COUNTING IN DOZENS

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

Our common number system is decimal - based on ten. 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.

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	3Ɛ2	Two ft. eight in.	2.8'
19Ɛ	1000	Eleven ft. seven in.	Ɛ.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 *2Ɛ*, 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 *X*, and the successive remainders are the desired decimal number.

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

Numerical Progression

1	One		
10	Do	.1	Edo
100	Gro	.01	Egro
1,000	Mo	.001	Emo
10,000	Do-mo	.000,1	Edo-mo
100,000	Gro-mo	.000,01	Egro-mo
1,000,000	Bi-mo	.000,001	Ebi-mo
1,000,000,000	Tri-mo	and so on.	

Multiplication Table

1	2	3	4	5	6	7	8	9	X	Ɛ
2	4	6	8	X	10	12	14	16	18	1X
3	6	9	10	13	16	19	20	23	26	29
4	8	10	14	18	20	24	28	30	34	38
5	X	13	18	21	26	2Ɛ	34	39	42	47
6	10	16	20	26	30	36	40	46	50	56
7	12	19	24	2Ɛ	36	41	48	53	5X	65
8	14	20	28	34	40	48	54	60	68	74
9	16	23	30	39	46	53	60	69	76	83
X	18	26	34	42	50	5X	68	76	84	92
Ɛ	1X	29	38	47	56	65	74	83	92	X1

The Duodecimal Bulletin

Whole Number 20

Volume 10, No. 1
July - 1956 (1170)

THE DUODECIMAL SOCIETY OF AMERICA

20 Carlton Place ~ ~ ~ ~ ~ Staten Island 4, N. Y.

THE DUODECIMAL SOCIETY OF AMERICA

is a voluntary nonprofit organization 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.

Full membership with voting privileges requires the passing of elementary tests in the performance of twelve-base arithmetic. The lessons and examinations are free to those whose entrance applications are accepted. Remittance of $6, covering initiation fee ($3) and one year's dues ($3), must accompany applications.

The Duodecimal Bulletin is the official publication of the Duodecimal Society of America, Inc., 20 Carlton Place, Staten Island 4, New York. F. Emerson Andrews, Chairman of the Board of Directors. Kingsland Camp, President. Ralph H. Beard, Editor.

Separate subscriptions $2.00 a year, 50¢ a copy.

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The Duodecimal Bulletin

All figures in italics are duodecimal.

A DUODECIMAL NOTATION

WITH COMMERCIAL AND SCIENTIFIC TABLES *

by Horatio W. Hallwright, B. Sc. A.
Victoria, B. C., Canada.

The following system of units was originally worked out in response to a suggestion by General Smuts that permanent world peace was impracticable without a universal currency system.

The implied challenge impressed me, and a summer vacation was spent in research. Almost from the start, it became evident that such a system was linked with another still-greater need, - a factor enabling the standard British units in all fields of measurement to be organized on the same scientific basis as the existing "Metric System." This was found to be a duodecimal notation.

There were many reasons for this; but chief of them was the incompatibility of a decimal radix (ten) with the traditional British units, which hold the field - at least in the English-speaking world - in spite of the efforts of would-be reformers to substitute the "Metric System" of units. On the duodecimal basis, these traditional units seem to possess an intrinsic natural correlation just as accurate and scientific as exists between the arbitrary units of the decimal metric system.

A glance over the tables herewith will reveal this very striking correlation. Even the old saying, "A pint is a pound, the world around," becomes literally and mathematically true under this system. And the way in which other traditional units, with almost negligible adjustments, slip into their natural places - making measurements such as longitude and time part of the whole scheme - seems to me to be nothing short of phenomenal.

I had often wondered why skilled artisans, engineers and architects continually resisted the general adoption of the "Metric System" in place of the traditional British system, when it seemed to offer so many advantages for general use. But now their innate wisdom is apparent to me.

Things are rapidly approaching the critical stage when something will have to be done to meet the needs of computation in a machine age. There is an urgent need for our standards to become more scientific and rational. Like everything else at the present time, this need is finding expression in an increasingly

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controversial atmosphere, and the present proposal may help towards a more peaceful solution.

At present, both the British and the decimal metric systems are being taught in the schools of English-speaking countries. This shows the urgency of the need.

It seems to me that it would be less complicated and less exacting on the mind of the child if from the start, side by side with the British system of traditional units - already almost wholly duodecimal - we should teach the duodecimal notation which makes these units rational and easy to learn, - rather than a whole system of new units such as the "Metric System."

Learning both, and using both, posterity can come to a decision as to which system is serving best.

This is a time when human knowledge in many fields has need to be made clear, uniform and simple, - streamlined for speed and service to mankind. Few will deny this need exists. It is with the firm conviction that the proposed duodecimal notation and tables can meet this need, that they are submitted.

Some of the Advantages of the Proposed Duodecimal System

The proposed Duodecimal System retains the advantages of our familiar units, but adapts them into a scientific organization. Prefixes are used to denote the uniform scalar multiples and subdivisions of the standard units. The Metric System has acquainted us with the advantages of uniform multiples and subdivisions, conforming to the number base or radix; and also with the use of uniform prefixes for designating them. But the standard units of the Metric System, wholly arbitrary as they are, do not altogether appeal to the masses of the people. It has been claimed that some of the units are inconvenient, being either too small, or too large, - as for instance the centimeter, and the liter and the kilogram.

The use of the duodecimal radix (twelve) enables this system to use those natural units which we have learned to know and to like, such as the inch and the foot, - the ounce (Troy) and the pound, and from these, - the mile and the ton. They are already a part of our social and economic heritage. The definition of the Imperial gallon as 277.274 cubic inches has loosely linked the cubic inch, the pint and the quart, the gallon and the bushel. But the definition of the duodecimal pint as 36 cubic inches, and the weight of one pound, makes this correlation definite and exact. Even the units of longitude and time can now be adapted into this scientific organization and correlated, - a second of longitude corresponding to a second of time, - as appears in the tables.

The decimal system can avail itself of just one set of factors, (5 x 2). The duodecimal system has two sets, (6 x 2 and 3 x 4). The increased flexibility makes available for our use a larger number of aliquot parts which can be designated by a single figure. Herewith is a list of these for each system. It reveals not only that the duodecimal system has eleven instead of nine of these, but that it can express with one figure such familiar and usable parts as 1/4, 1/3, 1/2, 2/3, and 3/4.

Duodecimal		Decimal	
.1 = 1/12	*.7* = 7/12	.1 = 1/10	.6 = 3/5
.2 = 1/6	*.8* = 2/3	.2 = 1/5	.7 = 7/10
.3 = 1/4	*.9* = 3/4	.3 = 3/10	.8 = 4/5
.4 = 1/3	*.X* = 5/6	.4 = 2/5	.9 = 9/10
.5 = 5/12	*.Ɛ* = 11/12	.5 = 1/2	- - - - -
.6 = 1/2	- - - - -		

The Structure of the Duodecimal Tables

We are all familiar with the dozen, the gross and the great gross through our daily transactions. We find twelve months in a year, twelve pence in a shilling, and twelve ounces in a pound, Troy.

