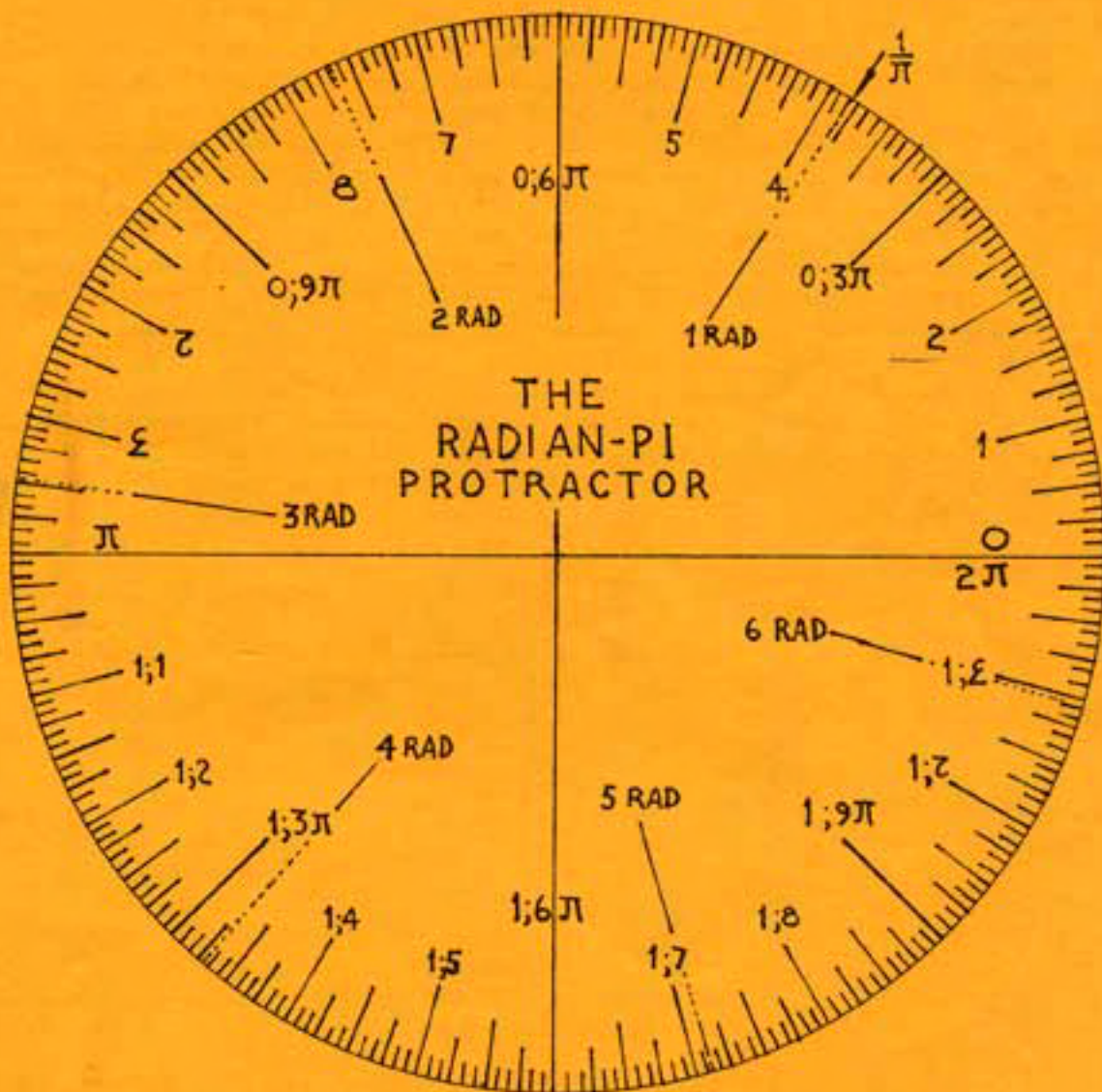


Corrections

pp	4	-
	12	-
	13	-
	10	✓
	12	✓



A Rationalised and Coherent Metrological System designed to facilitate the full exploitation of dozenal numeration.

Half the numbers are even (i.e. multiples of 2), a third of them are multiples of three, and since two twos are four, two threes are six, two fours are eight, three threes are nine, three fours are twelve, it is a natural law that these numbers, 2,3,4,6,8,9 and twelve play the most dominant rolls in calculation. They come through in spite of decimalisation.

The realisation of these truths has led many people to the conclusion that calculation and measurement can be much simplified by counting not in tens but in DOZENS. But if we still write twelve as 12, which means 1 ten and 2 units, we are not counting in dozens but in tens. The full benefit can only be achieved by using "10" to mean 1 dozen and no units. This is called dozenal numeration.

The counting goes:-

0	1	2	3	4	5	6	7	8	9	ζ	Ω	*10
Nought	one	two	three	four	five	six	seven	eight	nine	ten	elv	doZEN
												(or ONEZEN)

Since ten and twelve are not the same value, the asterisk is one of the signs we use to show that the number is "spelt" in dozens, not tens. Until we break into two figures it is not necessary.

*20 TWOZEN, *30 THREEZEN, *40 FOURZEN, etc., which mean 2 doz., 3 doz., 4 doz., etc. (The Isaac Pitman method). Counting continues (numbers in parentheses: decimal equivalent, the tens "spelling" of the same value):-

*11 Onezen one (13), *12 onezen two (14), *13 onezen three (15), etc.....
 *99 ninezen nine (117), *9ζ ninezen ten (118), *9Ω ninezen elv (119),
 *ζ0 tenzen (120), etc.....*ΩΩ elvzen elv (143), followed by *100 which means 1 gross, no dozens, and no units. It is twelve times twelve, just as a hundred is ten times ten.

Add a nought, you multiply by a dozen, just as in decimal you multiply by ten. Hence dozenal counterparts of thousands, tens of thousands, millions, etc. which look like these but stand for other values. The job of words is to evoke and distinguish ideas, so TGM gives these different ideas different names,--and on a more straight-forward basis. They are coined to suggest the number of noughts:-

			Decimal equivalent
ZEN	*10		
DUNA	*100 (= dozen times dozen, or 2 noughts)	*10 ²	144
TRIN	*1000 (*10 X *10 X *10, or 3 noughts)	*10 ³	1 728
QUEDRA	*1 0000	4 " *10 ⁴	20 736
QUEN	*10 0000	5 " *10 ⁵	248 832
HES	*100 0000	6 " *10 ⁶	2 985 984
SEV	*1000 0000	7 " *10 ⁷	35 831 808
AK	*1 0000 0000	8 " *10 ⁸	429 981 696
NEEN	*10 0000 0000	9 " *10 ⁹	5 159 780 352
DEX	*100 0000 0000	ζ " *10 ^ζ	61 917 364 224
LEF	*1000 0000 0000	Ω " *10 ^Ω	743 008 370 688
ZENNIL	*1 0000 0000 0000 dozen	" *10 ¹⁰	8 916 100 448 256
ZENZEN	*10 0000 0000 0000 onezen one noughts	" *10 ¹¹	106 993 205 379 072
and so on ad infinitum (more or less)			

You cannot imagine a million; it is just a whopping big lot. Hes is also a whopping big lot, only more so. To "translate" dozenal into decimal in order to understand it, doesn't really help. Large numbers can only be dealt with in the abstract by arithmetic: in dozenal more easily than in decimal.

Multiplying prefixes similar to hecto-, kilo-, mega-, etc.

ZENA- = multiplied by zen, DUNA- = X *100, TRINA- = X *1000, etc.---end in A

Dividing Prefixes similar to deci-, centi-, milli-, end in I

ZENI- = 1 twelfth of, DUNI- = ÷ *100, TRINI- ÷ *1000, QUEDRI- = ÷ *1 0000.

ACCELERATION DUE TO GRAVITY IS THE SECOND REALITY OF TGM.

To avoid any confusion with letters used for decimal prefixes the abbreviations are written as numerals:-

MAZ (unit of mass), $1 \text{ }^2\text{maz}$ (1 DUNAMAZ) = 1 gross maz, $1 \text{ }^4\text{maz}$ is 1 QUEDRAMAZ
 $1 \text{ }^2\text{maz}$ (1 DUNIMAZ) = $\text{maz} \div *100$, $1 \text{ }^5\text{maz}$ is 1 QUENIMAZ

In complex calculations it is often necessary to do a secondary calculation to find where to put the decimal point in the answer, these prefixes take care of that for you. They can be cancelled out, added, subtracted, etc. just like ordinary numbers.

Values less than 1 are expressed in ZENINAL FRACTIONS--like decimal fractions, but "spelt" in twelfths, not tenths. To distinguish from decimals the semicolon ";" is used instead of the decimal point or comma. Because they conform to halves, thirds, quarters, eighths, ninths, sixteenths, etc., they more readily multiply up to whole numbers than do decimals.

<u>Fraction</u>	<u>Decimal</u>	<u>ZENINAL</u>
Half	0.5	0;6
Third, two thirds	0.33333333 0.6666666	0;4 0;8
Quarter, three qtrs.	0.25 0.75	0;3 0;9
Fifths	0.2	0;2497
Sixths, 5 sixths	0.1666666 0.83	0;2 0;7
Eighths	0.125	0;16
Ninths	0.111111	0;14
Sixteenths	0.0625	0;09

The Units

Time. The Mean Solar Day divided first into two dozen hours like the traditional systems. *20 hours = 1 day. 4 a.m. is 04;00 hrs. 4 p.m. 14;00 hrs. (Straight-forward. No adding 2 for the p.m.)

Present day watches and clocks show TGM time. At a quarter past the hour the long hand is at 3 (3 twelfths of an hour--3 $\frac{1}{12}$ hr) Traditionally we actually multiply these ZENIHOURS by 5 to convert to minutes. 04.15 hrs does not mean 4 point 15, but 4 and 15 sixtieths. In TGM 04;3 hrs means 4 and 3 twelfth hours, like the clock says.

1 ZENIHOUR = 5 minutes.

To read individual minutes, do you get on eye-level with the clock and peer at the minute marks? No, you judge the distance between the figures in fifths. How much easier to judge in halves, thirds, quarters and get DUNIHOURL. Two-thirds the way from 4 to 5 means 0;48 of an hour--just a straight-forward dozenal number. (twenty three minutes or sixtieths--not tenths or hundredths--of an hour in the usual system).

1 DUNIHOURL = 25 seconds (100 secs. = 0;04 hrs)

You have now gathered that TGM disregards minutes and seconds but just counts time in straightforward numbers. For science we need yet smaller intervals:-

1 TRINIHOURL = 2;1 secs. (2.083333 in decimal)

1 QUEDRIHOURL = 0;21 ,, (0.1736111).....The TIM (Abbrev. tm)

1 SEVIHOURL (7hr) = 0.1004694 milliseconds

The decimal metric systems whether c.g.s. or M.K.S. are built upon the second of time. TGM is built upon the quedrihour which we now call the TIM (first initial in TGM) to remove the prefix quedri- from the base unit.

So: 100 secs = *400 tm, 5 minutes = *1000 tm, 1 hr = *1 0000tm
 1 day = *20 0000 tm, 1 week = *120 ⁴tm, thirty days = 5 ⁶tm, 365 dys=5;02 ⁷tm.
 (In the second system; 60, 3600, 86400, 604800, 2592000, 31536000)!!

OUR SOLAR DAY IS THE FIRST REALITY OF TGM.

Length. The metre and the foot come from origins quite independent of the second of time--they are arbitrary. The TGM unit of length derives from the TIM by the law of gravity.

Watch a diver dive from a high spring-board. His upward velocity gradually falls off until at the top of his jump he starts to fall, then down he comes faster and faster until he hits the water. This changing of velocity is called "acceleration due to gravity". If air-resistance is not allowed to interfere, that is to say in a vacuum, this acceleration is the same for all things, large or small, heavy or light, feather or lump of lead. Spacemen and others call it 1 g, and it is the unit of acceleration in TGM.

In traditional systems it is NOT the unit, for it comes out to 9.80665 metres per second per second, which is 32.1741 ft per sec per sec. These numbers are very fundamental to the metric and foot-lb systems and frequently have to be put in calculations. To forget them, or multiply when you ought to have divided can cause much trouble. In TGM, divide by 1, multiply by 1, or forget to do either amounts to the same thing.

