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

The Duodecimal Bulletin

Whole Number 45

Volume 27, Number 3

Fall 1982

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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 $6.00 for one year. Student membership is $3.00 per year.

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 45 *Volume 27, No. 3*
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SYMBOLS -- A PLEA FOR UNIFORMITY

Arthur Whillock
Essex, England

(Editor's note...At the special meeting held in 1980 between the DSA and Arthur Whillock of the DSGB, many of our discussions centered on the choice of appropriate symbols. We invited Arthur to share his thoughts with our readers. After you read his article, please write and tell us what you think.)

It should not have been a surprise to see the Bell Telephone symbols used in the DSA's Duodecimal Bulletin No. 42, since, as stated, this was the decision for the publication of No. 41. However, in the light of recent events it seems to be a retrograde step that should be earnestly reviewed.

The difference between symbols used by the DSA and the DSGB has always been a point of criticism by outsiders. Explanations that there are good reasons on both sides and that it is the principle that counts does little to counter the comment "if you cannot agree amongst yourselves how do you expect to convince us that your case has any merit?" With our closer cooperation the need for a resolution of the disparity has become more pressing: a journal with different symbols for the same number is more likely to repel any interest than attract.

An article on the historical antecedents of Dozenal numeration is planned for the DSGB's Journal. The objective here is to outline the situation and suggest a resolution in the hope that one side or other will swallow its pride or prejudices and accept the other's solution or that someone will make a break-through by suggesting a symbol for dek that conforms to the following requirements. It must be:-

	ᘔ	χ
1 Readily available from existing type faces either directly or by simple modification so that work can be produced without difficulty or expense by any printing process.	Yes	Yes
2 Not used as a symbol for a function or constant in any scientific discipline thereby incurring objections from the world of learning. Letters from all alphabets are already bespoken for some purpose or other.	Yes	No
3 A distinct symbol easy to write and an aesthetic fit to existing numerals.	Yes	Yes
4 Acceptable to the public and recognizable without too great an effort or explanation.	?	Yes
5 Distinguishable in seven-segment form for electronic display. ᒥ for the Pitman ᘔ and /-/ for the Dwiggins χ are not obvious at a glance to the uninitiated.	No	?

The Bell Telephone symbol, *, conforms to conditions 2, 3 & 5, possibly 4, but # fails on many counts and its seven segment form, the nearest possible, would be the same as for Ӿ . True, these symbols appear on the twelve button dialing array and are now familiar to the public, but only in America, and they are not used as part of an arithmetic scale. Letters are used in the UK for 'hold' and 'recall'.

The de facto numerals for dek and el in actual use as such are A and B in Hexadecimal for computer programming but these are unacceptable for general use.

There are groups of symbols which are available in limited ranges of type and untouched by the technical world and never likely to be in conflict with it. These are those used for the various Phonetic systems and there seem to be two likely candidates for dek. A voiced 'x' like g in Spanish 'rogar' is represented by Ɣ for the capital or ɣ for lower case in the International System, and this has been suggested by a DSGB member who later demurred on the grounds

Continued...

of possible confusion with a carelessly made 8. X is the least suspect and does offer an X form, which is the rationale behind X and ⋇ . It would not preclude the continued use of these symbols, and for internal work a plain X will be acceptable. In typescript, a trivial modification would suffice for photo-litho printing. In seven segment, H seems more appropriate (to me at least) than H for X .

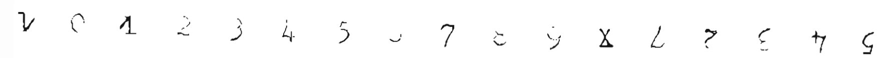
As an example of use of a bar, the phoneme for a long 'o' (as in note) is ō. The addition of a bar to a lower case 'o' is a simple matter in typescript and it is a natural in seven segment. This modest contribution of mine to the argument shows that the possibilities are not yet exhausted.

