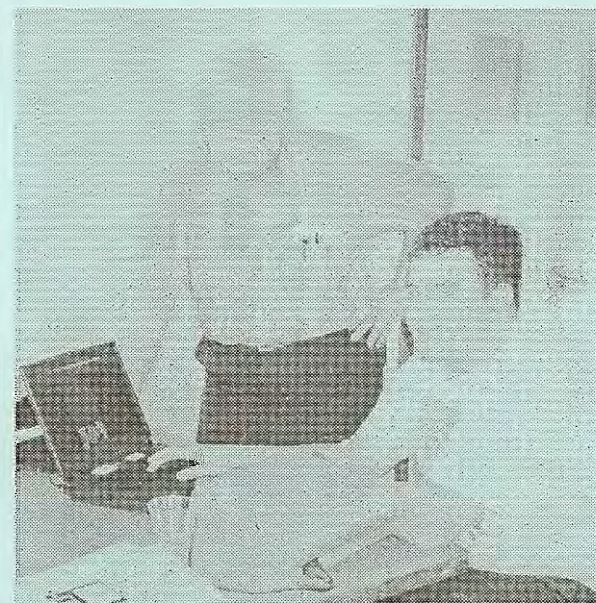


# THE 8 Dozen 6 DUODECIMAL BULLETIN



*John Earnest and Chris Harvey, Our web experts,  
conferring over the Society's web page*



*Volume 4 Dozen 3*

*Number 2*

*11 \*\*;(2002.)*

**THE DOZENAL SOCIETY OF AMERICA**  
% Math Department  
Nassau Community College  
Garden City LI NY 11530-6793

= THINK TWELVE! =



# THE DOZENAL SOCIETY OF AMERICA

(Formerly: The Duodecimal Society of America)

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

Membership dues are \$12 (US) for one calendar year. Student Membership is \$3 (US) per year, and a life Membership is \$144 (US).

*The Duodecimal Bulletin* is an official publication of the DOZENAL SOCIETY OF AMERICA, INC., % Math Department, Nassau Community College, Garden City, LI, NY 11530-6793.

△ △ △ △

## Board of Directors:

### Class of 11\*\*;(2002.)

Dr. Tony Scordato, Garden City NY  
Ian B Patten, Anchorage AK  
Christina K. D'Aiello, Yonkers NY  
Chris Harvey, Melville NY

### Class of 11\*#;(2003.)

John Steigerwald, Fanwood NJ  
Carmine DeSanto, Merrick NY  
Jay Schiffman Philadelphia, PA  
Timothy Travis, El Toro CA

### Class of 11#0;(2004.)

Alice Berridge, Massapequa NY  
Dr. John Impagliazzo, Hempstead NY  
Robert R. McPherson, Gainesville FL  
Gene Zirkel, West Islip NY

Web page: [www.Dozens.org](http://www.Dozens.org)

E-mail: [Contact@Dozens.org](mailto:Contact@Dozens.org)

DSGB Web page:

<http://www.dsgb.orbix.co.uk>

## Officers:

Board Chair, Gene Zirkel  
President, Jay Schiffman  
Vice President, John Earnest  
Secretary, Christina K. D'Aiello  
Treasurer, Alice Berridge  
eaberridge@aol.com

## Editorial Office:

Jay Schiffman, Editor  
604-36 S Washington Sq, 815  
Philadelphia PA 19106  
(215) 923-6167  
schiffman@camden.rowan.edu

Gene Zirkel, Associate Editor  
(631) 669-0273  
genezirk@optonline.net  
Pat Zirkel, Graphics Ed

## Nominating Committee

Alice Berridge (Chair)  
Jay Schiffman  
Patricia Zirkel

# THE DUODECIMAL BULLETIN

Whole Number Eight Dozen Six

Volume Four Dozen Three

Number 1;

11\*\*;



FOUNDED 1160; (1944.)