In terms of TIMS instead of seconds, this same acceleration is just under 0.3 metre per tim per tim, about eleven and five eighths inches, a little short of a foot, so it is called the GRAVITY FOOT or GRAFUT (abbreviation gf).

No one invented it. It is a natural phenomenon that comes to light when using hours and "spelling" in dozens.

Of course as a base for a metric system it must be most accurately defined. The technicalities of this are not dealt with here. All the other units of TGM rely on it, and it is desirable they are most suited to their applications. Gravity is slightly stronger at the poles and weaker at the equator which allows within very narrow limits a choice of standard best suited to the rest of the units.

$$1 \text{ GRAFUT (gf)} = 0.295682912 \text{ metres} = 0.97008999 \text{ ft} = 11.64107988 \text{ ins} \\ = *126572;72 \text{ wavelengths of the orange radiation of Krypton 86.}$$

The first four figures cannot be tampered with without upsetting the law:-

$$G = 1 \text{ gf /tm}^2 \quad (\text{TGM } G = 9.81005 \text{ metres/sec}^2 \text{ and represented by a capital G}).$$

These figures are for defining the absolute value accurately. In using the system you do not bother your head with them. Do you think about the number of wavelengths in an inch when measuring in inches and feet? The grafut is before your very eyes at this moment. The length of this page, the metric A4 size is 297 mm (less than $1\frac{1}{2}$ mm over the grafut). TGM paper sizes are the same as the metric ones, but it is a long story how that comes about.

To picture the unit acceleration of traditional systems you need special apparatus, say a cine film of our diver run in slow motion, they are quite abstract. G, the acceleration of falling is an ever present reality, the true norm. When you throw a double at darts, or catch a ball, you demonstrate how experienced and adept you are in judging G.

Here are a few other realities: the 8gf is ten times the polar diameter of Earth, the 11gf is just under the radius of the electron, stationary satellites such as Early Bird are at $4\frac{7}{8}\text{gf}$ from the centre of Earth, the mean distance from Earth to Moon is $3\frac{8}{9}\text{gf}$, and the distance light travels in one year is just over $2\frac{13}{14}\text{gf}$. These simple whole numbers are quite close to the precise values.

The unit of velocity, 1 gf per tim, is 3.8 mph, a comfortable walking pace--another real norm. It is also called the VLOS for easy use of prefixes. The present standard speeds of tape recording ($1\frac{7}{8}$, $3\frac{3}{4}$, and $7\frac{1}{2}$ inches per sec) come out to 4, 8 and *14 dunivlos.

The square grafut, also called the SURF (Sf) is a little under a square foot. Twelve of them, the zenasurf, is close to a square metre.

The cubic grafut (the VOM) is just over 25 litres (near to 6 gallon).

ACCELERATION DUE TO GRAVITY IS THE SECOND REALITY OF TGM.

Mass. There doesn't appear to be any natural standard of mass, but mass per volume, yes. Per volume, lead is heavier than aluminium, and both are heavier than water and sink. Wood on the other hand is lighter and floats. So many things are referenced to water, that TGM like the decimal metric system takes unit volume of water to be its unit of mass.

1 VOM of water = 1 MAZ (the unit of Mass) = 57 lb (avoir)

Again, as a basic unit it must be most accurately defined:-

1 MAZ is the mass of 1 Vom of pure air-free water under a pressure of 1 standard atmosphere and at the temperature of maximum density, i.e. 3.98°C . It = 25.850 355 55 kg = 56.990 576 30 lb avoir.

57 lb as near as damn it, and 4 maz is approx. 100 kg. These figures are only for defining and conversion. In using TGM you don't think about them, but as with the metric system just go ahead and use it.

But in the decimal system the gram is based not on the cubic metre, but the cubic centimetre which is only one millionth of a cubic metre. The latest system (SI) Systeme Internationale, to which Britain is now converting uses the kilogram as basic, which lines up with the cubic decimetre (a thousandth of a cubic metre). Such hopping about on the decimal place with fundamental units is just not done in TGM. 1 to 1 ratio is the rule for basic units (There are two inevitable exceptions: the steps into electrical and into light units which otherwise would come out extremely high).

THE DENSITY OF WATER IS THE THIRD REALITY OF TGM.

Force. The unit of Force is the strength required to keep 1 maz of anything from falling, the weight of 1 maz. Again, this is more straightforward than the decimal system. To support 1 gram requires 980.665 dynes of strength or force! To support 1 kg, 9.80665 newtons! In the foot-pound system the 32.1741 that we have already met caused the invention of the poundal and the slug, resulting in two systems! All because they are not based on $g = 1$.

The TGM unit of force is called the MAG, for it represents 1 maz X 1 G. The absolute definition:-

1 MAG (Mg) is that force which will support 1 maz against a standard gravity of 1 G ($G = 0.981005 \text{ m/s}^2$).

It comes out to 253.593262 newtons = 57.01033152 lbf

In plain English, the weight of 57 lb.

Standing, sitting, lying, walking, lifting, carrying, holding, running upstairs, weight is with us through every moment of our lives. The only escape is to go into orbit; then we sense the abnormality of weightlessness.

WEIGHT (OUR NORMAL EXPERIENCE OF FORCE TO MASS RATIO) IS THE FOURTH REALITY OF TGM

Work and Energy. 1 Mag X 1 grafut = 1 WERG, the unit of Work or enERGY. It comes out at 75 joules (the decimal metric unit of energy) (74.983 194 78 to be exact). Like the joule, it measures not only physical energy but also heat, electrical, light and nuclear energy, and so becomes the heart of the whole system.

The zenawerg is 900 joules (metre-newtons or watt-seconds), 0.25 watt-hrs. The heat required to raise 1 maz of water from 0°C to 100°C is slightly under 7 quedrawergs (within $3/4$ of 1%) which leads to a simple figure, 1, for the specific heat of water compared to the 4.1855 joules in metric SI.

Power. 1 werg per tim = 1 POV (the unit of power) = almost exactly 3 gross watts, a little over $1/2$ horse-power. The dunipov = 2.99932779 watt, when considered as 3 is within the permitted error of existing wattmeters. Use existing meters for TGM and simply divide by 3. (Existing Voltmeters and Ammeters also convert very easily to TGM units. See following page)

1 Kwh = 2394 Wg

ELECTRICAL UNITS

If by now you find things getting a little beyond you because you do not understand science, not to worry. You use weights and measures at present without understanding all the ins and outs of how they are derived. But a metric system to be complete has to cater for everyone (and try to please everyone!) It must be shown to the scientist and engineer that TGM is based solidly on the fundamental realities of their work. At the same time I am endeavouring to explain things in plain language that ordinary folk can understand.

When an electric current flows along a wire (or any time that electrons move) a magnetic flux is set up. This flux exerts physical force upon things and especially wires carrying electric currents in the vicinity. More often than not the force is so weak that it does not move them. How much force for how much current at what distance is a fundamental reality; like gravity, no one invents it.

The present unit of current the ampere is defined on this basic law as follows:-

The ampere is that current which when carried by each of two infinitely long parallel conductors at 1 metre apart between centres exerts a force between them of 2×10^{-7} newtons per metre length in vacuo.

Put 1 gf instead of 1 metre, 1×10^{-9} for 2×10^{-7} , and mags for newtons and you have the TGM unit of current the KUR. The calculation of its value, beyond the scope of this paper, is very involved. This is one case in TGM that deviates from the 1 to 1 principle by using 10^{-9} , which like the decimal system brings the unit down to practical proportions. The choice of -9 in place of -7 and 1 in place of the 2 in decimal together with "tricks without cheating" that could only happen in dozenal combined together to give a final value close to a simple ratio to the amp so that existing meters can be used:-

1 KUR = 0.495 722 064 amp, within 1 percent of half an amp.

6 Hesikurs = 0.996 097 901 microamps

Potential (voltage). 1 amp X 1 volt = 1 watt in the decimal system.

Similarly 1 KUR X 1 PEL = 1 POV in TGM

PEL for Potential Electric, or: as in compel, repel, dispel, from the Latin pellere - to drive. The voltage or pelage is what drives the electrons.

Since the Pov is 3 gross watts and the Kur is 1/2 amp, the Pel comes out to 6 gross volts roughly. (Though much bigger than the volt it is a step in the right direction to correct the abnormal sizes of the ohm and farad).

The trinipel = 0.504 201 852 volts (within 1 percent of half a volt). The $\frac{1}{2}$ volt dry cell used for pocket lamps and transistor radio batteries, and the 2 volt cells of car batteries are therefore 3 and 4 trinis respectively. Another case of simple numbers complying with natural phenomena.

Resistance. 1 volt $\div$ 1 amp = 1 ohm, similarly 1 Pel $\div$ 1 Kur = 1 OG. (This is the word GO spelt backwards just like the decimal system uses mho (ohm spelt backwards) for conductivity). It comes out at 1757.553 ohms and for practical purposes is the normal 1.8 kilohm stock resistor. We use kilohms and megohms but never miliohms, so the TGM larger unit is a step in the right direction.

The triniog = 1.017 101 ohms (well within the 2 % range of 1 ohm stock, 5 % tolerance is normal practice.)

Capacitance. The KAP (= 1 KUR X 1 tim $\div$ 1 PEL) = 98.779676 microfarad. The microfarad is a large unit, so the KAP comes well towards normal requirements.

Just as 1 farad X 1 ohm = 1 sec, so 1 Kp X 1 Og = 1 tm

Just as the definition of the amp makes the permeability of free space $\mu_0 = 4\pi \times 10^{-7}$ henry per metre, so in TGM it comes to $2\pi \times 10^{-9}$ Gen per gf. (The 4π in the decimal is the constant $2 \times 2\pi$ for the circle of flux at unit radius)

PERMEABILITY OF FREE SPACE IS THE FIFTH REALITY OF TGM.

ROTATION AND ANGLES

Just as TGM does not use minutes and seconds of time, neither does it use degrees, minutes and seconds of angle, and proposes NO REPLACEMENT FOR THEM.

There is already another system which HAS to be used in science and engineering. They express angles in radians and for a complete circle they put simply: 2π . Most people know π (the Greek letter PI, which means the number of times the diameter goes into the circumference) but the RADIAN is not so well-known. A wheel of 1 foot radius turns through 1 RADIAN for each foot it rolls along the ground, a 1 to 1 ratio basic to engineering. When it has turned full circle, it has rolled a distance of 2π feet.

So full circle, $360^\circ = 2\pi$. Half circle (180°) is put simply as π , the right angle (90°) as $\pi/2$, 60° as $\pi/3$, 45° as $\pi/4$, 30° as $\pi/6$ and so on. In zenimals these are: 2π , π , $0;6\pi$, $0;4\pi$, $0;3\pi$, $0;2\pi$ ---they are ZENIPIs:- 15° , 30° , 45° , 60° , 75° , 90° , 105° , 120° , 135° , 150° , 165° , 180° .

1 2 3 4 5 6 7 8 9 2 2 *10 ZENIPIs

the angles most commonly used in geometry and by draughtsmen.

To further divide these principal angles by dozen giving gradations in DUNIPIs, and TRINIPIs yields a protractor as shown on the front cover. The gradations are every bit as suitable as the 360° plus the following advantages:-

1. No need to divide by 180 as well as multiplying by π to convert to radians.

2. Diametrically opposite angles differ only by a 1 or a 0 as the first figure (add or subtract 180 in the degree system)

3. The sum of the angles of any triangle = 1π . (*10 or *100 if counting in zenipis or dunipis,---180 in degree system)

4. For trigonometrical tables (working in dunipis):-

a) 2nd quadrant: subtract angle from *100(from 180 in degs.)

b) 3rd quadrant: ignore the first 1 (in deg system subtract 180 from angle)

c) 4th quadrant: subtract angle from *200(,, , subtract angle from 360)

e.g. the following angles all have the same numerical value for their sines,

Angle looked for in table	2nd quad.	3rd qd	4th quad.
*16 dunipi	*26 (*+16 = *100)	*116	*126 (*+16 = *200)
In degree system:			
22°30'	157°30'	202°30'	337°30'

5. For longitude and astronomers the divisions line up with the hour system of time. $\pi = 1$ semiday, 1 zenipi = 1 hr, 1 dunipi = 1 zenihour (5 mins. of time. In present systems astronomers have to multiply minutes and seconds of time by 15 to equate to mins & secs of angle!)