We of DSGB have taken a poll of members on the need for change but without stressing the urgency of the situation. The result, predictably, was for no change and I am sure that DSA members would vote similarly. Yet, if any advance is to be made, a universally accepted dozenal numbering scale has to be established. The teaching of arithmetic to a range of bases would certainly include twelve if this were so. Its absence allows any aversion to the more efficient method full play.

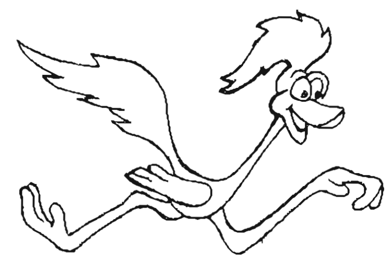
The weakness of the democratic process is that firm decisions are difficult to achieve. Would it be too outrageous to suggest that responsible officers be allowed to make the necessary change on a pragmatic basis, taking into account the many points that can be discussed in a circular pattern forever? One argument, inevitably, is that this or that symbol can be mistaken for that or this. But, the more symbols we have, the more carefully must they be written and read. With use, minor variations will creep in to make distinctions clear.

We should also have a regard for the future. A distinctive numbering scale up to hexadecimal is a requirement that should be met in a more suitable form than at present. A to F is an unsatisfactory expedient, however well established. The Pitman/Essig method of inverting existing numerals to create new numerals could well be used here with mnemonic advantages. If an inverted seven, L , were used for el (L in typescript) which can be considered as a simplified form of #, the inverted

ɛ would be freed for use as 'thirteen' followed by ϟ and ς . For balanced ternary, a symbol for minus one is required and an inverted 'one' has been used in the past. An exaggerated serif, continental style, will distinguish the two forms and be a better space filler. Thus, for all needs in the forseeable future we could have:



which, in seven segment, would be more acceptable than the mixture of upper and lower case letters used at the moment:



ANNUAL

MEETING

OF

1983

We look forward to seeing all of our members -- both new and old -- at next year's Annual Meeting in New York.

Please keep the weekend of October 14, 15, and 16, 1983 open on your calendars. (That's October 12; 13; and 14; 1193; -- dozenally!)

An agenda for the meeting will be published in a later issue. As in the past, Friday and Saturday evenings will be devoted to social gatherings of the Society and guests. DSA business will be conducted on Saturday; and Sunday will be at leisure for sightseeing or whatever.

We look forward to seeing ***you!***

The Board of Directors of the DSA regrets to inform the membership of the death of Board member Henry Webber on September 21, 1982. Henry had been hospitalized for a heart condition, and was thought to be recovering when he succumbed to a second attack. His funeral was held in Aurora, Colorado on Tuesday, September 28, 1982. May he rest in peace.

A biography of Mr. Webber will appear in the next issue.

SHOULD YOU BE ON THE BOARD OF DIRECTORS?

With the death of Board member Henry Webber the Nominating Committee is again faced with the task of filling a vacancy on the Board of Directors. Since we do not know all of the membership personally, we are asking for <u>your</u> help. If you would like to serve on the Board please write to us, briefly stating your goal or goals for the Society. If you do not wish to nominate yourself, you may write and nominate some other member for this leadership position.

Board members are not required to attend every meeting, and some do vote at such meetings by proxy. Directors are expected to guide and advise the Society, and to ensure that the officers are acting according to the traditions of the Society and in accordance with our Constitution and By-Laws.

Henry Webber was noted for his zeal for the spread of Dozenals, and that is really the only attribute a Board member need possess. Think it over and then drop us a line. Please don't be stopped by a false sense of modesty.

A DOZEN PROPERTIES OF THE NUMBER TWELVE

Jay Schiffman
Kean College of New Jersey
Union, New Jersey 07083

Introduction: The ancient Greeks viewed the significance of the role of number throughout their rich scientific tradition. These peoples established a one-to-one correspondence between all entities in the universe and the notion of number. Briefly, all numbers are things and all things are numbers. It is of interest in mathematics today to link various disciplines with specific cardinal numbers. The following note presents an enumeration of a dozen properties of the integer twelve in the branches of algebra and number theory. This list is far from exhaustive and the reader is invited to augment it. The basic definitions not presented in this list can readily be located in the papers referred to by references (3) and (5) in the appended bibliography.