## IN THIS ISSUE

MINUTES OF THE ANNUAL BOARD AND MEMBERSHIP MEETINGS	4
AN ALMOST BASE TWENTY SYSTEM	*
PAY DSA DUES ONLINE	#
JOTTINGS	1 Dozen 2
DOZENALS IN THE CLASSROOM	1 Dozen 5
GO (DOZENAL) METRIC	1 Dozen 6
ERRATA	1 Dozen 6
PROBLEM CORNER	1 Dozen 7
CROSSWORD PUZZLE SOLUTION	1 Dozen 9
WHY CHANGE?	1 Dozen *
APPLICATION	1 Dozen #



You can reach us at: [Contact@Dozens.org](mailto:Contact@Dozens.org)

*The Duodecimal Bulletin*

3

86; 43;1; 11\*\*;(2002.)



Friday, 5 October 11\*9(2001)  
Nassau Community College, Garden City, NY

Attendance: Prof. Alice Berridge, Prof. John Earnest, Chris Harvey, Dr. John Impagliazzo, Prof. Jay Schiffman, Prof. Gene Zirkel, Dr. Patricia Zirkel.

BOARD OF DIRECTORS MEETING

1. President Gene Zirkel convened the meeting at 3:35 PM. The following Board members were present: Alice Berridge, John Earnest, John Impagliazzo, Jay Schiffman, and Gene Zirkel.

2. The minutes of the meeting of 6 October 11\*8(2000) were approved as published in *The Bulletin*.

3. The Nominating Committee (A. Berridge, J. Schiffman, and Pat Zirkel) presented the following slate of officers. A motion was made and seconded and the following persons were elected unanimously:

Board Chair:	Gene Zirkel
President:	Jay Schiffman
Vice President:	John Earnest
Secretary:	Christina K. D'Aiello
Treasurer:	Alice Berridge

4. Appointments were made to the following DSA Committees:

Annual Meeting Committee: Alice Berridge and Gene Zirkel  
Awards Committee: Gene Zirkel, Patricia Zirkel, and Jay Schiffman.  
Volunteers to these committees are welcome at any time.

5. The following appointments were made:

Editor of *The Duodecimal Bulletin*: Jay Schiffman  
Associate Editor: Gene Zirkel  
Parliamentarian to the Board Chair: Christina K. D'Aiello

6. Awards Committee – Gene Zirkel

There were no awards for this year.



*Alice consults with Gene  
prior to the meeting*

7. Other Business of the Board:

Gene said that it might be necessary for other members to become more aware of the scope of his involvement in the workings of the Society in order to insure the long life of the Society. Nassau Community College has provided an office used for storage, for archival material and mailing. Gene handles information requests (there have been a number of requests from Home Schooling Teachers), supplying "An Excursions in Numbers", "A Brief Introduction to Dozenal Counting," "Let's not go metric!" and the Panda Pamphlet. There have usually been about six dozen requests; last year there were two dozen. It was agreed to arrange for reprinting of the Panda Pamphlet – 1000;(1728.) tri-fold, on good



color stock. In the future this dissemination of information can be done through the web site; Chris will look into this. Gene maintains the mailing list, which includes members, contact people, libraries, etc. These are used to mail *Bulletins* (done by Gene) and to solicit dues (done by Alice.) Gene has an archival file of membership lists and also has the current lists (and other information) on disk. Alice received a backup copy of this master disk. It was agreed to print the By-Laws in a *Bulletin* format. The Society has established a ten-year DSA Domain name with Oznic. John Earnest has agreed to look into setting up a permanent display case of DSA materials in lobby of the Nassau Community Library. Gene told us that he has been aware that as libraries put materials on disk those hard copies are discarded. He has been able to obtain a copy of the original *Atlantic Monthly* of October 1934 where Andrew's article had been printed.

The next Board Meeting will be held tentatively on Friday, 16; October 11 \*\*;(18 October 2002) early afternoon at Bank Street School in Manhattan. This year's scheduled meeting at Bank Street had been moved to Nassau Community College because of the turmoil in New York City. A special talk about the Society to faculty and/or students might be appropriate. Gene, who could talk on the use of dozens in the classroom, and John Earnest, who could talk on math anxiety, were both agreeable to this suggestion. Members would dine afterwards at a nearby restaurant. Gene called Christina who was ill at home. Christina has recently married and Board members have sent her a wedding gift.

