

THE DUODECIMAL BULLETIN 59;



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



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 Number 1;
 Winter 1988
 1198;

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.

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THE DUODECIMAL BULLETIN

Whole Number Five Dozen Nine

Volume 31; Number 1;

Winter 1198;



FOUNDED
1944

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Editorial Office:

6 Brancatelli Court
West Islip, NY 11795

DOZENAL SOCIETY OF AMERICA

MINUTES OF THE ANNUAL MEETING - 1197;

Saturday, October 17, 1987
 Nassau Community College
 Garden City, LI, NY 11530

Third Floor -- Building V

I BOARD OF DIRECTORS MEETING

Dr. Angelo Scordato opened the meeting at 10:20 AM by thanking everyone for coming, including the Board of Directors and especially Jamison Handy and his wife, Vera Sharp Handy, who travelled all the way from California, and Dr. Paul Rapoport, who travelled from Canada.

The following Board Members were present:

Jamison Handy, Jr.
 James Malone
 Fred Newhall
 Dr. Angelo Scordato
 Gene Zirkel
 Patricia Zirkel

Acting for Anthony Catania, Chair of the Nominating

Continued...

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. Whatever symbols are used, the numbers commonly called "ten", "eleven" and "twelve" are pronounced "dek", "el" and "do" in the duodecimal system.

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 $1/2 = 0.5 = 0;6$.

1987 ANNUAL MEETING, Continued

Committee, Alice Berridge presented the Committee's proposed slate of Officers for the coming year:

Chair	Fred Newhall
President	Gene Zirkel
Vice President	Dudley George
Secretary	Larry Aufiero
Treasurer	James Malone

The slate was elected unanimously.

James Malone and Gene Zirkel made the point that they wished to be replaced in their duties at the end of their current terms (i.e., at the 1988 Annual Meeting) by persons who might bring different ideas to their respective Offices. They added that they would continue to be active in Society business.

The following Committee Appointments for 1987-1988 were made by the Board:

Annual Meeting Committee:

Barbran Smith, Chair
 Anthony Catania
 Alice Berridge (Consultant)

Finance Committee:

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

Awards Committee:

Dr. Angelo Scordato, Chair
 Dr. John Impagliazzo
 James Malone

Continued...

Twelve also occurs very early as a mystical round number. Twelve vultures appeared as an omen to Romulus, the founder of the city of Rome, indicating that it was to last for 1200 years. The number 12 is also significant in Greek history: Homer relates that Ajax and Odysseus each commanded 12 ships; the 12 Ionian cities formed an alliance; 120 Boeotian sailors made up a ship's crew. And when we learn, further, that Memelaus was lord over 60 ships and recall that the swineherd Eumeaus' 360 pigs..., we realize that the round number 12 belongs to the same category as the other round number 60 and its multiples.

On page 157, Menninger discusses the use of the dozen in northern Europe:

...the north European tylft is an original, native measure, and not one that was first brought in by way of the Carolingian coinage system. For, quite apart from its ready divisibility, it was also consistent with the Roman pattern in the table of ounces.

The division of the day and night into 12 hours has a peculiar historical explanation, and the connection with 12 is quite fortuitous! O. Neugebauer [The Exact Sciences in Antiquity, 2nd. Ed., (Brown University Press, 1957; Harper, 1962)] discusses this on pages 80-88. Basically, the Egyptians used a 360 day year and divided it into 36 'decans' of ten days each. These corresponded to 36 sectors of the sky, of ten degrees each, each having its own star. Consequently the night is divided into eighteen parts. However, in the summer, only twelve of these can be seen because of the longer daylight, and this division into twelve parts was extended to the whole year. Note that the hours varied in length with the time of year.

Continued on page 18;...

Since we know that they had a twelve-month year in 4241 B.C., it's possible that they may have been using a twelve-hour clock as early as the fifth millenium B.C.

In order to build the pyramids and their many other remarkable structures, the Egyptians must have had some way to measure angles. They were probably astute enough to use a dozenal measure or some system compatible with the dozen. In all probability they used a system very much like the modern 360 degree circle. The 360 degree circle was used by the nearby Babylonians and could have been known to the Egyptians as well.