6. No matter how accurately an angle is quoted it is always a straight-forward dozenal number. $48^\circ 52' 17.5''$ cannot be used as the decimal number 485217.5 but its TGM equivalent *3;312 zenipi is *0;3312 π . Multiply by the numerical value of π (3;1848 in dozenal) gives 0;22923 radn. The corresponding deg. system calculation goes: $17.5'' (\div 60) = 0.291'$, add $52' = 52.291'$, divide by 60 = 0.8715, add $48^\circ = 48.8715^\circ$, divide by 180 = 0.271508 π , multiply by 3.14159 = 0.852967, which is the decimal spelling of 0;22921.

7 A metre viewed at a distance of 100 metres subtends an angle at the eye of 1 hundredth of a radian (or 1 ft at 100 ft, same angle). Similarly in TGM 1 gf at *100gf subtends 1 duniradian. This is called parallax. Parallax angles are usually measured in minutes and seconds with the usual rigamarole of calculation, but in TGM 1 dunipi = π duniradians, once again all we have to worry about is π --and that's bad enough without added complications.

Of the two existing systems TGM ignores the one, and evolves the other to provide one unified system,---with direct bonds between radians, gradations, parallax and arithmetic.

Units concerned with RADIATION, ROTATION & PERSPECTIVE involve the concept of division or multiplication by a unit radius plain, squared or cubed, for which TGM offers the prefixes:-

RADI-	divided by unit radius.	RADA-	multiplied by unit radius.
QUARI-	,, ,, ,, squared.	QUARA-	,, ,, ,, squared.
CUBRI-	,, ,, ,, cubed.	CUBRA-	,, ,, ,, cubed.

Examples: MAG is the unit of force, so RADAMAG is unit force multiplied by unit radius. This is unit TORQUE (= Force in rotation). QUARAMAZ = unit mass multiplied by unit radius squared, that is unit MOMENT OF INERTIA. The RADIFUT (unit length divided by unit radius) turns out to be just another name for Radian. Similarly QUARISURF (unit area divided by unit radius squared) = unit solid angle at present called the Steradian.

In abbreviations use the initial letters:-
 Q_{mz} (Quaramaz), Q_{sf} (Quarisurf), R_G (RadiGee, unit angular acceleration)

They can be added, subtracted, cancelled, etc. $\cancel{M_g} \times \cancel{r_{gf}} = W_g$. (Radamag multiplied by radifut = werg)

The unit of radiated power (1 POV per QUARISURF (steradian)) is called the PRAD

HEAT AND TEMPERATURE

There is no reason why any dozenal-minded person shouldn't count degrees C in dozenal if he wishes for it is a counting system. Boiling Point is then 84°C . To have BP expressed by a 1 followed by two or more noughts is a pretty idea but of little advantage mathematically; there are more important considerations. You do not divide or multiply 100°C to ascertain other things (except the scale itself). When in heat problems you have to multiply or divide temperature, the zero you must use is very much colder than 0°C . Called Absolute Zero it is -273.15°C and written 0 K (for Kelvin). Melting ice on this present-day system is then 273.16K and 100°C is put as 373.16K (The advantage of 100 just isn't there).

Another important thing is Specific Heat. Everyone has heard of Calories. There are four kinds, all obsolescent, the main one being the amount of heat to raise 1 gram of water through 1°C (not the calorie of dieting). The latest revision of the metric: Systeme Internationale, expresses all energy in Joules (TGM similarly puts all energy in WERGs). Specific Heat of Water in calories was 1, but in joules it comes out to 4185.5 (for the kilogram). In Metric you can't have it both ways! But:-

TGM combines the advantage of the calorie (Sp.Ht. = 1) with the advantage of the joule (all energy in like units) plus a simple arithmetic relationship to the present unit of temperature the kelvin!! Just sheer coincidence.

Heat required to raise 1 MAZ of Water from 0°C to 100°C comes out at $62708;7$ Wergs. One thousand = 624 . So TGM puts Sp.Ht of water = 1, that is 1 Werg of heat raises 1 maz of water through 1 CALGRAD of temperature. So 1 gross Calgrads (the DUNACAL) is very close to a tenth of a kelvin. 0.099657K to be exact.

Absolute zero	0	K	in TGM is	0	CALGRAD
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Melting point of ice	273.16 K (0°C)	,,	,,	,,	$*1705;0$	2°Cg
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Boiling point water	373.16 K (100°C)	,,	,,	,,	$*2200;5$	2°Cg
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For quick conversion from kelvins, add a nought, then if the number is large add 1 for every 3 hundred. Dozenise the number and the answer is to the nearest dunacal:-

273.16 K	---put 2732,	add 9 ($27 \div 3$)	2741 =	$*1705$	2°Cg
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373.16 K	---put 3732,	add 12	3744 =	$*2200$	2°Cg
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From 0°C similarly:-	30°C ---	300,	plus 1---	301 =	$*211$
------------------------------------	------------------------	------	-----------	-------	--------

	add	$*1705$
		$*1916$
		2°Cg

(Dozenisation of numbers is not part of the dozenal system. Usually done by tables, it undecimalises decimal data)

ABSOLUTE ZERO AND SPECIFIC HEAT OF WATER ARE THE SEVENTH REALITY OF TGM.

PRESSURE, STRESS, ETC.---The Atmosphere

1 Mag per square grafut is 1 PREM--the unit of Pressure Material or Molecular. It equals 2900.5827 newtons per square metre or 0.420696 lb. per square inch.

A vast amount of phenomena varies with atmospheric pressure, so for simplicity data is quoted at an agreed standard--the Standard Atmosphere. Decimal uses a barometer reading of 760 mm of mercury = 101325 newtons per sq. m. = 29.92 inches of mercury, or 14.696 lb/in²!

TGM uses 2 Ω Prem (= decimal 101520.4 n/m² = 29.978" (slightly under 30" of mercury). Awkward number? This is dozenal, not decimal! 2 Ω = 7 X 5 (the two numbers rather less well catered for in dozenal). It is 1 less than 3 dozen, *30, which has factors: 2, 3, 4, 6, 9, *10, *16. A quarter atmosphere is a quarter under 9, 8;9 Pm., a sixth atm. 6 - 1/6, 5;2 Pm.:-

Atmospheres	Prem	Atmospheres	Prem	Atmospheres	Prem
1/2	*15;6	1/7	5	1/*10	2;2
1/3	2;8	1/8	4;46	1/*12	2;6
1/4	8;9	1/9	3;28	1/*14	2;23
1/5	7	1/2	3;6	1/*16	1;24
1/6	5;2	1/2	3;2		

All exact except for 1/2 the only recurring zenimal, and dead easy mental arithmetic when you think dozenal. And:- *30 is quarter of a gross, so *100 Prem = 4 atmospheres and 4 Prem. Decimal has nothing to match such simplicity. Work out the above fractions in decimal, *2 Ω is thirty five.

DOUBLING UP AND HALVING DOWN

These are common practices, yet we have rather enigmatical ways of expressing them. Demi, quarto, octavo, are straight forward enough for paper sizes, but in music a note that is twice the frequency of another is said to be "an octave up". In photography f/2.8 means half the aperture area of f/2, while in film speeds 15 DIN is double the sensitivity of 12 DIN (+3 means doubling up). + 3 decibels means a doubling up of power. (The 3 comes from Log₁₀ 2 = 0.30103).

TGM calls a double a DOUBLE, and recommends the use of logarithms to base 2 (spelt of course in dozenal numeration). These are called DUBLOGS, details of which are outside the scope of this paper. The musical semitone is 1 ZENIDouble of frequency--the most concise and precise definition you will find anywhere. A gain of 3 decibels becomes in TGM a gain of 1 Double. Paper sizes based on the grafut and of proportion 1:square root of 2, come out almost identical to the metric ones. Larger and smaller sheets are got by doubling and halving.

Music and Acoustics. By numbering the notes of the musical chromatic scale in dozenal, the dozens figure indicates the octave, and the units figure the particular note. Middle C is *60. *70 = the octave higher, etc. The units figures indicate:-

0 C, B# D $\flat$	4 D $\times$, E, F $\flat$	8 G#, A $\flat$
1 B $\times$, C#, D $\flat$	5 E#, F, G $\flat$	9 G $\times$, A, B $\flat$
2 C $\times$, D, E $\flat$	6 F#, G $\flat$, E $\times$	2 A#, B $\flat$, C $\flat$
3 D#, E $\flat$, F $\flat$	7 F $\times$, G, A $\flat$	2 A $\times$, B, C $\flat$

It is possible to dispense with sharps, flats, key signatures, and much of the complicated jargon of music by use of these simple numbers.

The Dozenal Standard Musical Pitch is Note *78 = *100 cycles per tim. Instruments tuned to this are so very close to the present international Standard (A above middle C = 440 c/sec.) that only professional tuners could tell the difference and only on high notes longer than 1 second. Singers and orchestral players are usually way out compared with this.

The note numbers are also (when divided by dozen) the logarithms to base 2 (dublogs) of the relative frequency--a short cut that is totally impossible in decimal.

TO CUT A LONG STORY SHORT----

TGM goes on and on into every science and walk of life, but this discourse must end. Separate papers deal with the different facets, so individuals may select according to their requirements.

You will notice that, the only things invented are the names by which to call the newly revealed ideas. TGM is simply a remeasuring of the physical universe in terms of the dozenal spelling of numbers and other simplicities. Its norms, so far as practicable, are the real norms of our everyday experience; not some high-falutin arbitrary concepts that render natural norms abnormal.

No, the world can most certainly not be made to change over to it overnight, nor in the near future. That is why it is arranged to live alongside and distinguishable from the decimal cum something else systems like the metric ones (seconds, minutes, hours, and degrees, minutes, seconds are metric, but not decimal. km/hr are not numerically the same as m/s. But in TGM $1 \frac{4}{5} \text{ gf/hr} = 1 \text{ gf/tm} = 1 \text{ Vlos.}$)

Astronomy could benefit immediately. Right Ascension, Sidereal time, angles, parallax and radians, and the Julian Dates all fuse into one like system with values expressed as non-complex numbers ready for multiplication.

The Music trade has everything to gain from adopting the dozenal numbering of notes. Piano and organ keys at present are stamped with decimal serial numbers so that they can be put in the correct order, but these give no clue to the actual relevant notes. There are twelve not ten semitones to the octave. Musicians generally will find it easier to say for instance "Note *8Z (eightzen ten)" than, "The Bb nearly three octaves above Middle C". The dozenal note numbers are also in direct logarithmic relation to the vibration frequencies. See separate papers on MUSIC A LA DOZEN.

Students and others learning the spelling of numbers to bases other than ten, when dealing with base twelve, can, with TGM, tackle real problems of science and so get the feel of true simplicity. The present delusion of "decimal simplicity" will then start to crumble.

The present author does not append his name, for by the law of great minds think alike, others have stumbled on to the same tracks. Evolution of the system cannot be completed by one man alone. It is up to you the users to evolve it. Should you ever find yourselves getting at half-dozens and sevens, let this document be the "square one" to which you refer back. Let no reprint of this document alter any detail--not even by me.

In the tables that follow the left hand side of the page is TGM plain and simple. Though each unit is given a proper name of its own, there is no reason why users should not use derived names like grafut per tim (for VLOS) if they wish. The proper names are designed to suggest their application for ease of memorising, and are more suitable for use with the prefixes.

The right hand side of the page shows the relationship to traditional units; first to Systeme Internationale (the present day metric), in which very precise equivalents are given. These are sometimes followed by equivalents in other units to a precision suitable for most practical use. Further to the right are:-

Conversion Formulae. : indicates the point at which the number should be converted to dozenal. Instructions before : are therefore decimal, after it, dozenal. This exploits the advantages of both systems (an infinite number of combinations) to make mincemeat of the difficulties of conversion. Conversion is not part of dozenal (nor decimal)--Undecimalisation? It is only required when starting from data in decimal. Much data is already available in dozenal and grows day by day.

Numbers in parentheses () show the pergross error after using the conversion formulae. Those with a bar over e.g. (2) show a result that is down, the others are up. For many purposes they can be ignored, but they enable adjustment for a second degree of accuracy. (For ultra-accuracy scientists must as usual use their computers and the given precise values).

Note: 1 pergross is only 2/3 of 1%; 1% = 1;6 pg.