There were no awards for this year. Members are asked to suggest possible honorees for next year's presentation.

John Impagliazzo discussed a new grant, which involves five nearby universities (Hofstra, included.) The grant will provide a portal for any or all computer mathematics, or mathematics education issues. The final form of the project will be a giant umbrella of information. John suggested that it would be possible to link DSA to this portal. He said it would be possible to scan all *The Bulletins* and other Dozenal material — we will need to provide the information to the facilitators at VA Tech. John will aid us in making this special link. The Board members were unanimously very enthusiastic about the project.

The Board Meeting was adjourned at 4:30 PM.



Alice, John I. & Pat take a break between the two meetings  
ANNUAL MEMBERSHIP MEETING

President Jay Schiffman gavelled the meeting to order at 5:00 PM. He thanked everyone for attending the meeting, which had to be changed at the last minute. Special thanks to John Earnest for setting up the meeting room. He thanked Christina for the work she had done at Bank Street for the meeting. He extended congratulations to the new Mr. and Mrs. D'Aiello. Jay said he would like to see more activity from members. He wants to spread the *Gospel* and thinks that the web site and *The Bulletin* are our best tools. He encouraged us to spread ideas for stimulating student projects and for possible articles. He would like to see more articles for *The Bulletin*. Project work in any base can stimulate interest in dozens. John Impagliazzo donated Life Memberships to Christina and to Chris because of their active work for the Society. John suggested that we actively solicit participation for members via a campaign: "We need help on the \_\_\_ Committee to help with the \_\_\_ project." He felt that if we approach our members with *specific* chores we would have a better chance of getting people involved. He also suggested that we ask members to go to local schools or youth clubs to speak on dozens and possibly recruit new members. Other suggestions: get help for refreshment (or similar) committees at the annual meetings, ask members to reach out to institutions in their region to sponsor an annual meeting, speak on dozens at AMATYC, MAA or NCTM meetings, reach out to new college graduates. We would be able to supply materials and information to help presenters with possible talks from the dozenal point of view.



2. The minutes of the meeting of 6 October 11\*8(2000.) were approved as published in *The Bulletin*.

3. Treasurer's Report - Alice Berridge

Alice presented Income Statements for the years 11\*9 and 11\*8 for comparison, as well as Membership lists for the last two years and a listing of current members as reflected from the recent membership drive. Members have made special contributions to the Society amounting to \$194; (\$256.) A second pitch for membership will be made soon. The checking account balance as of October 6; was \$14#8;(\$2444.).

Members discussed the status of our stocks. Because of the recent tragedy and its effect on the Financial Center members had expected our stocks to plunge but that proved otherwise. The original stock investment of \$5,000 by George Terry and Ralph Beard has been a cushion for the Society and is now worth five times as much as it did in when first invested in 1944. Chris Harvey agreed to look into the possibility of online dues payment via PayPal, which would be directly linked to the web site. Chris will send a form to Alice, which will make it easier for our members to pay dues or fees and to make donations which would be deposited directly into our checking account.

4. Editor's Report - Jay Schiffman

Jay is still anxious to receive articles from readers. Gene is now handling the layout of *The Bulletin* on disk thereby eliminating paste-up work, and thus cutting costs. This procedure has been an enormous saving to the Society — it eliminates the need for typesetter services. Jay is hoping to receive additional articles from Ian Patten. It was suggested that articles concerning any number base should be solicited from students, graduate students from members' local colleges and elsewhere, and from Bank St. students and faculty, as well. Chris will be working with Jay to scan the next *Bulletin*. It is hoped that all past and future *Bulletins* will be available online. It may be possible for members to access and read any *Bulletin* — this could cut back on our mailing costs considerably. (Of course, this would only apply to those members with e-mail addresses.)

5. Annual Meeting Committee - Alice Berridge and Gene Zirkel

The next Annual Membership Meeting will take place on 16; October 11\*\* (18 October 2002) at Bank Street School. The meeting for the following year is

tentatively planned for Rowan University in New Jersey.