We can bring into harmony with these the tables of weight, and the tables of liquid and dry measure very easily. The Imperial pint is 34.66 cubic inches, and there are therefore about fifty in a cubic foot. If we make the duodecimal pint very slightly larger - 36 cubic inches - we have exactly 48 pints in a cubic foot; and by making the duodecimal pound to be the weight of this pint (of water), the tables of weight, and of liquid and dry measure are harmonized with the measures of length, area and volume.

The thermometer scale is made duodecimal by using the freezing point of water for zero, as for the Centigrade scale, and dividing the range to its boiling point into 144, or 12 x 12, degrees.

Just as the day has 24 hours, we make the circle of longitude, of latitude, or any circle, have 24 degrees; and we give the hour of time, also the degree of longitude, latitude, or any circle, 144 minutes. And to the minute of time, of longitude, latitude, or any circle, 144 seconds. By doing this, it develops that the sun, in its daily apparent journey westward, travels one degree in one hour, - one minute of longitude in one minute of time, - and one second of longitude in one second of time.

Duodecimal Table of Length

10 Motfeet (*.01* Inch)	= *1* Grotfoot, 1/12 Inch
10 Grotfeet	*1* Dotfoot, or Inch
10 Dotfeet	*1* Foot
10 Feet	*1* Dofoot, or Rod, 12 old feet
10 Dofeet	*1* Grofoot
10 Grofeet	*1* Mofoot, about 1/3 old mile
10 Mofeet	*1* Domofoot, or League, nearly 4 old miles.

Intermediate Units

3 Feet	= *1* Yard
4 Yards	*1* Dofoot, or Rod, 12 old feet
3 Grofeet	*1* Furlong, about 2/3 old furlong
4 Furlongs	*1* Mofoot, about 1/3 old mile
3 Mofeet	*1* Mile, 5184 feet
4 Miles	*1* Domofoot, or League, nearly 4 old miles

The old mile was 5280 feet, and the old league was about 3 old miles. The marine or nautical mile was 6080 feet, and the marine league was 3 nautical miles.

Duodecimal Table of Area

10 Square Inches	= *1* Dosquare
10 Dosquares	*1* Grosquare, or Square Foot
10 Grosquares	*1* Mosquare
10 Mosquares	*1* Domosquare, 144 sq. ft.
10 Domosquares	*1* Gromosquare
10 Gromosquares	*1* Bimosquare, about 1/2 acre
10 Bimosquares	*1* Dobimosquare
10 Dobimosquares	*1* Grobimosquare, about 1/9 sq. mi.

Duodecimal Table of Volume

10 Motcubes	= *1* Grotcube, 1/144 cu. in.
10 Grotcubes	*1* Dotcube
10 Dotcubes	*1* Cube, or Cubic Inch
10 Cubes	*1* Docube
10 Docubes	*1* Grocube
10 Grocube	*1* Mocube, or Cubic Foot.

Duodecimal Table of Capacity

Liquid Measure and Dry Measure

10 Motpints	= *1* Grotpint, 1/4 cu. in.
10 Grotpints	*1* Dopint, 3 cu. in.
10 Dotpints	*1* Pint, 36 cu. in., about the Imperial pint.
10 Pints	*1* Dopint, or Gallon, ¼ cu. ft., about 1½ old gallons, or 3/4 old peck.
10 Dopints or Gallons	*1* Gropint, or Sack, 3 cu. ft., about 16 old gallons, or 2¼ old bushels.
10 Gropints or Sacks	*1* Mopint, or Load, 36 cu. ft., about 216 old gallons, or 27 old bushels.

These measures are related to the table of weight through the duodecimal pound, which is the weight of 1 pint of water.

Duodecimal Table of Weight

replacing Troy, Apothecary and Avoirdupois Tables

10 Motpounds	= *1* Grotpound, or Drachm, about 63.2 grains, weight of ¼ cu. in. of water.
10 Grotpounds or Drachms	*1* Dotpound, or Ounce, weight of 3 cu. in. of water.
10 Dotpounds or Ounces	*1* Pound, 1.3 pounds avoir., weight of (1 pint) or 36 cu. in. of water, about 9100 grains.
10 Pounds	*1* Dopound, or Stone, weight of ¼ cu. ft. of water.
10 Dopounds or Stones	*1* Gropound, weight of 3 cu. ft., or 18 Gallons of water.
10 Gropounds	*1* Mopound or Ton, about a long ton, weight of 36 cu. ft. of water.

The Troy pound was 5760 grains, and both the apothecary pound, and the avoirdupois pound were 7000 grains.

Duodecimal Money

A duodecimal coinage is proposed in which the Rex or Sovereign is duodecimally subdivided into Shillings, Pence, and Mites, in a pattern similar to the above.

Duodecimal Table of Time

The duodecimal tables of time and longitude are unified by dividing the day into 24 hours and the circle into 24 degrees. The hour of time and the degree of longitude are subdivided into 144 minutes and the minutes into 144 seconds. The same division is used for any circle.

10 Gromotours	= *1* Domotour or Second, about 1/6 old second.
10 Domotours or Seconds	*1* Motour, about 2 old seconds.
10 Motours	*1* Grotour or Minute, about 5/12 old minute.
10 Grotours or Minutes	*1* Dotour. 5 old minutes.
10 Dotours	*1* Hour
20 Hours	*1* Day, midnight to midnight.

Duodecimal Table of Longitude and Circular Measure

10 Gromotrees	= *1* Domotree or Second, about 2½ old seconds.
10 Domotrees or Seconds	*1* Motree, about ½ old minute.
10 Motrees	*1* Grotree or Minute, 6¼ old minutes.
10 Grotrees	*1* Dotree, 1¼ old degrees.
10 Dotrees	*1* Degree, 15 old degrees.
20 Degrees	*1* Circumference or Circle.

The old degree of longitude measured about 69 miles at the equator, and the old minute was the nautical mile of 6080 feet. The gromotree measures 264 feet at the equator, and the domotree 3168 feet, or nearly the kilometer. The sun in its daily apparant journey westward travels a degree in an hour, a minute of longitude in a minute of time, and a second of arc in a second of time.

The rising generations are learning the advantages of numbering by twelves. They are learning how to use them. Practical applications will become more frequent. This system of duodecimal measures is submitted as a contribution toward easing their general use.

ROMAN DUMERALS

By

Brother Louis Francis, F.M.S.

When the Arabic notation was introduced into Europe around the year 1000 A.D., it was applied, without thinking, to the base ten. If at that time the Western World had been counting in the more logical twelve base there would be no need for the existence of our Society today. (Obviously, if our predecessors had been intelligent enough to count by dozens before the introduction of the place system they would also have been intelligent enough to see the advantages of each system and would have combined the Arabic notation with the Twelve base.)

Let us investigate these historical Might-have-beens, these Roman DUMERALS (Roman numerals to the base Twelve.)

SYMBOLISM: In order to distinguish between the numerals and the dumerals, we will use the ordinary capital letters for the former, as is customary, and the corresponding lower case letters for the latter.

