Interesting Facts Concerning Prime Products and Their Relationship to Lorentz-Like Transformations

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Abstract

Prime products are analyzed from various points of view, with an emphasis on graphical representation and analysis. A prime product N is determined to have two integer coordinates D and m. These coordinates are related to the solutions of a parabola, as well as to right triangles, in what the author calls a 'backbone - rib' representation. A prime number or a prime product fall on three dimensional helices, which can be represented in two dimensions as sets of parallel lines. If a prime or a prime product can be represented by 6s - 1, then helix 1 or H1 is designated; if a prime or a prime product can be represented by 6s + 1, then helix 2 or H2 is designated. The integer s is really a composite number, which can be represented as s = r + n, where r is the row number and n is the grouping number called the complex number, both determined from the two dimensional representation of the double helices.

It is also discovered that, due to the mathematical form relating N to D and m, that there must be Lorentz - like transformations between N, D, and m and a new set N′, D′ and m′; however, the concept of velocity and the speed of light seem out of place in this instance. Nevertheless, the question is asked as to whether or not prime products can be considered to be away to unite relativity and quantum mechanics, which also depends upon integers in a large measure.

Interesting Facts Concerning Prime Products and Their Relationship to Lorentz-Like Transformations

Prime Products are the multiplication of two prime numbers. Prime numbers populate one or the other of two helices. If a prime number can be represented by 6s - 1, where s is an integer, beginning with 1, then that number falls on helix 1 or H1. If, on the other hand, a prime number can be represented by 6s +1, where s is an integer, then that number falls on helix 2 or H2. The product of two prime numbers also falls on one of these two helices. In fact, if N is a product of two primes, then N satisfies the following integer relationship $D^2 - m^2 = N$, which naturally decomposes into $(D + m)(D - m) = N$. In this equation, D and m are integers.

Table 1.

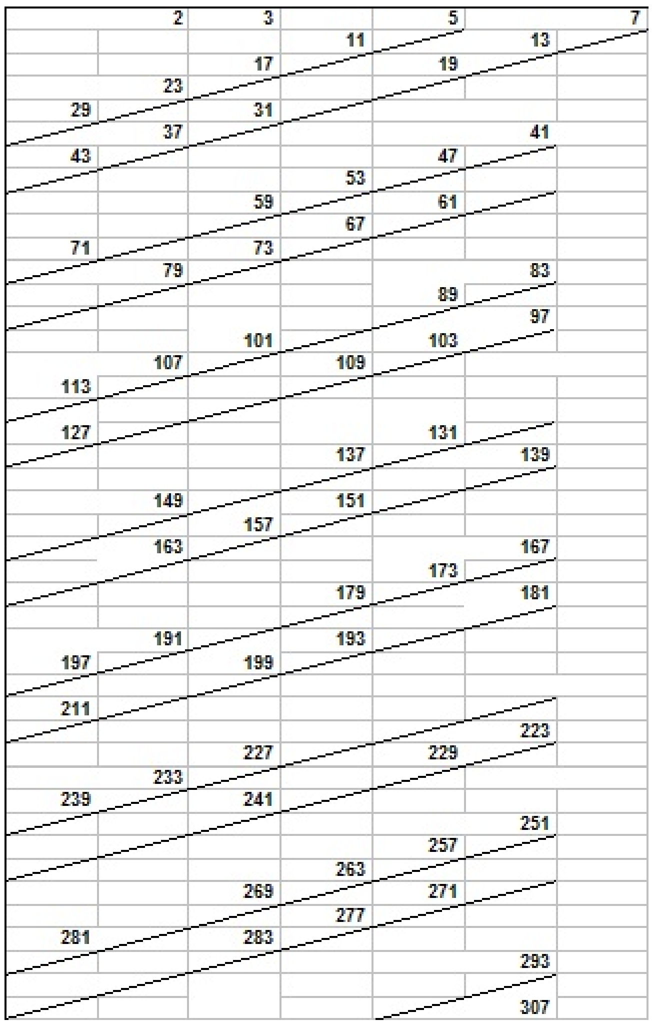
N	D - m	s	r	n	D + m	s	r	n	D	m
799(H2)	17(H1)	3	3	0	47(H1)	8	7	1	32	15
1081(H2)	23(H1)	4	4	0	47(H1)	8	7	1	35	12
803(H1)	11(H1)	2	2	0	73(H2)	12	11	1	42	31
1073(H1)	29(H1)	5	5	0	37(H2)	6	6	0	33	4
1219(H2)	23(H1)	4	4	0	53(H1)	9	8	1	38	15
851(H1)	23(H1)	4	4	0	37(H2)	6	6	0	30	7
1739(H1)	37(H2)	6	6	0	47(H1)	8	7	1	42	5
1763(H1)	41(H1)	7	6	1	43(H2)	7	7	0	42	1
1363(H2)	29(H1)	5	5	0	47(H1)	8	7	1	38	9
1591(H2)	37(H2)	6	6	0	43(H2)	7	7	0	40	3
3139(H2)	43(H2)	7	7	0	73(H2)	12	11	1	58	15