The evolution of the 360 degree circle is an extremely interesting story itself. The Babylonians divided the circle into six hexads instead of the four quadrants that we use. This apparently arose from the Babylonian estimate of pi as equal to three, which gives a circumference equal to six times the radius. This allows one to use the radius to subdivide the circle into six equal arcs. The Babylonians also must have realized that an equilateral hexagon approximates a circle, and it can be constructed from six equilateral triangles. This provides a convenient way to use triangles to subdivide the circle into six equal parts. The Babylonians then proceeded to subdivide each hexad into sixty degrees. This brings up another interesting question. Why did they use sixty? Why not ten? Why not six again?

Apparently they gave careful consideration to this question. There are many advantages of the sexagesimal base. Sixty is a multiple of both ten and six and hence is compatible with both these bases. Sixty is also a multiple of twelve and many other interesting numbers. But the deciding factor must have been that sixty degrees in all six hexads gives a total of 360 degrees in a circle. This approximates the number of days in a year. In fact, the Babylonians actually reckoned the year at 360 days, not 365 like the Egyptians. The Babylonians must have realized that their seasons gradually shifted, but this could have been without practical significance to them. The simplicity of a common

Continued on page 19;...

1987 ANNUAL MEETING, Continued

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

Reviewers of Articles for the Bulletin:

Anthony Catania
 John Impagliazzo
 Kathleen McKiernan
 Fred Newhall
 Barbran Smith
 Gene Zirkel

II ANNUAL MEMBERSHIP MEETING

At 10:40 President Gene Zirkel called the meeting to order.

In addition to Board Members already noted as present, those in attendance were:

Alice Berridge
 Vera Sharp Handy
 Mary Newhall
 Paul Rapoport
 Barbran Smith

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

Continued...

1987 ANNUAL MEETING, Continued

REPORTS OF OFFICERS:

President's Report - Gene Zirkel

Gene reported that this year we have a dozen new members. He sent out 33 post cards, 36 letters, answered 72 requests for information among which were a dozen sets of multiple copies, and two were sets of 1,000 copies for conventions. He thanked those responsible for a handsome new brochure. A set of prototype key rings had been donated and were given out to those present.

Treasurer's Report - James Malone

Jim gave the highlights for the year. The value of our treasury was increased by \$900 because dividends on stock were up by 18%, and the dues paid total was up. Liquid assets from October 11, 1986 to October 17, 1987 were \$3,677.52 with expenses of \$2,834.25. Revenue from investments was approximately \$1,000.00, and total assets exceed \$19,000.00. A full Treasurer's Report was submitted and accepted.

COMMITTEE REPORTS:

Finance Committee - Dr. Angelo Scordato

Miscellaneous requests for funds as reviewed by the Committee during the past year included the purchase of a new printer for the Society's editorial work and of some exhibit materials.

Continued...

Do you have an idea to share with our members? Why not submit an article to the Bulletin?

1987 ANNUAL MEETING, Continued

There was discussion about contacting the membership of the Dozenal Society of Great Britain with regard to their attending one of our Annual Meetings. Fred Newhall suggested a group phone call at our next meeting, arranged in advance so that several of our British counterparts could talk with those at our meeting, the call to be paid by our treasury. This was also approved.

Constitution & Bylaws Committee - Gene Zirkel

The Committee presented a Constitution revised to remove sexist language and to bring the document up to date with current practice. Those present voted to approve the revised Constitution.

Paul Rapoport asked about the Addendum to the Constitution, which states that spouses of members may join the Society at no additional cost. Pat Zirkel suggested it be added to the By-Laws in the article dealing with Membership, Section 2.1, paragraph 3. This was approved.

Tony Catania suggested that all new pages should be dated. This was also approved. Tony Catania further suggested that printed copies of the Constitution be available in the same size as the Bulletin, and Pat Zirkel suggested that these be published as a special issue of the Bulletin. These ideas were voted and carried.

Awards Committee - Dr. Angelo Scordato

The Committee recommended that the Dozenal materials and books which are housed in the Nassau Community College Library be dedicated as "The F. Emerson Andrews Memorial Collection"; and that a plaque attesting to this and to the fact that these materials were donated to the Library by The Dozenal Society of America be erected. The plaque should also note both the dates of donation and of dedication. This was voted and passed.

Continued...