6. Nominating Committee - Alice Berridge

The Committee presented the following slate for the class of 11#0(2004.): Alice Berridge, Dr. John Impagliazzo, Robert R. McPherson and Gene Zirkel.

Alice Berridge, Jay Schiffman and Patricia Zirkel were proposed as the Nominating Committee for the coming year. Both slates were elected unanimously.

Christina K. D'Aiello was appointed Parliamentarian to the Chair.

7. Other Business:

Thanks to John Earnest for his last minute scramble to arrange a room and to Alice for providing refreshments. This year's meetings were tinged by the great sadness of the recent terrorist tragedy.

The meeting was adjourned at 5:45 PM.

Featured Speaker

President Jay Schiffman gave a brief and very interesting talk on "Number Base Conversion with a CAS (Computer Algebra System.)" Jay said that the TI 85, 86 and 89 allow easy conversion for many bases, but not for dozens. Instead he suggests using the CAS program MATHEMATICA and he demonstrated how this would work for bases two through three dozen. He also discussed how to use the program for prime factors of repunits (numbers consisting of only repeated unit digits such as 11111) in various bases.

Respectfully submitted,

Christina K. D'Aiello, Secretary  
Alice Berridge, Treasurer

\*



If we counted in base twenty then the numeral 432 would indicate

$$4(20^2) + 3(20) + 2 \text{ which equals decimal } 1,662.$$

The Mayans in Mexico, however, used an *almost* base twenty system and thus their 432 was only equivalent to decimal 1,502. Why the difference?

The Mayan civilization flourished from about the fifth century BC thru the tenth century AD. They were very advanced in both mathematics and astronomy, and in fact had invented the zero long before the Europeans. Their symbol for zero was a fish-like oval shape.

Perhaps it was their discoveries in astronomy which led then to their eccentric counting system. But whether they forced the year to be 360 days to more easily fit their calculations or if they adjusted their counting to fit their 360 day year is not known.

What we do know is that they looked upon a numeral which we would write decimally as 432 as representing four 360-day years, three 20-day months and two days, or 1,502 days.

Mathematically then, Mayan 432 is equal to decimal  $4(20 \times 18) + 3(20) + 2$ . After the third digit from the right they returned to standard base twenty computation. Thus Mayan 204#7 (where # represents the digit eleven) would equal

$$2(20^4) + 0(20^3) + 4(20 \times 18) + 11(20) + 7$$

that is

$$2(160000) + 0(8000) + 4(360) + 11(20) + 7$$

or decimal 321,667.

Of course the Mayans using a line for 5 and a dot for 1 would have written our 204#6 either vertically as pictured at the right or horizontally as on the following page.



Horizontal Mayan 204#6 from the previous page .

Note, some texts state that the Mayan system would interpret 204#7 as

$$2(20^3 \times 18) + 0(20^2 \times 18) + 4(20 \times 18) + 11(20) + 7$$

instead of.  $2(20^4) + 0(20^3) + 4(20 \times 18) + 11(20) + 7$

This might be due to the fact that in addition to their calendar days (*kins*), months (*uinals*) and solar years (*haab*) the Mayans also used several cycles of days.

The month *contained* twenty days and a solar year contained 18 months or 360 days. (They added 5 "unlucky" days at the end to get 365 days.) These would be. In addition, they also used several cycles of *tuns* which like the haab also contained  $20 \times 18$  days. These included

- katun 20 tuns ( $20^2 \times 18$  days)
- baktuns 400 tuns ( $20^3 \times 18$  days)
- pictuns 8,000 tuns ( $20^4 \times 18$  days)
- calabtuns 160,000 ( $20^5 \times 18$  days)
- kinchiltuns 3,200,000 ( $20^6 \times 18$  days)
- alautun 23,040,000,000 ( $20^7 \times 18$  days)

If one makes the assumption that the Mayans wanted to express these cycles in "round" numbers then this second interpretation might be correct, *but did they?*



$$\frac{1}{2} = 0;6 \text{ or } 0.5 \qquad \frac{1}{3} = 0;4 \text{ or } 0.33333... \qquad \frac{1}{4} = 0;3 \text{ or } 0.25$$



## DOZENALS IN THE CLASSROOM

Jean Kelly

Dick Trelfa, member number 159; asks:

*As a matter of curiosity, what would you send a high school teacher to encourage him to use dozenal math as separate from standard approaches to numbering systems to various bases? Thanks Dick*

It's an excellent question, so let me briefly relate a few of things that I have done.

