D U O D E C I M A L

N E W S C A S T

Year 7
No.2
November.
*1179 (1965)

The Duodecimal Society of Great Britain,
155, Leighton Avenue, Leigh-on-Sea, Essex.

price:
1 shilling

CONTENTS

E D I T O R I A L

People often ask, "What is the point of view of the duodecimalist now that the British Government have said that they intend to support the movement toward the decimal metric system?" as if they expect us to say that this is the end of our support for a movement towards duodecimal numeration and measurement. Of course this does not make us any less keen.

There is scarcely anything in this world that does not have some element of both advantage and disadvantage. Whilst, in the case of decimalisation it may be felt that the disadvantages of the Government's decision outweigh the advantages, we have just got to accept it (just as the rest of the country except for a few personally motivated or imperfectly informed has had no choice in the matter) and make the best of it, not the worst, by seeking and exploiting the advantages and minimising the disadvantages. There are a number of ardent duodecimalists who see decimalisation as a logical first step: this puts things on a rational base, and it remains to make that base an efficient one as the next step. Circumstances as well as the opinion of some now mean that our aims will be achieved in two steps rather than one.

SEASONAL GREETINGS TO ALL OUR READERS

The Duodecimal Society of Great Britain

(155, Leighton Avenue, Leigh-on-Sea, Essex)

GENERAL MEETING

The seventh General Meeting of
the Duodecimal Society of Great Britain
will be held at

the Raglan Hotel
Aldersgate Street

at half past six in the evening on
Friday, the fourth day of JANUARY, 1966 (*4 January 117ᘔ)

Agenda

1. Progress in *1179
2. Finance
3. Election of Council
4. Policy for year ahead
5. Other Business

Light refreshments

All members, friends and well-wishers are cordially urged to come along. Notify the Hon. Secretary as soon as you can whether you expect to attend or of any matters you will wish to have raised if you cannot attend. Please make a special effort.

Nearest Underground Station: St. Paul's (2 mins)
Bus routes: ↑ 7, 8, 22, 23, 25, 32 East/West St. Paul's
141, 4 North/South to St. Martin's-le-Grand (1 min.)

To: The Hon. Secretary. The Duodecimal Society of Great Britain.

(1) I *expect/do not expect to attend the General Meeting and shall bring ..... guests. (2) I append a list of the points I wish discussed. (3) My annual subscription is enclosed.

*(Delete as appropriate) Signed .....

SUBSCRIPTIONS

Subscriptions for the coming year can now be paid. Please pay the Hon. Treasurer promptly to save him having to write to remind you, at the expense of his time (which he could be devoting better to our cause) and of the stationery and postage.

Subscription rates are still only:-

Life Member	* 200 shillings	(£14 - 8 - 0)	
Ordinary Member	* 10 "	(£ 12 - 0)	p.a.
Young Member	* 6 "		p.a.
Subscribing Supporter	* 10 "	(£ 12 - 0)	p.a.

DECIMAL NEWS

The references by the Government to their intention to push this country to use the decimal metric system of weights and measures was well reported in the National Press and there is no point in repeating it here. See the Hon. Secretary's comments via the Editorial and pages 9 and 10 of this issue.

Your comments on this are always welcome.

DECIMAL COINAGE - A LOST CAUSE?

B.A.M. Moon and K.P.G. Mears

2 June 1179 - Review of book - price 1/6

This is the most serious attempt so far made to make a practical assessment and comparison of the implications of a change-over to decimal or duodecimal currencies in financial as well as other terms for everyone. Though based primarily on New Zealand the scope of the booklet embraces Australia, the United Kingdom, the Commonwealth, the U.S.A. and the Western World. It shows how what, under a decimal scheme, would be a loss, under a duodecimal scheme would be an investment.

Postscripts shew that the figures used by the authors are less speculative than the official estimates, and list pertinent factual questions which official sources have been unable (perhaps unwilling?) to answer. A short explanation shows that dozens arithmetic is already part of our daily arithmetic.