1987 ANNUAL MEETING, Continued

The Committee also recommended that the "Annual Award" be henceforth called "The Ralph H. Beard Memorial Award". This award shall customarily be presented annually. So passed.

The Annual Award (the last by such title!) was then presented to James Malone, for his years of dedicated service as Society Treasurer. (See accompanying article.)

The following persons were named Fellows of the Society:

Robert R. McPherson of Gainesville, FL
Arthur F. Whillock of the DSGB
Dr. Angelo Scordato of Nassau Community College

The first two presentations were made by Dr. Scordato, who was then surprised with his award by Gene Zirkel.

Editor's Report - Patricia Zirkel

The Editor reported that the cost of publication has remained fairly constant from last year to this year. Additional reviewers are welcome to volunteer their services.

A call for papers was also issued. These may deal briefly with any topic under the general heading of number bases.

The Society has recently purchased several items which are intended to enhance the quality of the Bulletin: A software package known as "Pagemaker", with related peripheral hardware, and a 24-pin dot-matrix printer. The Editor thanked the Society for their continued strong support in this regard.

The Editor also requested an Associate Editor, and Jamison Handy volunteered, who is himself a past Editor of the Bulletin. He suggested that a modem could facilitate the transferrance of copy from the West Coast, where he lives, to our Editorial Office on the East Coast.

Continued...

1987 ANNUAL MEETING, Continued

Nominating Committee - Alice Berridge (for Anthony Catania)

The following slate was proposed for the Board of Directors,
Class of 1990:

Dudley George	Palo Alto, CA
Jamison Handy, Jr.	Pacific Palisades, CA
James Malone	Lynbrook, NY
Fred Newhall	Smithtown, NY

These were elected unanimously, by the Secretary's casting
of one vote.

The Committee also proposed the following persons as the
Nominating Committee for the coming year:

James Malone
Larry Aufiero
Anthony Catania

So carried.

NEW BUSINESS:

The DSA Annual Meeting for 1988 was voted to be Friday,
October 14 and Saturday, October 15.

The meeting was adjourned shortly before 1 p.m. as luncheon
reservations had been made at a nearby restaurant.

Respectfully submitted,

Fred Newhall,
Secretary (Outgoing)

Continued...

1987 ANNUAL MEETING, Continued

III AFTERNOON PRESENTATIONS:

Those present for any of the remaining functions were:

Larry Aufiero	Debbie DeSanto
Chris Aufiero	Ellis Von Eschen
Edmund Berridge	Dr. John Impagliazzo
Carmine DeSanto	Mary Malone
	Kay McKiernan

Continued...



*Gene Zirkel exhibited
an abacus and
explained an
adaptation of its use
for dozenal purposes.*

1987 ANNUAL MEETING, Continued

Following the break for luncheon the meeting was re-convened at approximately 2:30 p.m., and the following speakers were heard:

1. Ellis Von Eschen spoke on Divisibility Tests: decimal, terminal and recursive.



2. Fred Newhall spoke about Frequency in Music, which topic also included the notion of frequency in general.

Continued...

1987 ANNUAL MEETING, Continued

3. Dr. Paul Rapoport presented a Dozenal Clock, and explained its history and method of operation. (A separate article will be printed in a later issue of the Bulletin.)



IV EVENING BANQUET

We gathered with spouses and friends for cocktails and dinner. The following pictures show a small part of the evening's festivities!



Dr. John Impagliazzo stopped partying briefly to examine Paul Rapoport's Dozenal Clock.

Continued...

1987 ANNUAL MEETING, Continued



Paul Rapoport and Jamison Handy enjoyed a lengthy discussion of dozenal topics over dinner.



Professor James Malone received the DSA Annual Award for his many years of faithful service as Society Treasurer. Jim is shown (center) with Dr. Angelo Scordato, and his wife Mary.

DSA ANNUAL AWARD -- 1197;

Professor James Malone was presented with the DSA Annual Award for 1987 at the recent Annual Meeting. We believe the text of the Award is self-explanatory. Jim was very surprised to be so honored, and after receiving the plaque, he responded: "But I only keep figures!" We who depend on him know just how important his work has been. (Ed.)

The text of the Award is as follows:



The Annual Award of the
Dozenal Society of America

is hereby presented to

PROFESSOR JAMES MALONE

Who willingly took on the role of Treasurer when we needed him, and who has carefully & diligently managed the monies of the Society ever since.