Roman Numerals			Roman Dumerals	
I	one	unit	i	one
V	five	½ base	v	six
X	ten	base	x	do
L	fifty	½ base squared	l	six do
C	one hundred	base squared	c	gro
D	five hundred	½ base cubed	d	six gro
M	one thousand	base cubed	m	one mo

Thus we would count in dumerals:
i, ii, iii, iiv, iv, v, vi, vii, viii, iix, ix, x, etc.

CONVERSION: In order to convert numerals to dumerals and vice-versa, we set up the following conversion tables:

TABLE A

Numerals	Dumerals
I	i
V	iv
X	iix
L	xxxxii
C	lxxiiv
D	cccxlvii
M	dxciiii

TABLE B

Dumerals	Numerals
i	I
v	VI
x	XII
l	LXXII
c	CXLIV
d	DCCCLXIV
m	MDCCXXVIII

To convert a numeral, for example MCMLIV (1954), to a dumeral we proceed as follows:

1. Separate the positive symbols from the negative.

+	-
MMLV	CI

2. Convert each symbol individually into its dumeral values as found in Table A:

M = dxciiii M = dxciiii L = xxxxii V = iv	C = lxxiiv I = i

3. Separate these dumerals into positive and negative symbols as shown below:

	2	1
+	dciiii dciiii xxxxii v	lxxv i
	3	**4**
-	x x - i	ii -

4. For convenience we number each set of dumerals as the quadrants in Cartesian Geometry. Then we can cancel the dumerals in any odd numbered quadrant with the dumerals in an even numbered quadrant. In our example we cancel:

   the xxi in quadrant 3 with xxi in quadrant 2;
   the i in quadrant 1 with an i in quadrant 4;
   the xxv in quadrant 1 with xxv in quadrant 2.

The purpose of this cancellation is to remove all the dumerals from quadrants 1 and 3 (the negative symbols).

5. However, we still have one l in quadrant 1 so we subtract it from a c in quadrant 2, and put down the difference, namely l.

6. Now we combine the dumerals in quadrants 2 and 4 (the positive symbols) and writing them in order of magnitude we get:

   dd c l iii iii iii i

7. The final step is to simplify the dumeral into

   mcliix

   which gives us 116d, the Duodecimal equivalent of 1954.

To convert dumerals to numerals the same procedure is followed, substituting from Table B instead of Table A.

In actual practice it is not necessary to go through this method for every numeral we wish to change. Often it will be found easier to mentally break the number into dozens and then convert it. For example:

XVII = one dozen and five = xiv
LVI = four dozen and eight = xxxxvii
CIX = nine dozen and one = lxxxi

The only drawback in this system is that it has no advantages over ordinary ten base numerals. All systems of this type are equally poor for mathematical uses and especially for computation. Why, if we put dumerals on the face of a clock, instead of less symbols we would actually need one more than if we were to use numerals! And so, with no advantages save those to be gained after the adoption of arabic numerals, it is no surprise that the Romans would have resisted the introduction of a new base with the then unanswerable query, "Why change?"

****

X

Julius Caesar, an ardent Dodekaphile, once sent Brutus out for X buns. When Brutus returned with only ten Caesar was surprised and asked, "Et tu Brute?"

THE ANNUAL MEETING

The Annual Meeting of the Society was held on January 26th, 1956, at the Gramercy Park Hotel, in New York City, as usual. And, as usual it was preceded by a meeting of the Board of Directors.

This is the eleventh year of the Society's formal existence. The steady pace of its growth continues; its financial health is attested by another year's operation in the black; the number of its members slowly grows; and the requests for its duodecimal literature constantly increase.

Some fifty letters, selected from the 1800 we received, were circulated among the Directors to give them the feel of our correspondence, the range of our influence, and the productiveness of our work. A fourth printing of Mr. Andrews' AN EXCURSION IN NUMBERS has been necessary, and we have had to replenish our supply of Mr. Terry's THE DOZEN SYSTEM.

Treasurer Humphrey reported receipts of $1150 for the year, with expenses $25 less. Receipts included $870 of donations from those members whose generosity makes the work of the Society possible. The principle of our small endowment fund has remained untouched for the second successive year.

The present officers and committee chairmen were chosen to continue their assignments for the coming year. The Board expressed its deep appreciation of the work of these officers and chairmen who devotedly carry forward the work of the Society and largely absorb the expenses of their functions.

The Directors Dinner followed the meeting of the Board, and the Annual Meeting was called to order at 2030 EST. by President Kingsland Camp. He extended a warm welcome to the members of the Ridgewood High School Duodecimal Mathematical Society, (RHSDMS,) who arrived en masse, and to the other members and friends of the Society and their guests.

Secretary Beard, and Treasurer Humphrey delivered their reports as covered above. Chairman Anderson of the Member Qualification Committee reported the best year's gain in our history despite several losses through death and removals. At year's end, the total membership was eighty eight and we have had three other admissions since then. Four Aspirants were advanced to full membership during the year, and six of the new entrants were qualified as Members initially. Jay Anderson is founder and first president of the Ridgewood High School Duodecimal Mathematical Society, (RHSDMS.,) and it was his suggestion that student grades of membership be established. He described for the meeting, the formation of that society nearly two years ago, and its more formal organization this year. They hold their meetings, every other week, and were recently lent a Friden computing machiine for the further expansion of their mathematical interest.

The faculty of the Ridgewood High School, and Mr. E. E. Raffensperger, their Faculty Adviser, are to be congratulated on this notable testimonial to their cultivation of the interest and initiative of these students. Jay has inaugurated correspondence with other high school mathematics clubs which offers great promise for further duodecimal development among undergraduates.

Chairman Leopold Schorsch reported for the Nominating Commitee their recommendation that the Directors of the Class of 1956, - George S. Terry, H. K. Humphrey and Ralph H. Beard, - be re-elected as the Class of 1959. There being no other nominations, this was done, and the Nominating Committee, composed of P. J. Celani and Richard B. Parker in addition to Mr. Schorsch, was asked to serve for another term. The incumbent officers of the Society were also re-elected.

The Meeting adopted two amendments to the constitution. One provides for the establishment of two new grades of membership:-Student Aspirants and Student Members. Annual dues of $2.00 were established for these grades, and the initiation fee eliminated. They become regular members upon completion of their studies. The other amendment relaxed the provision as to the date of the Annual Meeting which my now be held anytime before June 1st.

In talks from the floor, H. C. Robert, Jr., described one of his recent assignments, a study of the operational control system of the Panama Canal, with recommendations for its simplification and modernization. This is to be considered in connection with the change of their main electric power system from 25 cycle to 60 cycle operation. His description of the use of symbolic logic in analyzing the problem was most interesting. Mr. Humphrey gave us a smile when he reported that he worked with General Electric years ago when the old system was installed. The archaic system was having a bad effect on the morale of their people, as they could not easily use many of their modern electrical domestic appliances.

Ralph Beard spoke of experiments with the notation of the 60-base. Two notational systems are practical. One can use a hexadecimal pattern, or a pentadozenal one. The use of the pentadozenal notation preserves the advantageous terminal figures of the dozen base, and makes many of the factors of the figures expressed apparent by inspection. Harry Robert amused the listeners by informing Beard that he had a table of the reciprocals of the 60-base stated in the pentadozenal notation, which would save him a lot of work.

