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	75	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 *34* Volume *19*, No. *2*
December 1966 *(117X)*

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.

The forms of membership include Honorary, Life, Fellow, and Senior Members, as well as Members and Student Members. Members and Student Members are not required to pass aptitude tests in base twelve, but are encouraged to do so.

Senior membership with voting privileges requires passing of elementary tests in the performance of twelve base arithmetic. The lessons and examinations are free to those whose entrance application is accepted. Remittance of $6, dues for one year, must accompany application. Forms free on request.

The Duodecimal Bulletin is an official publication of the Duodecimal Society of America, Inc., 20 Carlton Place, Staten Island, New York 10304. Kingsland Camp, Chairman of the Board of Directors; Charles S. Bagley, President; Jamison Handy, Jr., Editor. Permission for reproduction may be granted upon application. Separate subscription rate $2 per year.

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The Duodecimal Bulletin

All figures in italics are duodecimal.

ANNUAL MEETING

The Duodecimal Society of America held its annual meeting of members and the Board of Directors on July 9, 10, and 11, 1966, in Albuquerque, New Mexico, at the Holiday Inn.

The following were elected to the Board of Directors by the membership, to-wit:

Board Members Class of *1181* (1969)

F. Emerson Andrews, 34 Oak Street, Tenafly, New Jersey 07670;
Henry C. Churchman, 10 State St., Council Bluffs, Iowa 51501;
Jamison Handy, Jr., 659 Via de La Paz, Pacific Palisades, Ca;
Eugene M. Scifres, 1580 S. Milwaukee St., Denver, Colo 80210.

Chairman of the Board of Directors, Kingsland Camp, Hotel Shelton Towers, New York, N. Y. 10017, was reelected.

The following other officers of the Society were elected:

Charles S. Bagley, President, 1314 Ohio Av., Alamogordo, N.M. /88310;
Henry C. Churchman, Vice President;
Tom B. Linton, Secretary, 11561 Candy Lane, Garden Grove, Cal /92640;
Eugene M. Scifres, Treasurer.

Jamison Handy, Jr., was reappointed by the Board as Editor of the Duodecimal Bulletin, and stated that enough material was on hand to prepare another bulletin in December.

At the suggestion of Jamison Handy, Jr., all present remained silent for the space of 50 seconds to honor Americans who, so long as they stand free, have rejected compulsory exclusive use of the base-ten metric system of weights and measures.

Henry Churchman noted that legal use of that system alongside our customary weights and measures was authorized by the Congress of the United States just one hundred years ago this month and that we as individuals should urge the congress to authorize the voluntary use of an approved base-twelve metric system alongside the base-ten obsolete system.

"The talk of 'adopting' a Metric System," said Tom B. Linton, "is a form of non-truth. By Act of Congress one hundred years ago the Metric System was legalized---adopted. The current action is an attempt at prohibition of non-Metric units and measures. The euphemism 'adoption' seems to me to be intended to conceal the harsh facts of government-enforced prohibition of other systems. We experimented with prohibition once before in ratifying the 18th Amendment of the U. S. Constitution, and later found it necessary to adopt the 21st U. S. Constitutional Amendment to repeal the 18th. The world needs a better metric system, and this country of high technology and comprehensive schools could lead in developing and implementing such twelve-based system."

Charles S. Bagley stated that if the advice of Laplace in the first instance (or Essig in 1955) had been heeded that French metric units employ base-12 throughout, not only might the entire world be metric-minded today, but metric time, angle, navigation, and money might be in full use around the earth at this moment---and "we would not need to be here on the present business."

Council Bluffs, Iowa, on the invitation of Henry Churchman, was selected for the 1967 annual meeting, to be scheduled for some time in the Spring and the membership duly notified by the Secretary.

President Bagley declared the membership meeting adjourned sine die.

The minutes of the meeting of the Board of Directors are here omitted---consult Secretary for full details.

On the third day members took off in all directions by train, plane, and motor car, like fires from a Roman candle. We trust they were imbued with equal Pentecostal fervor.

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EXCERPTS FROM LETTERS AND COMMENTS:

J. HALCRO JOHNSTON, Orphir House, Orphir, Orkney, observes that "For more than two centuries architects and surveyors have used twelve arithmetic under the name *duodecimal*, and until recently the subject was explained in standard arithmetic books. But, sad to say, these men did their best to strangle it at birth. Like the figures on the clock they dressed it up in decimal clothes using double figures for ten and eleven. Thus, all the advantages of place value are lost and the calculations look most forbidding."

Editor's note: Write JHJ for his leaflet "Simpler Sums", free we think, but let us suggest that you enclose a self-addressed 4 by 9 envelope stamped for 1 oz. letter mail. The reason will appear why the U.S. and U.K. might have to go wholly decimetric before they can go wholly duodecimal. And during their forty dozen months in the desert, longing for the so easily performed arithmetic they shall have lost, these modern Chosen People of God being punished for their failure to employ their talents to their full capacity, cannot be expected to give those poor, decimal metric measures more than a cursory trial. Happy the man who senses that short life for decimetres. Perhaps to him will fall the lot of missionary to the French, as Augustine came to England and Patrick to Ireland centuries ago, since he shall be aware of the SI decimetric handicaps in every field of weights and measures. Some suspect the Russians now to be employing base-twelve in several technical fields, including angles and dimensions.

INCHES AND MILES

More Metric Than French Meters

By Henry Clarence Churchman, B.A., LL.B.

(Published with slight emendations by arrangement with the DUODECIMAL NEWSCAST of the Duodecimal Society of Great Britain, in which this article first appeared, May 1966, pp 5-8.)

Can we, as prudent persons, safely base our new dozenal unit of dimension on the international yard, which is dependent on the meter, which is based on a certain number of wavelengths of orange-red krypton 86 light? Inches and miles will never disappear, but it is doubtful that we can risk the definition of a Great Circle of the Earth on the present international foot. Today's meter-defined international inch contains 41,929.3987 krypton 86 light waves only so long as the meter remains equal to 1,650,763.73 such wavelengths---and an increase has been now suggested in France.

If one were properly to set up an independent system of mensuration it should be based NOT on the meter which is always itself subject to possible change. Perhaps it can be based, for permanency of comparison, on the foundation which now supports the meter and appears to be an invariant---krypton 86 light.

After we eventually move away from our present definition of the international yard and describe it independently, together with the foot and inch, in terms of krypton 86 light waves, as we do the meter, a Canadian inch might well be enlarged by not quite so much as 14 kr. 86 wavelengths, to total 41,943-3/11 exactly. Unless one is highly trained and has the necessary equipment to measure this small difference, the kr. 86-defined inch will appear to carpenters and cabinetmakers equal to the present inch, but this change would stretch our international or Canadian mile by perhaps one and three-quarters feet. In other words, a carefully surveyed distance across America equal to 3001 Canadian miles would be quite precisely equal to 3000 modern international or independent kr. 86-defined miles.

Dozenal Metric System Now Possible

If you would place exactly 44 such kr. 86-defined inches in a new dozenal unit of length, it will equal 1,845,504 kr. 86 wave lengths, or the dozenal metric dimension which has been called one "dometron." This important last cited quantity can be divided by 12 again and again, resulting in whole numbers until we drop to *7*5 krypton 86 light waves. It is known, and can be proven, that exactly *7*;5 kryp. 86 light waves times the twelfth power of twelve are equal to one great circle of the earth.

If we should place one gross "dometrons" into a new dozenal dimension unit, which for identification here we might call one "edon", it will be found quite precisely equal to one-tenth of the present International or Canadian mile. Actually, the edon is about 1/3000th part greater, or slightly more than two inches longer than the one-tenth Canadian statute mile.

But more important, that edon when multiplied by the fifth power of twelve is equal to the length of a great circle of the earth. Commonwealth and U. S. motor vehicles might continue to measure all traveled distances by the present one-tenth mile. Here now is a small wedge to open the tightly closed eyes of both the metric and nonmetric worlds.

No longer need anyone wonder why Englishmen, so long as they were free, held tenaciously to their inches and their statutory land miles. With some exceptions they kept their feet on the ground in the great English tradition, although legally free for over five score years to use such parts of the decimetric system as pleased them. Let us examine possible uses of those English unit lengths---44 inches or feet or the one-tenth mile.

We could in aid of navigation, and I believe eventually must, adopt one dozen krypton 86-defined one-tenth miles as our international "Aeromile", to distinguish it from both the nautical and land miles. An important and increasing segment of our total transportation now rides in the atmosphere.

This "air-mile" multiplied by the fourth power of twelve is equal to the length of one circumference of the earth. One Aeromile or Nante is exactly equal to 6,336 kr. 86-defined feet, and is equal also to the arc of 62-1/2 seconds of angle of one great circle of the earth. Thus, as 60 seconds of angle of a great circle is said to equal one nautical mile (1852 meters), an aero- or air-mile, counting by dozens, is the equal of *1000* dometrons exactly. That is to say, one greatgross dometrons.

We can divide and subdivide the length of a Great Circle of the Earth (as we do the face of a clock) into twelve equal parts again and again, and find, for instance, that one Great Circle when multiplied by the minus fourth power of twelve is the equal of one Aeromile. Stated another way, one great circle of the earth is equal to *10 000* (one dozen greatgross) Aeromiles even, with no fractions of the dozen or gross.