Jim joined us in 1979 (member no. 245;) & has faithfully and consistently served as an Officer and a Board Member for over a half dozen years.

His helpful advice, his warm personal encouragement, his service on numerous committees = all given with his ever-present smile = are deeply appreciated by the members of the Society.

Truly, without dedicated people such as Jim, there would be no DSA.

Given With Gratitude
By The Board of Directors

1197;

1987.

In *Bulletin* 57; page 10; we printed the following query:

We have heard that the priests under Cheops, the Egyptian King who built the great pyramid at Giza around 2500 B.C., counted in dozens. Can anyone substantiate or debunk this rumor?

We received two replies. We print them as we received them, and invite further comment.

DUODECIMALS IN ANTIQUITY

*David Singmaster
Polytechnic of the South Bank
London, England*

I have recently been reading up on the history of numbers in preparation for teaching it. I find no evidence that the ancient Egyptians actually counted in dozens. Menninger [Number Words and Number Symbols (MIT Press, 1969)] discusses twelves and dozens at a few points, especially on pages 154-162. On page 162, we find the following passage concerning fractions:

The duodecimal system of fractions was a purely indigenous Roman growth, for it was unknown to the other three ancient Mediterranean cultures, i.e., the Greek, Egyptian, and Babylonian, which at various times all developed their own fractions. Only the base number 12 can be traced back to Babylonian influence (as in the zodiac and the division of the day and night into 12 hours.*

*The division of the day and night into 12 hours is of Egyptian, not Babylonian, origin. Cf. O. Neugebauer (discussed below).

Continued on page 16;...

THE ORIGINS OF DOZENAL METROLOGY

*Gerard R. Brost
Gainesville, FL*

The great pyramid at Gizeh was built around 2900 B.C. under the direction of Pharaoh Kufu Cheops. The remarkable geometric precision of the structure has prompted much curiosity regarding the mathematical expertise of its architects. Many have speculated that they must have possessed advanced insights into the properties of numbers, and perhaps understood the advantages of the dozenal system of counting.

Unfortunately the scarcity of surviving papyri denies us direct access to their mathematical writings. However, there is enough information to reconstruct with confidence the type of metrological system they probably used.

Dozenal metrology was used by the Egyptians long before the pyramids were ever built. As early as 4241 B.C. Egyptian astronomers had measured the year at 365 1/4 days. Even though they typically counted in base ten, they divided the year into twelve months. It is possible that they used a twelve-month year because twelve is the smallest number that allows an annual division into four seasons as well as three agricultural trimesters. The adoption of the twelve-month calendar might then indicate an appreciation of the divisibility of the number twelve.

The Egyptians also divided the clock into twelve hours. Their oldest surviving sundial dates back to around 1500 B.C., but the Egyptians were probably using sundials much earlier than this. It is impossible to date the introduction of the first twelve-hour clock, but it could easily have predated the pyramids. The Egyptians had some way to measure the day at the time they measured the year, or they could not have obtained such an accurate result.

Continued on page 17;...

DUODECIMALS IN ANTIQUITY, Continued

The division of the day also had a decimal basis -- the Egyptians had sundials divided into ten hours. But then extra hours were added for dawn and dusk, giving twelve hours for the day. Note that the day hours and the night hours are of different length. It was not until the Hellenistic period that the 24 hours were made to be of equal length. Since the common number system of the Hellenistic astronomers was the Babylonian sexagesimal system, these equal hours were then divided into sixty minutes, each of sixty seconds.

End

ATTENTION SCIENCE FICTION AND FANTASY AUTHORS

A Short Story Contest

Cash Prizes!

Are you an individual with an interest in Science Fiction or Fantasy? Do you teach number bases or creative writing? The DSA invites you or your students or acquaintances to submit a short story based on number bases and dozens.

Three prizes will be offered:

- 1st prize is one gross dollars (\$144)
- 2nd prize is six dozen dollars (\$ 72)
- 3rd prize is three dozen dollars (\$ 36)



Continued...

ORIGINS OF DOZENAL METROLOGY, Continued

scale for both the circle and the year might have been more appealing than an accurate calendar.

