Le Manio: How ancient maths manipulated factors

by Richard Heath

Abstract

This article is based upon notes made in 22 May 2014 whilst the 32/29 relationship between AMY and day-inch lunar month was discovered by autumn 2009 (after this paper), being driven to use day-inch counting to explain the origins of megalithic monuments evidently created in the pursuit of astronomical knowledge yet measuring time as lengths. The movement from counting days as inches to using megalithic yards to stand for lunar months was partly explained in my *Sacred Number and the Lords of Time* by the fact that the excess of lunar months in the solar year is 7/19ths of a lunar year, a residue which adds up over nineteen years to lead to the Metonic period having 235 lunar months in nineteen years. If the AMY is 19/7 feet then it cancels with the residue if and when the megalithic astronomers counted in lunar months. Until last year, there seemed no way to derive the astronomic megalithic yard short of a Metonic scale of monument but the work on this site, on numeracy, and a growing set of techniques such as scaling, proportioning to cancel factors from denominators and hence "clear" fractions, has revealed the 32/29 relationship as deducible in the megalithic and necessary for the quantification of N = 32.585 inches, the measure Robin Heath referred to as the astronomic megalithic yard [2008].

Le Manio's Quadrilateral

This unique monument (figure 8), located east of the Carnac Alignments, has been interpreted as being a kerb monument, possibly once filled in as a mound. However, these kerbs follow a very purposeful geometrical design and have a south west to north east diagonal equal to four solar years in day-inch counting. The southern kerb (figure 1) expresses three years from a sun gate (a back-sight for both summer and winter solstice sunrises), of two types - three lunar years and three solar years. The relations between these is then projected into the Quadrilateral as a right angled triangle (figure 2). The astronomers at Carnac appear to have understood the right angled triangle as a means to define the ratio (or interval) between time periods as a super-particular ratio of the form N (the base) to N+1 (the hypotenuse), as well as enabling units of measure to be re-proportioned in order to "clear" the residues in their measures (that we call fractions.) Fractions can be avoided by choosing units of measure which divide into a measured distance *a whole number of times*. But in order to achieve this, the whole of a given problem had to be matched with different parts of their toolkit: metrological triangles. Instead we would flatten such problems into arithmetical solutions, and can ignore fractions by using the decimal system.

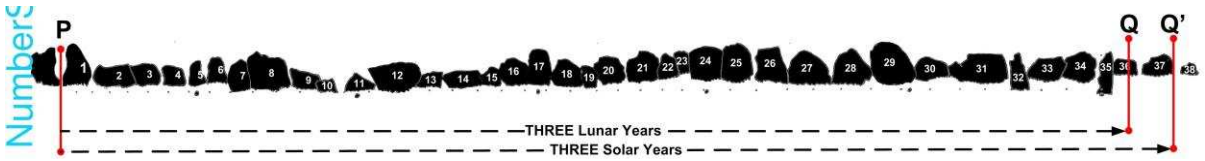

Figure 1 The silhouette of the southern kern of Le Manio's Quadrilateral made from a photo survey by the author. The stones are numbered from the Sun Gate, see below, and reach three lunar years at Q atop stone 36 and three solar years at Q' at eastern end of stone 37. See plan in figure 2 and photo of "gate".

In 2009/10, Robin Heath and I identified, surveyed and verified [HEATH, Richard and Robin. 2011] the existence of a day-inch count for three lunar years (1063.1 inches) within *Le Manio's* Quadrilateral, which then extends to the end of stone 37 by a megalithic yard of 32.625 inches, a megalithic yard, to the end of a three solar year count (1095.75 inches). The ratio of stones of the southern kerb 36:37 appears to symbolize and approximate the lunar months involved in those times periods.

