was the basis of Gene's presentation, "Binary Coded Dozenal Digits", at the 1986 Annual Meeting. He was also in contact with Paul Rapoport of Ontario, CAN, who is working on a dozenal clock.

Bill was an enthusiastic dozenalist who will be missed by the Society.

TERMINAL DIGITS, Continued

---

The period, written downward in 8 columns, has one row that is a palindrome and two rows, as well as the sums of the columns, that are cyclic permutations of palindromes. The first row, as written, is also a concatenation of two palindromes in which corresponding terms differ by 6. The same statement is true of cyclic permutations of the other rows.

$$1 * * 1 7 4 4 7 \quad (8)$$

$$5 \# 8 8 \# 5 2 2 \quad (4)$$

$$0 3 9 6 6 9 3 0 \quad (0)$$

$$\Sigma = 6 0 3 3 0 6 9 9$$

The sums of the three rows are 8, 4, 0, which are in arithmetic progression.

The period written downward in 10 columns forms two rows, each of which contains the 10 duodecimal digits. Thus the sums of the digits in the two rows are equal and their difference vanishes. Hence, the period, viewed as an integer, is divisible by 11. This follows, since in any base  $b$ , if the difference of the sums of the alternate digits of a number  $N$  is divisible by  $b + 1$ , then  $N$  is also divisible by  $b + 1$ .

$$1 0 \# * 9 8 7 6 5 4 3 2$$

$$5 * 3 8 1 6 \# 4 9 2 7 0$$

$$\Sigma = 6 * 2 6 * 2 6 * 2 6 * 2$$

The two rows are cyclic arithmetic progressions with common differences of 1 and 7, reading from the right. In the second row, the digits in order of magnitude are obtained by taking every fifth term starting with 0. The sums of the columns form a cyclic arithmetic progression,  $d = 4$ , repeated four times.

## ANNUAL AWARD - 1196;

At the DSA Annual Meeting on October 11, 1986 Gene Zirkel, current President, was honored with the Society's prestigious Annual Award for 1986.

Gene joined the Society in 1951 as a sophomore in college. He had been challenged into inquiring about the DSA when his mathematics professor at St. John's University (NY), Tony Sarno, referred to the idea of using duodecimals for counting and measuring as "crazy". Gene went on to publish "I'm a Dozener" in the Mathazine. This was reprinted in our Bulletin (Vol. 9, No. 1).

In 1978 Gene was elected to the Board of Directors to fill a vacancy caused by the death of DSA founder Ralph Beard in 1974. He has gone on to provide strong and forward-looking leadership to the Society.

*Continued . . .*

## NUMBER BASES ELSEWHERE PART III

Joe Baehr's letter in the Mathematics Teacher March 1986, p. 157, giving a second 'proof' that half of eleven is six is reminiscent of the three 'proofs' that half of twelve is seven:

- a) the top half of XII
- b) half of 12 in base twelve, and
- c) a demonstration from geometry  
- half of a dodecagon is a heptagon.---

## ANNUAL AWARD, Continued

The text of the award is as follows:



## THE ANNUAL AWARD

of

## THE DOZENAL SOCIETY OF AMERICA

is given to

**GENE ZIRKEL**

Member of the Society since 1951 (Number 67);  
Director of the Society since 1978  
President of the Society since 1981.

Driving force in revitalizing the DSA, 1979-1982.

Instrumental leader in establishing the DSA Archives and Library Collection at Nassau Community College and in increasing scholarly access to both.

Esteemed contributor to The Duodecimal Bulletin since 1953.

Continuing influence on the forward thrust of DSA goals.

Presented with gratitude  
By the Board of Directors

1196;

1986

## DOZENAL JOTTINGS

-----  
 ...from members and friends...News  
 of Dozens and Dozenalists...

DR. JOHN IMPAGLIAZZO (NY) was lead-off guest lecturer at the International Centre for Theoretical Physics in Europe during this past November...

FRED NEWHALL'S (NY) interest in Base 12 was written up in the Fall 1986 issue of the University of Rochester Review, an Alumni publication. Fred first heard about the Base 12 counting system at a meeting of the University's Math Club in 1938...

GENE ZIRKEL (NY) gave a talk on dozenal counting to a class studying the history of numbers and counting at Nassau Community College on September 24th. He also managed a mention of Base 12 in a light-hearted letter -- "Half of 12 is 7" -- published in the October '86 issue of the Mathematics Teacher...