This completed the formal business of the meeting, and it was adjourned for the informal talk that always follows. The refreshments included a birthday cake with a dozen candles in observation of the Society's anniversary.

The foregoing is a synopsis of the more ample report of the Annual Meeting and of the transactions of the Board of Directors sent to members of the Society in DOZENAL DOINGS, February, 1956. Jamison Handy, Jr., Editor, has earned the thanks of the Society for his prompt publication of that issue.

DOZENAL ARITHMOCRYPT

We are embarrassed. We must shamefacedly admit the intrusion of several errors in our last puzzles. The most excusable one was the typing of WNBC for WNBZ. We hope that Radio Station WNBC was not bothered by the unintentional publicity. But we are gratified that so many of our readers discovered the errors.

Here is a crypt that has been double-checked for correctness.

```
                  L W E
         ____________________
B L E A C H ) S N O W Y W A S H
              N O A H A O S
              _____________
                B B E L Y L S
                B C O S O Y O
                _____________
                  N O H H E E H
                  N H N S Y L I
                  _____________
                    B E E B O O
```

And here is a subtraction problem for the less ambitious.

```
T A L I N U E A C U N T A
N O O O U G M M M U A L N
_________________________
  U G R U R A C M A E T N
```

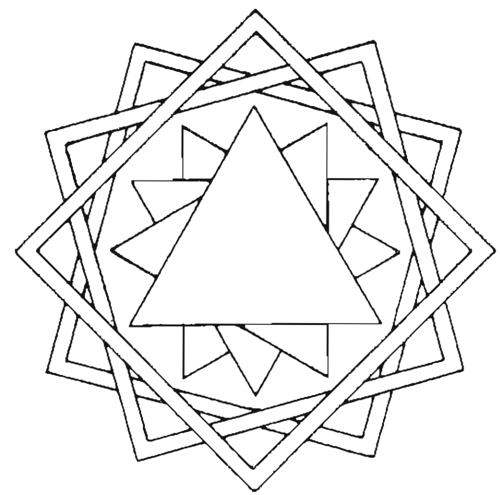
For those who have not tried them before, these arithmocrypts are arithmetic problems, with a letter substituted for each figure wherever it occurs. In their correct numerical order, the letters spell out a word, or words. In addition to being fun, they are helpful in developing familiarity with duodecimals, and with figure relations in general.

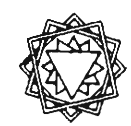
THE OFFICIAL SEAL

You are all familiar with the official seal of the Society. It appears on the front cover of the Bulletin. For this reproduction it was impressed on a piece of tough parchment and photographed under oblique lighting. This photograph was then screened for offset printing.

The original design was adapted by the die-cutter from the drawing of the duodecimal circle made for George Terry's THE DOZEN SYSTEM.

There has been some discussion as to whether a more appropriate and expressive symbol for the official seal might be developed. Treasurer H.K. Humphrey uses an emblem on his stationery formed of rotated triangles within rotated squares, which he drew to emphasize the flexibility of the duodecimal base, due to the factors three and four. It is shown here in several positions.





But a wide range of designs is possible. Actually there are four possible factors of the dozen, - 2, 3, 4, and 6; and for the gross there are many more. The dozen's particular adaptability for division of the circle and time should not be disregarded, and there are many other especial advantages of the dozen base, and the duodecimal system in general, that might properly find a place in the Society's insigne.

The essential applicability of the dozen as the basis of a metric system is one of its principal advantages. And the representation of weights and measures might well be included. Also there are good grounds for the belief that adoption of the natural dozen base for our numbers and measures may eliminate the feeling of repulsion that many mnay young students have for arithmetic. Could this find symbolic expression?

SEND US YOUR DESIGN. The question is on the official agenda, and the Board of Directors wishes to consider every design that might be more expressive of the purposes of the Society and of the advantages of duodecimals.

WE ARE DOING WELL

The year 1956 *(1170)* is the twelfth *(10th)* year of the existence of our Society as an incorporated body. And in a few months our membership will exceed one hundred. When this total reaches one gross a celebration is called for.

We have made solid progress. Duodecimals have entered the curricula of our schools. Our literature travels round the earth. Reference material is available to the interested mind anywhere. Our bibliography is reasonably comprehensive.

We are making reasonable progress in the enlistment of younger minds to carry on the work of the Society and provide the continuity of succession over the long years of growth.

Our financial condition is also fairly satisfactory. The last two years have been free of red ink. This year we do not hope to do that well. It is probable that there will be three issues of the Bulletin chargeable to this year's budget, - No. 2 of Vol. *Ɛ*, and Nos. 1 & 2, of Vol. *10*.

The prospective dent in our resources does not daunt us. More frequent issues of the Bulletin are essential to our progress. We must keep our members informed and in active contact. We operate as economically as possible. No salaries are paid, and, in addition, most of our staff absorbs the costs of their particular office. The devotion of our people is a constant joy.

Several of our major projects have had to be deferred. But eventually they will be successfully completed. We do what we can now, and will do more when our means permit. The appeal of duodecimals is irresistable, and only the rate of our progress is limited by our finances.

DOREMIC SYSTEM OF MEASURES AND WEIGHTS

By H. C. Churchman

I

Introduction

You do not have to be a skilled duodecimalist to grasp the advantages of the Doremic System of Measurements. If we might accustom ourselves to refer to the size of an 8 cubic foot household refrigerator in terms of four or more digits (for instance, cf*8.000*), we thus could achieve more accuracy in describing its capacity, especially its slightest proportion over or under cubic foot units.

Since we are arithmetically correct if we think of cf*8.000* (8 cu.ft.) as eight dozen, dozen, dozen cubic inches, we retain by use of the doremic system of measurements the identity and definite relationship of eight cubic feet to eight dozen, dozen, dozen cubic inches. That concept is wholly lost in the equivalent decimal expression of 13,824 cubic inches.

Assuming the box capacity is exactly 8 cubic feet, some of its possible dimensions are as follows: (Let f denote foot, and cf denote cubic foot.)

height		width		length		capacity
f8	x	f1	x	f1	equals	cf8
f4	x	f1	x	f2	equals	cf8
f2	x	f2	x	f2	equals	cf8

But if the cubic contents were even slightly decreased from the foregoing, we might incur some fraction of the cubic foot; and it is in this field that the use of dozens (rather than tens) of units shows its usefulness. For instance, if again we assume f to denote foot, cf to mean cubic foot, and f0.6 to equal 6/12th rather than six-tenths of a foot, the following dimensions might result, as shown below:

height		width		length		capacity
f*3.4*	x	f*1.6*	x	f*1.6*	equals	cf*7.6* or 7½ cu.ft.

In the foregoing example cf*7.6* might also be shown as *7600* cubic inches, keeping in mind that the *7000* equals seven dozen, dozen, dozen cubic inches, and the *600* represents six dozen, dozen cubic inches.

By use of dozenal arithmetic above we were able to visualize the proportion of *7600* to *8000*, and, in addition, we are able to comprehend the capacity of a box in either cubic feet or cubic inches, MERELY BY MOVING THE POINT.

Thus, cf*8.0* indicates and is pronounced eight cubic feet. But by moving the dozenal point three digits to the right, we indicate *8000* (eight dozen dozen dozen) cubic inches.