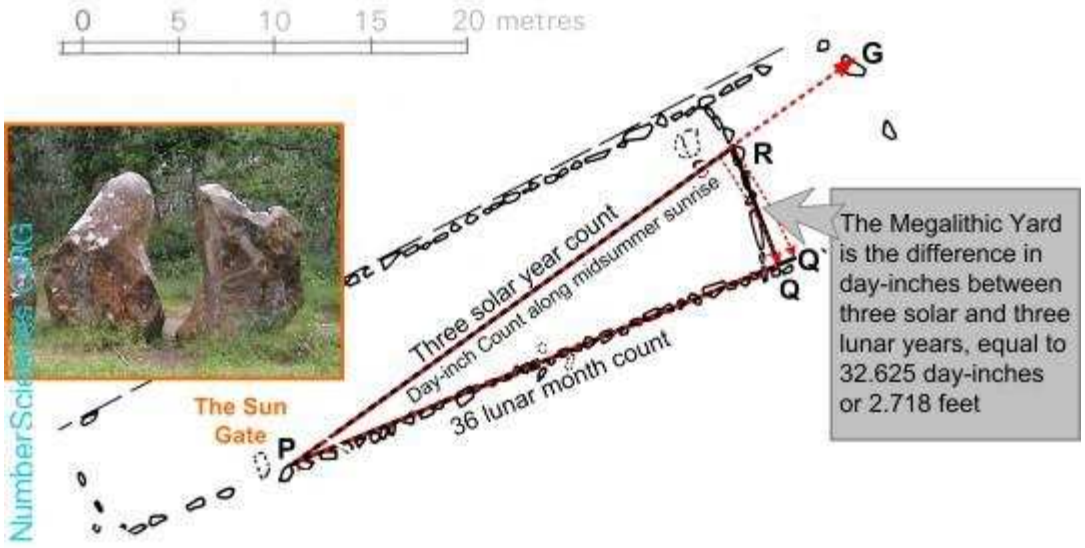

Figure 2 Plan of the Quadrilateral from Thom's Megalithic Sites in Britain and Brittany with geometry of day-inch counting overlaid. The solar years appear as counted aligned to the midsummer solstice sunrise to point G. The monument appears to memorialize the origin of the megalithic yard as the difference between three years of the solar and lunar kind.

This points to the origins of the megalithic yard as having been most naturally generated as a unit of length when megalithic astronomers were comparing the three year near-anniversary of sun and moon, using day-inches to count circa. 4000 BC. As a unit representing the ratio between lunar and solar years (1.035), the more accurate anniversary of 19 years can give a later refinement, almost exactly seven lunar months different in nineteen years. This identifies the astronomical megalithic yard (AMY of 19/7 feet long) as being the number of years in which the solar year count is ahead of the lunar year count by a single lunar month of difference (2.7154 lunar years or 32.585 lunar months). Adding one lunar month gives 33.585 lunar months which is 2.7154 *solar* years of counting.