Will 1852 meters multiplied by any power of ten equal the dimension of a great circle of the earth? Think of this before we court the base-ten metric system. This exhibits a glaring flaw in the 18th century metric system, wherein it lacks capability. In navigation the nautical mile, unlike the aeromile, is wholly unmetric. The French base-ten metric system can do nothing for it.

Inches Inherit the Earth

Englishmen could employ their ancient custom of dividing the shilling, in dividing the circle, as well as in dividing an aeromile on land, on water or in space; and enjoy a decent period of time in each separate industry, in which to change to the krypton 86-defined duodecimal metric system. After the changeover they could still count by their dozens and gross.

This modification might greatly aid civilian navigation and transportation in the air and on water immediately, replacing the nautical mile by an aeromile, with an equal employment of

that very same dozenal unit of distance on land. It is not too difficult to convert our astronomical almanacs as we print new ephemerides, until such time as astronomers rejoice in the dozenal system of angles, tied to our dozenal metric divisions of a day. In the meantime, we could retain all those dimensions cherished by the common man on the street.

In fact the whole English-speaking world, or any part, in a great metric system of its own, might continue to employ interchangeably the well-known one-tenth miles (no need to change mileage meters in use today on motor vehicles), the not uncommon American 44-foot street widths, and the 44-inch length (as well as the inch and all currently used fractions of an inch).

Since eventually we may expect to derive our own cubic metron and liquid measures, and ultimately a new system of weights, from inch or dometron lengths, we should be extremely exact, as well as certain that our base is immutable and neither dependent on the computed length of any great circle of the earth nor the dimension of a bar housed near Paris. Wavelengths of the orange-red krypton 86 light, by which a meter is defined today, are not unsuitable for describing our kr. 86-defined inch, and they are extremely exact as well as acceptable to the General Conference on Weights and Measures.

The krypton 86 dozenal metric system of lengths equal to 44 inches, and the one-tenth international modified mile, can supplant the base-10 metric system around the world as Englishmen now in authority begin to reflect their own beliefs and freedom and power. It can surpass and outlast the base-10 metric system (which is an unseaworthy land-measuring system) and ultimately compel its modification---as presently urged by thinking Frenchmen able to rise above conformity.

Other peoples of the earth no longer have to count on their fingers but can, as do Englishmen, conceive of the idea of one dozen units or one dozen parts. This dozenal capacity is self-evident in the manner in which a 6-pack or dozen cans or scones or eggs or bottles are packaged and sold to the general public around the earth today. And so much is traded in the many multiples of twelve.

Today's Englishman can not recall a time when he found it at all difficult to group, package, or count by dozens. The world might never forgive him if tomorrow he tosses away that national capability, only to drop to the mediocrity of a decimetric One-World.

Definition of the Dometron

The dometron length might be more accurately described today and better understood in an existing decimal age, by speaking in the Decimal tongue and employing an international language of great precision and ancient lineage, as follows:

Le dométron est la longeur égale à 1 845 504 longeurs d'onde dans le vide de la radiation correspondant à la transition entre les niveaux $2p_{10}$ et $5d_5$ de l'atome de krypton 86.

This method follows the rule employed by the Eleventh General Conference on Weights and Measures in defining the length of an international meter; and possesses the merit that it retains a practical relationship between the dometron and the meter for future comparisons in wavelengths of orange-red kr. 86 light.

The foregoing ideas are not unique or parochial. Mr. Shaun Ferguson, a member of The Duodecimal Society of Great Britain; Mr. Horatio W. Hallwright, a native Englishman settled in Victoria, Canada; Mr. Charles S. Bagley, a scientist of Alamogordo, New Mexico, President of The Duodecimal Society of America; and the brilliant M. Jean Essig of Paris, France, have each, independently of each other and of this writer, advanced in his own writings a not dissimilar but more lucid system of metric dimensions quite precisely equal to the 44-inch unit and the one-tenth statute mile described above, or some dozenal division or multiple, perhaps doubled, or halved in one instance.

They differ in their method of approach to a Great Circle and names of their units. Since a thousand scientists might come up with an equal number of great-circle-lengths we perhaps with a Great Circle in the background, could achieve a concensus by defining our basic dimension in wavelengths of orange-red krypton 86 light equal to *7;5* multiplied by some power of twelve, between *7;5* and *750 000 000*--the length of one duodecimal kilometer or Nante or Navinaut or Aeromile.

The dozenal metric system is a vital thing today. No other scientific effort is more urgent or more basic than achievement of a dozenal unit of measurement more precise than the present meter. No other units of measure, no matter what we call them, will bring so much glory to English-speaking people as the "dometron" and the "edon" lengths, so expressive of the usefulness of British inches and feet now in service around the earth. The English inch always was intended to serve humanity, not to rule the world. It might continue in this role to the end of time.

The old and the new units possibly were foreshadowed and preserved for us in one of the Magna Charta original documents written in 1215 on parchment which today can be said to measure one-third yard by one-half dometron (12 by 22 inches). The dometron and the yard represent two different dimension systems; an inch is common to both.

The dometron is not too foreign to grow on French or English soil. The diameter of the presently proposed tunnel beneath the English Channel, between Dover and Calais, is precisely six dometrons (22 feet). For Americans, all 8 horizontal dimensions of the octagonal central room designed and built by Thomas Jefferson, author of the Colonists' Declaration of Independence and later President of the United States, are each six dometrons long. His home in Virginia, "Monticello", is now a national shrine.

Jefferson was very active in the national government when the Congressional Township, containing three dozen square miles, took shape and became known later as the Northwest Ordinance of 1787. Most congressional townships as surveyed might fit snugly in a square area five *Aeromiles* on each side. Each Canadian square mile is quite exactly equal to one hundred duodecimal hectares, the land or crop measurement suggested by M. Jean Essig in his base-12 improved metric system described in "Douze, Notre Dix Futur" (Twelve, Our Modern Ten), Dunod, Paris 1955. Every duodecimal hectare and "Garden" or "Square Edon" will quite nearly match. So don't throw away the Canadian one-tenth mile in a thoughtless mood of reform. The opinions expressed above are the author's own and do not necessarily represent the views of DSGB or DSA or of any person whose name appears herein by reference.

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URGES USE OF BASE TWELVE IN SCIENCE (Continued from p. *33*.)

A comparison of the simplest fractions reveals:

Deci.	.5	.25	.125	.0625	.03125	.015625
Duod.	*;6*	*;3*	*;16*	*;09*	*;046*	*;023*

Take one-third of these:

Deci.	.16667	.08333	.04133	.020833	.010416	.0052083
Duod.	*;2*	*;1*	*;06*	*;03*	*;016*	*;009*

Take one-fourth:

Deci.	.125	.0625	.03125	.015625	.0078125	.00390625
Duod.	*;16*	*;09*	*;046*	*;023*	*;0116*	*;0069*

The nearest simple fraction that can be handled as easily in decimals as in duodecimals is one-fifth. But it is much too complicated for simple applications. Who can divide a square, a cube, a line segment, or even a pie into five equal parts as easily as he can into two, three, or four? Even six, because of its symmetry, is easier to use than five cuts of a pie.

In this article duodecimal terminology has been purposely avoided in order that some advantages might be pointed out without having to learn a new language.

A complete appreciation can be arrived at only after adopting two new symbols as substitutes for 10 and 11. The field for research and development with this new system is wide open. And scarcely anything has been done by large corporations compared to the possibilities. One exception is the telephone company---its growth is more likely to drive it to duodecimals ahead of the automotive industry, for instance.

Above article first appeared on page 3, Monthly News Bulletin of the Holloman Section, American Rocket Society, Vol. 6 No. 6, which is dedicated to the exploration of the vertical frontier and to the conquest of space. It contained the introductory comment that Charles S. Bagley of Alamogordo, New Mexico, is currently national president of the Duodecimal Society of America and recently was host of the annual meeting of the Directors and others interested in that movement.

DUODECIMAL SOCIETY URGES USE OF BASE TWELVE IN SCIENCE

Charles S. Bagley

The idea of counting by dozens antedates the Duodecimal Societies by some centuries. It may date from a comment of Simon Stevin, inventor of the decimal point, in 1585.

In England prominent proponents include Sir Isaac Pitman, who tried to induce his shorthand students to use duodecimal counting as early as 1855; Thomas Leech, whose *Dozens Versus Tens* in 1866 was the first substantial book on the subject; and Herbert Spencer, who made provision in his will for funds to oppose any action by the British Parliament toward introduction of the "metric" system into England.

Spencer's action may have been unfortunate, for it seems to have carried a useless spirit of animosity into our space-age. The battle of the foot and inch versus the meter and centimeter is as acrimonious, in some quarters, as was the equally useless controversy between supporters of Newton and Leibnitz over the calculus.

It is true that the American and English weights and measures appear to be more integrable with a dozenal system than their metric counterparts. However, the creation of the duodecimal, or any other numbering system, is entirely independent of the standards of weights and measures that may be used with it.

In America a few minor efforts had been made to promote duodecimal counting including Nystrom's Duodecimal Proposal, Parkhurst's material in his magazine *The Plowshare* and Perry's pamphlet "The American System of Mathematics", published in 1929.