The booklet is easy to read and assimilate using the fullest range of variety permitted by typescript in a direct style.

/See article by Mr. Moon on page 5/

CONVERSION

D.A. Sparrow

Seated one day, wondering why I couldn't interest more people in duodecimals, I glanced at the Manual of the Dozen and thought that I would have a try at a little conversion myself. "How fast", I wondered, "would light go in the duodecimal system?"

It is well known to be 186,000 miles a second so, with the aid of the Manual

1000,000	=	49,254
80,000	=	32,368
6,000	=	3,580
		8ℰ,780 or roughly, 90,000 miles per second.

But I forgot, in changing to duodecimals we will be using another measure. This will be the yard, so let's start again:

186,000 x 1760 = 186,000
1,760
11,160,000
130,200
186,000
327,360,000 Yards per sec which has to be converted

300,000,000	=	84,577,140
20,000,000	=	6,846,028
7,000,000	=	2,416,ℰ14
300,000	=	125,740
60,000	=	27,880
		91,763,540

But of course, Times aren't what they were - or they wouldn't be, anyway. What does the Manual say about Time? The "grovic" is 4.16666.. seconds. The name confused me, suggesting that it is a "groth" of something, which it is, I suppose, but after a little study, I was able to discover that it was an edomoth of a day: I consider that the Manual slips up here in choice of names, how about a "moday" (instead of their "minette" of 50 seconds) and a "domic" instead of their "grovic", which suggest the fractions of a day. The day is the common base, so we start again, with 86400 seconds per day 327,360,000 x 86,400 = 28,283,904,000,000 (or that's what I make it !) Having converted this the long way four times - and got different answers - I make it 2,ℰ45,ℰℰ5,ℰℰℰ,000 yards per day, or 3,209,732,280,000 yards per day or - as I got the last number twice I will guess that it might be right - 320,973,ℰ28 yards per my domic. Anyway, 186,000 miles is only a very rough approximation, so it might encourage the scientists to check some of these "constants" with more modern instruments. I now see in my Science Encyclopedia that the speed of light varies anyway - so what.

Offprint No. 11

HOW SHOULD THE CASE FOR DOZENS BE PRESENTED?

B. A. M. Moon,
Mobile Computer Laboratory,
University of Canterbury,
Christchurch, New Zealand.

INTRODUCTION

One of the interesting things about duodecimal or dozens arithmetic is how quickly its value in so many different fields can be appreciated, when its essential nature is revealed. All at once the good reasons behind the British system of coinage, weights and measures, which previously seemed to be designed so perversely to be difficult, become clear, and the reasons for the irritating nature of decimal arithmetic, which is so easy for fives and tens but so awkward for most practically useful numbers, become obvious.

This release from the mental straight-jacket of thinking in tens gives a powerful stimulus to start thinking of ways to reform our present weights and measures, to design a more complete system of nomenclature or even a Utopian ideal in which everything is done in dozens.

On the other hand, it cannot be denied that in spite of the efforts of many people, dozens arithmetic has so far failed to capture the imagination of the population as a whole, or to gain a very large number of supporters. While there may be many reasons for this situation, it may in part at least be that the very enthusiasm which advocates of dozens have displayed has made it to appear that they have adopted an extreme position, so that suspicion has been created and their ideas have not received the attention they deserve.

It behoves us, therefore, to consider how the case for dozens should be presented to have the most beneficial effects overall. There is of course, no final answer. The object of this article is to suggest some matters which might be given weight in seeking the effective approach which is so urgently needed.

MOTIVATION

People are naturally conservative. As de Camp has noted "people who live in an era of rapid change tend to suffer from a vague but persistent feeling of unease, "(1) and he quotes Russell "Few men's unconscious feels at home except in conditions very similar to those which prevailed when they were children."(2) There are plenty of changes taking place in the world today to generate such unease. It is this very discontent with the present which inclines people to

break completely with it and look for something new to cure their troubles, little realizing that those troubles are largely caused by too much that is new. It is this attitude, perhaps, which accounts for much of the emotional support which decimal coinage and the metric system receive in British countries today, for that support is not rational and most of the reasons offered for it are false.