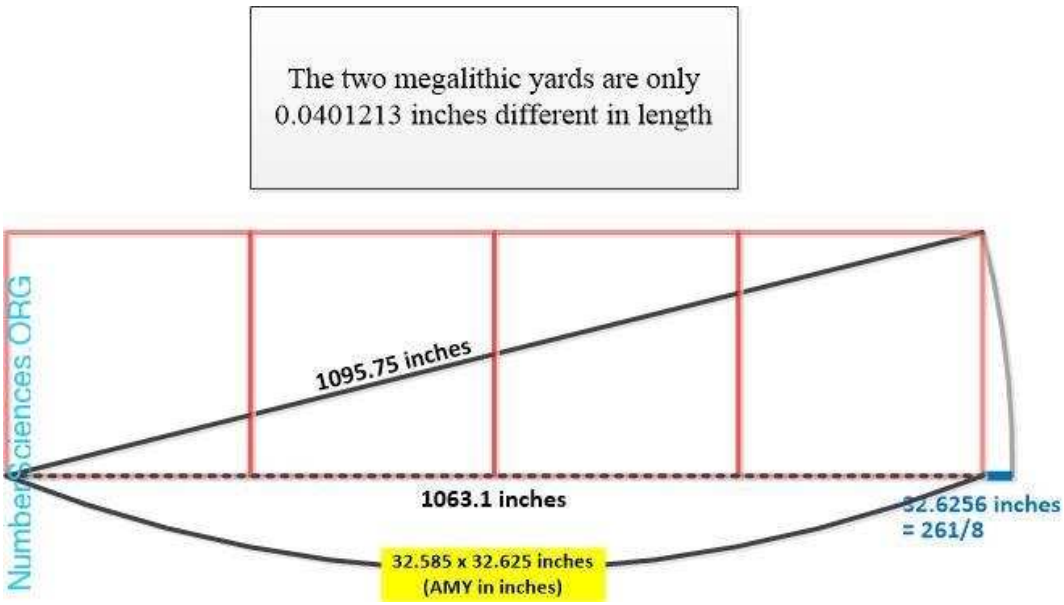

Figure 3 The geometry of solar versus lunar years as a "lunation triangle" (HEATH, Robin. 1998) almost perfectly matches the diagonal angle of a four-square triangle. The three lunar year period in day-inches is the near square of the difference (32.625 inches) times the super-particular ratio (N:N+1) of this triangle, where N = 32.585 (see figure 4), the number of inches in the astronomical megalithic yard found later in the megalithic (3500 BC onwards) [HEATH, Richard. 2014]

Since the AMY is widely found in later monuments then one is drawn to look for an explicit monument which, through counting over 19 lunar and 19 solar years (instead of three) might have shown a difference of seven lunar months between 228 and 235 lunar months respectively. It seemed possible that the distance to *Le Geant* from the Quadrilateral could have allowed this - but there is insufficient evidence for that and so one has to consider the alternative ways the AMY unit might have been resolved. For instance, there is a property of right angled triangles which could have been exploited within the three year counting at *Le Manio*, to isolate the AMY of 32.585 inches, as well as the megalithic yard of 32.625 inches, twin factors that sum to give three lunar years as a day count in inches.

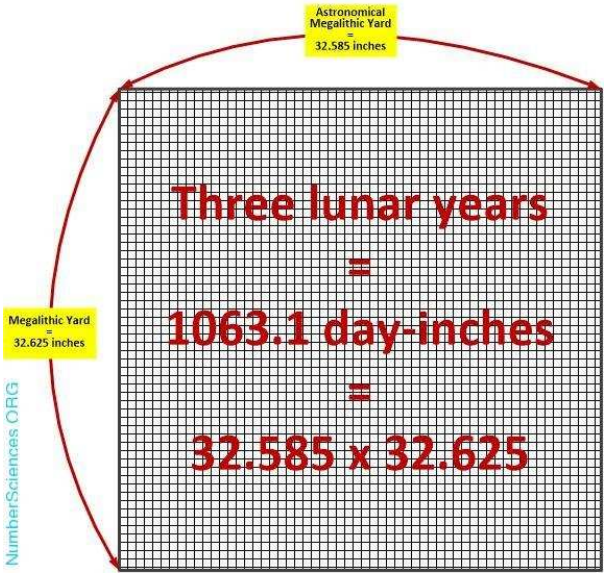

Figure 4 The near square of day-inches in three solar years is the megalithic yard times the astronomical megalithic yard for purely mathematical reasons, yet the nearness of this to a square number is a coincidence belonging to the sun-moon-earth system.

If the two counts could somehow be divided up by the differential unit between them (the MY of 32.625 inches), then the astronomers would have found 32.585 megalithic yards in the three lunar year count and 33.585 megalithic yards in the three solar year count. The amount left over, in either case, is then 19 (.0669) inches. That is, three lunar years is 32 x MY = 1044 plus nineteen inches making 1063 inches. The solar year is 33 x MY = 1076.625 plus nineteen inches making 1095.625.

The idea of dividing up the day-inch counts (into how many megalithic yards would fit them) arrives at a factorization demonstrating another feature of the counted lengths as forming a nearly square rectangular number when seen as being divided by the differential unit of length held between the base of the triangle and the hypotenuse. The difference can normalize the triangle: the difference becomes equal to one, revealing the unique numerical signature of the ratio between the two lengths.