The present wave of duodecimal interest may be said to stem from an article "An Excursion In Numbers", by F. Emerson Andrews, published in the *Atlantic Monthly* in October 1934. Since then Terry's *Duodecimal Arithmetic* and "The Dozen System" and others' articles at home and abroad have appeared.

Jean Essig, Director General of Finances in France, published *Douze Notre Dix Futur* in 1955. A recent article in *The New Yorker* magazine called forth responses from as far away as Johannesburg, South Africa.

Duodecimals have intrigued mathematicians in many countries. This is because deficiencies in our common decimal system have long been recognized.

Traditionally we use a decimal system probably because it is an inheritance from our ancestors who used their fingers to count. It is wrapped in the aura of superstition and "lucky number" but it is not the best system.

Others are known to be superior; even digital computers can not use the decimal system directly. Compared with the duodecimal system its base is only half as factorable and its capacity, e.g., in the four digit range, is less than half as great.

The decimal system does have an advantage over the binary for mental calculations such as making change at the grocery store.

Furthermore it is superior to octal because it has even and odd factors and greater orders of magnitude. But the *duodenary system* has greater capacity and factorability than any of the common bases, including the binary, trinary, quaternary, quinary, octenary, and denary. It also has the advantage of being the smallest, hence the simplest base with greater capacity than the common decimal system.

In addition, it is the smallest base having all of the following characteristics: four factors; three perfect squares; three square roots; two cubes; two cube roots; odd and even factors one of which is a square number; the first five factorials expressible with one significant figure; the first four reciprocal factorials expressible with one significant figure; four factors integrable with time which is the only universally adopted standard in the world.

When it is realized that the dozen-based system contains all of the above advantages it is easy to understand why those who have given it serious thought agree that it is a superior system. To illustrate, compare two cubes, one of which is divided into ten and the other into twelve parts on a side. The cube whose side is ten can be divided into 8 smaller cubes whose side is five; 125 cubes whose side is two; and 1000 cubes whose side is one.

The cube whose side is twelve gives 8 cubes of side six; 27 cubes of side four; 64 cubes of side three; 216 cubes of side two; 1728 cubes of side 1. The superiority of the cube divided by twelve for easy computation of cubage is apparent.

But even more important is the possibility of combining rows of integral cubes for most efficient packaging. For example, solids can be fitted whose length might be 1, 2, 3, 4, 6, or 12 units long, into the following end dimensions: 1 by 1, 2, 3, 4, 6, and 12; 2 by 2, 3, 4, 6, and 12; 3 by 3, 4, 6, and 12; 4 by 4, 6, and 12; 6 and 12. It is easy to compute the number of packages of each of the above sizes that will fit exactly into the master cube but it is not possible to calculate all combinations of different sizes here. Nevertheless, regardless of the way it is computed, the twelve-cube patently has many more desirable combinations than the ten-cube.

Exponential numbers are just as compatible with the duodecimal system as with the decimal. The principal difference is the relative rapidity with which cardinal values increase to the left of the decimal point and the corresponding rapid decreases to the right of the decimal point.

A practical example is in the use of tables whose accuracy is commonly gaged by the number of "places" in the table. For example, eight-place duodecimal tables are substantially the equivalent of ten-place decimal tables, a saving of 20%.

Going the other way, when planning telephone systems for expansion it is customary to assign four digits to follow a given prefix. If we use the decimal system the number of telephones is limited to 10,000 but the duodecimal capacity is 20,736.

(Please turn to page *31*.)

MODERNIZING OUR METRIC SYSTEM

John Jarndyce

Since our international metric system (SI) might be recast in base-twelve (most likely first in our international communications systems), it could include METRIC time, METRIC money, and METRIC navigational systems (including a worldwide zip code)---all with their many advantages, metric relations, and metric simplicity not now enjoyed in our metric world.

In the field of metric TIME the astronomer might by simple arithmetic subtract one "moment" from another with a few or myriads of Julian Period DAYS between them to thus determine the length of a cycle between one occurrence and its recurrence. Then simply by moving the point three places to our left (as we now move a decimal point), we might determine the moment of recurrence a certain number of Julian Period days and moments in the future. Think of the savings in allotted time even when figuring one cycle. And Moments are more precise than minutes.

If the Julian Day 244 1684 were to begin at Greenwich meridian on 1 January, say 1973, this date might be described dozenally as J. D. *99 9018*. And if we add just four places so as to read *099 9018 126*, which we might call 0-nine-nine, nine-0-one-eight, one-two-six, we might within ten places denote any Julian moment in a total period of time equal to more than three completed precessions of the equinox. Every completed precession is equal to about 25,800 earth years, decimally. In day to day transactions only the six or seven right-most digits would be used generally, such as *9018 126*---much as we drop the 19 from 1966 and list only '66. A matter of custom.

Moments, each equal to fifty present scientifically defined seconds of time, could be stated throughout a day by writing or telephonically speaking *only three digits*, thanks to the late G. Elbrow, R.N. admiral. Six-0-six, for instance, is the equal of 1205^h, and six-0-seven is fifty seconds later. Six-one-0 (*610*) is equal to 1210^h EXACTLY. Our present system of reckoning time goes back at least to Ur and requires one-third more digits as we write, speak, multiply, divide, add or subtract.

Dimensions

One should never overlook the fact that the 18th century ten-base metric system is land-based, wholly unsuitable for nautical and modern aerospace employment; whereas the duodecimal modern kilometer (the equal of ONE great circle of the earth multiplied by the minus fourth power of twelve) may be employed equally well on land, on the high seas, and in the space above. Its length is between 1.9 and 2.0 SI kilometers in use today---defined direct in terms of wavelengths of orange-red krypton 86 light, even as the SI meter is defined by today's scientists.

In terms of dimension, what will be the impact of change in the 1960 length of the meter and its subdivisions? In America, for the rank and file, the result might be almost uneventful. The length of one duodecimal meter is almost exactly 44 inches, but it would be defined for scientific purposes in terms of *750 000* wavelengths of orange-red krypton 86 light.

Table I shows the EXACT relationship of one to the other, in wavelengths of orange-red krypton 86 light. Observe please that the subdivisions of a duodecimal meter are stated, decimally or dozenally, *without endless fractions*.

Table I

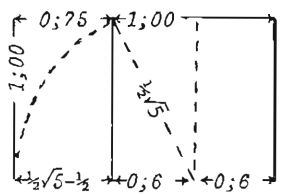
1 decimeter SI	= 165,076.373		wavelengths orange-red kr 86
1 dmd (duodecimal)	= 153,792.0	(*75 000*)	" " " kr 86
1 centimeter SI	= 16,507.6373		" " " kr 86
1 cmd (duodecimal)	= 12,816.0	(*7500*)	" " " kr 86
1 millimeter SI	= 1650.76373		" " " kr 86
1 mmd (duodecimal)	= 1068.0	(*750*)	" " " kr 86

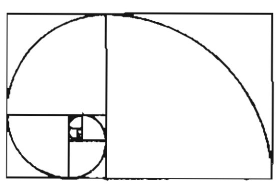
One émimètron equals one-twelfth of a duodecimal millimeter, 89.0 wavelengths of orange-red kr. 86 light exactly. Dozenally shown as *75* (seven-five, also 7 dozen and 5). An édomimètron, one-twelfth émimètron, equals *7;5* (seven point five, or seven and five-twelfths) wavelengths of kr. 86. And an érémimètron, one-twelfth édomimètron, equals a naught dozenal identification point seven-five (*0;75*) wavelength of orange-red kr. 86 light.

Ratio of the Golden Mean[1]

Note, for what it is worth, that the length of one érémimètron (*0;75*) in terms of wavelengths of orange-red kr. 86 light (now used to describe the length of a meter SI itself) ties in quite precisely with the Golden Mean ratio.

The long side of a golden mean rectangle is said to be equal to the diagonal of half the square of the short side plus half the short side. This works out mathematically so that a golden rectangle could be said to be 1 wavelength of orange-red kr. 86 light on its long side and *0;75* such wavelength (1 érémimètron) on its short side. The formula is $\frac{1}{2}\sqrt{5} - \frac{1}{2} = \frac{\sqrt{5}-1}{2} = 0;75.$





So, too, a golden rectangle with its long side equal to one duodecimal meter has a short side equal to *0;75* duodecimal meter. And a golden rectangle having a short side equal to one duodecimal kilometer has a long side equal to *1;75* duodecimal kilometers; or a short side of *0;75* kmd and *1;00* kmd long.

If the square of the short side be cut from either end of a golden rectangle, the remainder itself is found to be a golden rectangle. It is this eternal property which made this particular rectangle attractive to the Ancient Greek mathematicians--plus its symmetry and graceful appearance.

Canadian Foot Relationship

One duodecimal hectometer, one-twelfth of a duodecimal kilometer, is almost exactly 528 Canadian statute feet in length. Accordingly, in Utah, Louisiana, or California, a Congressional Section of farm lands (1 square statute mile) might be quite snugly fitted into a square equal to ten duodecimal hectometers on each side and containing EXACTLY one hundred duodecimal hectares. Only a few landowners, and perhaps no U.S. government civilian employees, might fear the coming of a metric system of measurements to the U. S. A. if it were wrapped up in general terms of a base-twelve metric system.