In classes in which some number bases are part of the syllabus, such as classes that include binary or hexadecimal bases for computers, I also included base twelve. Pedagogically, I always believed that broadening the syllabus helped students to better grasp the required topics.

I would give out some of our literature.

In computer classes, I would sometimes require the students to write programs to convert from base ten to base twelve and/or vice versa. Sometimes I gave such tasks as extra credit projects.

In math classes where number bases were required, I would bring in a dozenal clock and set it up without any comment. When the students asked about it (and they invariably did) I would explain how it worked and then ask them to tell me what the clock would read when the class ended. They always enjoyed that task. (If a clock is not available, one can describe the readout and still assign the problem of finding out the time when class is over.)

In such classes I would number the questions on an exam in a different base. The first question on the test would be: *In what base are the questions on this test numbered?* Later, while going over the test, when a student would ask a question about question "Number twenty-three" I would respond in the following manner. If, for example, I had used base 4, I would say, "Do you mean question twenty-three or question number two three in base four?" This usually brought laughter from some and groans from others.

Dozenals are a great project for math fairs and math projects for students at any grade level.

## Dozenals in the Classroom

I used duodecimals as a topic on occasions such as when I was asked to be the guest speaker at a math league awards ceremony. The audience included both these math whiz kids and their proud but not mathematically advanced parents.

Another occasion was when I was asked to suddenly give a 5 minute talk on any topic to my group at a seminar I was attending.

Once when I was asked to address fifth grade math teachers I asked about their syllabus. On learning that they taught percentages I taught them dozenal per grossages. For example that  $\frac{1}{2} = 0;6 = 6\%_6$ . In this way I tried to get them to understand the difficulties that their pupils were experiencing learning something new and somewhat challenging. Was I ever successful!

I also used dozenals as a fun topic on occasions such as one time when due to a snow storm less than a dozen students showed up and I felt constrained not to teach something new when so many were absent.

Base twelve counting is a great topic for math clubs also.

I always keep some of our literature in my car, my briefcase and my office. I am always prepared to respond to inquiries and in doing so, to leave something in their hands for future reading.

Today, of course, we can supply them with our web site address: [Dozens.org](http://Dozens.org) \*



### DON'T KEEP THIS MAGAZINE!

Do YOU discard your copies of the *Bulletin* after you have read them? Or do they gather dust on a shelf in your attic? Why not pass them along to your local library, or to a school library. Perhaps some nearby math teacher would appreciate a copy. You can also just leave them in a dentist's office or other waiting area.

*Help spread the word!*

(If you ever need a back copy, we'd be glad to help.)



We welcome our newest member, **DAVID ALDOUS**, DSA number 36# from Metaire LA.

...

Our gratitude goes to officers **CHRIS HARVEY** 367; and **ALICE BERRIDGE** 25\* who donated time to restore our office to order after those who installed a new carpet left it in chaos. *Thanks!*

...

We also thank member **JARED W HASLETT** 361; who recently became our newest Life Member.

...

Member **CHARLES F MARSCHNER** 270; donated \$3 for a student "**One you select**". What a wonderful idea! Why not include an extra few dollars when you pay your *very low* annual dues either for some *students that you know* or for some that we could select? As Ralph Beard, one of our founders, used to say, "*Each one teach one.*"

Charles also comments: "Note I understand in many schools multiplication tables must only be learned thru ten × ten! Not thru twelve × twelve as we once were. Why? For 'Seniors' why not teach Dozenal Anti-Aging? My wife is turning 80 and I am 88. How much younger we are using 12's! Try it you'll like it!"

...