And if we assume one pinch to equal one-twelfth of an inch, then we may indicate eight cubic feet as equal to *8000000* (eight dozen dozen dozen dozen dozen dozen) cubic pinches. Arithmetically, we are as correct as when we say one plus one equals two. We have merely substituted dozens for decimals.

II

Preliminary Problem

Now if we should separate Do-Re-Mi into its components and let Do (*10*) denote not ten but a dozen things; let Re (*100*) denote not one hundred but one dozen dozen things; and let Mi (*1000*) denote one dozen dozen dozen things and not one thousand units, we might with some slight effort understand the following problem.

What is the cubic foot capacity of an electric refrigerator box the dimensions of which are 21 inches times 16 inches times 38 inches?

Let us assume f to indicate foot, sf to mean square foot, cf to denote cubic ft., and .*2* to denote 2/12ths, .*4* to indicate 4/12ths, and .*48* to denote four dozen and eight of 144 parts of the given unit.

Work: 38" equal f*3.2* (3 ft. 2 in.) multiplied by
16" equal f*1.4* (1 ft. 4 in.)

108
32

equals sf*4.28* (4 sq.ft.,2 dozen and 8 sq.in.)
multiplied by f*1.9* (1 ft. 9 in.)

3200
428

equals cf*7.480* or *7480* (pronounced 7 Mi, 4 Re, 8 Do) cu.inches, or decimally 7-56/144ths, or 7-7/18ths cu.ft.

By moving the dozenal point three places to our right, we are able to change

cf*7.480* into 7 dozen dozen dozen cu.in., plus 4 dozen dozen cu.in., plus 8 dozen cu.in. And by removing the dozenal point back three places, we again have 7 cu.ft. plus 56/144ths of a cubic foot.

III

An Estimate of the Situation

Everyone with even the slightest knowledge of music is familiar with the Do-Re-Mi scale. Music knows no language barriers. If we consent that "Do" shall represent for us a dozen units of measurement, "Re" a dozen dozen objects, and "Mi" a dozen dozen dozen things, then we should have the implements of nomenclature with which to speak with facility about all values now described in our decimal system by "tens" and "hundreds" and "thousands," and we might all work our arithmetic with a song in our hearts. If attitude determines whether we look upon work as a pleasure or a chore, here is an opportunity to look upon our chores as a game.

But of what practical use to me is the common Do-Re-Mi nomenclature of the dozenal system? Well, for one thing, it might greatly alter our present system of coinage so that, as in England, we could divide the equivalent of our nickels and quarters in half without running into a fractional coin in the five, fifteen, and twenty-five cent area of merchandising. That subject is treated elsewhere.

Oddly enough, in American slang those three syllables thus taken together are synonymous with the word money. Yet the principal field of Do-Re-Mi is not, I believe, in the area of money or music. It is becoming daily more popular to avoid compound denominate numbers and fractions, and the dozenal system offers the greater hope of success in that endeavor in English-speaking countries.

With the dozenal system gathering strength in the field of measures and weights, we might find the Nemesis and the ultimate successor of the metric system with its awkward liquid "fifths" attempting to supplant our "quarts" in the liquid refreshments field, and its fractions of meters never quite equalling our yards, feet, and inches, our gallons, and pounds. Indeed, our day may mark the end of a tactical retreat and the beginning of a mushrooming counterattack which might carry our pound, our foot, our gallon, and other long honored units of measurement among us, beyond our lands and deep into the metric areas of the world. We stand on the threshold of change.

Initially, this is no more than an approach to the beginning of consideration of the usefulness of a dozenal system of measures and weights, and nothing that I here say is to be treated as either sacred or final or to be cut in stone. The subject matter will require much work by many minds before it can flower around the earth.

Metric Terms

Let us first, to understand our problem, glance at the terms used in the metric system of measurements.

Stems are used to denote a type of measurement. For instance, gram denotes weight; meter denotes length, surface, or cubic capacity; liter denotes liquid volume.

Prefixes which denote metric quantity, and the value which each represents, are, for general use, as follows:

Myria	10,000 units
Kilo	1,000 units
Hecto	100 units
Deka	10 units
	1 unit
Deci	1/10 part
Centi	1/100 part
Milli	1/1000 part

Thus, if we use the term kilometer, we know that one kilometer equals 1000 meters; if we use the word centimeter, we conceive it to be one of the 100 parts of a meter. If we use the word kilogram, we picture it as equal to 1000 grams; and if we employ the term centigram, each of us understands it, by common consent, to represent the value of one of the 100 parts of a gram. The same is true of liters. By international agreement, the value of one meter, one gram, or one liter is as fixed as is the value of one U. S. standard foot, pound (Av.), or gallon.

The metric system was not erected purposelessly; fathered by a group of mathematicians who could no longer tolerate the conglomerate systems of measurement and weight existing in their time in France, it was conceived out of necessity and born in Paris during the French revolution. It has been penetrating other nations quite peacefully; but English-speaking countries have resisted, on the whole, quite completely its efforts to substitute decimals for dozens.

Our Own Difficulties

And while our own system of measurements and weights, most of which we brought with us from England, might be said to be less confusing and frustrating than a system found in another nation, yet we must frankly confess it to be a mess when we venture a second step above or below the known value of the foot, the pound, and the gallon.

Even a quick glance at the Troy pound may indicate one of the difficulties in teaching arithmetric today. For instance, note the scales in these denominate numbers:

24 (double dozen) grain equal one scruple;
20 (double decimal) scruples equal one ounce;
12 (single dozen) ounces equal one pound (Troy).

And to bring home the confusion of our present system, let us remind ourselves that there are 12 ounces in one Troy pound, 16 ounces in the Avoirdupois pound, and there are 14.58 plus Troy ounces in the Avoirdupois pound. Only Troy grains and Avoirdupois grains are of equal mass, but there are 7000 grains in the Avoirdupois pound, and 5760 grains in one pound Troy. This, we deliberately inflict upon our children so that they may understand our miseries when they join us in adult activities. Without sacrificing our foot, pound, or gallon, we might eventually teach them more sensible alternate scales above and below those quantities. There is no other reason for this essay.

The metric system is wholly base ten. It contains no compromises with double decimals, double dozens, sixteenths, or eighths. Therein lies its strength, and ease of handling and memorizing. I shall not mention here its disadvantages; but in our own system it is especially frustrating when, to add or to subtract, we must convert feet to inches, pounds to ounces, pints to fluid ounces, hours to minutes, or minutes to seconds. Out of the habits of the past, we employ almost every scale in our present system of measurements and weights from two to sixty, especially favoring eight, ten, twelve, sixteen and twenty.

In the metric system we find the decimal base revealed in all of its utilitarian nakedness. Let us attempt to disclose the dozenal base in its natural beauty and usefulness. We can get away from our scruples, and grains, drams, and pennyweights, without going metric.

Doremic Terms

In the Doremic system of measurements and weights, the common stems are fut, gal, and pound. The United States standard avoirdupois pound is the stem used to denote mass. Its grains are of equal mass with Troy grains, and the grains of either are standardized in their relation to the avoirdupois pound. The U. S. standard foot (both singular and plural shortened to fut) is the stem to denote length, surface, and cubic capacity. The U. S. standard gallon (both plural and singular abbreviated to gal) is the stem to denote liquid volume. We, therefore, possess our basic stems, already standardized by U. S. statutory regulations.