Let us note here for the benefit of many in the U. S. Defense Department that one duodecimal kilometer multiplied by the 4th power of twelve is the equal of one great circle of the earth; and that the smallest unit of dimension on the American automobile odometer today measures quite precisely one duodecimal hectometer or 528 feet. Perhaps we are too enmeshed in foreign entanglements to stay away from the base-ten meter; but should we servilely imitate others or strive rather to teach them an improved system pioneered by Essig which they will eventually accept, driven by Russia perhaps as each vies for international leadership. It is sometimes said: "A prophet is not without honor, save in France." The reception of Essig's conception of the *mètre duodécimal* sustains that otherwise droll saying.

Camp, Garden, Park, and Square

One square plane measuring one dometron (1 duodecimal meter) on each side may be called one Square. One rightangled surface a duodecimal decameter (44 feet) on each side might be called a Park; and a square duodecimal hectometer (528^2 feet) might be called one Garden or one duodecimal hectare. One square surface one duodecimal kilometer (6336 feet) on each side may be called a Field or Camp. Bulletin Vol. *14*, No. *2*, page *3Ɛ*; also *44*.

Twelve U. S. one-tenth land miles are quite precisely equal to M. Essig's duodecimal kilometer, which significantly he suggested as a replacement of the nautical mile so there would be no differences between the land and nautical or aero miles.

Many of Essig's proposed units of dimension are interchangeable with American historical measurements, such as 3-2/3 inches in length, 44 inches, the one-tenth land mile employed in surveying by George Washington (and on U. S. motor vehicle odometers today), and see the 44-foot dimensions used in platting many Colonial and later building sites, and found in abstracts of title, town plats and additions in the U.S. to this day.

Even the Township, prescribed by Congress for surveying and describing lands belonging to the 13 colonies and lying west of the Ohio (and later Mississippi) river or south of the states of Georgia or Tennessee (excepting Texas and parts of the state of Ohio), is now found to be an area quite precisely five Essig duodecimal kilometers square and containing three dozen Congressional Sections of farm lands. While perhaps unintended on the part of Essig, this coincidence is far-reaching in the Midwestern, Southern, and Western United States, including Alaska.

Eventually, the area of a state might be reckoned as a certain number of Camps, just as we now make comparisons by square miles. To convert to Camps or square duodecimal kilometers, we simply multiply the number of square miles by 100 and divide by 144. If Iowa contains 56,280 square miles, it could equally be said to measure 39,080 camps or square duodecimal kilometers.

Going further and indicating the ease of conversion of acre and rod to M. Essig's duodecimal metric system, one old square mile or Section of farm lands would seem to be the equal of one hundred duodecimal hectares; and a 320-acre farm could be described in northwest America as fifty of his duodecimal hectares if Essig's new meter be defined by governments as exactly equal to *750000* (seven-five domo or 1,845,504) wavelengths of orange-red krypton 86 light.

Again, any side of one duodecimal hectare might be said to equal 528 Canadian feet, 32 rods, 8 chains, or 800 American links, and the square of such side might equal 6.4 acres, all within a possible error of 1/3000 part. The actual surveys as they exist today can not be said to be more accurate.

Thomas Jefferson favored a Metric System

Is it possible that PRESIDENT THOMAS JEFFERSON, in making the Louisiana Purchase from France in 1803, had envisioned its description by duodecimal hectares and congressional townships all of two centuries ago? In or about 1766 he built his farm home in Virginia, designed by himself, containing an octagonal central room the sides of which (22 feet) are each one-half a duodecimal decameter in length. Visit Monticello next summer.

You may have heard of a movement a few years ago to reinter the body of Thomas Jefferson---to place it in more precise surroundings, employing architectural SI units. I'm told it was blocked by good people who warned the enthusiasts that his body might be found lying face down---that Jefferson would turn over in his grave if credited with backing the SI or base-ten metric system, the form of which did not exist in 1787.

Jefferson, who at age 33 wrote the colonies' Declaration of Independence, had (before his departure to succeed Franklin at Paris) no small part in preparation of the "Northwest Ordinance of 1787", which provided for the survey of the colonies' lands lying north and west of the Ohio river, and prescribing the Congressional Township as six statute miles square---containing three dozen sections of land (36 square miles). Today each Section will fit neatly into one hundred square duodecimal hectometers, each hectometer being equal to *75 000 000* (seven-five bimo, 265,752,576) wavelengths of orange-red krypton 86 light.

Further, the Congressional Township, prescribed by law during the active political lifetime of Thomas Jefferson, will gently fit into a square area equal to two dozen and one square duodecimal kilometers. Without an opportunity to compare the work of the other, it is amazing how closely the Essig and Jeffersonian ideas of dimension and square units agree in fact.

[1]See Robert S. Beard "Golden Mean", p. *4*, Oct 1947 Bulletin.

One Dozen to the Sixtieth Power Related to Base-ten

Appendix "A" was excerpted from computer sheets run by Robert Edelen, a member of The Duodecimal Society of America. These digits were separated into groups of threes so far as possible and crosschecked against the computer sheets by Henry C. Churchman.

APPENDIX "A"

12^{17}	100 000 000 000 000 000;0 2 218 611 106 740 436 992.0
12^{18}	1 000 000 000 000 000 000;0 26 623 333 280 885 243 904.0
12^{19}	10 000 000 000 000 000 000;0 319 479 999 370 622 926 848.0
12^{20}	100 000 000 000 000 000 000;0 3 833 759 992 447 475 122 176.0
12^{21}	1 000 000 000 000 000 000 000;0 46 005 119 909 369 701 466 112.0
12^{22}	10 000 000 000 000 000 000 000;0 552 061 438 912 436 417 593 344.0
12^{23}	100 000 000 000 000 000 000 000;0 6 624 737 266 949 237 011 120 128.0
12^{24}	1 000 000 000 000 000 000 000 000;0 79 496 847 203 390 844 133 441 536.0
12^{25}	10 000 000 000 000 000 000 000 000;0 953 962 166 440 690 129 601 298 432.0
12^{26}	100 000 000 000 000 000 000 000 000;0 11 447 545 997 288 281 555 215 581 184.0
12^{27}	1 000 000 000 000 000 000 000 000 000;0 137 370 551 967 459 378 662 586 974 208.0
12^{28}	10 000 000 000 000 000 000 000 000 000;0 1 648 446 623 609 512 543 951 043 690 496.0
12^{29}	100 000 000 000 000 000 000 000 000 000;0 19 781 359 483 314 150 527 412 524 285 952.0
12^{30}	1 000 000 000 000 000 000 000 000 000 000;0 237 376 313 799 769 806 328 950 291 431 424.0
12^{31}	10 000 000 000 000 000 000 000 000 000 000;0 2 848 515 765 597 237 675 947 403 497 177 088.0
12^{32}	100 000 000 000 000 000 000 000 000 000 000;0 34 182 189 187 166 852 111 368 841 966 125 056.0
12^{33}	1 000 000 000 000 000 000 000 000 000 000 000;0 410 186 270 246 002 225 336 426 103 593 500 672.0
12^{34}	10 000 000 000 000 000 000 000 000 000 000 000;0 4 922 235 242 952 026 704 037 113 243 122 008 064.0
12^{35}	100 000 000 000 000 000 000 000 000 000 000 000;0 59 066 822 915 424 320 448 445 358 917 464 096 768.0
12^{36}	1 000 000 000 000 000 000 000 000 000 000 000 000;0 708 801 874 985 091 845 381 344 307 009 569 161 216.0
12^{37}	10 000 000 000 000 000 000 000 000 000 000 000 000;0 8 505 622 499 821 102 144 576 131 684 114 829 934 592.0
12^{38}	100 000 000 000 000 000 000 000 000 000 000 000 000;0 102 067 469 997 853 225 734 913 580 209 377 959 215 104.0

10 000 000 000 000 000;0 184 884 258 895 036 416.0	12^{16}
1 000 000 000 000 000;0 15 407 021 574 586 368.0	12^{15}
100 000 000 000 000;0 1 283 918 464 548 864.0	12^{14}
10 000 000 000 000;0 106 993 205 379 072.0	12^{13}
1 000 000 000 000;0 8 916 100 448 256.0	12^{12}
100 000 000 000;0 743 008 370 688.0	12^{11}
10 000 000 000;0 61 917 364 224.0	12^{10}
1 000 000 000;0 5 159 780 352.0	12^{9}
100 000 000;0 429 981 696.0	12^{8}
10 000 000;0 35 831 808.0	12^{7}
1 000 000;0 2 985 984.0	12^{6}
100 000;0 248 832.0	12^{5}
10 000;0 20 736.0	12^{4}
1 000;0 1 728.0	12^{3}
100;0 144.0	12^{2}
10;0 12.0	12^{1}
1;0 1.0	12^{0}