From the above chart we can see the multiplication rules for helices
$H1 \otimes H1 = H2$
$H2 \otimes H2 = H2$
$H1 \otimes H2 = H2 \otimes H1 = H1$

The Chart 1 below is from a previous paper entitled *DO PRIME NUMBERS OBEY A THREE DIMENSIONAL DOUBLE HELIX?*

In using the formulas 6s - 1 and 6s + 1 to determine whether a prime or prime product falls on H1 or H2, it may not be well known that the integer s is actually

Chart 1. Partial list of prime numbers along H1 and H2.



a composite number, which is the sum of two other numbers, taken from the above Chart 1. As explained in the previous paper, the above sets of parallel lines are what the double helix looks like when it is cut and folded in two dimensions. The number s is the sum of a row number and a complex number.

This is not a complex number in the sense of quadratures a + ib, where $i = (-1)^{1/2}$, but in the sense of groupings. The first set of parallel lines is n = 0 or complex 0, the second set of parallel lines is n = 1 or complex 1, and so on. The breakdown of s is as follows: s = r + n, where r is the row number of where the prime number is located and n is the complex it is located in. The values for s, r, and n are given in Table 1 for each of the prime numbers D - m and D + m. A few other numbers are given in the following table.

Table 1a.

Prime number	s	r	n
293(H1)	49	42	7
197(H1)	33	29	4
181(H2)	30	26	4
241(H2)	40	35	5
97(H2)	16	14	2
239(H1)	40	35	5
199(H2)	33	29	4

Consider the equation $y = x^2 - 2Dx + N$, where $N = (D - m)(D + m)$. This is a parabola with solutions for x at y = 0.

Chart 2.

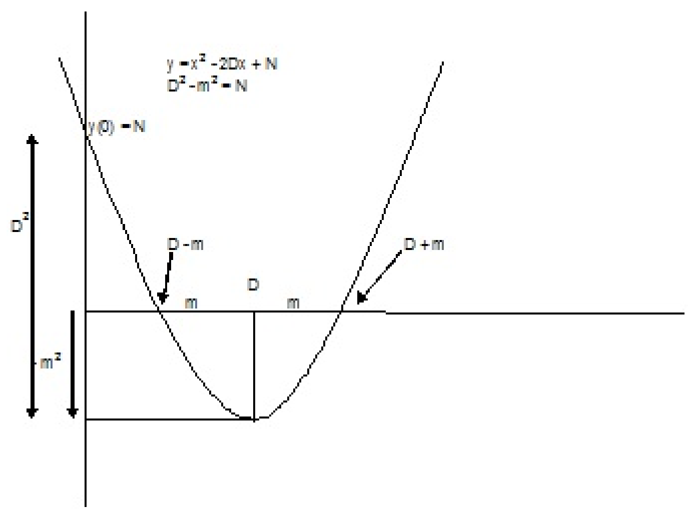


Chart 3.