Given the facts, it seems reasonable to conclude the following about the people who built the pyramids: They usually counted in base ten, but they divided the year into twelve months. They probably used twelve-hour clocks and demarcated the circle by twelves or some multiple of twelve. They most likely used a 360 degree circle subdivided into six hexads of sixty degrees each.

Most of the remaining details of Egyptian mathematics are unknown. People have marvelled about the mysteries of the pyramids and their creators for thousands of years, and they probably always will. Perhaps this is one of the reasons the pyramids were built. They wanted us to remember them!

End

CONTEST, Continued



There will also
be up to one dozen
(what else?)
Honorable Mentions.

All entrants must agree that their entries may be printed in whole or in part by the Society.

Typewritten entries must be submitted by June 12, 1988. The decision of the judges is final. For further information contact Gene Zirkel (516) 222-7611 or 669-0273.

VIDEOTAPE AVAILABLE!

Our DSA Video Committee has been working behind the scenes to develop a videotape which presents a series of Dozenal lectures.

The Dozenal "Cast of Characters", together with their texts, reads as follows:



	Approx. Time
Introduction - a Dozenal Panda	2 min.
Prof. James Malone - Nassau C.C. "Dozens and Dozens of Eggs"	35 min.
NBC TV clip 3/26/85 "Dozens and Dozens of Pencils"	2 min.
Fred Newhall - Smithtown, NY "Use of an Accuracy Scale"	12 min.
Dudley George - Palo Alto, CA "Dozens in Measurement"	10 min.
Walter Berkman - Norwalk, CT "Design and Use of a Dozenal Abacus"	20 min.
Prof. Gene Zirkel - Nassau C.C. "Use of Symbols"	4 min.

Continued...

VIDEOTAPE, Continued

The finished product provides 90 minutes of Dozenal viewing pleasure. Each segment is interesting in a different way. Our lecturers are long-time members of the Society, and each presentation provides a unique look at the diversity of thinking and experience within the world of base 12.

The 90 minute, one-half inch videotape can be shown on home VCR machines. The master tapes are being preserved at Nassau Community College. Tapes can be copied and borrowed if a blank tape and \$2.00 (to cover postage costs) is sent to the Society.

Work on the project began at the October 1985 Annual Meeting, was resumed early in 1987, and was completed in November 1987. DSA members Alice Berridge, Tony Catania and Carmine DeSanto worked on the project. We extend thanks to them and also to the staff of the Television Studio of the Communications Department at Nassau Community College for their work on the project.



MAKE A NOTE OF THESE DATES!

--12; and 13; October 1198;--

(See page * to find out why.)

MESSAGE FROM FRED NEWHALL, CHAIR

DSA Board of Directors

Let's make this year 1198; 1988 a banner year for Dozenals!

Three dozen years ago, few people would have predicted that there would be a computer age. Likewise, hardly anyone knew of the binary system of numbers now essential for computers. Progress is accelerating at an increasing rate! People are accepting change (for the better) with few complaints. We're tired of doing things the inefficient way just for the sake of tradition.

Arithmetic and language are the tools of civilization. When the tools are dull or worn out they should be sharpened for ultimate efficiency. If some people want to beautify the tools or to make them fancy, or to preserve old tools from our heritage, let them do it. But they should not hold up progress by their conservatism.

There are no longer world wars, but a secret war is being fought among the big nations. The country that can produce most efficiently will win out, gaining the highest standard of living. We can't remain tied to the apron strings of tradition and expect to enjoy the luxury of happiness in the future. Our language tool has to be simplified, and our number tool has to be the best -- dozenals!

Several grades of schooling could be cut from the curriculum if language were logical and the number system were based on twelve. There is nothing mystical about how this could be done; all the details have been worked out. All that is needed is their acceptance by people anxious to advance our civilization. These people are in the majority and are only waiting for our leadership. We need to speak out with newspaper and magazine articles, talks in schools, and TV appearances.

That bright future we dream about is as near as we wish to make it. Why wait for it? Let's enjoy it now!