Prefixes which denote quantity in the doremic system of units, and the value which each represents, are, for general use, as follows:

Dozenal Symbol	Doremic Value		Decimal Equivalent
10000	called Domi	equals one dozen, dozen, dozen, dozen units.	20736 units.
1000	Mi	one dozen, dozen, dozen units.	1728 units.
100	Re	one dozen, dozen units.	144 units.
10	Do	one dozen units.	12 units.
1		one of anything.	1 unit.
0.1	Edo	one dozenth part.	1/12 part.
0.01	Ere	one dozen, dozenth part.	1/144 part.
0.001	Emi	one dozen, dozen, dozenth part.	1/1728 part.
0.0001	Edomi	one dozen, dozen, dozen, dozenth part.	1/20736 part.

Observe how the symbol *10000* (Domi), if we think of each cipher as a dozen, describes itself by mere inspection as (count the ciphers) one dozen, dozen, dozen, dozen units.

For limited use, the dozenal symbol *1,000,000,* having the value of one dozen raised to the sixth power, when used as a doremic prefix is called Mammo, i.e., mammofut, mammocrosm, mammoscopic, etc. Also used only in special work, the dozenal symbol *0.000001,* having the value of one dozen, dozen, dozen, dozen, dozen, dozenth, when used as a doremic prefix is called Mimi, i.e., mimifut, mimicrosm, mimiscopic, etc.

The letter "a" is sometimes used in the English language as a prefix to denote the opposite direction or direct opposition, i.e., theist, atheist; gnostic, agnostic; "e" assumes that duty in the dozenal system.

Let us join several stems and doremic prefixes for a trial run.

Length

If we use the term "dofut", we know that one dofut equals one dozen U. S. standard feet, 144 inches, 4 yards, two fathoms, or one Mark Twain.

If we use the word "edofut", we know that one edofut equals one-twelfth part of one U. S. standard foot, or one inch if you wish. And one erefut equals one-twelfth part of one U. S. standard inch, or one pinch if you will say so. One emifut equals one-twelfth part of one pinch, and one edomifut equals one-twelfth part of one emifut or, decimally, 1/20736 part of one foot.

By standardizing the "dofut" to one Mark Twain, the fathom is equal to a half dofut, the yard to a quarter dofut, and we begin to simplify our denominate number system to doremic terms alone.

Table

Dimension (f) symbol for Measures of Length

Dozenal Symbol		Doremic Value		Decimal Equivalent	
f10000	pronounced	domifut,	equal to	20736 ft.	
f1000	"	mifut,	"	1728 ft.	
f100	"	refut,	"	144 ft.	
f10	"	dofut,	"	12 ft.	or one Mark Twain.
f1	"	fut,	"	1 ft.	or 12 inches.
f0.01	"	edofut,	"	1/12 ft.	or 1 inch.
f0.01	"	erefut,	"	1/144 ft.	or 1 pinch.
f0.001	"	emifut,	"	1/1728 ft.	
f0.0001	"	edomifut,	"	1/20736 ft.	

Liquid

If we use the word "dogal", we know that the dogal equals one dozen U. S. standard gallons of bulk liquid.

If we use the term "edogal", we know that one edogal equals one-twelfth part of one U. S. standard gallon, or two-thirds of one U. S. standard pint of liquid. Also we know that three edogal equal two pints, or one U. S. standard quart; and that six edogal equal four pints or two U. S. standard quarts.

We might note at this point that, in purchasing gasoline or petrol for your car or truck, ten British Imperial gallons of petrol are so nearly equal to one U. S. standard dogal that a thimble will swallow the difference, or one rapid acceleration.

Incidentally, the edogal (2/3 pint) is already being enjoyed commercially by a large supplier who by a recently developed process reduces one quart of whole milk to a quantity equal to two-thirds of a pint, freezes the concentrate at 15 to 20 degrees below zero, and so delivers it. This edogal, still frozen, is placed in a milk container with two edogal of distilled water, and, as its temperature rises, it becomes on shipboard one quart of pasteurized, cooled, delicious, American fresh milk. That system was pioneered, I am apprised, at the Iowa State College at Ames. (See Farm Journal December 1954, p. 37, Frozen Milk).

If one gallon of concentrate could be separated or scored in one layer of three dozen frozen cubes (6 x 6), each cube, containing 4 eregal, might be placed in eight eregal of distilled water in a milk glass, producing one edogal (2/3 pint) of cool, fresh, whole milk on the table, when Johnny arrives home from school. Thawed out and used straight, it is said to whip just like cream. It is said to make good coffee cream when mixed with equal parts of water. So actually, one might retail three products in one flat, gallon, waxed container, easy to store in the freezing compartment, compact, nonspillable.

Table

Bulk Liquids (g) Symbol for Measures of Volume

Dozenal Symbol		Doremic Value		Decimal Equivalent		
g10000	pronounced	domigal,	equal to	20736	U. S. standard gallons, liquid.	
g1000	"	migal,	"	1728		
g100	"	regal,	"	144		
g10	"	dogal,	"	12		
g1	"	gallon,	"	1	"	gallon, "
g0.1	"	edogal,	"	1/12	"	" "
g0.01	"	eregal,	"	1/144		
g0.001	"	emigal,	"	1/1728		
g0.0001	"	edomigal,	"	1/20736		

Table

Precious Liquids (n) Symbol for Measures of Volume

Dozenal Symbol		Doremic Value		Decimal Equivalent		Present Terms
n10000	pronounced	dominal,	equal to	20736	Edomigal	or 1 U.S. stand. gallon, liquid.
n1000	"	minal	"	1728	"	or 1 Edogal or 5120 minims.
n100	"	renal	"	144	"	or 1 Eregal or 426-2/3 "
n10	"	donal	"	12	"	or 1 Emigal or 35.55 "
n1	"	nal	"	1	"	see Bulk Liquids, or 3 " , short.
n0.1	"	edonal	"	1/12	"	" " "
n0.01	"	erenal	"	1/144	"	" "
n0.001	"	eminal	"	1/1728	"	" "
n0.0001	"	edominal	"	1/20736	"	" "

Mass

If we use the word "dopound", we know that one dopound equals one dozen U. S. standard pounds, avoirdupois.

If we use the word "edopound", we know that one edopound equals one twelfth part of one U. S. standard pound, avoirdupois. And everything being in dozenth parts, we may eventually forget whether twelve or sixteen ounces equal the pound, and pupils no longer will need to learn, except for historical purposes, the number of scruples in one ounce.

Groceries, if purchased by the pound, may be measured by one or more (three, seven, nine, or eleven) edopounds, every housewife eventually becoming familiar with the fact that twelve edopounds equal one pound; that twelve pounds of potatoes, for instance, equal one dopound.