Example:- Convert 8.4 metres to Grafuts (conversion formula, 10 : 1/3)

8.4 X 10 = 84, = *70, ÷ 3 = *24 Gf. This is 2 pergross under, so for greater accuracy add:

$\frac{0;48}{*24;48}$ The ;48 should be omitted unless it is known that 8.4 was accurate to

8.400. Two figures decimal, two figures dozenal; 4 figs.dec. 4 figs. doz. is the rule. Tables are available for quick decimal-dozenal conversion.

TGM Units

-----TGM-----				-----Relation to other systems-----		
Ref. Unit			SI (precise)			
No. names	Abbrev.	Origin	and other equivalents	Conversion (see above notes)	pg error	
1. Time (See page 2)						
T	TIM	Tm	Mean Solar day	0.17361 s	s to Tm	1/25:100 (0)
	= Quedrihour	4hr	*20 0000	0;21 s	s to Tm	: 6 (6)
						(100 s = *400 Tm)
2. Acceleration						
	GEE	G	Earth's	9.81005 m/s ²	m/s ² --G	1/10: (3)
	Gf/Tm ²		Gravity	32.1852 ft/s ²	ft/s ² --G	1/2:9/*100(0;2)
3. Length						
G	GRAFUT	Gf	G.Tm ²	0.2956829m	m--Gf	10 : 1/3 (2)
	Gravity Foot			0.9700 ft	mm-- ² Gf	1/2 : (4)
	(See front cover)			11.641 in	km-- ³ Gf	2 : (3;1)
	(See page 3)		1 ³ Gf = 511 m		ft--Gf	: (4)
	1 km = <u>exactly</u>	1252 grafuts			ft--Gf add 3 in for every 8ft :	(0;2)
4. Velocity						
	VLOS	Vl	G.Tm	1.7031278m/s	m/s--Vl	1/10 : 6 (3)
	Gf/Tm			6.13126 km/hr	km/hr--Vl	: 1/6 (3)
A comfortable walking speed.				3.8099055mph	mph--Vl	1/30: 8 (2)
				3.31008knots	kn--Vl	1/10: 3 (1)
5. Area						
	SURF	Sf	Gf ²	0.08742838m ²	m ² -- ¹ Sf	: (7)
	Sq.Gf.			0.94107039ft ²	m ² --Sf	1/100:800 (1)
					km ² -- ⁷ Sf	4/100: 8 (0;7)
			1:1 gives(9)		ft ² --Sf	:1;09 (0;02)
					mile ² -- ⁶ Sf	10 : (1)
6. Volume and Capacity						
	VOM	Vm	Gf ³	0.02585108 m ³	m ³ --Vm	40 : (5)
	Cubic Gf.			0.91292582ft ³	ft ³ --Vm	: 1/9 (2)
				5.68645 Imp.gl.	I.gl--Vm	100:1/*400 (2)
				6.82909 US gl	USgl--Vm	1/20: 3 (4)
					cc-- ⁴ Vm	8/10: (0;5)
7. Mass (See page 4)						
M	MAZ	Mz	Vm.Dz	25.8503555kg	kg--Mz	1/100: 4 (5)
				56.9905763 lb	lb--Mz	10:1/*400(1;6)
					lb--Mz	:1/*49 (0;03)
					gm-- ⁴ Mz	1/10: 8 (0;5)
8. Density (See page 4)						
	DENZ	Dz	Max.dens. 1000 kg/m ³	kg/m ³ --Dz	1/1000 :	(0)
			water @ 1Atm. 1 gm/cc	gm/cc--Dz	:	(0)
9. Velocity squared						
	VLOV	Vv	Gf.G	2.9006443m ² /s ²	m ² /s ² --Vv	100:1/*200 (1)

-----TGM-----				-----Relation to other systems-----		
Ref. No.	Unit names	Abbrev.	Origin	SI (precise) and other equivalents	Conversion (see page 9)	pg error
2. Momentum						
	MAV	Mv	mz.Vl	44.026459	kg.m/s--Mv	1/4:1/2 (0;02)
	mz.gf/tm			kg.m/s		
2. Force						
	MAG	Mg	mz.G	253.593262N	Newtons--Ng	1/1000:4 (2)
	(see page 4)			57.01033152 lbf	lbf--Ng	10:1/*400 (1;6)
					lbf--Ng	:1/*49 (0;03)
10. Tension						
	TENZ	Tz	Mg/gf	857.6528 N/m	N/m--Tz	:1/*600 (1)
11. Pressure, Stress (See page 8)						
	PRIM	Pm	Mg/Sf	2900.58275N/m ²	N/m ² --Pm	1/10:1/*200(1)
				0.42069656psi	psi--Pm	:10/5 (1)
TGM Standard Atmosphere = 29 Pm = 101 520.4 N/m ² = 29.978 in.Hg. =						
761.465 mmHg = 1.001928 decimal metric atmospheres (see page 8)						
12. Work or Energy, Heat, etc.						
	WERG	Wg	Mg.gf	74.98319478J	J--Wg	1/100:10/9(0;05)
	(see page 4)		1 Wg =	5.18283842kWh	kWh--Wg	1000:100/3 (0;04)
			1 Wg =	10.239 BTU	BTU--Wg	100/7: (2)
			1 Wg =	55.2769 ft.lb	ft.lb--Wg	1/5:1/2 (0;9)
TGM Specific Heat of water = 1 Wg per mz per calgrad, at pressure 29 Pm.						
Latent Heat of fusion of ice = 5;6690 qudrawergs per maz.						
Latent Heat of steam = 3;162314 qudrawergs per maz at 29 Pm (i.e.100.055°C)						
1 electron-pel (see unit 23) = 4;16888 Wg (= 871.26 electron-volts)						
13. Power (See page 4)						
	POV	Pv	Wg/tm	431.903202watt	W--Pv	: 1/*300 (0;05)
			1 Pv =	2.99932779 , ,	432 = *300/	
			1 Pov =	0.579 HP	HP--Pv	100:1/*400(0;9)
14. Viscosity (dynamic)						
	VISCOD	Vsd	Mg.tm/Sf	503.57271 Ns/m ²	--Vsd	1/500: (1)
15. Viscosity (kinematic)						
	VISKIN	Vsn	Sf/tm	0.5035874 m ² /s	m ² /s--Vsn	2 : (1)
ANGULAR, ROTATIONAL, CYCLIC, and PERSPECTIVE UNITS						
(See page 7 for explanation of prefixes)						
16. Plane Angle (See front cover and page 6)						
16.a Radian						
	RADIFUT	Rsf		1 radian.	Rad--*Rad	: (0)
				Minutes to quenirads.	:6 (0;9)	
16.b PI						
		π	π rad	180°;0;1π = 15°	--ZENIPIs	1/30: 2 (0)
				0;01π = 75'	--DUNIPIs	1/100:1;4 (0)
				1 5π = 2.604"	--QUENIPIs	5:1/*11 (0;4)
17. Solid Angle						
	STERADIAN	Sr		1 Steradian	Sr--*Sr	: (0)
	QUARISURF	Rsf				
18. Angular Velocity						
	RADIVLOS	Rvl	Rgf/tm	5.76 radn/s	rdn/s--Rvl	100:1/*400 (0)
	Radn/tim					
19. Angular Acceleration						
	RADIGEE	Rg	Rgf/tm ²	33.1776rdn/s ²	rdn/s ² --Rg	1/100: 3 (0;9)
= Released loaded frictionless windlass of radius 1 gf						
12. Frequency						
	CIM	Cm	2π/tm	5.76 Hz or c/s	Hz--Cm	100:1/*400 (0)
	Cycles, revs. vibs./tm			345.6 RPM	RPM--Cm	5:1/*1000 (0)

-----TGM-----				-----Relation to other systems-----		
Ref. Unit				SI (precise)	Conversion (see	pg
No.	names	Abbrev.	Origin	and other	page 9)	error
<u>19. Moment of Momentum, Angular Momentum</u>						
	RADAMAV	R_{Mv}	Mv rotating	13.017871 kg.m ² /s	-- $R_{Mv} : 1/11$	(0;3)
<u>20. Turning Moment, Torque, Moment of Force, AND Moment of Mass (for G=1)</u>						
	RADAMAG	R_{Mg}	Mg rotating	74.98319 N.m	N.m-- $R_{Mg} 1/100:10/9$	(0;05)
<u>21. Moment of Inertia, Mass in rotation</u>						
	QUARAMAZ	Q_{mz}	R_{Mg}/R_G	2.2600547 kg.m ²	kg,m ² -- $Q_{mz} : 4/9$	(1;4)
Note how RADA- <u>divided</u> by RADI- = QUARA-						
<u>12. Work or Energy in rotation:</u> $R_{Mg} \times R_{gf} = Mg.gf = WERG$ (unit No 12)						
<u>2. Centrifugal or centripetal acceleration:</u> = 1 GEE (X 1 Radian)(Unit No 2)						
Proof: $R_{Vl}^2 = G.R_{gf} = G.radian$						
<u>2. Centrifugal or centripetal Force:</u> = 1 MAG (X 1 radian) (Unit No 2)						

ELECTRICAL AND MAGNETIC UNITS

22.	<u>Current</u> (See page 5)					
	KUR	Kr	Mag and permeability of free space.	0.495722 Amp	A--Kr : 2 mA--3Kr 1000:1/*200 μA --5Kr : 1/2	(1;3) (0;8) (0;8)
23.	<u>Magneto Motive Force</u>					
	KURN	Kn	Kr.turn	0.495722 Amp-turn	as above	
24.	<u>Potential, Electro Motive Force.</u> (See page 5)					
	PEL	Pl	Pov/Kur $1/3 Pl = 0.50420$ volt	871.2607997 V	Volt--Pl : 2/*1000	(1;3)
25.	<u>Resistance, Reactance, Impedance.</u> (See page 5)					
	OG	Og	Pl/Kr $1/3 Og = 1.0171015$ Ohm	1757.5530 Ohm	Ohm--Og : 1/*1000	(2;5)
Resistors to $\pm 5\%$ are normal trade practice. The above conversion is within the finer grading of $\pm 2\%$. 1800 Ohm is a stock resistor. The ohm is quite a low resistance.						
26.	<u>Conductance, Susceptance, Admittance.</u>					
	GO	Go	Kr/Pl	568.97 micromhos	Mho--Go $10^6:1/*400$	(1;9)
27.	<u>Quantity, Charge.</u>					
	QUEL	Ql	Kr.tm	0.08606 Coulomb	C--Ql $10^4:1/*600$	(0;9)
28.	<u>Capacity</u> (See page 5)					
	KAP	Kp	Ql/Pl $1/6 Kp = 33.081$ picroFd	98.779676 MFD	MFD--Kp $1/100 : 3$ pF--6Kp $1/100: 3$	(1;9) (1;2)
The microfarad is quite large, the farad, enormous. Kap much nearer normal. $1 KAP \times 1 OG = 1 tim$						
29.	<u>Permittivity</u>					
	MIT	Mt	Kp/gf	334.072999 $\mu F/m$	$\mu F/m$ --Mt $1/1000: 3$	(0;4)
22.	<u>Magnetic Flux</u>					
	FLUM	Fm	Kr _R Sf	151.2605 weber	Wb--Fm $1/100:2/3$	(1;3)
22.	<u>Magnetic Flux Density, Magnetic Induction.</u>					
	FLENZ	Fz	Fm/Sf	1730;1081 Tesla	T--Fz : $1/*1000$	(0;2) (Weber/sq.m)

-----TGM-----			-----Relation to other systems-----		
Ref. Unit			SI(precise)		
No. names	Abbrev.	Origin	and other	Conversion (see	pg
			equivalents	page 9)	error

30. Inductance, Self- and Mutual-, EMF GENERATION.
 GEN Gn $\frac{\text{Fm.turn}}{\text{Kr}}$ 305.131779henry H--Gn 1/100:1/3 (2;6)
 (exact)

31. Reluctance
 LUKT Lk Kn/Pm 0.0032772726 At/Wb--Lk 100: 3 (2;6)
 amp-turn/Wb

32. Permeability
 MEAB Mb Gn/Gf 1031.95607 H/m H/m--Mb $10^7/2:1*10^9(0)$
 or:- $20:1*10000(0;9)$

RADIATION, LIGHT, ETC.