From Life Member **MARY NEWHALL** 321;

It's always good to get the *Bulletin* and read about the Society. Please change my address ... At a mere 7 dozen 1, I became too feeble to live alone, so I moved next door with my sister and brother-in-law. The three of us are all over 6 dozen 8 years of age! My oldest grandchild is entering college at RPI this fall majoring in math and physics. Your grandchildren are a great joy to you I'm sure. Greetings to all.

**ARTHUR WHILLOCK** 262; Fellow of the DSA and an officer of the DSGB sent us this clipping from *The Sunday Telegraph* of 2 December 2001.

CAMPAIGN COUP, Benn backs the metric martyrs

What has Tony Benn in common with Lord Tebbit, John Cleese, the astronomer Sir Patrick Moore, the former racing driver Sir Stirling Moss, the *Sun* columnist Richard Littlejohn and Matt, the *Telegraph* cartoonist? The answer is that he has just become a patron of the Metric Martyrs defense fund, which is also supported by J K Rowling, Lord Hanson and a host of other opponents of compulsory metrication.

Mr Benn's Support is significant because it was he who as Technology Minister announced to MPs in 1968 the Government's intention that Britain should be fully metric within 10 years, but that "compulsion is not part of the process". The reason that the Government insisted metrication should be voluntary was that what it wanted above all to avoid was the need for an Act of Parliament, requiring proper debate.

It is precisely on this point that Lord Justice Laws, as I reported last week, has in the Current metrication case finally called the bluff of successive governments, by describing the imposition of such a huge change on the British people without an Act of Parliament as "shameful". Whichever way judgement goes in this historic case, at least that point has now been acknowledged by the High Court. Its endorsement by the politician who set the whole dismal process in train is like a final defiant flourish for parliamentary democracy.

Arthur also sent us the following e-mail site. It's a Japanese paper on why duodecimals. The first site is the document broken down into sections and pages. The second is the entire document.

<http://www.asahi-net.or.jp/~dd6t-sg/univunit-e/>  
<http://www.asahi-net.or.jp/~dd6t-sg/univunit-e/univunit.pdf>

...

We recently learned of the death of **DR JOHN A SCHUMAKER** 319; on 15 November 2000. Our condolences to his family and friends.



We thank **DR JOHN IMPAGLIAZZO** 27# for our two recent Life Members: **CHRIS HARVEY** 367; our computer maven, and **CHRISTINA K. D'AIELLO**- 35\*, our Secretary and a member of the meeting Committee

...

Life member **DICK TRELFA** 159; sent us this clipping from *The Sunday Telegraph* of 21 October 2001, page 33.

READERS RALLY, Funds flow in for metric martyrs

Neil Herron, the Sunderland businessman who runs the Metric Martyrs Defence Fund, reports an amazing response to my emergency appeal last week for more financial support. This was made because of Sunderland council's belated move to press for costs in a bid to head off the great metrication case before its full hearing in the London high court on November 19. "Hundreds of cheques have flooded in," says Herron, "including one for £1,000 from one of our leading industrialists who said he and his wife were 'outraged' at the way these small traders are being persecuted."

Another reader said that he was sending £25, and a further £250 on behalf of his brother who had already contributed to the fund last April but died during the summer. Mr Herron says he and his small staff cannot thank all these contributors individually, but the "the wonderful response of *Sunday Telegraph* readers has given us a fantastic boost".

...

From **BOB McPHERSON** 4# we received -My relatives seem to equate numbers with death and numerals with evil. Hence I paraphrase David's Psalm:

*Yea, though I walk through the valley of shadow of numbers, I will fear no numerals: for Thou art with me; Thy rod and Thy staff they comfort me.*

(We all have met people like those)

**PRESIDENT JAY SCHIFFMAN** 2\* 8 co-authored an article with Eric Milou

also of Rowan University. Their work entitled *A Most Unusual Social Security Number: a "Mega-clue" Problem* appeared in the Fall 2000. Issue of the "New Jersey Mathematics Teacher", Vol.58. No. 1.

...