Property 1; Twelve is the initial abundant number. An abundant number is a number which is smaller than the sum of its aliquot (proper) divisors. We note $10 < 1 + 2 + 3 + 4 + 6 = 14$;.

Property 2; Twelve is hypercomposite. An integer is termed hypercomposite if it possesses a greater number of divisors than any of its predecessors. 10 has six divisors, while each integer smaller than twelve contains no more than four divisors.

Property 3; Twelve represents the first number which is neither a Converse Lagrange Theorem group (CLT) nor supersolvable. To explain these ideas in more lucid terms, let G be a finite group of order n. If for every integer d dividing n, G has a subgroup of order d, then G is called a CLT group. Moreover, if n is a positive integer such that every group of order n is CLT, then n is called a CLT number. A supersolvable number is defined analogously.

Property 4; Twelve represents the minimal number of divisors for the cardinality of a nonabelian simple group as well as a nonsolvable group and a non-trivial perfect group. A group G is styled perfect if $G' = G$ where G' is the subgroup generated by the set of commutators of the form $a^{-1}b^{-1}ab$ where $a, b \in G$.

Continued...

Property 5; Twelve is the first group order possessing a greater number of (distinct) nonabelian isomorphism classes than abelian isomorphism classes. There exist three nonabelian isomorphism classes (corresponding to the alternating group A_4, the dihedral group D_6, and the dicyclic group) and two abelian isomorphism classes (corresponding to the cyclic group C_{10}, and the group $C_2 \oplus C_2 \oplus C_3$, where the symbol $\oplus$ denotes the group theoretic operation of direct sum.) All of the above groups can be defined in terms of generators and defining relations encompassing the calculus of presentations. Two rather lucid references explaining these ideas quite fully are the first and last sources provided in the appended bibliography.

Two groups G and G* are designated isomorphic if there exists a one-to-one correspondence between them preserving the group elements. More specifically, we are given a function f which establishes a one-to-one correspondence such that f (a ' b) = f (a) ' f (b) for every a, b $\in$ G. All groups which are isomorphic (structurally the same from an algebraic standpoint) belong to identical classes known as isomorphism classes.

Property 6; Twelve is the first natural number having a perfect number of divisors (six). A perfect number is a number enjoying the unique distinction that it coincides with the sum of its aliquot divisors. Six is a perfect number; for $6 = 1 + 2 + 3$. The origin of this concept dates back to the Ancient Greek Civilization. The universe was created by God, a perfect supreme being, in six days and on the seventh day he rested. Thus the concept of perfect number evolved from theological pursuits.

Property 7; The cardinality of any nonabelian simple group must necessarily be divisible by at least one of the integers 10; 14; or 48. This arithmetic fact was proven by W. Burnside in 1895 (and is known decimally as the 12-16-56 theorem). Reference 2 provides the exact paper. Twelve once again plays a premier role as the initial integer in the theorem.

Property 8; Consider the nonabelian simple alternating group of degree five, A_5. Twelve represents the largest cardinality for which a proper subgroup of A_5 exists. This idea is often stated as follows: A_5 possesses no subgroups of index 2, 3, or 4.

Property 9; The group SL (2, 3) of 2-square unimodular matrices (matrices of determinant one) over a field of cardinality three possesses no subgroup of cardinal number twelve, the second smallest counterexample to the nonvalidity of the direct converse of Lagrange's Theorem on finite groups. One can demonstrate that SL (2, 3) is a group of order twenty-four.

Property *; Twelve is the initial non square-free integer possessing a group (A_4) with trivial center. Such a group is called centerless.

Property #; If n is an odd integer multiple of twelve, then n is not a Converse Lagrange Number in the sense that there exists at least one group of such order not satisfying the direct converse to Lagrange's Theorem on finite groups. Reference (3) provides the paper for the reader desiring additional information. Moreover, if n is any integral multiple of twelve, then n cannot be a supersolvable number. This follows since one can write the group order of one such group as $A_4 \times C_n$ (The direct product of A_4 with the cyclic group of order n, C_n) and note that $A_4 \times C_n$ contains the nonsupersolvable group A_4 as a subgroup. In lieu of the fact that subgroups of supersolvable groups are likewise supersolvable, the argument is complete.