33. Power Density
 PENZ Pz Pv/Sf 4940.0798W/m² W/m²--Pz 2/10000: (1;6)

34. Radiant Power (point source)
 PRAD Pr Pv/Sr 431.903202W/Sr W/Sr--Pr :1/*300 (0;06)
 Pov/Steradian

35. Light Power, Luminous Flux
 LUPOV Lp $\left\{ \begin{array}{l} 1 \text{ } \frac{1}{5} \text{ Pv at } \\ \text{wavelength } 5;73 \text{ } \frac{1}{6} \text{ Gf =} \\ \text{,, of max. visibility} \end{array} \right\}$ 1.17996 lumen lm--Lp $10:1*10(2;6)$

36. Illumination, Luminance, Brightness.
 LUDENZ Ld Lp/Sf 13.49630 Lm/m² Lm/m²--Ld 1/10:0;9 (1;9)
 1.25385 Lm/ft² Lm/ft²--Ld 1/10:8 (0;6)

37. Photographic Sensitivity
 O SENZ Sz $\left\{ \begin{array}{l} \text{Ld.Tm @ f/1} \\ \text{for "correct"} \\ \text{exposure} \end{array} \right\}$ 9 DIN(log'c) DIN--Sz 1/3:subtract 3
 (Logarithmic to base 2) { 6 ASA(arith) ASA--Sz :1/6 then find
 log to base 2

Note: that it is zero Sz that = 9 DIN etc. 1 Sz is double the sensitivity, so stop down to f/1;5 or exp. 1/2 Tm. 2 Sz: f/2 or 1/4 Tm, etc. (1/4 Tm = 1/25s)

38. Luminous Intensity, "Candle Power".
 LUPRAD Lr Lp/Sr 1.17996 candela cd--Lr $10:1*10(2;6)$

39. Temperature, (heat or colour) (See page 7)
 CALGRAD Cg Wg and $\left\{ \begin{array}{l} 0.099701 \\ \text{Sp.Ht.water} \end{array} \right\}$ kelvin K--²Cg 10: (0;6)

The BYRAZ Colour Co-ordinating System by L Loynes enables one to "spell" any hue by a 3-figure dozenal number. Much of this can be done at sight. Two further digits cover all shades from black to white. The digits always sum to make *10. All based on the proportionality of dozenal factors.

USEFUL CONSTANTS

$\pi = 3;1848$ $2\pi = 6;3494$ $1/\pi = 0;39706$ $1/2\pi = 0;12203$ $\pi^2 = 9;7528$
 $e = 2;8752$ $e^2 = 7;4803$ $e^\pi = 12;183$ $1/e = 0;44284$ $1/e^2 = 0;17524$
 $\sqrt{2} = 1;41421$ $\sqrt{3} = 1;73205$ $\sqrt{6} = 2;44949$ $\sqrt{8} = 2;82843$ $\sqrt{10} = 3;16228$
 c (vel.light) = $4;7247 \text{ } \frac{1}{7} \text{ Vl. } c^2 = 20;17172$ $12 \text{ Vv. Lightyear} = 2;020617$ 13 Gf
 μ_0 (permeability free space) $2\pi \text{ } \frac{1}{9} \text{ Gn/Gf}$ } product = $1/c^2$
 ϵ_0 (permittivity ,, ,,) $0;299448 \text{ } \frac{1}{7} \text{ Kp/Gf}$
 h (Planck's const.) = $1;8763 \text{ } \frac{1}{28} \text{ WgTm. } c_1 = 8\pi hc = 1;52967$ 12 WgGf
 k (Boltzmann's ,,) = $1;56060 \text{ } \frac{1}{22} \text{ Wg/Cg} = R_0/N_z. c_2 = hc/k = 52;3898 \text{ GfCg.}$
 N_z (Avogadro's ,,) = $1;43206 \text{ } \times 10^{22}$ per MOLZ (Mlz) (atoms in $10 \text{ Mz Carbon } * 10$)
 R_0 (Gas Constant) = $1;2979 \text{ Wg per Cg per Mlz. VlZ (Vol. Mlz, ice pt. } 22 \text{ Pm) =}$
 R_∞ (Rydberg's ,, , infinite nuclear mass) = $1105824;693$ per Gf. $10241;2 \text{ Vm}$
 RH (,, ,, , hydrogen) = $1104882;427$ per Gf.
 $\text{GRAV (Gv) (gravitational unit) = } 0;2458 \text{ } \frac{1}{2} \text{ } \frac{1}{\text{Mg/Mz}^2} \text{ (dexi-quara-mags/maz sq)}$

σ (Stefan's Constant) 1;55365 10^{16} Pv per Sf per Cg⁴

e (electron charge) 4;1688726 10^{15} Ql.

e/m (,,specific,,) 5;2125 10^{10} Ql per mz

m (electron rest mass) 8;4461 26 mz

M (Proton ,, ,,) 8;7732 23 mz

n (neutron ,, ,,) 8;79747 23 mz

H (H atom ,, ,,) 8;78856 23 mz

M/m (Ratio, proton to electron mass) 1090;12. Earth's Mass 5;0373 19 mz

Velocity of sound in air 142;75 Vl

Temperature Points:-

Absolute Zero = 0 Calgrad.

B.P. Oxygen *63420 Cg

F.P. Water *170500 Cg

B.P. water (22 Pm) *220100 Cg

B.P. Sulphur

F.P. Silver

F.P. Gold

*420220 Cg

*712710 Cg

*791300 Cg

1 Astronomical Unit (Mean distance from Earth to Sun)

= 8;208 2 gf

Polar dia Earth = $1/2$ 8 gf(exact)

Mean dist. Earth-Moon 3;035 8 gf

Equator 3;9485 7 gf= 4 7 nf(NAFUT,

nautical foot, aux. length unit for navigation, etc.)

Specimen Trigonometry Table

Rad. π	sin	tan	
0 1;0	;0000	;0000	;6
1 1;2	;3133	;3270	;5 ;7
2 1;2	;6000	;6218	;4 ;8
3 1;9	;8592	1;0000	;3 ;9
4 1;8	;2486	1;8950	;2 ;2
5 1;7	;2711	3;8950	;1 ;2
6 1;0	1;0000	∞	0 1;0
	(cos	cot	Radian- π

Note that for any quadrant you can read straight into the table without the humbug of finding the difference from 180, e.g.

$\sin ;3 = \sin ;9 = -\sin 1;3 = -\sin 1;9$

$\cos ;2 = -\cos ;2 = -\cos 1;2 = \cos 1;2$

$\tan ;5 = -\tan ;7 = \tan 1;5 = -\tan 1;7$

$\cot ;4 = -\cot ;8 = \cot 1;4 = -\cot 1;8$

Tables like degrees etc to radians become superseded by tables of multiples of π , useful for many other applications.

The secret of working in dozenal is to put decimal right out of your mind. Don't think like this: four eights are thirty two, that is, let me see, two dozen and eight! Reckon up by dozens and half dozens. If three eights make two dozen, then four eights must be twozen eight. The author of this paper never bothered to learn the:-

Multiplication Table

1	2	3	4	5	6	7	8	9	2	2	10
2	4	6	8	2	10	12	14	16	18	12	20
3	6	9	10	13	16	19	20	23	26	29	30
4	8	10	14	18	20	24	28	30	34	38	40
5	2	13	18	21	26	22	34	39	42	47	50
6	10	16	20	26	30	36	40	46	50	56	60
7	12	19	24	22	36	41	48	53	52	65	70
8	14	20	28	34	40	48	54	60	68	74	80
9	16	23	30	39	46	53	60	69	76	83	90
2	18	26	34	42	50	52	68	76	84	92	20
2	12	29	38	47	56	65	74	83	92	21	20

With 2 X 6 or 3 X 4 = *10 in your head doubling or trebling any of these factors easily gets you to any of the underlined stepping stones. The only lines that reach the end before getting a nought on are 1, 5, 7, 2.

Now 1 X 1 = 1, 5 X 5 = 21, 7 X 7 = 41, 2 X 2 = 21, 5 X 7 = 22, 5 X 2 = 47, 7 X 2 = 65. All numbers ending in these digits are either prime numbers or have no factors but numbers ending in 1, 5, 7, or 2. One of the many sym-

metries of dozenal. All even nos. end in 2 4 6 8 2 or 0. All triple nos. end in 3 6 9 or 0, all quadruples in 4 8 or 0. Every no. tells a story!

Good ready-reckoner tables are available for quick undecimalisation.

Meanwhile, this short table can help:- 95432 means 0;0005432 et.simile.

10 ⁶	10 ⁵	10 ⁴	1000	100	10	0.1	0.01	0.001	0.0001	0.00001
402854	49254	5954	624	84	2 (1)	12497	15344	18820	20272	25232
805428	97828	2628	1128	148	18 (2)	24972	22688	35580	41924	42878
100812	125740	15440	1820	210	26 (3)	37242	43210	52252	62797	75625
140222	173594	12194	2394	294	34 (4)	49725	59153	62232	83649	92533
181162	201428	24228	2788	358	42 (5)	6	72497	87812	24422	910537
201432	242280	27880	3580	420	50 (6)	72497	87812	24422	910537	912212
241622	299114	34614	4074	424	52 (7)	84972	20263	10112	12622	915503
281982	326268	32368	4768	568	68 (8)	97242	26227	11928	14709	917227
302042	374200	44100	5260	630	76 (9)	29725	10263	13676	16725	912482

TGM is from and for dozenal notation. Cases do occur when to pop into TGM and back out again into decimal can make a short cut in decimal working. But generally conversion takes time. The formulæ given exploit factors 2,5,25 and decimal place shift on lefthand, and 2,3,4,6,8,9, with dozenal place shift on righthand, thus keeping the job simple. For the number "spelling" change at : rapid conversion tables are available over the range 9999 000 000 to 0.000 000 01. Only add two numbers, it converts a four-figure value. Example: Convert 7823×10^5 :-

Look for 78, trace across to place column "+7" and put down *199280000

[illegible]

EXAMPLES. Decimal examples are given for comparison, so their values are analogous rather than strict equivalents.

Example 1: A tank 4 gf X 3 gf holds water to depth 2 gf. Volume of water?

4 gf X 3 gf = *10 Surf(area of base) 4 ft X 3 ft = 12 sq feet.

$$*10 \text{ Sf} \times 2 \text{ gf} = *20 \text{ Vom (vol of water)} \quad 12 \text{ sq ft} \times 2 \text{ ft} = \underline{24 \text{ cu ft.}}$$

Example 2: What is the mass of the water? Assume maximum density.

$$*20 \text{ Vm} \times 1 \text{ Denz}(\text{mz/Vm}) = *20 \text{ maz} \qquad 24 \text{ cu ft} \times 62.5 \text{ lb} = 1500 \text{ lb}$$

Example 3: What force does the water exert on the base of the tank?

*20 mg X 1 G = *20 Mg 1500 lb X 32.1741 ft/s² = 48261 poundal

Example 4: What is the pressure on the base? (We now skip back to

Example 4: what is the pressure on the base: (we now skip
 $\ast 20 \text{ Ng} \div \ast 10 \text{ Sf} = 2 \text{ Prem}$ pounds force lbf)

(2 Prem is also 2 gf head of water) $1500 \text{ lbf}/(12 \times 144 \text{ in}^2) = 0.87 \text{ psi}$

Example 5: How much heat is require to raise the temp. from 18°C to 100°C Calgrad

Example 3: how much heat is require to raise the temp
(20°C) to *125000 Cg (50°C)? $50 - 20 = 30\text{ }^{\circ}\text{C}$

$$*125 - *184 = *21 \text{ trinacals} \quad 30 \text{ C}^0 \times 9/5 = 54 \text{ F}^0$$
$$2 \text{ } ^1\text{mz} \times 21 \text{ } ^3\text{Cg} = \underline{42 \text{ } ^4\text{Wergs}} \qquad 54 \text{ } ^0\text{F} \times 1500 \text{ lb} = \underline{81 \text{ } ^0\text{BTU}}$$

Example 6: An immersion heater takes *10 hrs to raise this temperature.