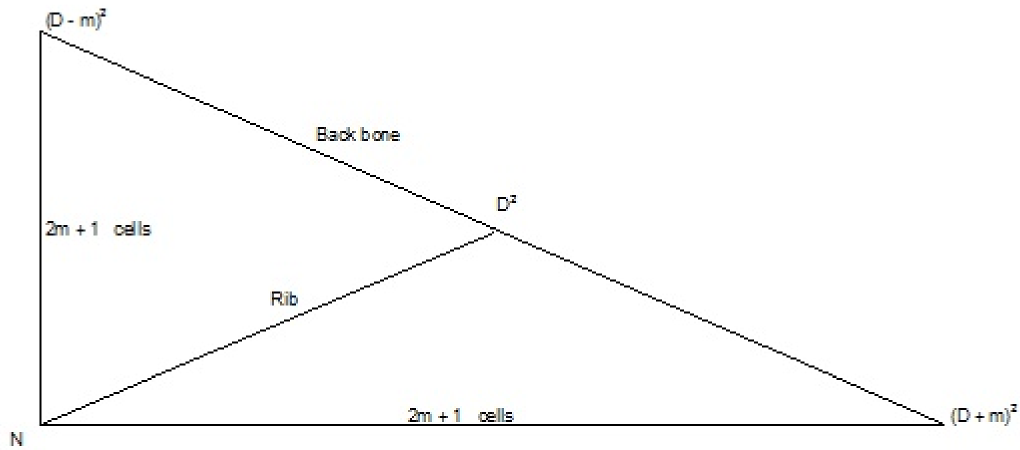
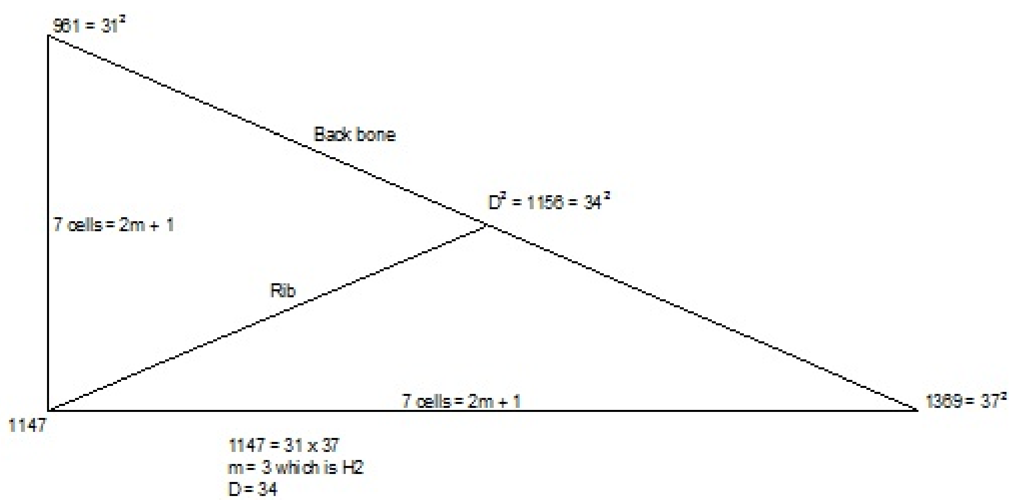


Chart 3 illustrates the essentials of Figure 1 below. The line of numbers starting with 25, 36, 49, etc. is referred to by this author as the backbone, with yellow and turquoise ribs extending from it to numbers located in various cells. These numbers are the values of N (the prime product) for various prime numbers.

Examples 1 and 2.