Fred Newhall
Chair
DSA Board of Directors

DOZENAL JOTTINGS

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

BJARKE NIELSEN writes from Glostrup, Denmark that he had a dispute with some computer system experts at his firm. "They knew all about binary and base 16 operations, but they had never heard about base twelve. At first they both quite arrogantly said that it was nonsense. But at last one of them admitted that base 12 really has some advantages." He goes on to note that "It is rather difficult to convince Danes of the advantages of base 12, because we use the meter system, and all our old measures based on 12 have been forgotten...we are not used to calculating in dozens." He concludes: "I'll try to be the drop which will some day make a hole in the stone!"...

FRED NEWHALL gave a talk about Dozenals to the combined sixth grades of Willow Road Elementary School in Franklin Square LI, NY on December 1st, at the invitation of his friend, GUY JACOB, who teaches one of the classes. Fred showed that in the history of number systems there have been many changes and that numbers are still evolving toward dozenals...

EDITH ANDREWS (Mrs. F. Emerson Andrews) wrote to express her family's appreciation for the Society's proposed naming of the Library Collection in honor of her late husband...

DON HAMMOND writes from Denmead, Hampshire, England: "Chap here, a lecturer at Edinburgh Polytechnic, is actually trying to devise a metric scale for printing and typography! I have written to him to tell him it's a waste of time to expect ten-based units to equal the performance of the point-lign-pica arrangement, but he now wants me to explain why...I just might enjoy doing that.

"I found Brost's 'Doman' numerals interesting, but it would be a brave man who would attempt to do arithmetic with

Continued...

DOZENAL JOTTINGS, Continued

them, I think. However, if they are to be used for purposes similar to those for which Roman numerals are now used-- indexing, clocks, etc. -- then why bother with place-value and zero? One could allow up to four-alike instead of three-alike and the job would be done! Just a thought..."

JERRY BROST writes about several projects from Gainesville, FL: "IGOR VALEVSKY has asked me to review his contributions to dozenal metrology for the Society. I thought this would be a good time to review all of the metrologies that have been proposed. (Ed. note: See article, page 15;.)"

"I also heard from Bjarke Nielsen in Denmark. He heard from the Society that I'm interested in Esperanto. I referred him to Igor, since they both know Esperanto. I am in the process of joining the Esperanto League of North America.

The Dozenal Society has expanded my horizons. I have also joined the Dozenal Society of Great Britain. I am also joining the Mathematical Society of America. They publish a number of interesting journals that may be of interest to members. They do not seem to be aware of our existence yet. I thought it's time we started infiltrating!"...

GENE ZIRKEL recently had an article ("I'm a Dozener") published in The Triad, a newsletter put out by the League of Reason in North Olmsted, Ohio. **MATTHEW WEITENDORF**, Director of the League, recently wrote to Gene as follows:

"Your article has been a great contribution to our organization and the undated edition of The Triad will be part of the introductory literature sent to all prospective members. Reforms, such as dozenal counting, are the type we look forward to. That is, those scientific reforms which will permanently enhance the quality of our lives, as opposed to those temporary palliatives offered by political and economic reforms."

Continued...

DOZENAL JOTTINGS, Continued

DSA Director **JAMISON HANDY, JR.** and his wife **VERA SHARP HANDY** attended the recent DSA Annual Meeting in New York, and both have written to express thanks for a great time. Vera has officially joined the Society as of the Meeting. We welcome her as new member number 2#3. She is included in the 1987 edition of Who's Who in California, is a teacher of music, and is working on publishing a music education program which she has authored. Good luck, Vera!...

A hearty welcome to another new member:

Number 2#2 **LES ROBBINS** of New York, NY...

...End...

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. *Douze: 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)

JOURNAL OF RECREATIONAL MATHEMATICS

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The *Journal of Recreational Mathematics* fulfills the desire of many for a periodical devoted to the lighter side of mathematics. It provides thought-provoking, stimulating, and wit-sharpening games, puzzles, and articles that challenge the mental agility of everyone who enjoys the intricacies of mathematics.

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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 ($1/3 \approx 0.4$) 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 *do*, 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.

$$\begin{array}{r} 12 \overline{) 365} \\ \underline{12 0} + 5 \\ 12 \overline{) 2} + 6 \\ \underline{0} + 2 \end{array} \text{ Answer: } 265$$

Dozenal numbers may be converted to decimal numbers by setting down the units figure, adding to it 12 times the second figure, plus 12^2 (or 144) times the third figure, plus 12^3 (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)

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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