What is the power? $\frac{81000\text{BTU} \times 1.055 \text{ kJ}}{\text{hr}} = 1.98 \text{ kW}$

$$*42 \text{ } ^4Wg \div \frac{*10^{-4} \text{ tim}}{12 \times 3600 \text{ seconds}} = 4;2 \text{ Pov} = \frac{1.98 \text{ Kw}}{}$$

Example 7: The supply potential is *34 duniPel (240 V).What is the curr

$$*4;2 \text{ Pv} \div 0;34 \text{ Pl} = \overline{*13 \text{ Kur}} (\text{almost } 7.5 \text{ amp}). \quad 1980 \text{ W} \div 240 \text{ V} = \overline{8.22 \text{ A}}$$

Example 8: What is the resistance of the element?

$$0;34 \text{ Pl} \div *13 \text{ Kr} = 0;028 \text{ Og} \qquad 240 \text{ V} \div 8.22 \text{ A} = 29.19 \text{ ohms}$$

(or *28 30g, triniogs = Ohms, dec of *28 = 32)

Example 9: A train leaves London at 19:27 hrs (21.53) and arrives in

Example 9: A train leaves London at 19:30 hrs (21.50) and arrives Manchester at 01:30 hrs (01.45) next day. How long did it take?

To 01:90 hrs we add *20 hrs for 1 day. (Add 24 hrs)

21:90 hrs	25.45
-----------	-------

19:27 hrs 21.53

Answer: 3;25 hrs Answer: 3.52 hrs.mins

This is a straight dozenal subtraction. Notice that this is not a straight decimal subtraction, due to $60 \text{ mins} = 1 \text{ hr.}$

Example 7: Assume distance London/Manchester to be $\cdot 40^4_{gf}$ (180 miles)

find average speed of train (ex. 9), (i) in km/hr (or mph), and (ii)

Vlos (or, ft/s). 52 min $\div$ 60 = 0.86 hrs.

(i) $*40^4 \text{ gf}/3.75 \text{ hrs} = \underline{10.42^4 \text{ gf/hr.}}$ $180 \text{ miles}/3.86 \text{ hrs} = \underline{46.6 \text{ mph}}$

(ii) $1 \underline{V_{los}} = 1g_f/t_m = 1g_f/1t_m = 2g_f/2t_m, \text{etc.}$ $44 \text{ ft/s} = 30 \text{ mph},$

so:- $\overline{10;42}^4 \text{ gf/hr} = \underline{10;42} \text{ VI}$ so:- $46.6 \text{ mph} \times 44/30 = 68.35 \text{ ft/s.}$

Example 2: A gas has a volume of 8 Vm (0.2 m^3) and expands to 20 Vm (0.6 m^3)

Example 1: A gas has a volume of 0.01 m³ and expands to 0.02 m³ under a constant pressure of 1 Atmosphere, 29 Pm (10.15 kN/m²). Find

the work done by the gas against the external pressure of the atmosphere.

$$\Delta V_{\text{el}} = 1.20 - 0.8 = 0.4 \text{ В} \quad \Delta V_{\text{el}} = 0.6 - 0.2 = 0.4 \text{ В}^3$$
$$\Delta V_{01} = 20 - 8 = 12 \text{ Vm} \quad \Delta V_{01} = 0.9 - 0.2 = 0.7 \text{ Vm}$$

$$\text{Work done} = q\Delta V = 2 \times 10^{-6} \times 12 \quad \text{Work done} = 10^{-6} \times 0.7$$
$$= (30 \times 14) - 14 = 378 \text{ Werg}$$
$$\frac{1}{2} \times 0.0067 \times 10^{-3} \times 10^8 = 33.5 \text{ J}$$

(about 4200 J)

... ..

Example *10: A bucket has an average diameter of 0;97 Gf (0.24m) and is 1 Gf (0.3m) deep. What is the volume?

Dia squared = 0;772 Sf

0.0576 m^2

$\text{Volume} = \frac{\pi D^2 h}{4} = 0;172\pi \text{ Vom} = 0;6 \text{ Vom}$

$\frac{0.0576 \times 0.3 \pi}{4} = 0.01357 \text{ m}^3$

Example *11: The bucket is lowered into a well and fills to the brim with water. What mass of water is in the bucket?

$0;6 \text{ Vom} \times 1 \text{ Dz}(\text{Mz/Vm}) = 0;6 \text{ Mz}$

$0.01357 \times 1000 \text{ kg/m}^3 = 13.57 \text{ kg}$

Example *12: What is the weight of the water?

$0;6 \text{ Mz} \times 1 \text{ G} = 0;6 \text{ Mag}$

$13.57 \text{ kg} \times 1 \text{ g} = 13.57 \text{ kgf}$

Example *13: What force is required to hold the bucket of water stationary after withdrawal from the well-water? Assume no spillage, and that the weight of the bucket empty is 0;1 Mg (2.15 kgf)

$0;6 \text{ Mg} + 0;1 \text{ Mg} = 0;7 \text{ Mg}$

$13.57 + 2.15 = 15.72 \text{ Kgf}$
Multiply by $g = 9.80665 \text{ m/s}^2$
 $= 154 \text{ newtons.}$

Example *14: The surface of the well water is *30 gf below the top of the well wall. The diameter of the windlass plus the thickness of the rope is 1 Gf. Through what angle (radians) does the handle of the windlass turn, while the bucket descends the *30 Gf?

Windlass radius = 0;6 Gf.

$*30 \text{ Gf} = 10.8 \text{ m}$

$\therefore 0;6 \text{ Gf}$ of rope is paid out per radian.

Radius of windlass + rope
 $= 0.15 \text{ m.}$

Answer: $*30 \div 0;6 = *60 \text{ radn.}$

$10.8 \div 0.15 = 72 \text{ radn.}$

Example *15: What is the angular position of the handle of the windlass at the end of the descent relative to its position at the start?

(Answer in zenipis, or $^\circ$ in decimal) ($\pi = 3;1848 = 3.1416$)

$*60 \div 3;1848 = 12;203$

$72 \div 3.1416 = 22.9182$

$12\pi = 2$ turns, so remaining angle is

$22\pi = 11 \text{ turns.}$

$2;03 \text{ zenipis.}$

$180^\circ \times 0.9182 = 165^\circ.276$

$0.276 \times 60 = 16'.56$

Answer $165^\circ 17'$

Example *16: After *30Gf descent, the bottom of the bucket is just touching the water. What further angular displacement of the handle occurs, when after submergence the rope is re-tautened to bring the brim level with the surface of the water? (Bottom rim of bucket is 2 zenifut deep).

Total height of bucket = 1;2 Gf.

$0.3 + 0.05 = 0.35 \text{ m}$

$1;2 \div 0;6 = 2;4 \text{ radians}$

$0.35 \div 0.15 = 2.3 \text{ radn}$

Divided by $\pi = 8;225 \text{ zenipi}$

$\div \pi = 0.7321$

$\times 180^\circ = 131.778$

Example *17: The windlass crank is 1;6Gf long between centres. What force is

$.778 \times 60 = 46!68$

Answer: $131^\circ 46'.68$

applied to the handle, to hold the bucket

of water stationary when clear of the well

Leverage is $1;6\text{Gf} \div 0;6\text{Gf} = 3$.

water? $G = 1$ (Dec. 9.80665)

$0.45 \text{ m} \div 0.15 \text{ m} = 3$

From example *13, Force on rope is 0;7Mg

154 newtons

$\therefore \text{Force on handle} = 0;7/3 = 0;24 \text{ Mg}$

$154/3 = 51.3 \text{ N}$

Example *18: What is the torque?

$0;7 \text{ Mg} \times 0;6 \text{ Gf radius} = 0;36 \text{ Radamag}$

$154 \text{ N} \times 0.15 \text{ m} = 23.1 \text{ m N}$

Example *19: What work is done in raising the bucket of water *30 Gf?

$0;7 \text{ Mg} \times *30 \text{ Gf} = *19 \text{ Werg}$

$154 \text{ N} \times 10.8 \text{ m} = 1663.2 \text{ N m}$

Example *12: When the bucket is at the top of the well the (or Joule operator lets slip the handle. How long before the bottom of the bucket strikes the water? Moment of inertia of windlass is $1/4 \text{ Qmz}$ (quaramaz).

$0;3 \text{ Qmz} \div 0;3\text{Gf}(\text{rad.squared}) = 1\text{Mz}$ effect on rope. Total mass $1 + 0;7 = 1;7$

Force = Mass $\times$ accel. = $7\text{Mg} = 1;7\text{Mz} \times \text{acc. Gf/Tm}^2 = ;7/1;7 = 0;45\text{G}$

Time² = $*30\text{Gf}/0;45\text{Gf/Tm}^2$. $\therefore \text{Time} = \sqrt{*30/\sqrt{.45}} = 6;/734 = 2 \text{ Tim}$ (1.7sec)

Example *12: The average power during fall?

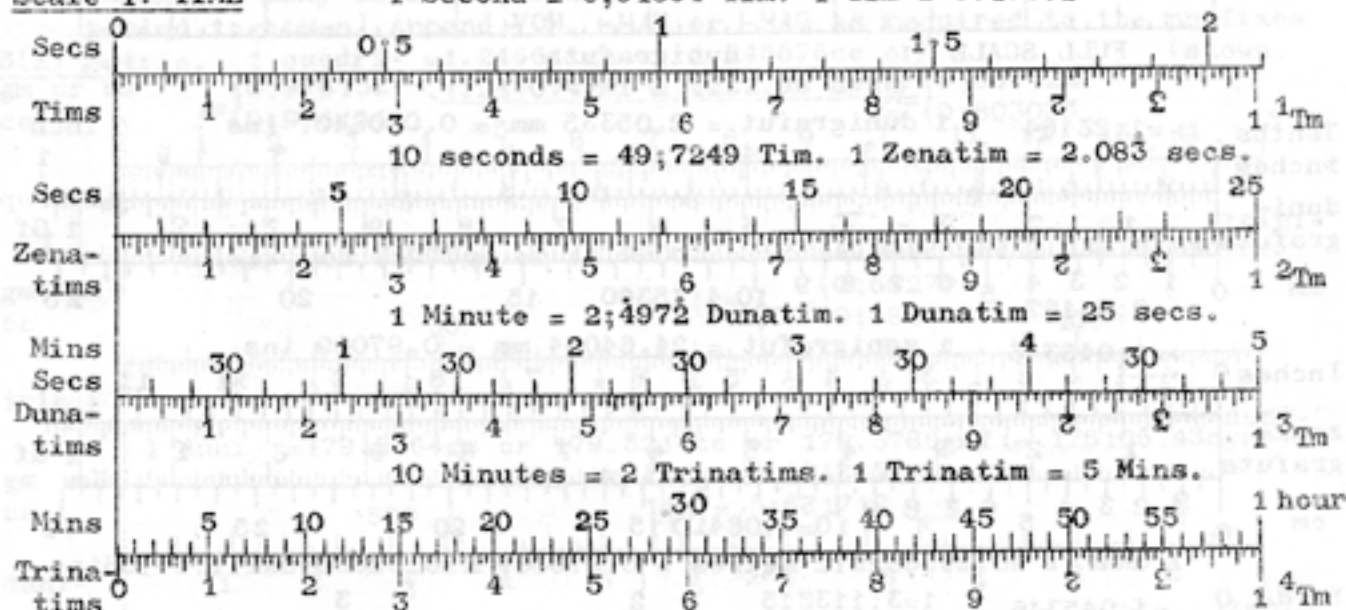
$*19 \text{ Wg} \div 2 \text{ Tm} = 2;12 \text{ Pov}$