Property 10; A regular dodecagon is constructible via a straightedge and compass alone. In fact, a regular n-gon is constructible in the above sense if the only odd primes dividing n are the Fermat primes whose squares do not divide n. A Fermat prime is a prime of the form $p = 2^{2^n} + 1$ where n is a whole number. The five presently known Fermat primes are 3, 5, 257, and 65,537 corresponding to n = 0, 1, 2, 3 and 4 respectively.

Reference (8) provides the theorem concerning when a regular n-gon is constructible utilizing a straightedge and compass alone. See Page 393. We note that the sole odd prime dividing 10 is 3, a Fermat Prime, and $3^2 = 9$ does not divide 10.

References

1. B. Baumslag and B. Chandler, Theory and Problems of Group

Continued...

References, continued

Theory, Schaum's Outline Series, McGraw Hill, New York 1968.
2. J. Gallian, "The Search for Finite Simple Groups", Math Magazine, Vol. 49, No. 4, September 1976, P. 162-179.
3. D. Mc Carthy, "A Survey of Partial Converses to Lagrange's Theorem on Finite Groups", Trans. of The New York Academy of Sciences, Series 2, Vol. 33, No. 6, P. 586-599, June 1971.
4. H. Rademacher and O. Toeplitz, The Enjoyment of Mathematics, Princeton University Press, Princeton, New Jersey, 1957.
5. J. Schiffman, "A Group Theoretic Application of The Number Twelve", The Duodecimal Bulletin, Volume 27, Number 1, Winter 1982.
6. R. Struik, "Partial Converses to Lagrange's Theorem", Communications in Algebra, Vol. 6, No. 5, P. 421-482, (1978).
7. J. Rotman, The Theory of Groups - An Introduction, Allyn and Bacon, Boston, 1965.
8. J.B. Fraleigh, A First Course in Abstract Algebra, Addison Wesley, 1976

DUES TO RISE?

A proposal to raise the annual dues will be submitted to the membership at our Annual Meeting in the Fall of 1983. However, any member who pays dues now will be charged the old rate of $6.00 per year. So, if you want to save money, now is the time to prepay your dues for two, three, four or more years.

In the past, many of our members have made donations in addition to payment of their regular dues. Because of this generosity, we have NEVER had to refuse our literature to anyone -- a fact in which these members can justly take pride.

Remember, all donations to the Society are tax deductible.

CALENDAR REFORM

Jean Kelly

On 6 February 1981 A. Adler Hirsch, a retired engineer, presented a paper on calendar reform to the Louisiana Academy of Sciences. [1] In his presentation he noted that we add one day to our annual calendar every four years except in centennial years. However, we do add a day if the centennial year is divisible by four hundred. This is equivalent to adding

$$365 + 1/4 - 1/100 + 1/1400$$

to obtain 365.2425 days a year. This differs from the tropical year of 365.2422 days by only 0.0003 days, that is one day in 3,333 years (but no one ever seems to talk about this small error).

Hirsch argues that instead of using one hundred year cycles, we should use cycles of 128 years. Then we would have

$$365 + 1/4 - 1/128$$

which equals 365.2422 days!

But it is not likely that we would quickly convince the world that dropping a leap year every 128 years is better than the present method of dropping three out of every four of those leap years which fall in centennial years.

Note however, that Hirsch's (or is it nature's) 128 year cycle is closer to a gross of years than it is to a century. When we change our counting to dozenals, the calendar will automatically improve. We would still add a leap year every fourth year, and as is now customary, we would not celebrate a leap year in years ending in 00, that is every gross of years (every grossury?).
This is equivalent to adding

$$365 + 1/4 - 1/144 = 365.2431$$

or

265; + 0;3 - 0;01 = 265;2# in dozens.

This simple method of leap year counting would not be encumbered by the need for additional corrections every four centuries. As with the present system, it would eventually be off by about one day in eight gross years.