The DSA gave copies of books, pamphlets, back issues of our Bulletin and some DSGB materials to the Goudreau Math Museum in New Hyde Park, LI, NY, during the Fall semester...

BRUCE MOON (New Zealand) writes that he is perhaps the only person on our mailing list who also receives the New Zealand Mathematics Magazine. At any rate, both publications use the panda for illustration purposes. He suggests that our two organizations amalgamate, as the only way out of our "difficult problem"! (But our panda is prettier and has nicer fingers)...

JERRY BROST (FL) proposes that we name our panda "Twella". "This is a corruption of a traditional southern name 'Twila', which means 'born at twilight'. The name Twella would mean 'born with twelve fingers.' We can also create a masculine form, 'Twellus', and have a pair of pandas, so no one can accuse us of sexism."

He also writes: "I found Cedric Smith's article on two-way numbers in issue number 55; quite intriguing. I took

## DOZENAL JOTTINGS, Continued

-----  
 especial note of his idea that numbers are written backwards from our usual convention of writing from left to right. This is true if one is thinking in terms of the numerical value of numbers. However, if one is considering them in terms of their most significant digits coming first, then our convention is in fact consistent. I have put much thought into this question, and I always seem to be able to think of an equal number of reasons for writing in either direction. Tests of serial recall have shown that people are equally likely to remember the beginning and the ending of a series of numbers (or any other items) but forget what came in the middle. Directionality doesn't matter, as long as the important parts come on one end or the other, or both. Dozenal numbers are interesting because the most important digits come at both ends. In our present mode of writing, the initial digits are the most significant, while the terminal digit identifies the divisors of the whole number. To compound matters further, it is usually easier for left-handed people to write from right to left. Perhaps we should let them have some crumbs!

"So it seems that there is no scientific reason for writing in either direction, just so long as we don't write  
 v  
 e  
 r  
 t  
 i  
 c  
 a  
 l  
 l  
 y  
 . It's  
 hard on the eyes. But I would still like to see what other dozenists think, so let's keep the controversy going.

Continued . . .

-----  
 Add some spice to our Society, and enroll your spouse when you pay your 1987 dues. Spouses of current members may join the DSA at no added cost.

## DOZENAL JOTTINGS, Continued

"I am also interested in pursuing Esperanto. I don't know the language yet, but I'm interested in learning it." Jerry would be interested in hearing from anyone with a similar interest.

The DSA received Holiday Greetings from ROBERT R. MC PHERSON of Gainesville, FL and ARTHUR WHILLOCK of the DSGB....

Welcome to new members:

Number 2\*1; ROBERT K. SONNTAG of Santa Monica, CA, whose name was inadvertently omitted from our last issue...

Number 2\*3; ELAINE O. FURMAN of the Bellows Free Academy in Fairfax, VT...

Number 2\*4; DAVID ADAM HOROWITZ of Simsbury, CT, who was recruited by ISAAC RUSSELL, a new member welcomed in our Summer '86 issue...

Number 2\*5; PROFESSOR LARRY J. AUFIERO, of the Department of Mathematics/Statistics/Computer Processing at Nassau Community College, Garden City, LI, NY...

Number 2\*6; PAUL M. SCHUMACHER of Cherry Hill, NJ, son of recently deceased member Bill Schumacher. Paul is an avid philatelist and edits the monthly Bulletin of the Merchantville Stamp Club in Pennsauken, NJ...

end

Please pay your 1987 DUES today!

Dues help in defraying the cost of your Bulletin, and are payable yearly as of January 1st.

Thank you!

## PUZZLE CORNER

The Annual TWELFTH DAY OF CHRISTMAS Cocktail Party was held in the New York area on January 2nd at 8 p.m., in the home of Gene and Pat Zirkel. A small, but merry, group had a fine time. In attendance were: George Zirkel, Alice and Edmund Berridge, John and Jean Earnest, Fred and Mary Newhall, and Larry Aufiero. The group played the following game:

TWELVES

- 1; Epiphany is known as Twelfth \_\_\_\_\_.
- 2; The date that "Twelfth Night" was first performed was \_\_\_\_\_, 1601.
- 3; "The Twelve Pound Look" is a play by \_\_\_\_\_.
- 4; Gross Dam is in \_\_\_\_\_.

Continued . . .