Member **VITA B ALAIMO** 328; writes that she was unable to attend our meeting since her driving is quite limited at age 7 dozen 3 but she enjoys being a member of our Society and says that "I still 'advertise' the Dozenal Society to anyone who will listen". \*

○ ○

**PAY DSA DUES ONLINE**

1. Go to [www.paypal.com](http://www.paypal.com).
  - A. If you are already a PayPal member: click on [Log in](#).
  - B. If you are not a PayPal member: click on [Sign up for your free PayPal Account](#). You will notice that you will get a \$5 bonus for signing up. There is a quick 1-page sign up. (International customers can also apply.)
2. Click on [Send Money](#)
3. At Recipient's Email enter: [berridge@Dozens.org](mailto:berridge@Dozens.org)
4. At Amount enter dues (plus any optional donation)
 

Dues are-	Annual Dues Twelve Dollars(US)
	Life One Gross Dollars(US)
	Student Three Dollars(US)

Contributions are always appreciated.
5. At Type click: [Service](#)
6. At Email subject: This is optional. May be blank or the word "Dues"
7. At Note enter: Your name (& address if new)
8. Click: [Continue](#)
9. At next page, if correct Click: [Send Money](#)

*That's all there is to it!* \*



Recently a sign was taped to the door of our DSA office at Nassau Community College. It read:

Go Metric  
1000. = 100.0

That, of course, is not true. Presumably the author was trying to illustrate something such as

$$1000. \text{ grams} = 100.0 \text{ dekagrams.}$$

We could correct his or her mistake by adding 2 words and 2 semicolons. How about the following?

*Dozenal*  
Go ^ Metric  
1000; = 100;0 dozen

△ △ △ △

**ERRATA**

In Bulletin 83; (99.), on Page 1 dozen 7, in my article NUMBER BASE CONVERSION WITH A CAS, the last sentence in the next to last paragraph should read Our result is {1, 0, 0, 0, 0}, which we express as 10000 (subscript 16). In the first paragraph on Page 1 dozen eight, in the sentence To cite two additional examples,... type From Digits{{1,1,1,0,0,0,1},2] as the input and obtain 113 as our output.

1. Consider the famous Fibonacci Sequence FIB(N) which is recursively defined as follows:

$$FIB(1) = FIB(2) = 1 \text{ and } FIB(N) = FIB(N - 2) + FIB(N - 1) \text{ } N \geq 3.$$

Thus FIB(3) = 2 and FIB(4) = 3. Show that every doventh term of the sequence is divisible by twelve (and hence by 2, 3, 4 and 6).

2. The Lucas Numbers are a Fibonacci-like sequence. LUC(N) is recursively defined as follows:

$$LUC(1) = 1, LUC(2) = 3 \text{ \& } LUC(N) = LUC(N - 2) + LUC(N - 1) \text{ for } N \geq 3.$$

Thus LUC(3) = 4 and LUC(4) = 7. Show that no Lucas Number is a multiple of 5, 8 or 10.

3. Show that the periods of the units digits of the Fibonacci and Lucas sequences in Base Dek are respectively five dozen and one dozen while in Base Twelve, the units digits of each sequence is two dozen.

SOLUTION TO A PREVIOUS PROBLEM:

In base dek the cryptarithm  $E^2 = DE$  has 2 solutions:  $5^2 = 25$  or  $6^2 = 36$ . Hence  $E = 5$  or  $6$  and  $D = 2$  or  $3$  respectively.

In base do,  $E^2 = DE$  has a unique solution for D and E. Furthermore if

$$\begin{aligned} L^2 &= ED \\ EA - OE &= DZ \\ O \times Z &= A \\ O + Z &= N \\ Z - O &= D \end{aligned}$$

find the values of all the digits represented by letters and place them in numerical order.

*Solution:*

From  $E^2 = DE$  we have  $E = 4$  and  $D = 1$  and hence  $L = \sqrt{41} = 7$ .



4A - O4 = 1Z yields these possibilities:

A	Z	O
0	8	2
3	#	2
6	2	3
9	5	3
*	6	3

but since  $O \times Z = A$  we have  $A = 6$  and  $O = 2$  or  $3$  while  $Z = 3$  or  $2$ . Either way  $N = 5$ .

Finally  $Z - O = 1$  yields  $Z = 3$  and  $O = 2$ .