Continued...

We would compensate for this by simply omitting a leap year every eight gross years. This would give us

$$365 + \frac{1}{4} - \frac{1}{144} - \frac{1}{8(144)} = 365.2422$$

or

265;+ 0;3 - 0;01 -0;01/8 = 265;2**6 days,

precisely what we wanted, and without our being burdened by the cumbersome 128 year cycle which Mother Nature has provided.

---

1. "Error In Same-Dating The Louisiana Territorial Tricentennial, Some Associated Defects, and a More Rational Calendar", by A. Adler Hirsch, a paper presented before the Physics Section during the Fifty-Fifth Annual Meeting of the Louisiana Academy of Sciences at Louisiana State University at Alexandria; Alexandria, Louisiana, 6 February 1981.
   The Proceedings of the Louisiana Academy of Sciences, Vol. XLIV, December 1981, pp. 132-142.

Membership Lists

As a result of a request by our Treasurer Jim Malone, our membership list has now been computerized. Lists are available to members who need them.

A BASE OF FIVE-DOZENS?

In research on the Gregorian calendar it has been noted that Lilius, the chief author, proposed a mean solar year of 365.2425 days.

How he arrived at this is not known, but the three main sources of the length of the tropical year known to him each gives a value of approximately 365 days 5 hours 49 minutes and 16 seconds. They differ from one another by less than 1 second!

It has been observed[1] that all three values when expressed in a base of five-dozens (a natural base for hours and minutes) equal 6 5 ; 14 33 days! This is exactly equal to 365.2425 days.

We note in passing that the four place doudecimal equivalent 265.2*#1, is a better approximation of this tropical year than either the decimal or the five-dozenal expressions.

---

1 Scientific American May 1982, page 152

If 6 + 6 = 10 then 7 + 7 = 12

The above statement is always true!

First, logicians tell us that a statement of the form 'If P then Q' is true whenever P is false. Therefore, our title statement is true whenever 6 + 6 is not 10.

Moreover, if 6 + 6 is 10 then we must be counting in dozens and so 7 + 7 does = 12, and once again our statement is true!!

A RECURSIVE OPERATION ON TWO-DIGIT DUODECIMAL INTEGERS

Charles W. Trigg
San Diego, California

Let S be the sum of the digits of the duodecimal integer N, and $N_1 + S_1 = N_2$, $N_2 + S_2 = N_3$, ..., $N_k + S_k = N_{k+1}$, with each N_i being reduced modulo 100. For example, if N_1 = *3, then N_2 = *3 +(* + 3) = #4, and N_3 = #4 + (# +4) = 107 = 07. Since there are only 100 two-digit integers (with initial zeros being permitted), this recursive operation must eventually repeat one or more integers. Indeed, all 100 integers are included in either a 6-term string terminating in the self-replicating 00, or a 35 term loop with three chains (see I, II and III below) attached to the consecutive terms 11, 13, and 17. Two of these chains (I and III) are branched. The three chains are exhibited separately below.

The six term string is: 64 72 7# 95 *7 00'00
(where the symbol ' indicates the start of the cycle.)

The three chains are:

I. 31 35 41 46 54 61 68 7* 93 *3 #4 07 12 ┐
#9 ┘ ├ 15 1# 2# 40 44 50 55 63 70 77 89 *2 #2 03 ┐
42 48 58 69 80 88 *0 ** ┘ ├ 06 10 11

II. 20 22 26 32 37 45 52 59 6# 84 94 *5 #8 13

III. 53 5# 73 81 8* *4 #6 0# 1* 29 38 47 56 65 74 83 92 *1 #0 ## ┐
*8 ┐
86 98 #1 01 ┘ ├ 02 ┐
75 85 96 *9 ┘ ├ 04 ┐
97 *# ┘ ├ 08 14 ┘ ├ 19 27 34 3# 51 57 67 78 8# *6 #* 17

Continued...

