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The Beal Conjecture:

A Proof and Counterexamples

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Extract

The Beal Conjecture, $\boldsymbol{A^x + B^y = C^z}$*, is analyzed as of a proof based on selfsame multiples through addition and the presentation of counterexamples. The Beal Conjecture requests the presentation of counterexamples based upon selfsame multiplication, when in fact such counterexamples do not exist. Counterexamples do exist through selfsame addition* $\boldsymbol{A^x + B^y = z(C)}$*, where it is possible to present relations of equivalency that have terms in positive integers with no common prime factor. The analysis in this essay presents an explanation of the equation based upon its stipulated algebraic notation.*

The Beal Conjecture: $A^x + B^y = C^z$

The conjecture $\boldsymbol{A^x + B^y = C^z}$ made by Mr. Andrew Beal is mainly concerned with the ***common prime factor*** for positive integer terms and their exponents. The algebraic notation determines the procedural method of ***selfsame multiplication*** [x^n] of the terms in order to obtain the ***relation of equivalency*** in the cited equation. However, we shall consider the procedural step of obtaining the products of the terms through ***selfsame addition.*** The Beal Conjecture may be approached and resolved through simple addition. In our view, the algebraic notation of the terms and their exponents obfuscates what is actually happening within the equation itself.

The Beal Conjecture requires positive integers in the terms [A, B, C] and in the exponents [x, y, z] of the equation (the latter whose value must be greater than 2). The products of the terms must reflect the *selfsame multiplication* of the terms in whole numbers or positive integers. Obviously, no fractional expressions are to appear in any of the three terms or three exponents of the equation. And, the most significant part of the conjecture affirms the necessity that the terms share a common prime divisor. Or, to the contrary, one must present *counterexamples*.

Consider the original statement of the Beal Conjecture:

"If , $a^x + b^y = c^z$, where A,B,C, x, y and z, are positive integers x, y and z are all greater than 2, then A, B and C must have a common prime factor." [Mauldin, 1997]

Professor R. Daniel Mauldin offered the following examples of the resolution of the equation: *"Here are some examples of solutions to the equation $A^x + B^y = C^z$. Note that all values are positive integers, all exponents are greater than or equal to 3, and A, B, and C always share a common factor."*

		Common Prime Factor
$2^3 + 2^3 = 2^4$	=>	**2**
$2^9 + 8^3 = 4^5$	=>	**2**
$3^3 + 6^3 = 3^5$	=>	**3**
$3^9 + 54^3 = 3^{11}$	=>	**3**
$27^4 + 162^3 = 9^7$	=>	**3**
$7^6 + 7^7 = 98^3$	=>	**7**
$33^5 + 66^5 = 33^6$	=>	**11**
$34^5 + 51^4 = 85^4$	=>	**17**
$19^4 + 38^3 = 57^3$	=>	**19**

Each example reflects terms that have a common prime divisor. The objective of the conjecture is to present a **proof** that only those kinds of resolutions are available, or, to present **counterexamples** that do not contain a common prime factor ---within the stipulations of the conjecture.

In our previous analyses, we initially thought that each term and each exponent had to be distinct from one another because of the distinction of the Beal notation from Fermat's notation [$x^n + y^n = z^n$]. On the contrary, unlike Fermat's Last Theorem, some of the terms have pairs of exponents of the same value in the Beal equations. *"The Beal Conjecture does not stipulate that the three terms and exponents of the equation must be distinct" –Professor Mauldin*,

The Beal Conjecture appears to stipulate that, the positive integer *terms* may be assigned any numerical value in any given order of distinction or repetition, the positive integer *exponents of the terms* may be assigned any numerical value greater than 2 in any given order of distinction or repetition while the terms must have a common prime factor.

The terms of the resolutions cited by Professor Mauldin contain terms that are multiples of the primes listed for the common prime divisor. In other words, the terms in the cited examples are either prime numbers or multiples of that particular prime number. Therefore, the redundancy of the statement of equivalency made by each equation is obvious. For example:

$33^5 + 66^5 = 33^6$ = ***Multiples of 11 plus multiples of 11 equal multiples of 11.***

More exactly: *selfsame* multiples of 11 plus *selfsame* multiples of 11 equal *selfsame* multiples of 11.

$34^5 + 51^4 = 85^4$ = ***Multiples of 17 plus multiples of 17 equal multiples of 17.***

More exactly: *selfsame* multiples of 17 plus *selfsame* multiples of 17 equal *selfsame* multiples of 17.

More specifically, and listed respectively as above:

3557763 [11s] plus **113848416 [11s]** equal **117406179 [11s]**

2672672 [17s] plus **397953 [17s]** equal **3070625 [17s]**

Hence, the cited multiples *necessarily* have a common prime divisor, as each term is a multiple of that particular common prime divisor. These same relationships may be viewed inversely as:

11 [3557763s] plus **11 [113848416s]** equal **11 [117406179s]**

17 [2672672s] plus **17 [397953s]** equal **17 [3070625s]**

However, such a view denies the algebraic notation as expressed in terms and exponents (powers).

The equation begins with the terms and the exponents of **selfsame multiplication [x^n]**, but the equation ends with the elementary procedure of adding together the sum of the two products of two of the terms in a comparison of equivalency with the third term. The procedure of addition mediates the terms/exponents *and* the final relation of equivalency.