Some grocery scales now are being developed to divide pounds into ten decimal parts. If we can stand that break with tradition, the end of our compound denominate number system is closer than we think. Gasoline is being retailed in the U. S. nominally in tenths of gallons, but is actually measured by the dollars and cents scale; and its price is always quoted "per gallon." If you advise the service station attendant to "fill the tank" of your automobile, he will endeavor to end up on a round cent; to that extent, it might be said that we retail gasoline to the customer and motorist by the hundredth part of the dollar. And no doubt we will continue to do that until our monetary system is improved.

Field corn and small grains, more and more fed or sold by their weight in pounds, need no longer be measured by a bushel basket. It approaches a legal fiction to quote the price per bushel, and fewer farms each year keep a bushel basket around. Eventually, we might quote and sell grains by the pound, the dopound (12 lbs.), the four-dopound (48 lbs.), the repound (144 lbs.) or even by the domipound (20736 lbs.) when transferred in large, single deals. They divide readily into halves and quarters and thirds down to the pound and below.

If corn sells at $1.40 per bushel, it equals 2½¢ per pound, 30¢ per dopound, or $3.60 per repound. The repound is the better unit of price quotation, perhaps, since it may fluctuate upward or downward by one cent without the use of fractions of a cent.

The doremic system embraces only simple denominate numbers. Compound denominate numbers are entirely avoided, just as they are unknown to the metric system.

Some of the units and the larger and smaller containers might be shown with a prefix letter to indicate their stem, quite the same as we prefix the $ sign to indicate that we are referring to money denominations in the United States of America. The symbol for the avoirdùpois pound (#) is familiar to grocers and meat markets throughout the land.

Table

Avoirdupois (#) symbol for Measures of Weight

Dozenal Symbol		Doremic Value		Decimal Equivalent	Troy or Apothecary Grains
#10000	pronounced	domipound,	equal to	20736 lbs.	
#1000	"	mipound,	"	1728 lbs.	
#1000	"	repound,	"	144 lbs.	
#10	"	dopound,	"	12 lbs.	
#1	"	pound,	"	1 lb.	or 7000 grains.
#0.1	"	edopound,	"	1/12 lb.	or 583 plus grains.
#0.01	"	erepound,	"	1/144 lb.	or 48 plus grains.
#0.001	"	emipound,	"	1/1728 lb.	or 4 plus grains.
#0.0001	"	edomipound,	"	1/20736 lb.	or 1/3 plus grain.

Transforming Denominate Numbers

A denominate number in the doremic system can be changed to the next higher denomination simply by moving the dozenal point one space.

In measures of surface, since it requires *100* (one re) of any denomination (dozen times dozen) to make one of the next higher, the dozenal point must be moved two places at once.

And in measures of cubic capacity, since it requires *1000* (one mi) of any denomination (dozen times dozen times dozen) to make one of the next higher, the dozenal point must be removed three places in a single change to the next denomination.

We can best illustrate these principles by setting forth tables of length, surface, and capacity, as they move from one denomination to the next.

Table

Doremic Measures of Length

Dozenal Symbol	Doremic Value	Doremic Denomination	Decimal Equivalent
10 (pronounced do)	edomifut equal	1 emifut,	or 1/1728 part of 1 U.S. stand. ft.
10 (" do)	emifut "	1 erefut,	or 1/144 part 1 " ft.
10 (" do)	erefut "	1 edofut,	or 1/12 part 1 " ft.
10 (" do)	edofut "	1 fut,	or 1 " ft.
10 (" do)	fut "	1 dofut,	or 12 U. S. standard feet.
10 (" do)	dofut "	1 refut,	or 144 " "
10 (" do)	refut "	1 mifut,	or 1728 " "
10 (" do)	mifut "	1 domifut,	or 20736 " "

Table

Doremic Measures of Surface

Dozenal Symbol	Doremic Value	Doremic Denomination	Decimal Equivalent
100 (pronounced re)	sq. edomifut equal	1 sq. emifut,	or 1/144 square pinch.
100 (" re)	sq. emifut "	1 sq. erefut,	or 1 square pinch.
100 (" re)	sq. erefut "	1 sq. edofut,	or 144 sq. pinches, 1 sq. in.
100 (" re)	sq. edofut "	1 sq. fut,	or 144 sq. inches, 1 sq. ft.
100 (" re)	sq. fut "	1 sq. dofut,	or 144 sq. feet.
100 (" re)	sq. dofut "	1 sq. refut,	or 144 square dofut.
100 (" re)	sq. refut "	1 sq. mifut,	or 144 " refut.
100 (" re)	sq. mifut "	1 sq. domifut,	144 " mifut.

Table

Doremic Measures of Capacity

Dozenal Symbol	Doremic Value	Doremic Denomination	Decimal Equivalent
1000 (pronounced mi)	cu. edomifut equal	1 cu. emifut	or 1/1728 cu. pinch.
1000 (" mi)	cu. emifut "	1 cu. erefut	or 1 cubic pinch.
1000 (" mi)	cu. erefut "	1 cu. edofut	or 1728 cu. pinches, 1 cu. in.
1000 (" mi)	cu. edofut "	1 cu. fut	or 1728 cu. in. or 1 cu. ft.
1000 (" mi)	cu. fut "	1 cu. dofut	or 1728 cu. ft. or 64 cu. yds.
1000 (" mi)	cu. dofut "	1 cu. refut	or 1728 cu.dofut, 110592 cu.yds.
1000 (" mi)	cu. refut "	1 cu. mifut	or 1728 cu.refut, 191102976 cu.yd.
1000 (" mi)	cu. mifut "	1 cu. domifut	or 1728 cu. mifut.

In computing the capacity of commercial vehicles, the cubic contents of rooms, surface of windows, walls, floors, rugs, now shown in compound denominate numbers of feet and inches, the Doremic dozenal system of measurements might prove itself more useful to architects, carpenters, builders, and manufacturers simply because fractions seem to just vanish. We may add or multiply feet and inches without converting to inches. We may subtract or divide without meeting any apparent fractions.

Soon we may see the dozenal adding machine in extensive use in the transportation of freight and cargo.

The big effort today is to standardize sizes, to avoid fractions, to construct buildings so that when in place a certain number of parts will equal the length of so many feet or so many inches. In brick, incidentally, units of four inches (4 edofut) or their multiples (8 edofut, 12 edofut, 16 edofut) are emerging as popular dimensions. Automobile license plates tend to standardize at six by twelve edofut.

A grocer or grosser originally was one who bought and sold by the gross or some twelfth part of a gross or dozen. Since one re is equal to one gross in doremial nomenclature, all retailers might now be classed as those who tally and sell by the re or some twelfth part of the re or the dozen; those who tell or tally by the re, and hence, retailers, tellers, or talliers. Originally it meant "a piece cut off" or "to cut again." The word retail is especially fitting, since it is in retailing that dozens prove so essential.

The metric system has been resisted in English-speaking countries around the earth; and also in other nations which have adhered from time immemorial to habits of merchandising, particularly wholesaling, in terms of dozens, gross, and dozens of gross. Their reasoning is simple. The metric system is just plain impractical.

One phase of resistance to that system lies in the inability of the metric system to break down into thirds and quarters as readily as in halves, without breaking into a bottle or a bunch or a bundle of lower units.