A RECURSIVE OPERATION, Continued

The 35 term loop is:

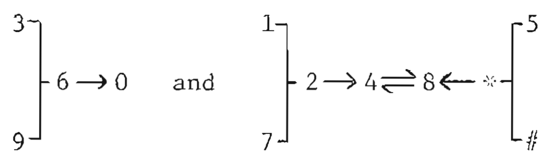
23 28 36 43 4* 60 66 76 87 9* #5 09 16

21 24 2* 3* 4# 62 6* 82 90 99 #3 05 0*

18 25 30 33 39 49 5* 71 79 91 9# #7 $\overline{11}$ $\overline{13}$ $\overline{17}$'23

Thus from the * underscored starters, 64, #9, 31, 42, 20, 53, *8, 86, 75, and 97, the remaining two-digit integers can be generated.

If the N_i's are reduced modulo 10, two groups are formed,



so it takes the 6 odd integers to generate the complete set of digits.

FOUR FOURS

Rich Silvestri of Nassau Community College solved some of the missing four fours problem given in the last issue. Rich gave

$$21 = \frac{44 - \sqrt{4}}{\sqrt{4}} \qquad \text{and} \qquad 23 = \frac{44 + \sqrt{4}}{\sqrt{4}}$$

We still need 19, 1# and 25.

On the following pages we continue the publishing of reports of past DSA Annual Meetings.

DOZENAL SOCIETY OF AMERICA

Annual Meeting Report 1978

Holiday Inn Gateway
El Paso, Texas
June 2, 3, and 4, 1978

The meeting was held in a parlor room that Tom (Linton) arranged for us to obtain gratis.

Members present:

Charles and Miriam Bagley
Henry Churchman
Jamison Handy
Tom and Vivian Linton
Henry Webber

Laura Hlvach of the El Paso Times visited the meeting and wrote up our meeting nicely for her publication. Headlined, "Assets of Base Twelve System Subject of National Convention", it appeared on Saturday, June 3, on pages 1-B and 2-B.

Review of past elections to the Board of Directors:

At this meeting the class of 1978 was re-elected as the class of 1981:

F. Emerson Andrews
Henry Churchman
Jamison Handy
Eugene Scifres

The class of 1980 is:

Charles Bagley
Vivian Linton
Robert McPherson
Gene Zirkel

Continued...

The class of 1979 is:

Miriam Bagley
Kingsland Camp
Tom Linton
John Selfridge

Election of Officers

The members present elected the following Officers for the Society:

Charles Bagley	Chairman of the Board
Tom Linton	President
Henry Churchman	Vice President
Vivian Linton	Secretary
James Ellis	Treasurer (Jim is from Huntington Beach, CA)
Henry Churchman	Editor of the Bulletin (Henry asked to be relieved)

Technical comments:

1. Charles Bagley discussed and illustrated the experience of geodicists at Holloman Air Force Base in preferring to use "Wild" Theodolites graduated in the customary units of degrees, minutes and seconds, vs metric units.

2. Tom Linton described the various kinds of electronic calculators, operating in bases from binary to hexadecimal, with emphasis on twelve-base calculation ability.

3. Henry Churchman described a dozenal system of locating places on the surface of the earth, based on work by Bagley, Essig, Camp, himself and others.

Discussion of Agenda

The following items were discussed, and reports of the Membership and Treasury Committees were given:

1. Reprint An Excursion in Numbers to include member application and much of the DSA folder information.

2. A series of between-Bulletins Newsletters would be helpful when Bulletins are more than six months apart, to keep members better informed.

3. Webber discussed Asimov's Realm of Numbers, especially page 44, etc., re twelves and Fomin's Number Systems.

4. Our income consists of dues and donations and sales of slide rules, Manual of the Dozen System, Reciprocals booklet and Bulletin subscriptions.

5. Our DSA Annual Award is overdue to go to Kingsland Camp.

6. An annual budget of $1,400.00 was set as a goal, most of that to cover the costs of two Bulletin issues per year (hopefully). Our cash assets as of January 1978 were $4,301.40 in checking and savings.