A primary goal of supporters of the dozens system should be therefore, to endeavour to convince people that to learn and use dozens arithmetic in conjunction with British weights and measures, and the modest reforms in them which might be based upon it subsequently, require less mental effort and adjustment than adoption of the metric system - let alone that the cost is very much less and the ultimate benefits much greater.

It should be made clear that dozens arithmetic is not something completely new, but simply a rationalisation and simplification of existing knowledge. Those ideas which have shown the relations between previously unrelated facts, have answered previously unanswered questions and generalized rules that were previously restricted to special cases, have always had the most profound effects on human thought. Dozens arithmetic has the opportunity to do this, to make people better understand and appreciate what is familiar and relieve them of some of that acute unease they suffer from the pressure of constant change.

TEACHING DOZENS ARITHMETIC

It is still true however, that dozens arithmetic must be taught, even though much of that teaching consists of removing the unnecessary barriers that were placed about us when, as children, we were only told about decimal arithmetic. For instance, it must be made clear that the point and place value rules in multiplication and division are no special property of ten, but are independent of number base. Then the well-known "dozen rule" is no longer a special rule but simply a practical example of the general rule that multiplication by the base shifts the point one place right.

All good teachers know that new ideas are assimilated most easily by being related to that which is known already. We could start with the name of the subject. Everybody who has ever bought eggs knows what a dozen is - that is the practical way to buy eggs. The word duodecimal, though derived in fact from exactly the same Latin root, sounds by comparison 'academic' or 'theoretical', and unfamiliar. One reason why the subject is so described is because the Library of Congress of the United States has chosen the word "duodecimal" for the primary indexing of material on it. This arbitary choice need not

be the dominant factor in the choice of names if there are good reasons for an alternative.

Multiplication in dozens can be introduced and practised using examples in packaging or the calculation of areas and volumes in feet and inches and to calculate costs of materials or freight when the unit cost is expressed in shillings and pence per square or cubic foot. All of these are familiar quantities and the saving in labour in using dozens multiplication directly is dramatic. Duodecimal fractions can be introduced by using the clock-face:

quarter past - minute hand at 3
one quarter - point three,

and the disadvantages of a decimal clock face pointed out at the same time, and generalized into arithmetic.

Symbols for ten and eleven are needed early in the development: those chosen by the Duodecimal Society of America posses links with the familiar: ↊ is reminiscent of Roman X and ↋ of the first letter of eleven. The colon can be used as a distinctive duodecimal point. It can be retained in base twelve integers to distinguish them from decimal numbers. There is little change to nomenclature which is essential.

Thus	20:	may be	two dozen
	26:		two and six, a familiar term
	123:4		one gross, two and three point four
		or even	one, two, three point four
	1↊:6	is	one and ten point six
	1:↊8		one point ten eight

Since ten is still ten, there is no need to rename it 'dek', nor eleven 'el', although it is important to break their respective associations with 10 and 11. This can be achieved by pointing out that X is another well-known symbol for ten and that II is two, not eleven, in Roman numerals.

In due course, extension of nomenclature is needed, but this need not be introduced until students see the need. When this need is seen, the opportunity arises to point out that the notion that the metric system is superior to the foot-pound system for high-precision work is quite fallacious; that the existence of a name for the millionth part of a metre but not for a fraction of a foot of about the same size is a difference of name only, not substance. In fact there is an established but not well-known sequence of names for the fractions of an inch: 6 points equal one line, twelve lines equal one inch, and these terms do in fact specify a finer graduation

then millimetres. The student's natural response is to start suggesting further names - the necessary precaution is to see that it is further duodecimal fractions which get the names!