$1663.2\text{J} \div 1.7\text{s} = 978.35\text{watts}$

TGM Appendix 1: CONVERSION SCALES

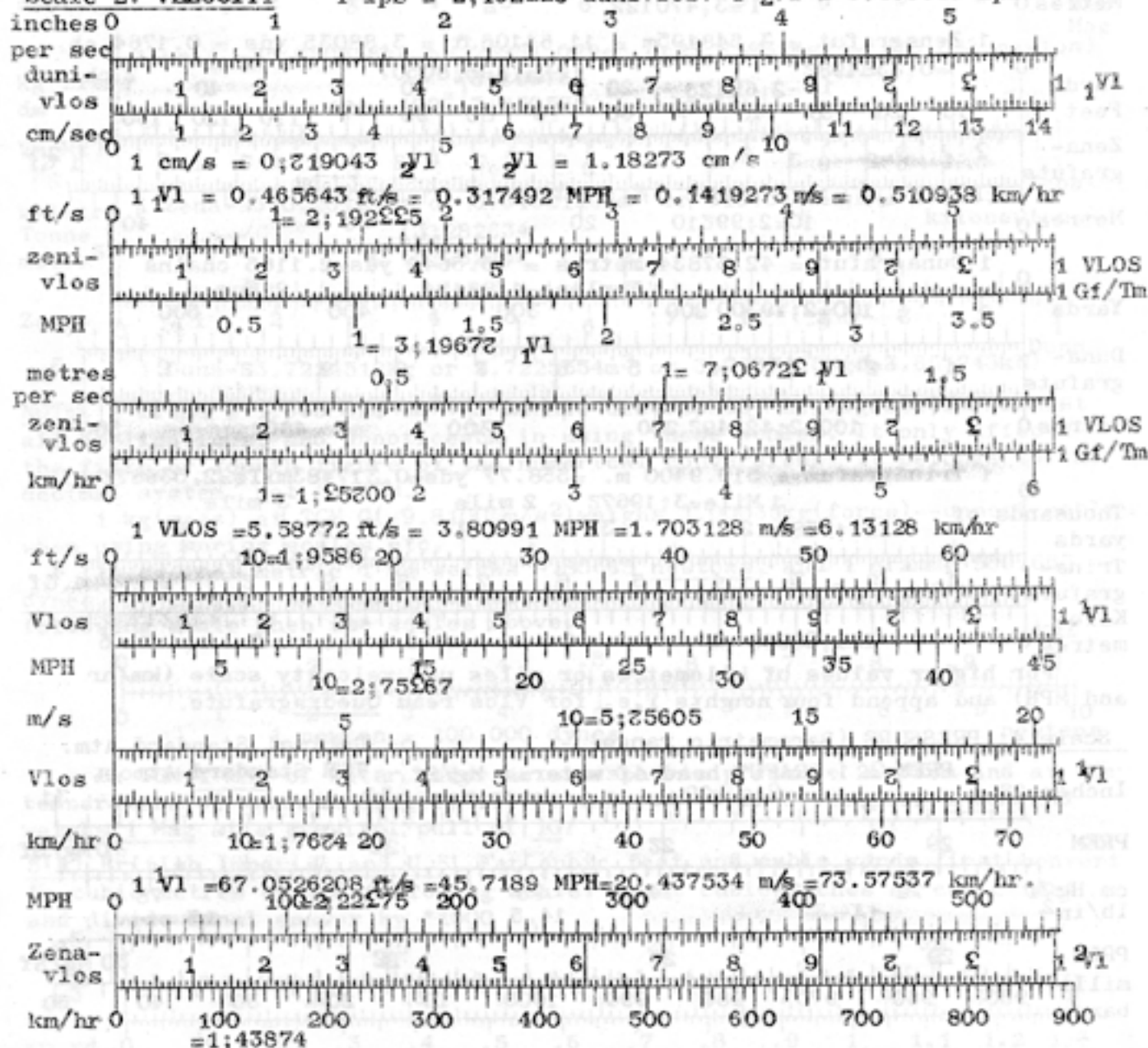
Scale 1: TIME

1 Second = 5;91534 Tim. 1 Tim = 0.17361



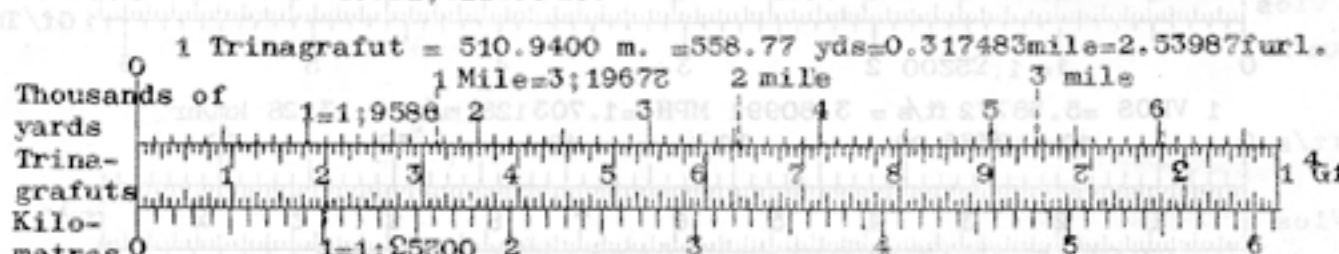
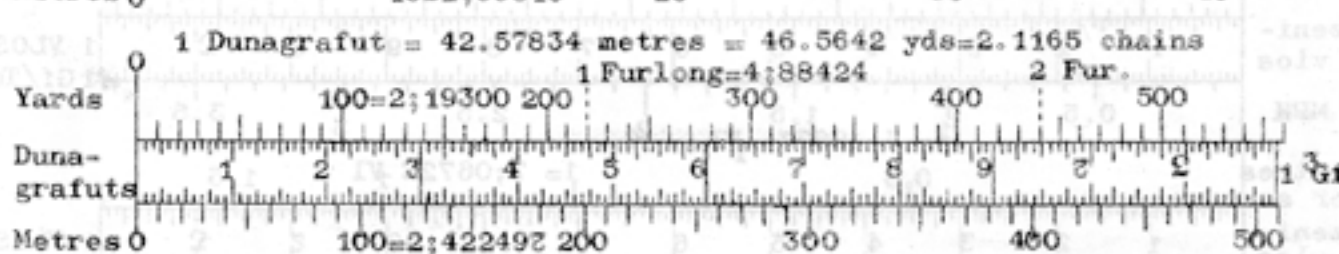
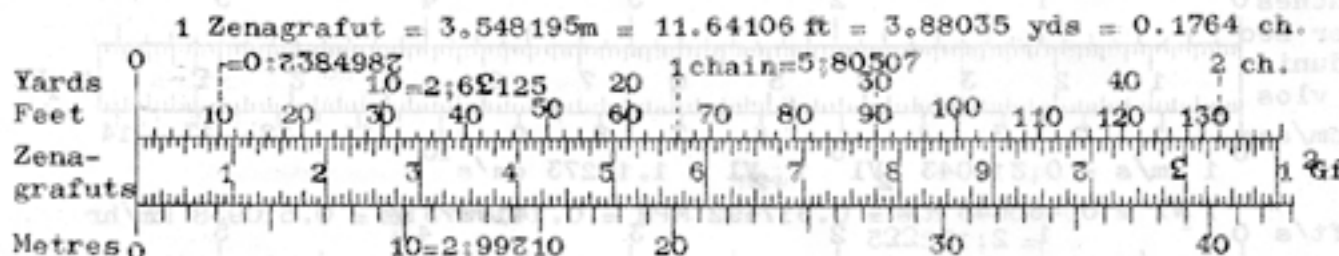
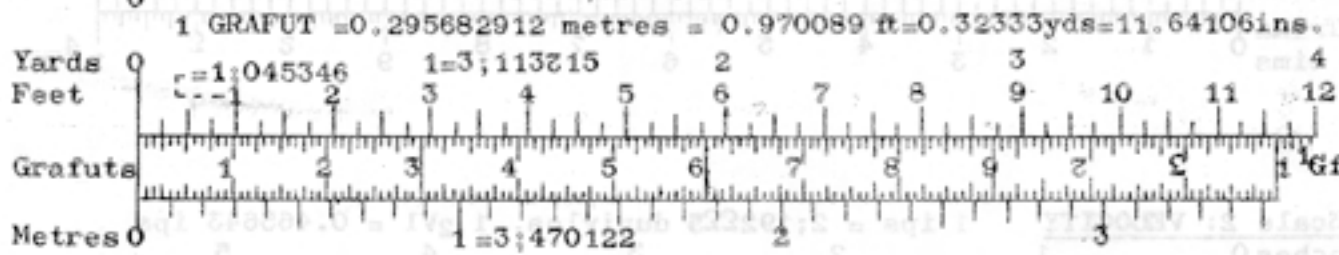
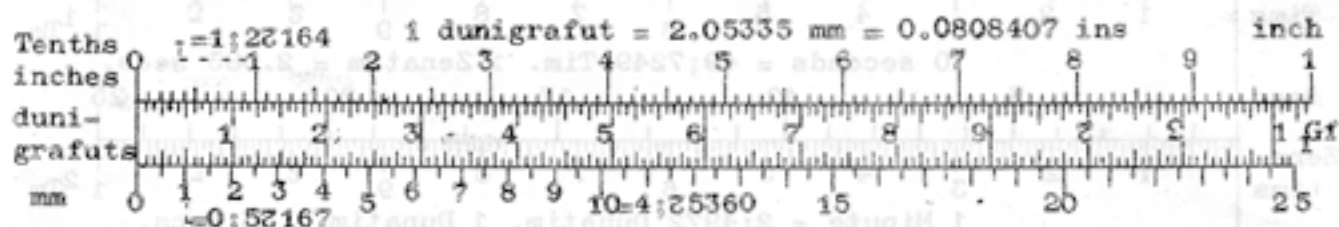
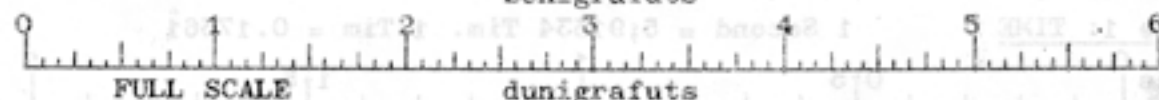
Scale 2: VELOCITY

1 ips = 2;192225 dunivlos. 1 2V1 = 0.465643 ips



Scale 3: LENGTH

zenigrafuts



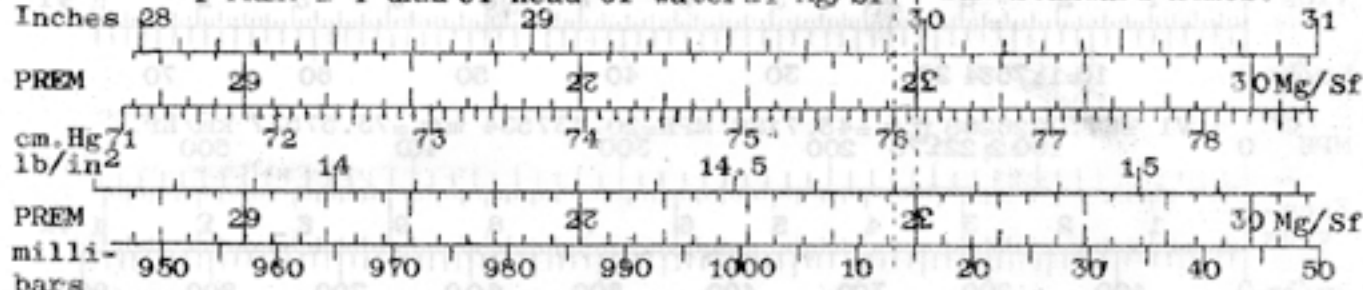
For higher values of kilometres or miles use velocity scale (km/hr and MPH) and append four naughts i.e. for Vlos read Quedragrafuts.