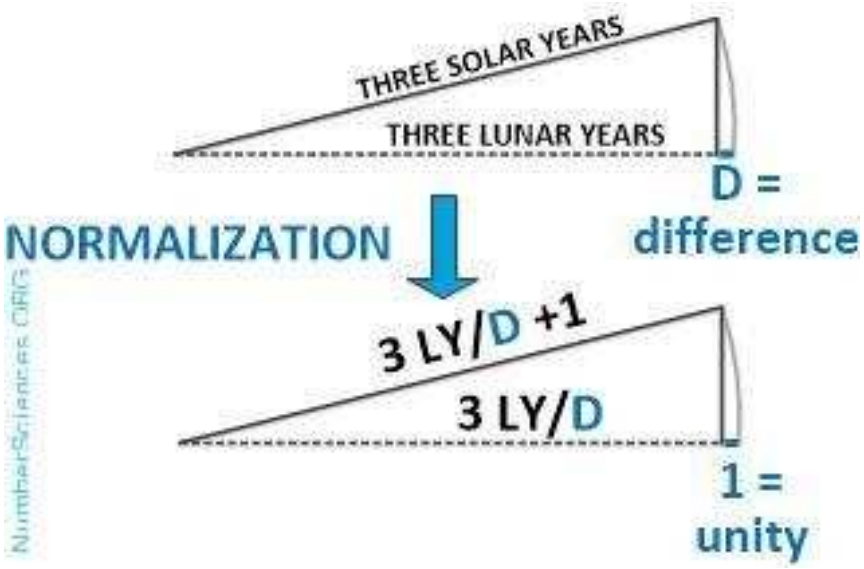

Figure 5 Triangles such as the three solar and lunar year triangles have a differential length which, divided into their two longer sides, leaves the difference as unity whilst the two sides are necessarily then super-particular, that is of the form N:N+1 and in this case N is the AMY and three lunar years divided by the difference becomes the AMY as a pure number, as per figure 4's near square property.

Having established that N = 32.585 rather than the almost identical 3-year difference of 32.625 days, one can resort to a little-known property of super-particular right triangles; that their difference multiplied by N gives the original measurement of the baseline. In this case, the original measurement is the lunar year count over three years, of 1063.1 days, whilst N must therefore be that count divided by 32.625 (the MY difference), a value already very close to N. This therefore makes it possible to divide up the count 32.585 times using the MY, but then what meaning or utility would a new count of 32.585 megalithic yards have?

It is here that stone age numeracy can display its ability to **factorize and re-proportion**. The process of dividing 1063.1 by 32.625 to obtain 32.585 (the true value of N for the solar-lunar ratio) must be achieved using **geometrical metrology**. The MY is 32.625 or 32 and five eighths, so that this length can be shown as 261/8 seen then as a number of eighths of an inch; a limit of likely resolution when using inches.

The numerator 261 then has the factors 3 x 3 x 29 whilst the denominator is 2 x 2 x 2 = 8.

That is 261 = 29 x 9/8

Since dividing 261 into 1063 was not directly possible in the megalithic, as a first step, and knowing the above prime factors of 261 (as the stone age was able to, from simple

experimentation with numbers as objects) the lunar year count of 36 months could be divided into nine parts leaving each divided part as 118.12 day-inches, or four lunar months (36 lunar months are 9 x 4 lunar months). This division by nine could then be followed by a multiplication by 8, the denominator of the divisor and so a multiplier for the required calculation. This results in 4 x 8 = 32 lunar months (in day-inches).