7. A dues increase from $6.00 to $12.00 was projected at such time as our Bulletins get back on schedule.

8. Next year's meeting (1979) was scheduled for New York, based on discussions with Prof. Zirkel at Nassau Community College (on Long Island, near Kennedy Airport) and with Emerson Andrews. Kingsland Camp, Chairman of the Board Emeritus lives alone in New York City, and hopefully he could attend.

9. A library depository for DSA material, as suggested by Andrews, was put on the action list.

10. Some extension of the use of paid typing help was agreed upon.

11. Tom Linton received a telegram from B.A. Moon in New Zealand which read: "Best Wishes for a successful meeting."

Continued....

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Continued....

3. Eugene Scifres, our Treasurer for ten years, asked to be relieved, due to pressures of his job, and is sending his records to the President's office in Garden Grove, CA. The transfer of Society funds from the Colorado State Bank (Denver) to a Garden Grove Bank was agreed upon.

4. Use of funds:

   a) Electronic calculator
   b) Library
   c) Republish New Numbers, My Love Affair With Dozens and bound volumes of Bulletins (see item 9 below)

5. Henry Churchman (Bulletin Editor) reviewed his problems of time with regard to his ongoing involvement with publishing the Bulletin. Therefore, Dr. Glaser has offered his services as new Editor, if help is forthcoming from other Society members.

6. A discussion was held regarding the renting of space for a Society headquarters. Perhaps the editorial offices of the Bulletin could share these quarters.

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. (Single copies free. Bulk orders 20;¢ each)
3. *Manual of the Dozen System* by George S. Terry ($1;00)
4. *Duodecimal Reciprocals 4/6 Places* by James M. Dixon ($1;00)
5. *New Numbers* by F. Emerson Andrews ($10;00)
6. *Douze: Notre Dix Futur* by Jean Essig in French ($10;00)
7. Dozenal Slide rule, designed by Tom Linton ($3;00)
8. Back issues of the *Duodecimal Bulletin* (as available) 1944 to present ($1;00 each)

7. A discussion was held regarding the current status of our Constitution, By Laws, and Articles of Incorporation.

8. The United States General Accounting Office will shortly report to Congress with regard to a U.S. conversion to a metric system. It was suggested that the DSA could provide input to the GAO with regard to dozenal measurements and a dozenal metric system.

9. It was suggested that the Society reprint past Bulletins (volume 500 to 1000 per issue) and bind them (hard cover) in complete sets. A few complete sets have already been bound in this manner. The back issues of our Bulletin contain the history of our Society and much rich lore.

10. Henry Churchman was acclaimed as outgoing Bulletin Editor by all present. His efforts and good will on behalf of the Society are much appreciated. Henry's advice is always sought; he is truly a pillar of the Society.

Continued...

Gene Zirkel, Jim Malone, Tony Glaser and Henry Webber, at the 1979 Annual Meeting.

11. It was suggested that all Board Members submit biographical sketches to the Editor of the Bulletin.

12. A biography of Kingsland Camp has been prepared by Henry Churchman, with additions by Tom Linton and Jamison Handy. Tom Linton will write to The Equitable Life Assurance Society for further information.

13. It was suggested that items which the Society offers for sale should be listed, with prices, in each issue of the Bulletin.

IV Speakers:

1. An Introduction to Dozens by James Malone. Jim presented an easy way to teach dozenal counting. (See "Eggsactly A Dozen"; DSA #42)

2. An Idea Whose Time Has Come by Gene Zirkel. An elementary discussion that led from relative motion to relative number bases and a dozenal metric system.