Scale 4: PRESSURE (Barometric range)

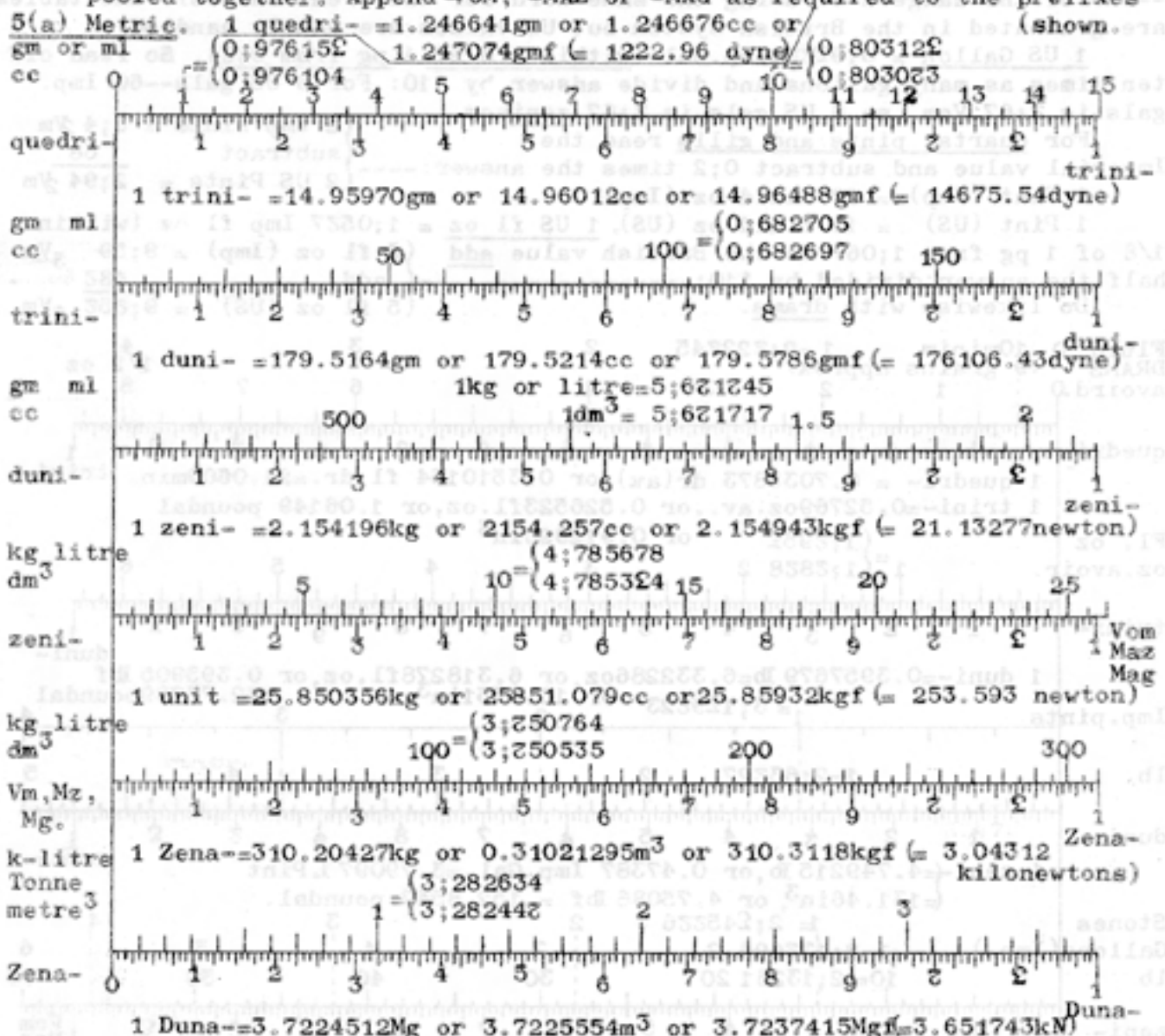
- Decimal Standard Atm.

1 PREM = 1 GRAFUT head of water = 1 Mg/Sf

TGM Standard Atmos.



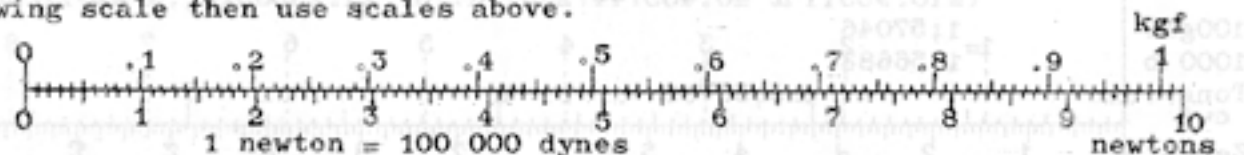
Scale 5: Volume, Capacity, Mass and Force. Though these are three different things in many cases the conversion ratios co-incide so they are here pooled together. Append -VOM, -MAZ or -MAG as required to the prefixes -



NOTE: 1 litre = 1.000 028 dm³--a minute discrepancy negligible for almost all applications, and unnoticeable in using these scales. It only affects the fifth or fourth figure of the numerical conversions. It belongs to the decimal system, not to TGM.

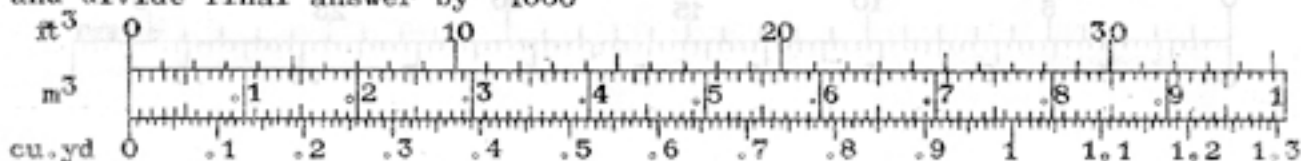
1 kg(mass) at TGM G(=9.81005m/s²) weighs 1.00035kg(force)--unnoticeable when using spring scales, etc.

In decimal metric 1 kg weighs 9.80665 newtons, and 1 gramme 980.665 dynes. To convert newtons or dynes, first convert to kgf or gmf by the following scale then use scales above.



In TGM 1 maz of water under an atmospheric pressure 2 Ω Prem and at the temperature of maximum density *173786 Calgrad (3;29°C) occupies 1 Vom and weighs 1 Mag at a gravital pull of 1G.

5(b) British Imperial and U.S. For cubic feet and cubic yards first convert to cubic metres by the following scale. Treat cubic inches as cubic feet and divide final answer by *1000



5(b) British Imperial and U.S.(contd.)

The British and US units of Capacity are NOT the same (except in words --one of the dangers of using the same word for different values). The tables are graduated in the British system but US values are easily handled:-

1 US Gallon = 0;9222 Imp.Gal (within 1/8 of 1 pg from 0;2). So read off ten times as many gallons and divide answer by *10: For 6 US gals--60 Imp. gals is 2;67 Vom, so 6 US gals is 2;67 zenivom.

For quarts, pints and gills read the Imperial value and subtract 0;2 times the answer:-----

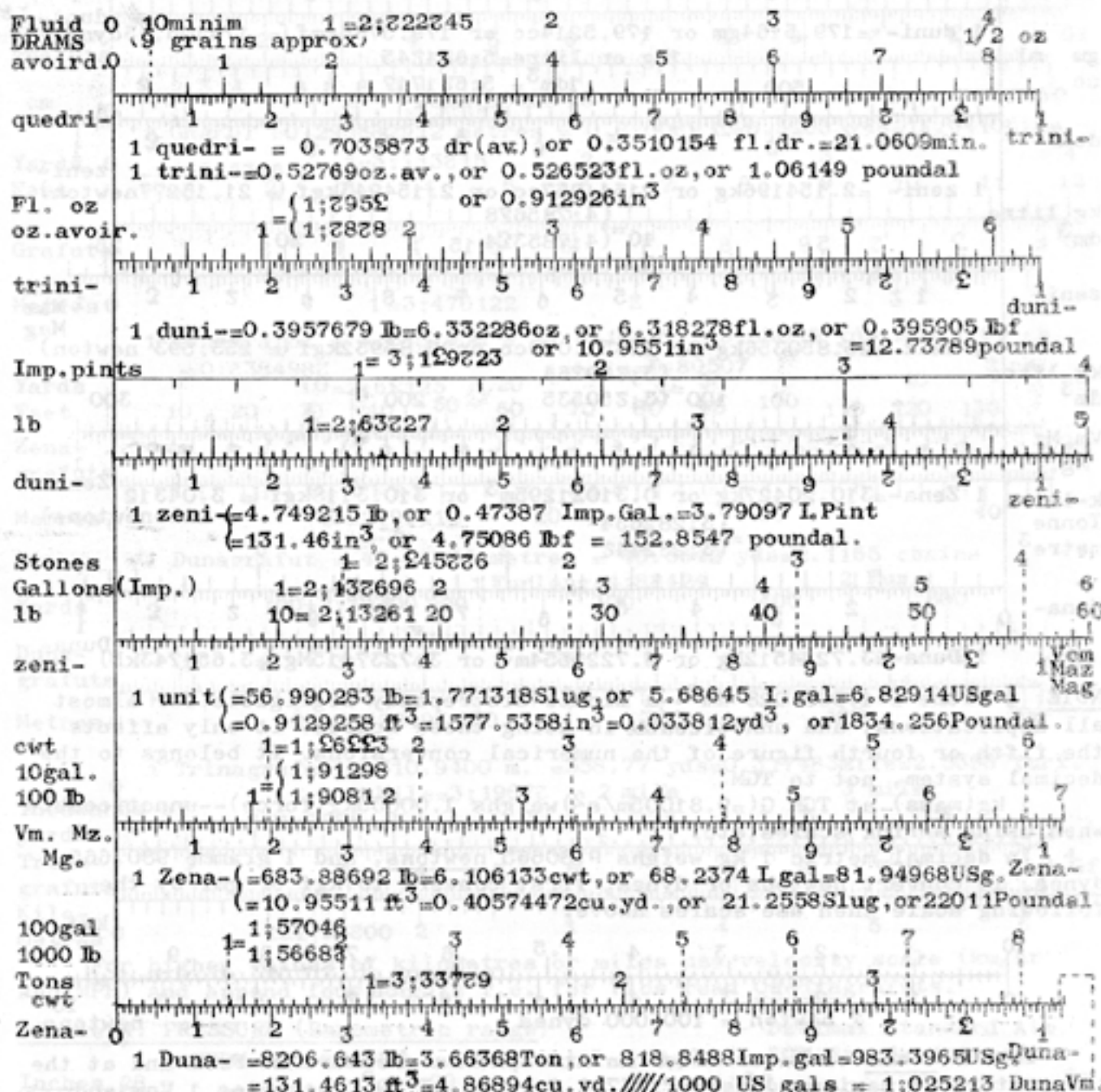
1 Pint (Imp) = 20 fluid oz (Imp)

1 Pint (US) = 16 fluid oz (US). 1 US fl oz = 1;0527 Imp fl oz (within 1/8 of 1 pg from 1;06) To the British value add half the answer divided by *10:-----

Do likewise with drams.

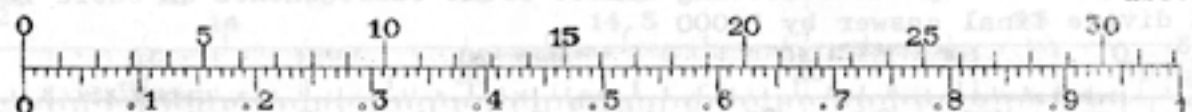
2 Imp Pints = 3;4 2/3m
subtract 68
2 US Pints = 2;94 2/3m

5 fl oz (Imp) = 9;59 3/4m
add 482
5 fl oz (US) = 9;252 3/4m



Force Units: 1 lb(mass) weighs 32.1741 Poundal. 1 Slug weighs 32.1741 lb(force)

Use following table to convert to lb(mass) or lb(force), then tables above.



The **Duodecimal Society Of Great Britain** provides a centre for all who consider that naturally developed methods of conducting our daily affairs - largely based on divisible groups of twelve - are superior to those restricted to an inflexible decimal progression. The Society aims to counsel the public in the principles of numeration and measurement, and study the application of base twelve arithmetic to all social and scientific purposes.

With the co-operation of other organisations, we afford a channel of informed resistance against any proposal intended to restrict our thinking to inept and out-moded methods.

Membership of the D.S.G.B. is open to all who have an interest in the development of arithmetic as an essential tool of science that will also allow a broader understanding of the ways in which the physical world is described and regulated. Members receive copies of this Review free, plus the Duodecimal Bulletin of the Duodecimal Society of America. An occasional Newsletter is also issued for internal affairs. Non-members may purchase copies of the Review at 1/6d each.

The numeration in this journal is dozenal with the sequence 1 2 3 4 5 6 7 8 9 ζ ε 10 11 12 13 14 15 16 . . . In some instances decimal notation is used. Unless clear from the text, dozenal numbers are prefixed with a star (*) and decimal with a dagger (†) e.g. *100 = †144 or 1000 = *6ε4.

The generally accepted sign for the dozenal point is a semi-colon (;) e.g. $2\frac{1}{2} = 2;6$ or $\frac{1}{2} = 0;9$. Any special notation used by authors should be described at the beginning.

Articles and letters are welcomed for publication; both members and non-members being invited to contribute. Although the majority of articles are concerned with base twelve and have a mathematical bias, discussion of any topic with arithmetical connections, and work in other bases, will interest our readers.

The Editor reserves the right to shorten any article, but will take care not to alter its conclusions. Contributions should be sent to: Editor, Duodecimal Review, 69 Scotby Road, Scotby, Carlisle CA4 8BG