THE EFFECT OF COMPUTERS

The tremndous effect on the whole art and science of computation of the modern electronic computer is now obvious. In one way this has been adverse and generated support for decimals. The reason is that although conceptually at least, mixed base computers may have advantages for some purposes, all practical computers are not like that so sterling calculations, for example, have appeared to need special treatment. The irony of this situation is that computers are so powerful and flexible that the added complexity of mixed bases is a triviality as far as they are concerned. In fact, in the 'New Programming Language' for computers specified in June 1964 by the "SHARE" group, sterling, decimal, binary or octal data layout are all equally available alternatives (3) and there is no reason why any other base or base-combination could not be added to this set.

It is well-known now that binary or base two arithmetic is best suited to the internal operation of computers, though some supporters of dozens arithmetic have endeavoured to discount the advantages of base two here and argued for computers operating in twelve-base arithmetic.

In a sense they have cause for concern, because, before the rise of the decimal heresy, the issue amongst practical people was always whether binary or duodecimal division of units (such as the inch) was to be preferred.

It is true that twelve is better than ten as a base for internal computer operation, but advocates of dozens like everyone else must accept that it is better to let computers work in binary arithmetic and employ base-conversion in input and output.

One consequence of the better appreciation of this point is that decimal computers are becoming less popular than they were a few years ago.

The situation is really one that dozens supporters can turn to advantage. Here is palpable evidence, not only that ten is not the only number base that can be used, but that in this application there is another base, namely two, which is very much superior. The reasons are twofold. First, binary numbers are much easier to represent and second, binary arithmetic and hence the circuitry required to perform it, are very much simpler.

At this point the disadvantage of binary representation can be considered, namely that to represent moderately large numbers, too many digits are required for human convenience. The possibility of using any whole number (except minus one) can then be stated (4) and the question may be put: since arithmetic can be more or less simple depending on the base, and since the compactness of numerical representation increases with the size of the base, what base gives the best combination of these properties?

It is not difficult to show that twelve is the answer to this question and in fact the possibilities of dozens arithmetic need not be stated explicitly until this stage. Then all the illustrations of the practical use of twelve that are well-known to the Duodecimal Society can be introduced, showing that not only as an ideal, but also in a very large number of immediate practical applications, the simplest and most effective method is dozens arithmetic.

To answer those who suggest that octal arithmetic may be preferable, it may be pointed out that successive binary operations can be represented efficiently in dozens arithmetic, but that in octal arithmetic, operations using dozens are not as simple - for instance, one-twelfth is a recurring fraction. The importance of binary operations must be acknowledged however and the fact that dozens are twice as efficient as decimals to represent the successive binary fractions may be demonstrated.

NUMBERS WHICH ARE LABELS

One other argument which is raised is that since motor registration plates, street addresses and telephone numbers are decimal it would be hopelessly difficult to convert them to base twelve. The answer is of course that they are not decimal at all - they are simply labels, as their frequent mixture with letter symbols attests. While in the case of street numbers at least, an ordered sequence is necessary, this does not require the presence of every member of the natural number sequence and in fact on most occasions, frequent gaps do occur. In one sense, given a sequence of street numbers containing the numeral symbols up to nine, these may be considered a subset of the natural numbers, represented using <u>any</u> base greater than nine.

CONCLUSION

Not all that may be said in favour of dozens arithmetic has been mentioned in this short article, of course - for example its superiority for the introduction of children to arithmetic is another subject. The intention has been to suggest how people who believe that there is much to be gained by using dozens arithmetic, can show that they are practical and moderate people, and how they can present their ideas in a way that will hold the interest of those they wish to inform. Conversion of the date to a duodecimal number may be a useful exervise - the suggestion that this must be done if dozens are to replace decimal arithmetic must be firmly denied - even the most ardent decimalist does not these days advocate a ten-hour clock.

We know that the arguments in favour of dozens arithmetic are sound and significant - there is no need to overstate them.