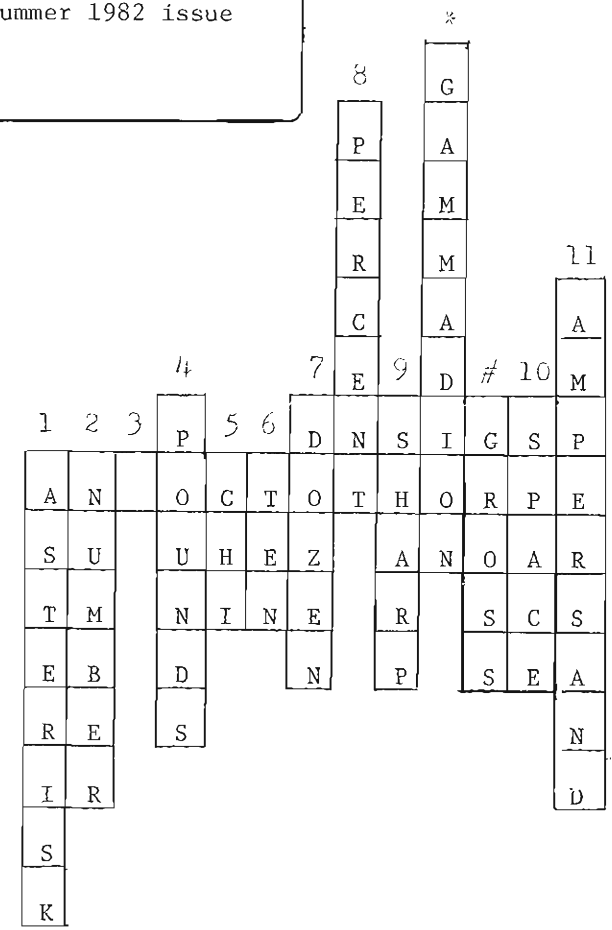
3. Dr. Anton Glaser discussed some of the ideas from his excellent book, A History of Binary and Other Nondecimal Notation.

4. Henry Churchman spoke concerning dozenal metric vs decimal metric, and proposed some dozenal units of measurement. It was suggested that members be asked for input for our Bulletin regarding specific conversions, algorithms, etc., and that a dozenal data sheet be formulated listing all these units of dozenal measurement. This data sheet could then be regularly included in our Bulletin.

An informal discussion commenced among all present as we proceeded from Roman numerals to computer presentations, from music to history, and so on.....

Symbolically Speaking

from Summer 1982 issue



DOZENAL JOTTINGS.....

News from or about the dozenal activities of members and friends....

CHARLES S. BAGLEY, our former Chairman of the Board, was written up in the September 9, 1982 issue of the Alamogordo (NM) Daily News as recipient of the 1982 Annual Award from the Society. The article gives a brief explanation of the Society, and goes on to laud Bagley for his leadership and efforts on behalf of the DSA. At the head of the article, he is pictured with the award...CHARLIE also wrote to suggest "that the dozenal equivalent of the'googol' be called a 'douzel' and the 'googolplex' the 'douzelplex'". He says, "Of course they are both much larger in dozenals.". ..."Nationwide Coverage" continued: In our last issue we reported hearing from all over the continent in response to Ms. Virag's excellent coverage of our Annual Meeting. Well, the mail is still coming in! Since we went to press on that issue we have heard from such places as Rochester, New York and Norman, Oklahoma, and from a member of the House of Commons in Ottowa, Canada....DON HAMMOND, Editor of the DSGB Journal writes: "Did you know that the much-vaunted 'metric' paper sizes come out easier in inches? Size A4 is 8;3 inches by £;8 inches!!! How do like that for rotational symmetry?" (Note: Our British confreres use a rotated three for el.)... As a result of a recent DSA ad in the Arithmetic Teacher we have received three dozen requests for literature from teachers all over the world. We also acquired another new member through the ad, bringing our total membership since our founding in 1944 to over two and one half gross persons......

end

PUZZLE CORNER

You are invited to send us your solutions to or your extensions of these problems. Also send us other problems which are related to dozenals or to number bases.

Four Or Mo' — Can you express 1000; as the sum of 4 or more consecutive integers?

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 D 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 accomodated 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 accomodates 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 unsatis**FACTOR**y 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 measurings. 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.

```
  12)365
  12) 30 + 5
  12)  2 + 6
       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 12^2 (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).

DETACH HERE

We extend an invitation to membership in our society.
Dues are only $6 per 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)

Date & Place of Birth ______________________________

College ______________ Degrees ______________

Business or Profession ______________________________

Employer (Optional) ______________________________

Annual Dues $6.00

Student (Enter data below) $3.00

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:

Mail to:

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