Take liquids, for instance. Divide a gallon of liquid into ten parts, placed in ten receptacles. You may want to buy a quarter of a gallon. You can buy two one-tenth gallon bottles or three, but not a quarter gallon without opening one of them. If you want a third of a gallon, you must buy either three bottles or four but you can not buy three and one-third bottles (1/3 gallon) without opening one of them and removing a portion. It is no more palatable that you use the term liter instead of gallon. Metrically, we become slaves to numbers instead of letting numbers work for our pleasure.

Theorectically, fractions may exist; and a sufficient number of fractions might add up to one whole number, but no one, in fact, wants to split bundles or bottles or bunches or packages to conform to odd fractions.

If, on the other hand, you will divide a gallon of liquid into a dozen parts, placed in twelve receptacles, you may buy or sell at retail one-sixth of a gallon (2 bottles), one-quarter of a gallon (3 bottles), a third of a gallon (4 bottles), a half gallon (6 bottles), two-thirds of a gallon (8 bottles), three-quarters of a gallon (9 bottles), or any number of one-twelfths of a gallon, without breaking the seal or bond of any edogal container. In this manner, the reputation of the manufacturer or the packer is carried direct to the purchaser; and this will encourage more direct advertising by the manufacturer or packer or producer.

Everyone enjoys music of one type or another. In practicing Do Re Mi the voice rises in a musical scale. In running the scale, Mi Re Do we come down the steps. In the doremial nomenclature of the dozenal system, denomination changes are suggested by that same musical scale. Thus,

Mifut (1728 units), and again, Mifut,
Refut (144 units), Refut,
Dofut (12 units), Dofut.

More and more, men will count by dozens, particularly in transportation and in the building trades and professions. Pinch by pinch, inch by inch, and foot by foot, glaciers move to the sea. As unstoppable as a glacier, dozens are descending upon us, do what anyone will to stop the avalanche.

The doremic system of measurements would come like a cyclone if merchants and hucksters should persuade the Congress to set up a Doremic Branch in the Office of Weights and Measures, National Bureau of Standards. But a cyclone is often destructive, and perhaps we should gladly accept the pace of the glacier or some other moderate rate of travel to which the subject matter may naturally gravitate according to its usefulness.

THE MAIL BAG

Horatio E. Hallwright, whose duodecimal proposal is the leading article this issue, has the interesting address of "Lowlands," 4387 Majestic Drive, Victoria, B. C. He was born in Greenwich, England, and in his youth lived at Birmingham, where his forbears were contemporaries of, - and acquainted with Herbert Spencer.

A unique feature of Mr. Hallwright's proposal is the division of the half-circle and the half-day duodecimally. This permits exact conformity with the hour of the present time measure, and the angle of 15° of arc. The international time zones are 15°.

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We recently learned of the publication of a duodecimal proposal in French, - DOUZE, NOTRE DIX FUTUR, written by Jean Essig, and published 1955 by Dunod, Paris. The basis of Mr. Essig's theme is the revision of the French decimal Metric System on the duodecimal base. We have secured a limited number of this paper-bound edition for interested members at $1.50 a copy, and expect to have a review of this important work in the next Bulletin.

Mr. Essig's proposed division of the day to arrive at a unit of time resembles Mr. Hallwright's, but the angular measure differs. Mr. Essig derives his unit of length from the duodecimal subdivision of the circumference of the earth, and consequently his proposed angular measure is a duodecimal subdivision of the entire circle.

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The paper by Henry C. Churchman on the duodecimal weights and measures of his Do-re-mic System acquires added importance with the appearance in the May issue of The Mathematics Teacher of an article by him on a proposed currency for the Do-re-mic system, titled, "Our National Debt Reduced to 54,253,475 Dominions." The terms for the denominations and coins which he derives from the Do-re-mi nomenclature are remarkably apt.

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In April, the members of the Ridgewood High School Duodecimal Mathematical Society, (RHSDMS.,) made an excursion to these headquarters. Ridgewood is in New Jersey, and the distance involved is not inconsiderable; especially when one realizes that the trip by train, bus, ferry, and afoot was made in their free time and at their own expense, their eager interest is impressive. We all had a wonderful time, and hope to get together soon again.

In April, too, we enjoyed a telephone call from Jamison Handy, Jr., Editor of Dozenal Doings. He and his wife Rosemary were making a vacation airflight to Washington while the grandparents manned the fort at home at Pacific Palisades in the Los Angeles area. He called from La Guardia field, here. We owe a great debt to Jux for his fine work on Dozenal Doings.

We have just received a copy of the report on Problems in Mathematical Education by the Educational Testing Service, and have read it with interest. The picture it presents should occasion considerable alarm. It finds the pupils uninterested. It finds the teachers poorly based in their subject and somewhat antagonistic toward it. The only areas in which satisfactory accomplishment was found was where the emphasis was on discipline.

This is natural and might have been anticipated. What more can be expected when the base of our arithmetic is an obsolete number system, only adequate for primary counting operations, and too awkward in today's computations, transformations and analyses.

Obviously the only recourse is to discipline. But we would like to suggest that there is a refreshing aid available. The four fundamental operations of arithmetic having been learned, the pupils should be introduced to the idea of other number systems than the ten. They should learn to handle the same four operations on the natural dozen base. As they do their problems of quantity and measure, they can comprehend the advantages of the ideal system of numbers and measures. The stimulus adds pleasure to their work and lends wings to their imagination. They gain clearer concepts of all number and all measure, and the stodgy repulsiveness of their arithmetic is gone.

Their familiarity with the twelve base will help to hasten the inevitable ultimate change, and to ease clear thinking in the future.

We believe that this is solution of the problem at its source, rather the treatment of symtoms.

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We are always delighted when eager young scholars select duodecimals as the subject of their project for the annual talent search. We wish to cite especially the work of Sidney Rautbort, Glen Miles and Jay Anderson. Their themes were so excellent that we wish to publish them when space and time permit. But we believe that we should utter a word of caution.

The essential requirement and criterion for these projects is originality. The many years that have passed since Simon of Bruges first (?) realized the advantages of the twelve base have recorded an impressive wealth of independent thinking. The range of these good minds makes originality today improbable without thorough familiarity with what they have done. Good work by these talented young scholars will be recognized, but they may limit the degree of attainment possible through the choice of a most difficult field.

Walter Measday, a friend to us and to the Society, called our attention to a reference to duodecimals by Sir Winston Churchill. Sir Winston, in his impressive new work, A HISTORY OF THE ENGLISH SPEAKING PEOPLES, describes the raiding of the English coasts and settlements by the Danes in the latter part of the 800 century. On page 111, of Volume 1, he reports:- The reformed and placated mariners brought with them many Danish customs. They had a different notation, which they would have been alarmed to hear described as the "duodecimal system." They thought in twelves instead of tens, and in our own day in certain parts of East Anglia the expression "the long hundred" (i.e., 120) is heard on market days.

We are delighted, though not surprised, that duodecimals have earned their way into a place in Sir Winston's capacious mind.

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Among our members, there must be several who find pleasure in extended personal correspondence, and have the time and the facilities to cultivate it. We wish they would volunteer to undertake for the Society an interchange of comments and ideas with a limited number of our members, so that they and the Society would be brought into more intimate and more frequent contact.

Ye Ed.