One Dozen to the Sixtieth Power Related to Base-ten

Down to the Zero Power of Twelve

12^{60}	1 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 56 347 514 353 166 785 389 812 313 795 980 500 551 139 163 800 306 781 874 894 667 776.0
12^{59}	100 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 4 695 626 196 097 232 115 817 692 816 331 708 379 261 596 983 358 898 489 574 555 648.0
12^{58}	10 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 391 302 183 008 102 676 318 141 068 027 642 364 938 466 415 279 908 207 464 546 304.0
12^{57}	1 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 32 608 515 250 675 223 026 511 755 668 970 197 078 205 534 606 659 017 288 712 192.0
12^{56}	100 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 2 717 376 270 889 601 918 875 979 639 080 849 756 517 127 883 888 251 440 726 016.0
12^{55}	10 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 226 448 022 574 133 493 239 664 969 923 404 146 376 427 323 657 354 286 727 168.0
12^{54}	1 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 18 870 668 547 844 457 769 972 080 826 950 345 531 368 943 638 112 857 227 264.0
12^{53}	100 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 1 572 555 712 320 371 480 831 006 735 579 195 460 947 411 969 842 738 102 272.0
12^{52}	10 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 131 046 309 360 030 956 735 917 227 964 932 955 078 950 997 486 894 841 856.0
12^{51}	1 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 10 920 525 780 002 579 727 993 102 330 411 079 589 912 583 123 907 903 488.0
12^{50}	100 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 910 043 815 000 214 977 332 758 527 534 256 632 492 715 260 325 658 624.0
12^{49}	10 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 75 836 984 583 351 248 111 063 210 627 854 719 374 392 938 360 471 552.0
12^{48}	1 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 6 319 748 715 279 270 675 921 934 218 987 893 281 199 411 530 039 296.0
12^{47}	100 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 526 645 726 273 272 556 326 827 851 582 324 440 099 950 960 836 608.0
12^{46}	10 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 43 887 143 856 106 046 360 568 987 631 860 370 008 329 246 736 384.0
12^{45}	1 000 000 000 000 000 000 000 000 000 000 000 000 000 000;0 3 657 261 988 008 837 196 714 082 302 655 030 834 027 437 228 032.0
12^{44}	100 000 000 000 000 000 000 000 000 000 000 000 000 000;0 304 771 832 334 069 766 392 840 191 887 919 236 168 953 102 336.0
12^{43}	10 000 000 000 000 000 000 000 000 000 000 000 000 000;0 25 397 652 694 505 813 866 070 015 990 659 936 347 412 758 528.0
12^{42}	1 000 000 000 000 000 000 000 000 000 000 000 000 000;0 2 116 471 057 875 484 488 839 167 999 221 661 362 284 396 544.0
12^{41}	100 000 000 000 000 000 000 000 000 000 000 000 000;0 176 372 588 156 290 374 069 930 666 601 805 113 523 699 712.0
12^{40}	10 000 000 000 000 000 000 000 000 000 000 000 000;0 14 697 715 679 690 864 505 827 555 550 150 426 126 974 976.0
12^{39}	1 000 000 000 000 000 000 000 000 000 000 000 000;0 1 224 809 639 974 238 708 818 962 962 512 535 510 581 248.0

A VELOCITY OF LIGHT EXPRESSED IN DOZENALS

Gower Neal Euston

If we might employ Aeromiles (each *750 000 000* wavelengths of orange-red Krypton 86 light), then the velocity of light may be expressed in Moment, Flash, or Dot simply by moving the dozenal point one space at a time to our left.

First, let us define our terms, which now have more exact meanings than they had yesterday.

If we will divide our mean day into a dozen equal parts once, and again and again, we shall find fifty seconds of time, the equal of one Moment. One-twelfth moment equals 4-1/6th seconds or one Flash. The 25/72nd (a fat 1/3) part of a second equals one per gross of a Moment, or one Dot.

One Dot times the 5th power of twelve (that is to say one gross, greatgross, shown *100 000* dots) equals the mean day.

Now, for the imperative, we may say: "Be here at eight, on the Dot!" Or exclaim: "It all happened in a Flash!" Or, "I'll be with you in a Moment." It will mean something more precise in time and action than ever before.

And to understand a dozenal unit of distance measurement very little different from the Canadian one-tenth statute mile, let us assume one Edon of distance, seven (dozen and) five great gross, great gross, wavelengths of orange-red Krypton 86 light, shown as *75 000 000*, to be two and a fraction inches greater than 528 Canadian feet, as in fact it is; and one Aeromile as the equal of a dozen Edons.

One Edon times the 5th power of twelve (that is to say one gross, greatgross, shown *100 000* edons) equals ONE Circumference of the Earth. (See "Dominante Unit of Dimension" below.)

Now, in fact, if light travels 299,792.5 kilometres per second, and if a metre equals 1,650,763.73 wavelengths of orange-red Krypton 86 light, then light might be said to travel 1,862,208 Edons per second of time, or 93,110,400 (fifty times as many) Edons in one Moment, roughly.

Above, we have worked with velocity in base ten. Let us now convert the Edons per Moment into dozenals. Then by shifting the dozenal point, velocity of light might be expressed as:

```
12)93 110 400 Edons = 27 223 400;0 Edons per Moment, or
 12)7 759 200 + 0      2 722 340;0 Aeromiles per Moment, or
   12)646 600 + 0        272 234;0 Aeromiles per Flash, or
    12)53 883 + 4         27 223;4 Aeromiles per Dot, or
     12)4 490 + 3             27;2 Minantes per Dot, or
       12)374 + 2              2;7 Dominantes per Dot.
        12)31 + 2
            2 + 7
```

Light travels Moon-Earth within 4 Dots. Light travels a distance greater than 2-7/12 times around the earth in one Dot, if *10 000* Aeromiles equal ONE Circumference of the Earth. The speed of light per Flash, in Aeromiles, will score near two-seven-two greatgross, two gross, threedo-four.

Interchangeably, 93,110,400 Edons per Momente (50 seconds) equal 93,110,400 Canadian statute miles (within 1/3000th leeway) in ten Moments (500 seconds) or 186,220,800 plus, say 1/3044th, to equal 186,281,976 miles[1] in twenty Moments (1 kilosecond).

You, too, can check the nearer eclipse of Jupiter's moon, Io, and between 6 and 6½ months later see if its movement seems not very far from twenty Moments delayed beyond where a computer or your own figuring might have scheduled another eclipse, by reason of its light traveling a further distance equal to the diameter of the earth's orbit---approximately 185,788,000 statute miles. Let us call the 16-2/3 minutes 1000 seconds, since Moments are yet to be recognized as scientific units of time. We may subtract up to a dozen Dots from twenty Moments to equal 996 seconds of time, one finding made by others. Subtracting from 186,282,000 miles .004 of it, leaves 185,536,872---another and not too distant estimate of one diameter of earth's orbit. Delay of light was first measured this way by Ole Roemer.

[1]186,282 miles per second of time approximates speed of light.

-o-0-o-

DOMINANTE UNIT OF DIMENSION---EARTH'S CIRCUMFERENCE

Lawrence Boythorn

If 12^{12} is equal to 8,916,100,448,256 (see p. *38*), then this number multiplied by 7-5/12 equals 66,127,744,991,232 decimally or seven-five-gro tri-mo, shown *7 500 000 000 000* dozenally. This product represents the number of wavelengths of orange-red Krypton 86 light contained in one Dominante unit of length. One Minante is one-twelfth the dimension of the Dominante.

The Dominante unit is not intended to equal the earth's equatorial girth. By definition its length is determined by a certain number of wavelengths of Krypton 86 light. But it is described as equal to the length of ONE great circle of the earth. Let us see if it exceeds the equatorial circumference of the earth and, therefore, jumps that description.

One of the authentic estimates of the length of the equator (it never has been land-surveyed, since three oceans interfere) is given in miles as 24,902.45 (40,075,510 metres).[1]

The equatorial radius as given in metres is equal to 6,378,160, but an earlier estimate was recorded as 6,378,260 metres. If we accept the smaller, and multiply it by 2π, quite roughly, it could produce an estimated length of 40,075,254.912 metres.

Allowing 1,650,763.73 wavelengths of orange-red Kr. 86 light per metre, that estimated length of the equator is equal to 66,154,777,279,234 such wavelengths. If we subtract the dimension of one Dominante unit, stated in wavelengths of orange-red Kry. 86 light, from this smaller estimate of the length of the equator, the Dominante unit is still smaller by some 16 or 17 kilometres, or perhaps ten Canadian statute miles. This leaves room for an improved accuracy in measuring the equatorial girth.

[1]Encyc.Brit.,Inc, Chicago, London, © 1963, Vol. 7, p. 846.

(Abstracted from)
THE CASE AGAINST DECIMALISATION*

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It has long been known to mathematicians that the system of numeration which, by gradual evolution, we have inherited from previous ages and now use, namely the decimal system, is not the ideal system.

Equally it has been known that there has always existed a superior system, the duodecimal, certainly possessing some defects---since no system can be perfect---but superior in all important respects to the decimal system.

The great names in the list of those who have explicitly criticized the decimal and upheld the duodecimal are: Blaise Pascal, that outstanding mathematical and religious genius of the early seventeenth century; Gottfried Wilhelm Leibniz, philosopher and theologian, joint inventor with Newton of the differential calculus, first of all names in perceiving the possibility of expressing logic itself in mathematical terms and notation; Pierre Simon Laplace, the celebrated mathematician of the later eighteenth and early nineteenth century, expositor of celestial mechanics, founder of the modern mathematical theory of probability, a name still associated with formulae and methods which are household words in mathematical analysis. Pascal in 1642 at the age of nineteen invented an adding machine; Leibniz in 1673 at the age of twenty-seven exhibited an adding and multiplying machine at the Royal Society of London.