References

1. De Camp, L. S. "The Ancient Engineers", p 371., Sourvenir Press, London, 1963

2. Russell, B. "The Impact of Science on Society", p 108., Columbia University Press, New York, 1951

3. IBM/SHARE "Report II of the Advanced Language Development Committee", New York, 1964

4. Moon, B. A. M. "On Indo-Arabic Number Systems", N. Z. Math.Mag. 1, No 1, p 14, 1963

Extract from a letter from
Mr. J. Halcro-Johnston

It is in the factory and on the building site that we must look for the economic advantages of the yard as standard. The diameters of British water tubes, for instance, are given in inches under BSS 788 and BSS 1387 and these specifications would appear to hold everywhere; the French measure the same diameters in pouces, a one-inch pipe being shown in their catalogues as 1 pouce or 26/34 mm. Another example appears in connexion with the agricultural tractor. With the help of a three-point linkage this can be used with a large range of implements. Details of the linkage are given in BSS 1841. The diameters of the pins of the linkage are in inches. Now British and American tractors are the most common in the world and to change this specification from inches to millimeters would surely lead to expence and confusion.

Other specifications based on inches that would appear to hold over a large part of the world are:

BSS 1083 bolts and nuts
BSS 21 pipe threads
BSS 84 screw threads
BSS 4, 4A, 6. dimensions of steel sections

and there are many others.

Of less importance are the dimensions of playing fields such as tennis courts and football fields which are usually in feet or yards.

Apart from the great advantages resulting from richness in factors the yard-foot-inch system being the result of evolution and the survival of the fittest gives units of a practical size, units that have stood the test of time. The sizes of steel sections, timber scantlings, bricks, etc., are more simply expressed in inches than in millimeters. Compare, for example, the British 6 x 3 steel beam with the nearest French equivalent, the 160 x 74.

These are only a few reasons for accepting the yard rather than the metre as the universal standard of length. The question is: Can we put up a strong enough case based on purely economic grounds?

Hansard 24th May 1965

Mr. Horner asked the President Board of Trade if he will make a statement on the adoption in Great Britain of metric weights and measures.

Mr. Jay: The Government are impressed with the case which has been put to them by the representatives of industry for the wider use in British industry of the metric system of weights and measures. Countries using that system now take more than one-half of our exports: and the total proportion of world trade conducted in terms of metric units will no doubt continue to increase. Against that background the Government consider it desirable that British industry on a broadening front should adopt metric units, sector by sector, until that system can become in time the primary system of weights and measures for the country as a whole.

One necessary condition for advances in this field will be the provision of metric standards, wherever possible internationally recognised, which will enable particular sectors of industry to work in metric units. The Government have therefore asked the British Standards Institution - and the Institution have agreed - to pay special attention to the work and to press on with it as speedily as possible. The Government will, of course, take this new commitment into account in determining the amount of future grants - in-aid to the Institution. We are also considering how we can best encourage the educational work to familiarise future school generations and students in technological establishments with working in terms of metric units.

We shall also encourage the change to the metric system as and when this become practicable for particular industries, by seeking to arrange that tenders for procuremnet by the Government and other public authorities shall be in terms of metric specification.

Practical difficulties attending the change-over will, of course, mean that the process must be gradual: but the Government hope that within ten years the greater part of the country's industry will have effected the change. To this end they propose to establish a small standing joint committee of representatives of Government Departments, and industry to facilitate the removal of obstacles and to keep under constant review the progress which is being achieved.

The Government will keep in touch with Commonwealth Governments on this matter.

STOP PRESS 'The Duodecimal Bulletin' of the Duodecimal Society of America has just come out, including notes of the Meeting of the Board, 1965, a reprint of the two articles by Dr. R. C. Gilles in 'The F.B.I. Review', and some interesting articles.

Membership of the D.S.A. is up. Their Secretary averages six requests a day for free literature. Steps will be taken to provide a simple plastic 6" slide rule and a badge.