It then appears that, in order to finally divide by 29 (and complete this "calculation") the scaling effect between base and hypotenuse within any right angled triangle could be used to form a hypotenuse of 32 lunar months above a base of 29 lunar months, so as to reveal that the required value of N = 32.625 must be 32/29 of the lunar month in day-inches, and indeed the lunar month of 29.53 x 32/29 equals 32.5854786, effectively exact. (see Appendix for algebraic version of the solution)

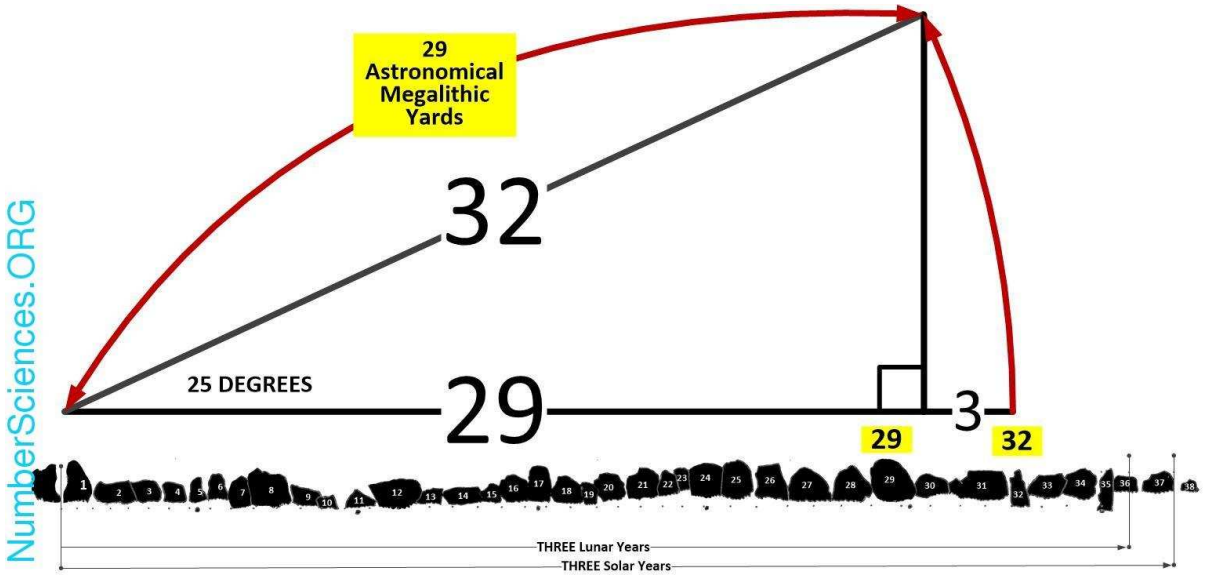

Figure 6 The method of manipulating factors to derive the AMY (instead of creating a nineteen-year triangle) could possibly have been shown within the Quadrilateral. If the kerb from the solar gate to stone 29 was taken to be 29 lunar months and to stone 32 that number of lunar months, then 32 lunar months is 29 astronomical megalithic yards. The method of converstion then follows convenience, such as using a four lunar month count of 118.125 inches and obtaining four AMY on the hypotenuse.

Each of the twenty-nine lunar months on the base of this triangle can be seen in horizontal width to select a length 32.585 day inches on the hypotenuse, each the length of the true Astronomical Megalithic Yard (AMY) which is also the value for N for the lunar-solar ratio between respective years. In feet, this length is 2.7154, which is the number of these years which then differ by a single lunar month and are 32.585:33.585 lunar months long. The units

of this 2.7154 figure are solar years per lunar month of difference. In principle the figure below shows how the day-inch count for a single lunar month translates into the astronomical megalithic yard when a 29:32 right-triangle is used.