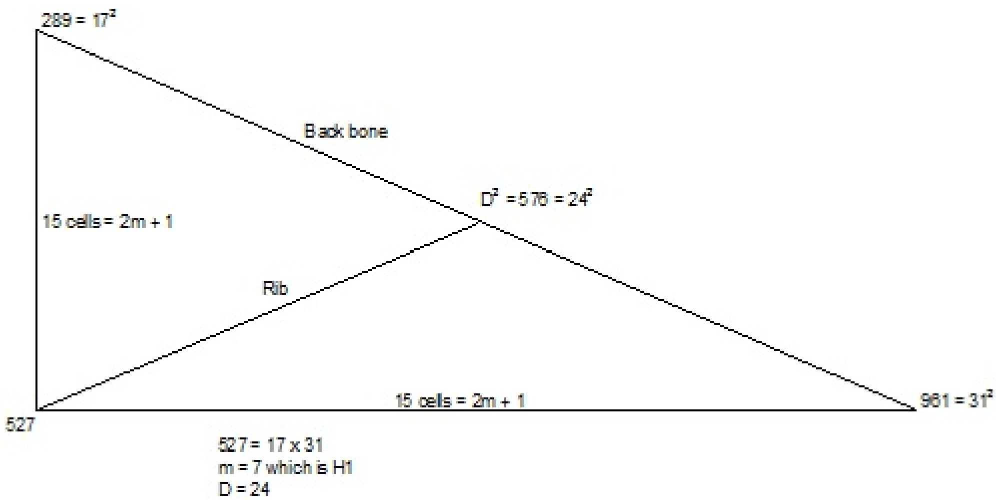


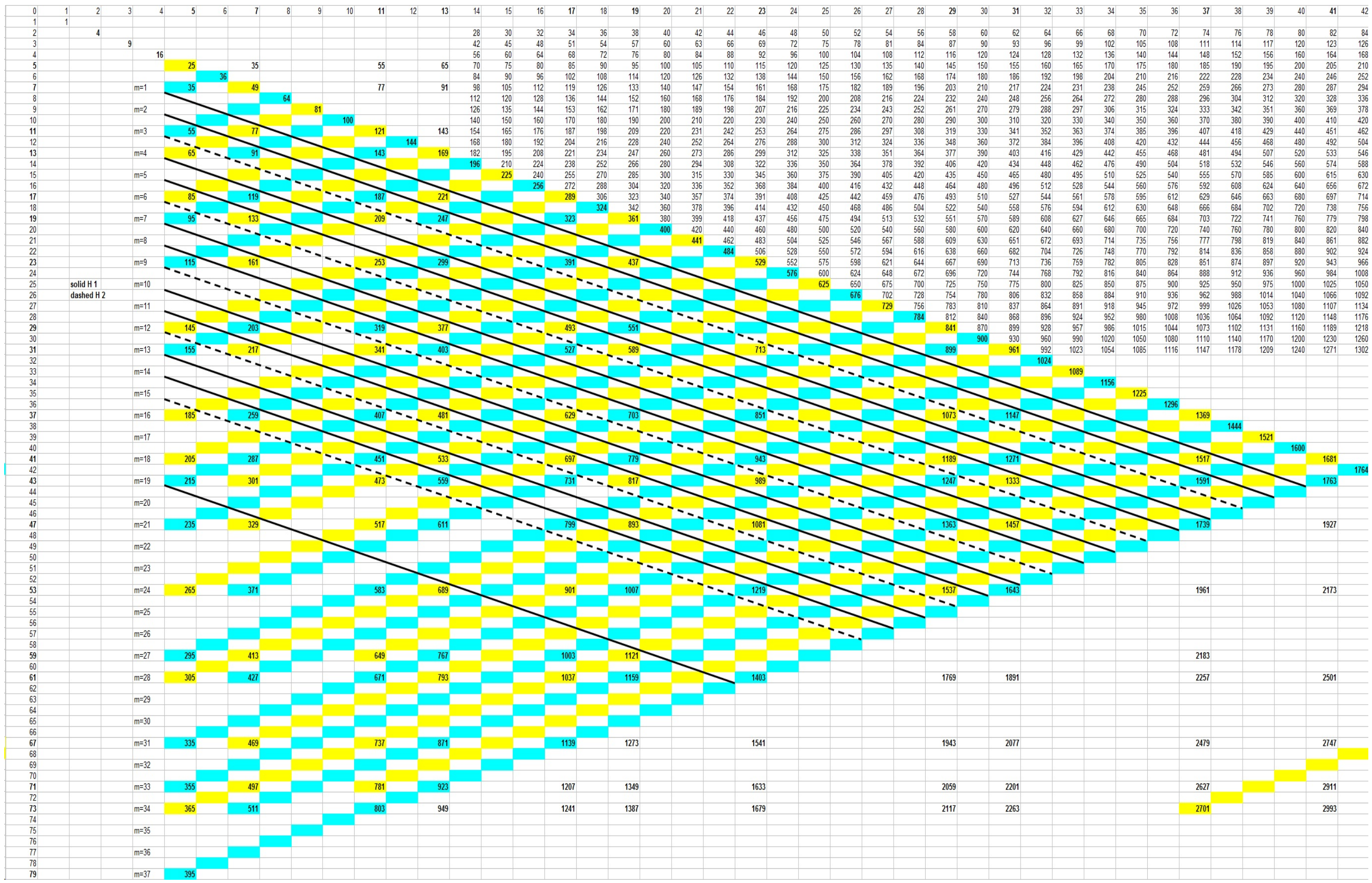
Figure 1 below, obviously, represents only a very small portion of prime products. It is clear from this figure that there is a peculiar repetition regarding the m values. There are two contiguous solid lines of different m's that represent H1, only to be followed by a single dashed line representing H2, and this pattern repeats.