As for Laplace, he is related to our topic by the fact that, with Borda, Condorcet, Lagrange and Monge, he was one of the Commission set up by the French Academy of Sciences in 1790 to examine the possibility of a system of measures and of currency, and to take steps to introduce it. It is known that in the early stages of these deliberations the possibility of a duodecimal system, recognized as superior to the decimal, was discussed; but that it was rejected, on the ground that it was out of the question to educate the French public, within reasonable time, in this kind of calculation.

In Britain, where the dozen had more uses, these considerations might have weighed less. At any rate decimal currency was imposed on France in 1795, and the decimal metric system, which ought logically to have preceded or been simultaneous with the currency change, since commodity and its measurement logically precede the monetary medium, was postponed until 1799. However, this was not intentional. Both changes would have been made together but that the quadrant of the earth had to be accurately surveyed (as was done by measuring an arc between Dunkirk and Barcelona), and this difficult piece of geodesy could not be completed before 1799. Only then could the standard base-ten metre be adopted.

When all was over, regrets were felt by some, not then but later. Laplace, himself, in his later years gave expression to these; and one can hardly doubt that when, in his last recorded words to his disciple M. Poisson "Man chases colorful phantoms" ("L'homme ne poursuit que des chimeres.") he included among the phantoms captured and found wanting, the decimal metric system. Napoleon himself (Napoleon's remark was characteristic: "Twelve as a dividend has always been preferred to ten. I can understand the twelfth part of an inch, but not the thousandth part of a metre") expressed regret for the extirpation of the number twelve from numeration and from exchange, for that is what any proposal of wholesale decimalism implies.

It implies, indeed, as will be shown in cumulative detail in this essay, the elevation to an undeserved place of a very unsuitable integer, namely ten, whose only distinctive property is that it divides by five, with the consequent demotion of twelve, a number divisible by 2, 3, 4 and 6, while its square, the gross, 144, divides by these and in addition by 8, 9, 12, 16, 18, 24, 36, 48 and 72, with all the consequences of economical and suitable use in parcelling, packaging, geometrical and physical construction, trigonometry and the rest, to which any applied mathematician (or for that matter any practical man ---carpenter, grocer, joiner, packer---could bear witness.

Once again, currency should come afterwards and subserve all these; it should be in a one-to-one correspondence with them, which is indeed the reason for the traditional and well-grounded British preference for the shilling with twelve pence, the foot with twelve inches; and also for the relation of the foot to the yard, since the number three, so intractable in the decimal system (consider one-third, 0.33333..., or the similar equivalents for a sixth, a twelfth and the rest), precedes the number five in order, use, and logic.

The twenty shillings to the pound was a characteristically British (indeed not British but French) attempt at reconciliation and compromise, for the French used not so much ten as the score (e.g. quatre-vingts, quatre-vingt-dix), and this accomodation of twenty as well as twelve produced our hybrid system of pounds, shillings and pence, the disadvantage of which is precisely that it *is* hybrid, and therefore does not lend itself as the decimal system does to a "place" and "point" system of numeration. Twelve shillings in a new unit could rectify this.

With all this, however, pounds and pence have an advantage which the franc and centime, dollar and cent, metre and centimetre, cannot possibly claim, namely the exceptional divisibility of the number 240. This, in fact, is one of these integers which mathematicians, in that special field called the "theory of numbers", are accustomed to call "abundant". An abundant number is one that has more factors than any number less than it; other examples of small size are 12, 24, 36, 60, 120, 360. The gross, 144, or twelve dozen, just misses abundancy, being excelled by 120 (but the square root of 120 is a fraction, whereas 12 is the square root of 144). Compared with 120 and

144, even 60, the number 100 is relatively poverty stricken in this respect---which indeed is why the ten-base metric system is a notably inferior one; it cannot even express exactly for example the division of the unit, either of currency, a base-ten meter, or whatever, by a number so simple, ubiquitous, and constantly useful, as three.

We are therefore entitled to ask: "Why, *in this age of scientific progress,* do we endure a system of numeration with so many disadvantages?"

The answer removes us at once to remote history and probably, prehistory; men counted on their fingers, and to this alone, reinforced, it is to be feared, by the indolent, unreflecting, and often arithmetically illiterate force of habit, the survival of the ten-base system is due. This cannot however last; men will not always evade decision by the facile and procrastinatory cliché of our times, "not practicable in the foreseeable future."

Let us note here that new kinds of electronic computers, and the new type of education that this will enforce in the schools, universities and colleges of technology, are bound to produce a full acquaintance with four systems of numeration at least: (1) the binary, based on two, the foundation of all electronic computation, to the exclusion (meanwhile) of the decimal except at the final stage of conversion and recording results; (2) the octonary, the system based on eight, by which binary results may by the simplest of transformations be compressed and held in store; (3) the decimal, since unfortunately, with all its defects, it is still with us; (4) the duodecimal, which in the opinion of many such as the writer will prove to be that system which translates the binary to the world at large, the world of men and women behind counters, ticket offices, carpenters' benches, in stores, in homes.

Let us look at the history of numeration. We know of course in primitive times, arithmetic being necessarily primitive, that counting and barter were done on the fingers (whence the name digit for a number-sign), and that these hardened into written marks or into such movable objects as the beads or counters on the Chinese, Japanese or Russian abacus. For example, on the abacus, the several parallel rods carrying counters are all crossed at right angles halfway along by a fixed dividing bar; each rod has on one side of the bar five counters, on the other side a single counter.

The number five, it is interesting to note, can be represented in *two* different ways; either, with the thumb, push all five counters up against the bar, or leave them alone and with the finger pull that other counter back against the bar. The abacus is said to have beat an American using a hand-operated calculating machine. The whole point of mentioning this here is that if, for example, Russia should go duodecimal, a not unlikely possibility which would give her people, in all the ordinary calculations of life, an advantage of at least 35 man-hours---so I reckon---in every 100, China could align herself

with Russia even more simply, by having [1]*six* counters instead of five placed on the half-rod of every abacus.

But to return to ancient history. The Sumerians of minus two thousand, as is shown by certain cuneiform inscriptions brought to light not so long ago, used the ten system but also the sixty, the sexagesimal system; we have for example their multiplication tables. By 1800-1700 B.C. something quite extraordinary takes place; the Babylonians take over from the Sumerians, and while still the scale of ten persists in the market place, yet astronomers, architects, in fact what one may call the mathematicians, scientists, technologists of that remote period (the Hammurabi dynasty of 3700 years ago) constituted a hierarchy skilled in arithmetic to a degree unrivalled in the modern world, for they actually used the scale of 60, the sexagesimal scale, for fractions, reciprocals, even square roots. They have left the trace of their system in the 60-fold division of the hour into minutes and the minutes into seconds, a predominantly duodecimal subdivision, as one may see by looking at a clock, but in this we observe an accommodation not so much with the scale of 10 as with 5.

Another such trace is the division of the whole circumference of the circle into 360 degrees. At the time of the French Revolution certain fanatical decimalists (following in the footsteps of Stevinus of Bruges two hundred years earlier) were for dividing the right angle into 100 degrees called "grades", the half day into ten hours, even the year into ten months. These efforts, or rather the latter of them, met with no success. Astronomers and surveyors can never bring themselves to use a system so defective; and numbers of instances can be cited, from trigonometry, periodic analysis, approximate evaluation of areas and volumes, and so on, in which a five-fold or ten-fold subdivision of the range gives formulae and methods remarkably inferior to a six-fold or twelve-fold one.

Those Babylonian mathematicians, by the way, had extensive tables, not only of reciprocals and square roots but actually of triads of integers making the sides of a right-angled triangle--the theorem of Pythagoras 1150 years before Pythagoras; but all in sexagesimal. The central point in all this is that 60 is an "abundant" number. That was why the Babylonians, masters of arithmetic in a way that we with a few exceptions are not, used it as a suitable base for their numerical system.

The Egyptians were not good at arithmetic; they could "do sums", but even the addition of vulgar fractions was carried out by them in an unbelievably cumbrous manner. The Greek system of numeration was an inconvenient one, letters of the alphabet being used for numbers. The Roman was hardly better, except that with a special kind of abacus they used a duodeci-

[1]Linton, "More Abacus", Oct 62 Bulletin, p. Ɛ, suggests duodecimal counting by the Chinese or Japanese "one-up, five-down" abacus with the same efficiency and without modification. -Ed.

mal notation for fractions, traces of which survive in two of our nouns, ounce and quincunx, that is to say, a twelfth and five-twelfths.

For integers, however, the Romans used the ten system and their well-known numerals; beautiful (none better, said Eric Gill) for lapidary inscriptions and coins, of no use for convenient calculation. These endured in arithmetic almost up to A. D. 1500, simply because of the all-pervading dominance of the Roman Empire, and later of Rome itself. In Asia this was not so.

Hindu arithmetic had evolved special single symbols for the integers up to nine, together with the zero, long believed to be a Hindu invention until lately rediscovered, in an analogous role, in Babylonian cuneiform. This Hindu system, with its excellent "place" convention, though not yet extended to fractional use with the "point", percolated to Europe by way of the Arabs (for what we call Arabic numerals ought more justly to be called Hindu-Arabic), and the geography, early steps, and manner of this percolation are worth a brief interlude.