The following are available from the Society

1. Our brochure (free)
2. "An Excursion in Numbers" by F. Emerson Andrews. Reprinted from the *Atlantic Monthly*, Oct. 1934. (Free.)
3. *Manual of the Dozen System* by George S. Terry (\$1;00)
4. *New Numbers* by F. Emerson Andrews (\$10;00)
5. *Doze: Notre Dix Futur* by Jean Essig, in French (\$10;00)
6. Dozenal Slide rule, designed by Tom Linton (\$3;00)
7. Back issues of the *Duodecimal Bulletin* (as available) 1944 to present (\$4;00 each)

## PUZZLE CORNER, Continued

- 5; The Dozen Islands are in \_\_\_\_\_.
- 6; The Twelvers are a \_\_\_\_\_ sect.
- 7; The Twelve Years' Truce was between \_\_\_\_\_, and \_\_\_\_\_.
- 8; The Twelve Bens are mountains in \_\_\_\_\_.
- 9; One musical system is the \_\_\_\_\_ scale.
- \*; The Twelve Tribes of Israel are named for the sons of \_\_\_\_\_.
- #; The Twelve Patriarchs were the sons of \_\_\_\_\_.
- 10; Jesus picked one dozen \_\_\_\_\_, and six dozen \_\_\_\_\_.
- 11; The hypoglossal nerve is the \_\_\_\_\_ nerve.
- 12; Economists are concerned with the \_\_\_\_\_.
- 13; Lawyers are concerned with the \_\_\_\_\_ law.
- 14; Milt \_\_\_\_\_ was an American cartoonist.
- 15; The Concordat of Worms was signed in the \_\_\_\_\_.
- 16; John Biddle, the Father of English Unitarianism, wrote the "\_\_\_\_\_ " denying the Trinity.
- 17; \_\_\_\_\_ is a popular Carol.
- 18; The Capture of Cerebus was the \_\_\_\_\_.
- 19; \_\_\_\_\_ and \_\_\_\_\_ were two Apostles who shared the same name.
- 1\*; \_\_\_\_\_ the \_\_\_\_\_ ruled England in the Twelfth Century.
- 1#; Eugenio Pacelli was also known as \_\_\_\_\_.
- 20; Sir Toby Belch is a character in \_\_\_\_\_.

ANSWERS IN NEXT ISSUE

## WHY CHANGE?

This same question was probably rife in Europe between the years 1000 and 1500, when the new Hindu-Arabic numerals were slowly making their inching progress in displacing the comfortable and familiar Roman numerals then universally used.

Yet, although it took 500 years, and despite much opposition—"Who needs a symbol for nothing?"—the new notation did come into popular use. Released from the drag of Roman notation, man's thinking leapt forward dramatically, and mathematicians discovered a new dimension in mathematical symbolism. Working with Hindu-Arabic numeration, they found that the new system better accommodated mathematical statements and facilitated the working out of ideas. Re-examining their fundamental concepts of numbers, they made advances in arithmetic, algebra, logarithms, analytic geometry and calculus, and thus contributed to the explosion of human thought which later became known as the Renaissance.

In a related development, man awoke to the fact that different number bases could be used, and as early as 1585, Simon Stevin stated that the duodecimal base was to be preferred to the base ten.

The parallel seems tenable. The notation of the dozen base better accommodates mathematical statement and facilitates ideation. It, too, is a step forward in numerical symbolism. The factorable base is preferred for the very same advantages which led the carpenter to divide the foot into twelve inches, the baker and the grocer (one who deals in *grosses*) to sell in dozens, the chemist and the jeweler to subdivide the Troy pound into twelve ounces. And yet, this is accomplished by such simple means that students in the primary grades can tell why they are better. Literally, the decimal base is unsatisfactory because it has NOT ENOUGH FACTORS.

Then should we change? Yes, but no change should be forced, and we urge no mandated change. All the world counts in tens. But people of understanding should learn to use duodecimals to facilitate their thinking, their computations and their measurements. Base twelve should be man's second mathematical language. It should be taught in all the schools. In any operation, that base should be used which is the most advantageous, and best suited to the work involved. We expect that duodecimals will progressively earn their way into general popularity because they simplify the all-important problem of the correlation of weights and measures, the expansion of fractions ( $1/3 = 0;4$ ) and give an advantage in calculations involving time and our twelve-month calendar. Perhaps by the year 2000, (or maybe by 1200; which is 14; years later!) duodecimals may be the more popular base. But then no change need be made, because people will already be using the more convenient base.