There is also another fact that must be examined. The form of $D^2 - m^2 = N$. If we divide both sides by N we obtain

$$\left(\frac{D}{\sqrt{N}}\right)^2 - \left(\frac{m}{\sqrt{N}}\right)^2 = 1$$

This is an important equation, because we recall from relativity theory the equation $x^2 - c^2 t^2 = \pm 1$ which represents the calibration hyperbola curves in special relativity. This means that, strangely, the values of $\left(\frac{D}{\sqrt{N}}\right)$ $\left(\frac{m}{\sqrt{N}}\right)$ transfer to a new set of values $\left(\frac{D'}{\sqrt{N'}}\right)$ $\left(\frac{m'}{\sqrt{N'}}\right)$ via a set of transformations *similar* to the Lorentz transformations. Could this mean that prime products may represent a way that special relativity can be united with quantum mechanics, since quantum mechanics deals with integers in many ways, and this does seem to exemplify a way that integers *may* be connected with the Lorentz transformations.

Figure 1: Prime Product Chart



The D's and m's are derived from a general set of integers. For $N = D^2 - m^2$ to fall on either Helix 1 or Helix 2, there are certain requirements forced upon D and m. One requirement is either D even and m odd or D odd and m even. However, there is still need for a further refinement to a smaller subset of integers; namely, that either D or m, but not both, be divisible by 3. To prove this, we have four cases to look at:

Case I:	Case II:	Case III:	Case IV:
$D - m = 6s + 1$	$D - m = 6s + 1$	$D - m = 6s - 1$	$D - m = 6s - 1$
$D + m = 6r + 1$	$D + m = 6r - 1$	$D + m = 6r + 1$	$D + m = 6r - 1$

Case I:

$D - m = 6s + 1$
$\underline{D + m = 6r + 1}$
$2D = 6(s + r) + 2$
$D = 3(s + r) + 1$
Similarly for m, we obtain
$m = 3(r - s)$
Thus D is not divisible by 3, but m is.

Case II:

$D - m = 6s + 1$
$\underline{D + m = 6r - 1}$
$2D = 6(s + r)$
$D = 3(s + r)$
Similarly for m, we obtain
$m = 3(r - s) - 1$
Thus D is divisible by 3, but m is not.

Case III:

$D - m = 6s - 1$
$\underline{D + m = 6r + 1}$
$2D = 6(s + r)$
$D = 3(s + r)$
Similarly, $m = 3(r - s) + 1$
Thus D is divisible by 3, but m is not.

Case IV:

$D - m = 6s - 1$
$\underline{D + m = 6r - 1}$
$2D = 6(s + r) - 2$
$D = 3(s + r) - 1$
Similarly, $m = 3(r - s)$
Thus D is not divisible by 3, but m is.

We also have to prove that in $6s + 1$ and $6s - 1$, that $s = r + n$. Reference will be made to Chart 1 above taken from Reference 1.

Prime numbers or prime products falling on H_1 are denoted by $P_{1(n)x} = 6x - 35 - 42n$, where x represents the column number and n represents the complex number. For H_2, in similar fashion, $P_{2(n)x} = 6x - 49 - 42n$.

It is also true that the numbers along the helical lines can be represented by $P_{r,x} = 7(r - 1) + x$. Solving for x and substituting in the above two equations, we obtain

$P_{1(n)x} = 6(P_{r,x} - 7(r - 1)) - 35 - 42n = 6P_{r,x} - 42(r - 1) - 35 - 42n =$
$6P_{r,x} - 42(r + n) + 7$. We now note that $P_{1(n)x}$ is always negative and $P_{r,x}$ is always positive, so we let $P_{1(n)x} = -P_{r,x}$.

$-P_{r,x} = 6P_{r,x} - 42(r + n) + 7$, which rearranges into $P_{r,x} = 6(r + n) - 1 = 6s - 1$.
Similarly for H_2, we have $P_{2(n)x} = 6x - 49 - 42n = 6(P_{r,x} - 7(r - 1)) - 49 - 42n$.
Again we let $P_{2(n)x} = -P_{r,x}$ and upon rearranging, we obtain
$P_{r,x} = 6(r + n) + 1 = 6s + 1$, which concludes the proof.

REFERENCES

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