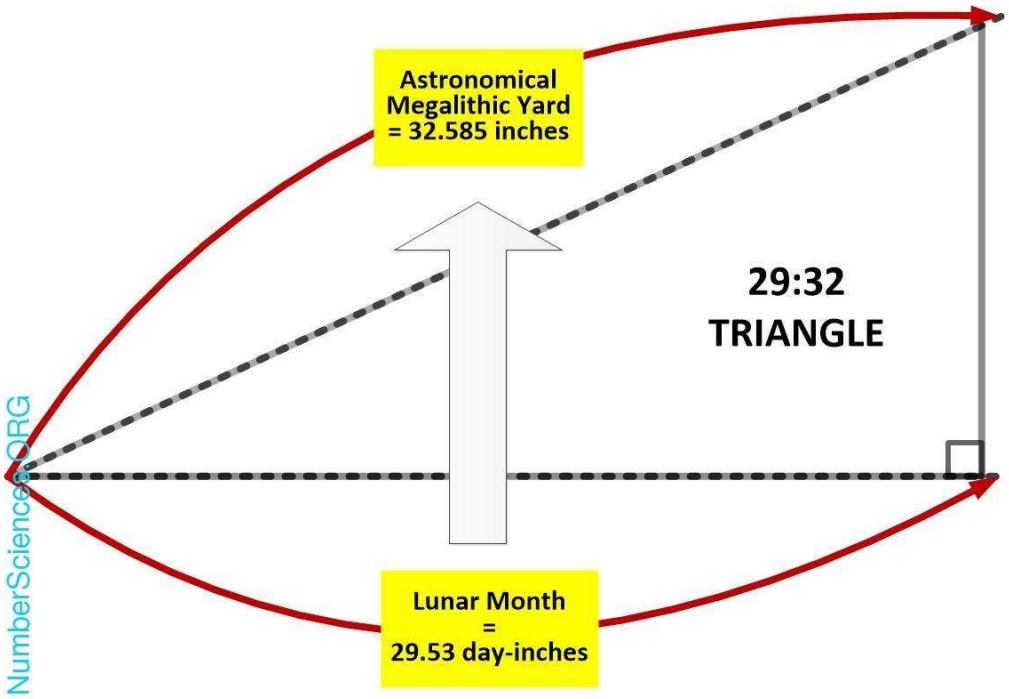

Figure 7 The methodology of using a 29:32 triangle to generate astronomical megalithic yards can employ near integer numbers of days found in multiple lunar months. The three-year period of 36 months is one such, being 1063.1 inches long, so that there must be 36 AMY at a 25-degree slope angle above three lunar years. In practice, once the slope angle of 29:32 is constructed, any convenient number of lunar months on the base will correspond with the same number on the length of the hypotenuse above so that there is no need to divide by 29 at all!

Conclusions

The 32 to 29 relationship of AMY to the lunar month in day-inches appears to be defining; alongside the near-square nature of three lunar years as the difference (32.625) times the AMY (32.585). Perhaps it has a causal explanation? It has also been found that *Le Manio* embodies an extensive descriptive pattern belonging to the numerically intensive field of astronomical time. The Quadrilateral involves many more relationships than was first thought, suggesting it was a memorial to already determined facts rather than the original instrument for elucidating them.

Figure 8 Le Manio Quadrilateral, viewed from the north east. Extreme left is grooved stone G and extending right is the northern kerb and behind that the southern kerb, terminated by the taller "Sun Gate", from where one can view the midsummer solstice sunrise above the grooved stone.

Appendix: Seeing this Megalithic Method in Algebraic Terms

We can say 3 x LY = D x N = MY x AMY (1) where

- LY = lunar year
- D = difference between three solar and three lunar years = megalithic yard
- N = the base number for normalised triangle of solar and lunar years
- MY = 32.625 inches = 261/8 inches
- AMY = N = the superparticular ratio governing the relationship of solar and lunar year, in inches

Therefore N = 3 x LY / D (2)

where N is the desired unit length expressing the solar lunar relationship.

If we factorise 261 in MY it equals 29 x 9

so that MY = 29 x 8/9 (3)

So (2) becomes

N = 3 x LY x 8 / 29 x 9

then N = 36 x 8 / 29 x 9 [lunar months]and then

N = 4 x 8 / 29 [lunar months] (4)

1. The astronomical megalithic yard = N = 32/29 of the lunar month (in day-inches).
2. But 32/29 is a unitless ratio, albeit for conversion between the lunar month and the AMY, allowing the true value of N to be derived from the lunar month in day-inches.
3. We note that the lunar month in day-inches is 3/4 metres and 4 of them are equal to three metres, a metric clearly visible on the ground at the Le Manio Quadrilateral.

CITATIONS

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