If "playing with numbers" has sometimes fascinated you, if the idea of experimenting with a new number base seems intriguing, if you think you might like to be one of the adventurers along new trails in a science which some have erroneously thought staid and established and without new trails, then whether you are a professor of mathematics of international reputation, or merely an interested pedestrian who can add and subtract, multiply and divide, your membership in the Society may prove mutually profitable, and is most cordially invited.

## COUNTING IN DOZENS

1	2	3	4	5	6	7	8	9	*	#	10
one	two	three	four	five	six	seven	eight	nine	dek	el	do

Our common number system is decimal—based on 10. The dozen system uses twelve as the base, which is written *10*, and is called *do*, for dozen. The quantity *one gross* is written *100*, and is called *gro*. *1000* is called *mo*, representing the meg-gross, or great-gross.

In our customary counting, the places in our numbers represent successive powers of ten; that is, in 365, the 5 applies to units, the 6 applies to tens, and the 3 applies to tens-of-tens, or hundreds. Place value is even more important in dozenal counting. For example, 265 represents 5 units, 6 dozen, and 2 dozen-dozen, or gross. This number would be called *2 gro 6 do 5*, and by a coincidence, represents the same quantity normally expressed as 365.

We use a semicolon as a unit point, thus two and one-half is written 2;6.

Place value is the whole key to dozenal arithmetic. Observe the following additions, remembering that we add up to a dozen before carrying one.

94	136	Five ft. nine in.	5;9'
31	694	Three ft. two in.	3;2'
96	3#2	Two ft. eight in.	2;8'
19#	1000	Eleven ft. seven in.	#;7'

You will not have to learn the dozenal multiplication tables since you already know the 12-times table. Mentally convert the quantities into dozens, and set them down. For example, 7 times 9 is 63, *which is 5 dozen and 3*; so set down 53. Using this "*which is*" step, you will be able to multiply and divide dozenal numbers without referring to the dozenal multiplication table.

Conversion of small quantities is obvious. By simple inspection, if you are 35 years old, dozenally you are only 2#, which is two dozen and eleven. For larger numbers, keep dividing by 12, and the successive remainders are the desired dozenal numbers.

$$\begin{array}{r} 12 \overline{) 365} \\ \underline{12} \phantom{0} \\ 30 \phantom{0} \\ \underline{12} \phantom{0} \\ 18 \phantom{0} \\ \underline{12} \phantom{0} \\ 6 \phantom{0} \\ \underline{0} \\ 0 \end{array}$$

0 + 2 Answer: 265

Dozenal numbers may be converted to decimal numbers by setting down the units figure, adding to it 12 times the second figure, plus 12<sup>2</sup> (or 144) times the third figure, plus 12<sup>3</sup> (or 1728) times the fourth figure, and so on as far as needed. Or, to use a method corresponding to the illustration, keep dividing by #, and the successive remainders are the desired decimal number.

Fractions may be similarly converted by using successive multiplications, instead of divisions, by 12 or #.

For more detailed information, see *Manual of the Dozen System* (\$1.00).

We extend an invitation to membership in our society. dues are only \$12 (US) per calendar year; the only requirement is a constructive interest.

## Application for Admission to the Dozenal Society of America

Name \_\_\_\_\_  
LAST FIRST MIDDLE

Mailing Address (for DSA items) \_\_\_\_\_  
(See below for alternate address)

Telephone: Home \_\_\_\_\_ Business \_\_\_\_\_

Date & Place of Birth \_\_\_\_\_

College \_\_\_\_\_ Degrees \_\_\_\_\_

Business or Profession \_\_\_\_\_

Annual Dues ..... \$12.00 (US)

Student (Enter data below) ..... \$3.00 (US)

Life ..... \$144.00 (US)

School \_\_\_\_\_

Address \_\_\_\_\_

Year & Math Class \_\_\_\_\_

Instructor \_\_\_\_\_ Dept. \_\_\_\_\_

Other Society Memberships \_\_\_\_\_

Alternate Address (indicate whether home, office, school, other) \_\_\_\_\_

Signed \_\_\_\_\_ Date \_\_\_\_\_

My interest in duodecimals arose from \_\_\_\_\_

Use space below to indicate special duodecimal interests, comments, and other suggestions, or attach a separate sheet:

Mail to: Dozenal Society of America  
 c/o Math Department  
 Nassau Community College  
 Garden City, LI, NY 11530

DETACH HERE OR PHOTOCOPY