It is convenient here for speed to link in sequence a few sentences from Cajori's *History of Mathematics:* " . . . at the beginning of the thirteenth century the talent and activity of one man was sufficient to assign to the mathematical science a home in Italy . . . This man, Leonardo of Pisa, . . . also called Fibonacci, . . . was a layman who found time for scientific study. His father, secretary at one of the numerous factories on the south and east coast of the Mediterranean erected by the enterprising merchants of Pisa, made Leonardo, when a boy, learn the use of the abacus. .... During extensive travels in Egypt, Syria, Greece and Sicily .... of all methods of calculation he found the Hindu to be unquestionably the best. Returning to Pisa he published, in 1202, his great work *Liber Abaci* (Abacus Book), ...the first great mathematician to advocate the adoption of the 'Arabic notation'". And later we read: "In 1299, nearly 100 years after the publication of Leonardo's *Liber Abaci*, the Florentine merchants were forbidden (by law) the use of the Arabic numeral(s) in book-keeping, and ordered to employ the Roman numerals or to write the numeral adjectives out in full."

The interesting parallel, but in the opposite direction of legal enforcement of *innovation*, is that in 1801 and again in 1837 the French introduced legal penalties against those recalcitrants who still held out against the decimetric system.

The system of Arabic numerals, really, as we have just seen, Hindu-Arabic, with its "place" convention---and this (not the choice of ten at all) is the real novelty and the real advantage---was thus introduced into Europe by one man, and had to fight its way to acceptance long years after he was dead. Thus a gravestone in Baden in 1371 and another in Ulm in 1388 are the first to show Arabic and not Roman numerals. Coins of governments were slower to change: Swiss of 1424, Austrian 1484,

French 1485, German 1489, Scots 1539, English 1551. The earliest calendar with Arabic figures is of date 1518. So our authority sets down; but he may be out in slight respects.

It would be tedious for the present purpose, however interesting for leisurely investigation, to pursue this. Enough to say that the first to invent the "decimal" point, written by him as a comma, was John Napier of Merchiston, in his *Rabdologia* of 1617, the year of his death, and three years after the publication of his logarithms.

The episode of Leonardo Pisano is significant. The supersession of Roman numerals by Arabic digits, and eventually, but not all at once, by the "place" and "point-shifting" system, was in its initial stage the work of one man of perception but above all of conviction and energy. This strength of conviction, now in a new and even more progressive direction, namely, that the system of Leonardo is not the final word, but that the duodecimal system with appropriate notation is appreciably superior again, is held at the present time by a relatively small number of persons in the whole world. It is true that the vast majority of the rest are, of course, entirely ignorant of the whole issue.

One may mention the Duodecimal Society of America, counting in its membership distinguished actuaries and other prominent men---and it is symptomatic that such a society should take its origin in a country devoted since 1786 (a date in which America had no mathematical standing whatever) to decimal currency, though not, and this is again symptomatic, to decimal metric; there is a Duodecimal Society of Great Britain, recently founded, small in membership and resources; while in France, home of the decimal-metric system, there is M. Jean Essig, Inspecteur-Général des Finances, whose notable treatise on duodecimal arithmetic and measures, *Douze: notre dix futur* (Twelve, our modern ten), Dunod, 1955, is taken seriously, as the foreword shows, by Membres de l'Institut in France and Belgium. This small band of convinced men increases its numbers all the time and gains successes here and there, as when, for example, the most recent and progressive American schooltexts on arithmetic and algebra, at the secondary stage, devote an extensive chapter to the description and appraisement of "scales of notation", leaving the pupil in no doubt regarding the relative inferiority of the decimal system.

Yet anyone who enters into public discussion on duodecimal calculation comes at once upon the strangest circumstance: incredible numbers of persons have been so imperfectly educated as to suppose that the decimal system is the only one that admits "place" notation and the property of shifting the "point" under multiplication or division by the base.

This defect of education, amounting in the case of certain newspaper correspondents to arithmetical illiteracy, has to be combatted. The fact is that any integer whatever, suitable or unsuitable, can be taken as base of the corresponding system. A younger generation of persons selected by ability knows this already, namely all those who are preparing themselves for modern electronic computation, destined as it is, in the form of new machines not yet in production but easily imaginable, to transform in a hardly recognizable way whole domains of financial and official calculation, to say nothing of the arithmetical apparatus of technology generally.

For while 1900-1925 was the period of the hand-operated mechanical calculating machine, and 1925 and onward that of the electrical one, from 1961 to the end of the millennium will be the era of electronic computers of every range, not merely of the large, and for certain purposes too large, ones that we see being installed in more and more places, but those of moderate size (and there will be smaller ones still) which are only now beginning to be in production. These will transform not merely arithmetic, but education in arithmetic; and a younger generation, familiar with binary and octonary systems, as well as with decimal, will be sure to ask: What, reckoned in terms of time and efficiency, is the worth of the decimal system, and is there a better? We shall without doubt see this happen, probably in Russia and America almost simultaneously, while we, who of all nations in the world are in the special and most favourable position to make the change, may be left behind; may well in fact have made a belated change, only to have to make a further belated one.

Of course, on the other hand, there may be financial, economic and indeed political considerations which may enforce the other, to my mind reactionary, decision; but that would require a separate study, which has in some part been done and is in any case outside my competence. I will simply say to you: *political expediency is the ruin of science.*

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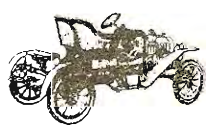
OLD MODELS



The American Maxwell-Briscoe 1910 model shown herewith would not carry a motorist very far or fast today. Neither should we expect much from the 18th century base-ten metric model. The 21st century dozenal metric system holds the possibility of making all other metric systems obsolete. The Canadian or American one-tenth statute mile, for instance, is called one "edon" or "hectomètre duodécimal", and a dozen of these units of dimension are said to equal one "Navinaut" or "Aeromile".

There are exactly domo (*10 000*) navinauts in a Great Circle, but 40,000 SI kilometres are <u>less</u> than the <u>smallest</u> circumference of the earth. Which represents the real "metric <u>system</u>"? Even NASA might profit by edons or navinauts in place of kilometres to achieve a simple dimension unequivocally natural.

THE HORROR OF IT

H. C. Churchman

Twenty-one (21) years ago at 5:29.45 A.M., Mountain War Time, 16 July, 1945, an atomic bomb explosion, perhaps the first after this earth took orbit, is said to have occurred at the top of a tower on the desert flat of Jornada del Muerto, some miles west of Alamogordo, New Mexico, home of the President of D.S.A.

That is to say, in counting from Mountain War Time midnight, there had accrued a lapse of 5/24 part of a day, plus 29/60 of 1/24 part of a day, plus 45/100 of 1/60 of 1/24 part of 16 July 1945.

In common fractions of base-ten, that portion of a day would seem to equal $\frac{5}{24} + \left(\frac{29}{60} \times \frac{1}{24}\right) + \left(\frac{45}{100} \times \frac{1}{60} \times \frac{1}{24}\right)$ of a scientist's day. What kind of scientist would endure those fractions? All of us do; especially those in the ten-base metric nations who are trying to shame Englishmen out of sterling pounds, shilling and penny, as compound denominate numbers, or hybrid fractions, and therefore obsolete.

Reducing the foregoing aggregation of vulgar fractions to its lowest common divisor, the one-hundredth part of a second, we find: $\frac{30,000}{144,000} + \frac{2,900}{144,000} + \frac{45}{144,000} = \frac{32,945}{144,000}$ part of a mean day.

Thus, $\frac{32,945}{144,000} \times 8,640,000 = 1,976,700$ hundredths-of-seconds

or 19,767 seconds of time, or [1]395.34 Moments (50 secs. each). Here, employing the F. Howard Seely conversion method from base ten to base twelve, including the 34 percent of a moment, we finally arrive at the statement of *28Ɛ;4* Moments or *28Ɛ41* Dots of that historical date, where we might have been initially if all scientists were using metric timepieces some 21 years ago.

A *28Ɛ41* on a Metric Timepiece would have recorded, dozenally, the precise number of Dots which, on 16 July 1945, Mountain War Time, had followed the first instant of that day into history.

In Metric time, *28Ɛ41* might be read telephonically as two, eight, el, four, one Dots, or as 2 duors, 8 restes, Ɛ moments, 4 flashes, and 1 dot. We still, in compound fractions, say: five hours, twenty-nine and forty-five-hundredths minutes, Ante Meridian. Or, in a precise military manner, equally horrible, zero five hundred twenty-nine Hours and forty-five hundredths minute.