Putting the digits in order gives 1, 2, 3, 4, 5, 6, 7 and the word DOZENAL!



Margaret Calderon writes commenting on the 7-segment symbols Paul Rapoport 230; and DSGB used on his dozenal clock-

I would prefer new numeric symbols for ten and eleven, something that looks as though it may have come down to us from the Arabs and friends. I think the upside-down F and the 5 without a top bar that were used on the base twelve digital clock are easy to write and look "numeric". (The alphabet and the numerals each have their own general appearance.) They would also be unambiguous on alphabetic and numeric digital displays, and have some currency in general usage (at least on one make of clock). Once I tried to invent such symbols myself. I wrote down all the 7-line display digital shapes, eliminated the ones already in use, then tried to invent symbols from the remainder. I never was able to choose one over another, so it's great someone has already made the choice for me. Thank you for telling me about them; I'm going to adopt their use.

■ ■	■ ■	S	■ ■	■ ■	L	8	■ ■	B	■ ■
■ ■	P	O	10.	T	8	■ ■	B	A	6
M	O	M	■ ■	L	E	O	9	■ ■	S
■ ■	L	E	■ ■	C	R	Y	■ ■	O	H
N	E	1	■ ■	■ ■	■ ■	E	■ ■	■ ■	O
I	■ ■	■ ■	■ ■	■ ■	■ ■	Z	E	R	O
C	L	A	6	■ ■	■ ■	■ ■	■ ■	■ ■	T
E	O	N	■ ■	■ ■	3	S	O	M	E
R	■ ■	■ ■	8	■ ■	R	■ ■	C	A	R
■ ■	■ ■	10.	T	H	S	■ ■	T	R	■ ■
■ ■	5	S	■ ■	I	■ ■	■ ■	O	■ ■	B
4	G	I	V	E	S	■ ■	T	■ ■	4
C	■ ■	O	■ ■	■ ■	X	■ ■	H	■ ■	■ ■
■ ■	O	N	E	R	■ ■	T	O	T	S
T	H	■ ■	L	■ ■	■ ■	O	R	O	■ ■
H	O	T	■ ■	6	E	M	P	E	R
E	■ ■	A	U	■ ■	T	■ ■	E	■ ■	E
12.	■ ■	2	S	D	A	Y	S	■ ■	■ ■
■ ■	U	■ ■	■ ■	A	T	E	■ ■	4	5
4	F	O	L	D	■ ■	A	■ ■	G	E
T	O	N	E	■ ■	O	R	8	O	R

You can contact us at:

Contact@Dozens.org



## 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, people'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. Then, in a related development, people awoke to the fact that different number bases could be used.

A parallel to today 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 measurings. Base twelve should be man's second mathematical language. It should be taught in all the schools. In any operation, the most advantageous base should be used, the one best suited to the task at hand. (Similar to computer scientists use of binary, hexadecimal or octal - whichever is most convenient.) If this were done, duodecimals would 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 \*

## YOU ARE INVITED TO JOIN THE DOZENAL SOCIETY OF AMERICA

*The only requirement is a constructive interest in duodecimals*

Name \_\_\_\_\_ / /  
Last First Middle Date  
Mailing Address (including full 9 digit ZIP code)  
\_\_\_\_\_  
\_\_\_\_\_

Phone: Home \_\_\_\_\_ Business \_\_\_\_\_  
Fax \_\_\_\_\_ E-mail \_\_\_\_\_

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

Annual Dues ..... Twelve Dollars (US)  
Life ..... One Gross Dollars (US)  
Student (Enter data below) ..... Three Dollars (US)  
(A limited number of free memberships are available to students)

School \_\_\_\_\_

Address \_\_\_\_\_

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

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

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

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

To facilitate communication do you grant permission for your name, address & phones to be furnished to other members of our Society?

Yes: \_\_\_\_\_ No: \_\_\_\_\_

Please include on a separate sheet your particular duodecimal interests, comments, and other suggestions.

Mail to: Dozenal Society of America  
% Math Department  
Nassau Community College  
Garden City LI NY 11530-6793

DETACH--HERE--OR--PHOTOCOPY