CALENDAR FOR 1172

JANUARY

Sunday		2	9	14	1ɛ	26
Monday		3	ɛ	15	20	27
Tuesday		4	ɛ	16	21	
Wednesday		5	10	17	22	
Thursday		6	11	18	23	
Friday		7	12	19	24	
Saturday	1	8	13	1ɛ	25	

FEBRUARY

Sunday		6	11	18	23	
Monday		7	12	19	24	
Tuesday	1	8	13	1ɛ		
Wednesday	2	9	14	1ɛ		
Thursday	3	ɛ	15	20		
Friday	4	ɛ	16	21		
Saturday	5	10	17	22		

MARCH

Sunday		6	11	18	23	
Monday		7	12	19	24	
Tuesday	1	8	13	1ɛ	25	
Wednesday	2	9	14	1ɛ	26	
Thursday	3	ɛ	15	20	27	
Friday	4	ɛ	16	21		
Saturday	5	10	17	22		

APRIL

Sunday		3	ɛ	15	20	
Monday		4	ɛ	16	21	
Tuesday		5	10	17	22	
Wednesday		6	11	18	23	
Thursday		7	12	19	24	
Friday	1	8	13	1ɛ	25	
Saturday	2	9	14	1ɛ	26	

MAY

Sunday	1	8	13	1ɛ	25	
Monday	2	9	14	1ɛ	26	
Tuesday	3	ɛ	15	20	27	
Wednesday	4	ɛ	16	21		
Thursday	5	10	17	22		
Friday	6	11	18	23		
Saturday	7	12	19	24		

JUNE

Sunday		5	10	17	22	
Monday		6	11	18	23	
Tuesday		7	12	19	24	
Wednesday	1	8	13	1ɛ	25	
Thursday	2	9	14	1ɛ	26	
Friday	3	ɛ	15	20		
Saturday	4	ɛ	16	21		

JULY

Sunday		3	ɛ	15	20	27
Monday		4	ɛ	16	21	
Tuesday		5	10	17	22	
Wednesday		6	11	18	23	
Thursday		7	12	19	24	
Friday	1	8	13	1ɛ	25	
Saturday	2	9	14	1ɛ	26	

AUGUST

Sunday		7	12	19	24	
Monday	1	8	13	1ɛ	25	
Tuesday	2	9	14	1ɛ	26	
Wednesday	3	ɛ	15	20	27	
Thursday	4	ɛ	16	21		
Friday	5	10	17	22		
Saturday	6	11	18	23		

SEPTEMBER

Sunday		4	ɛ	16	21	
Monday		5	10	17	22	
Tuesday		6	11	18	23	
Wednesday		7	12	19	24	
Thursday	1	8	13	1ɛ	25	
Friday	2	9	14	1ɛ	26	
Saturday	3	ɛ	15	20		

OCTOBER

Sunday		2	9	14	1ɛ	26
Monday		3	ɛ	15	20	27
Tuesday		4	ɛ	16	21	
Wednesday		5	10	17	22	
Thursday		6	11	18	23	
Friday		7	12	19	24	
Saturday	1	8	13	1ɛ	25	

NOVEMBER

Sunday		6	11	18	23	
Monday		7	12	19	24	
Tuesday	1	8	13	1ɛ	25	
Wednesday	2	9	14	1ɛ	26	
Thursday	3	ɛ	15	20		
Friday	4	ɛ	16	21		
Saturday	5	10	17	22		

DECEMBER

Sunday		4	ɛ	16	21	
Monday		5	10	17	22	
Tuesday		6	11	18	23	
Wednesday		7	12	19	24	
Thursday	1	8	13	1ɛ	25	
Friday	2	9	14	1ɛ	26	
Saturday	3	ɛ	15	20	27	

Easter, Whitsun and Christmas marked
Spring and Late Summer Bank Holidays marked

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