[1]One facet of the F. Howard Seely method follows:

```
12)39534         X)1XX66;00    Proof:  200 = 288     0;41 =  49
 12)3294 + 6      X)2355;49             80 =  96             144
  12)274 + 6         28Ɛ;41              Ɛ =  11
   12)22 + X                           28Ɛ   395     144)49. (0.34
        1 + X                                             432
                                                           580
                                                           576
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INTELLIGENCE ITEMS:

The Russians, this year, selected a rocket test target in the Pacific ocean, according to UPI press reports (24 April 1966) nearly forty nautical miles in circumference. The diameter of such circle is greater than twelve nautical miles. Was this no other than a ring whose radius was 6 aeromiles? Is it possible the USSR is determined to surpass France and America in the use of a duodecimal metric system?

One aeromile is the same dimension on land, in the air, and on the high seas----it has been defined as exactly equal to the sum of *750 000 000* wavelengths of orange-red krypton 86 light. When one begins to measure rocket points of impact in aeromile or navinaut units, one means to reduce the bracket of certainty by reducing the number of zeros.

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Gemini Ɛ spaceship landed within two nautical miles off the Carrier Guam, with automatic controls. Gemini 9 landed within 300 yards of its planned point of impact (AP release 15 September 1966), with manual controls.

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An absurd, unsystemic 1852 meters equal a nautical mile. The French base-ten metric system is a land-based conception. With English participation in setting up a metric system, that maritime nation might have held, with Laplace, for a base-12 construction to include time, angles, navigation, money, and other duodecimal units of mass and measures.

Abandoning the position taken by Laplace (as well as Thomas Jefferson when he designed and built Monticello's octagonal central room, each wall with a length of half a duodecimal decameter, 22 feet), the commission, fearing that French peasants would be incapable of grasping base-12 measures, gave to France a base-ten metric system unable to cope with metric time, angle or navigation, metric money, weights, and measures.

That fear was groundless for at that time the better or least educated subject of France or of Britain (and throughout Europe and America) was skilfully handling at least some dozenal units of measure. It was and remains an insult to the intelligence of the common man who generally knows much more than he talks about.

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Bell Telephone is mushrooming so fast in the United States in a healthy annual growth, it might be forced to move to base-12 exchanges or become hopelessly inefficient. It could remain in ten-base and employ 5 digits in place of 4 following the prefix of your group of lines. Which will it be?

DOLLARS BY THE DOZEN

Grosvenor Bond

In 1962 Canadians were using a five-cent piece in everyday business with the markings "5 CENTS - CANADA - 1962" on one face and "ELIZABETH II DEI GRATIA REGINA" on the obverse. It is about the same weight and diameter as the U. S. Nickel. But prophetically, it was minted from a dodecagon die.

The most direct method for the U. S. and Canada to pursue, when they jointly or severally launch upon a course of counting their money metrically, is to strike out the "5" and substitute a "6" so as to read "6 CENTS", and where "FIVE" appears, strike it and insert "SIX"; then sing a song of sixpence, Uncle Sam's neat Nickel will purchase all of six cents of sugar plums or treacle. That short cut to duodecimal metric coinage has been advocated for many years by F. Emerson Andrews, Ralph H. Beard, Kay Humphrey, Charles S. Bagley, and others.

The size and wording of all U. S. coins other than the nickel would remain as now found, including size of nickel. Vending machine slots same---two dozen cigarettes replace 20, etc.

If one U. S. or Canadian dollar contains, in metric money terms, one hundred forty-four pennies, then the Half-dollar has a value of seventy-two pennies, the Quarter-dollar thirty-six pennies, and each Dime will equal twelve pennies. Accordingly, using integers alone, you could spend those common fractions of 3/4, 2/3, 1/2, 1/3, 1/4, or 1/6 of a dollar, Half, Quarter, or DIME, and receive EXACT change in the coin of the realm, the considered and unquestioned purpose of any coinage system.

Instead of the ten dimes in a 1950 dollar, there will be a dozen dimes in the modern American or Canadian metric dollar. Redemption of old coinage is practicable---spend it. This will tend to bring out an ocean of coins believed lost. A similar rule applies to paper notes but one "old" paper dollar is worth legally one hundred cents or an even half-dollar, two dimes, and four cents as our coins become more valuable.

New Paper Denomination Notes	Dozenal Metric	Printed on	Decimal Value
1 Dollar (144 cents)	*$ 1;00*	red paper	$ 1.44
1 Donion (a dozen dollars) =	*10;00*	orange "	17.28
1 Renion (144 metric ") =	*100;00*	yellow "	207.36
1 Minion (1728 " ") =	*1 000;00*	green "	2,488.42
1 Dominion (20736 " ") =	*10 000;00*	blue "	29,859.84

As we see, one Dominion (one bi-mo pennies) would be the same value as 2,985,984 cents of the early 1950's, or $29,859.84 in bigger money of the "good old days". This monetary step will appear to bring prices down on such "hard" items as automobiles and homes, but actually no individual will be impoverished or enriched by one cent. The metric dollar represents more effort and is accordingly more valuable.

DOZENAL JOES

(A Children's Song by Westbourn Grove)

1;00 SOLO: Howdy to you, Dozenal Joes!
Learning to count? Here's how it goes:
2;00 One, two, three, four, all quick like that;
Five, six, seven, eight, now hold it, cat!
3;00 We stop at ten no more, dear Joe---
Since after nine comes dek, el, doe!
4;00 VOICES: Since after nine comes dek, el, doe!
SOLO: All ready, class, now let's begin
5;00 To count the cubic [1]metrons in
A tub or tank or old oat-bin.
6;00 VOICES: (all count slowly)
One two three four
7;00 Five six seven eight
Nine dek el doe!
8;00 SOLO: One dozen [2]jons are tallied out
From tub or tank or old oat-spout.
9;00 Now, "dozen-base" ENGLISH COUSIN,
Let the countdown start abuzzin'.
X;00 VOICES: (slow start, with rapid increase)
Doe! El! Dek! Nine!
Ɛ;00 Eight! Seven! Six! Five!
Four! Three! Two! One!
10;00 Class all set for another run!

51;00 SOLO: Sing, Cousins Joseph, Josephine!
The more matured, or not thirteen:
52;00 Five-one, five-two, [3]five-three, five-four;
Upward we count, onward we roar!
53;00 And when we pass five-nine, dear Joe---
Sing out five-dek, five-el, six-doe!
54;00 VOICES: Sing out five-dek, five-el, six-doe!
SOLO: All ready, class, continue in
55;00 The count of cubic metrons in
A tub or tank or old oat-bin.
56;00 VOICES: (all count slowly)
Five-one five-two five-three five-four
57;00 Five-five five-six five-seven five-eight
Five-nine five-dek five-el six-doe!
58;00 SOLO: Six dozen jons are tallied out
From tub or tank or old oat-spout,
59;00 Now, "dozen-base" [4]U. S. COUSIN,
Let the countdown start abuzzin'.
5X;00 VOICES: (slow start, with rapid increase)
Six-doe! Five-el! Five-dek! Five-nine!
5Ɛ;00 Five-eight! Five-seven! Five-six! Five-five!
Five-four! Five-three! Five-two! Five-one!
60;00 Class all set for another run.

Ɛ1;00 SOLO: Then listen, cousins, to me now;
I'll do my best to show you how:

Ɛ2;00 El-one, el-two, el-three, el-four;
Upward we count, onward we roar!
Ɛ3;00 With el-nine past, keep with it, Joe---
El-dek, el-el, then comes one gro!
Ɛ4;00 VOICES: El-dek, el-el, then comes one gro!
SOLO: All ready, class, continue in
Ɛ5;00 The count of cubic metrons in
A tub or tank or old oat-bin.
Ɛ6;00 VOICES: (all count slowly)
El-one el-two el-three el-four
Ɛ7;00 El-five el-six el-seven el-eight
El-nine el-dek el-el one-gro!
Ɛ8;00 SOLO: One gross of jons are tallied out
From tub or tank or old oat-spout!
Ɛ9;00 Now, "dozen-base" [5]ANZAC COUSIN,
Let the countdown start abuzzin'.
ƐX;00 VOICES: (slow start, with rapid increase)
One-gro! El-el! El-dek! El-nine!
ƐƐ;00 El-eight! El-seven! El-six! El-five!
El-four! El-three! El-two! El-one!
100;00 (slowly) Sor-ry, tea-cher, we've got to run!
(Exeunt all but soloist)

NOTES:

[1]One metron (m 1) equals *75 000* (seven-five-mo, or decimally 153,792) wavelengths of orange-red krypton 86 light. Sometimes called 3-2/3 inches, 44 lines, or 1 *duodécimètre duodécimal*.

[2]One jon (j 1) equals the volume, wet or dry, of one cubic metron exactly; not less than one U.S. "Fifth" of liquor, 1/6 Imperial gallon, or 4/5 of one liter. A cubic metron of pure water, under certain controls, equals the mass of one kal (k 1) exactly, or about 4/5 kilogram. In abbreviating metron or jon or kal, the m or j or k precedes the numeral as does a $ sign.

[3]In the American tongue, in expressing dozenally the count of the base and one or more units, it is permissible to omit, as silent but understood, the words "dozen and", as five-three or five-six is the quantity equal to five dozen and three, or five dozen and six. Doe is normally spelled "do", and is equal to and rhymes with "one-oh". So, "one-double-oh" is the equal of "gro". And "one-triple-oh" (*1000*) is equal to "one-mo".

[4]U. S. is here pronounced "Yew Ess" in Dogpatch styling.

[5]ANZAC refers to the stalwart World War I Australian-New Zealand Army Corps veterans, called Anzacs by U.S. troops in France in 1917-18, from A.N.Z.A.C. stenciled on their supplies.

(The foregoing expresses but the author's opinion of a method of counting by dozens; it is not official and it is not claimed to have the expressed approval of any other member of the Duodecimal Society of America. It is just one method of learning to count in base-twelve. It is only a song.) --The author.

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