When such equations exist that have no common prime divisor, then, the terms shall reflect multiples of different primes (or co-primes), inasmuch as a prime is divisible only by 1 and itself without a remainder, and co-primes are divisible only by 1. The third term in a co-prime equation is irrelevant, be it another prime number or a composite number, inasmuch as the presence of two prime numbers (i.e., a co-prime) determines the absence of a common prime factor for the three terms of the equation. When the concept of **selfsame**

addition is used instead of *selfsame multiplication*, relations of equivalency with no common prime divisor appear, that are otherwise denied by the conjecture. In order to illustrate the distinction between selfsame multiplication and selfsame addition, we must first address the question of ***notation*** in the Beal conjecture.

A proof of the Beal Conjecture or a counter proof in which counterexamples may be presented is generally considered to be required for confirming or denying the conjecture. More than likely, as we shall illustrate in this essay, a possible explanation of the Beal Conjecture lies somewhere in between these two options. There are different levels from which the conjecture may be examined. The proof requires one level of inquiry and the counter proof (counterexamples) requires another level of inquiry. Obviously, they are both linked, but each requires its own line of reasoning. The conjecture purports a certain type of counterexample, when the counterexamples have their own reasoning for being. In that sense, more than a proof or a counter proof, what is required is an explanation of the various levels involved in the conjecture itself.

We shall examine various levels of analysis in this essay, but let us begin by viewing the *relations of equivalency* portrayed by the algebraic notation of the previous examples.

Examples of Resolutions of the Beal Conjecture

$2^3 + 2^3 = 2^4$ common prime factor [2]
example 4 [2s] plus 4[2s] equal 8 [2s]

$2^9 + 8^3 = 4^5$ common prime factor [2]
example 256[2s] plus 64[8s] equal 256 [4s]

$3^3 + 6^3 = 3^5$ common prime factor [3]
example 9[3s] plus 36[6s] equal 81[3s]

$3^9 + 54^3 = 3^{11}$ common prime factor [3]
example 6561[3s] plus 2916[54s] equal 59049[3s]

$27^4 + 162^3 = 9^7$ common prime factor [9]
example 19683[27s] plus 26244[162s] equal 531441[9s]

$7^6 + 7^7 = 98^3$ common prime factor [7]
example 16807[7s] plus 117649[7s] equal 9604[98s]

$33^5 + 66^5 = 33^6$ common prime factor [11]
example 1185921[33s] plus 18974736[66s] equal 39135393[33s]

$34^5 + 51^4 = 85^4$ common prime factor [17]

example 1336336[34s] plus 132651[51s] equal 614125[85s]

$19^4 + 38^3 = 57^3$ common prime factor [19]
example 6859 [19s] plus 1444 [38s] equal 3249 [57s]

The Beal Conjecture states that all equations *must* contain a common prime factor shared by the terms. The implications of the conjecture are that one should either present a ***proof*** of said statement or present ***counterexamples*** to the conjecture. The question arises as to what would constitute a counterexample. The initial interpretation may be that all of the stipulations of the Beal Conjecture must be fulfilled, and simply the terms ***must not*** have a common prime factor. The previous nine examples suggest that *counter examples* could have terms and exponents similar to the arrangements in those examples *as long as* the terms had no common prime divisor. The conjecture focuses upon the level of the terms and a common prime factor.

In our view, the concept of a counterexample stipulated by the Beal Conjecture is simply impossible by definition. An equation with co-prime terms cannot have positive integer terms and exponents, as stipulated, given the very definition of primes and co-primes, and their multiples. *If a co-prime pair of terms (divisible only by the greater common denominator of 1) were to exist, then that would represent a counterexample in our view.* Now, the fact that the conjecture may wish to see a counterexample with all exponents as whole numbers (as well as the terms) is simply expecting something that cannot derive from co-primes and their relationship in the cited equation. We shall explain the reason for this as of the concept of *selfsame addition* of terms.

The Beal Conjecture is concerned with the appearance of the common prime factor in relation to the positive integer terms and exponents of the equation. The conjecture is not questioning the positive integers and like exponents, as in Fermat's Last Theorem, but rather *the surprise caused by the presence of common prime divisors in the terms of the equations*. But, nothing is really specified in the conjecture about the counterexamples that might have terms *without* a common prime factor. The conjecture appears to affirm, that a counterexample would have all the stipulations fulfilled, and yet have no common prime factor of the terms.

Selfsame Multiplication and Selfsame Addition

At the level of the initial algebraic notation procedure of the equation, the following is being stated, and any numerical value shall illustrate the point:

$$7^4 + 10^3 = 3401$$

Mentally, one may think of the terms and their exponents as the procedure of **selfsame multiplication** as in 7 • 7 • 7 • 7 = 2401. In selfsame multiplication, in this example, the number seven represents both the **multiplicand** and the **multiplier.** This mental visualization, although often employed, does not reflect what is happening, for what occurs in the computation is: 7 • 7 = **49** • 7 = **343** • 7 = **2401.** However, when we view the detail in the multiplication procedure of selfsame multiplication, we see that the multiplier and the multiplicand change in nature with each step. At the level of the first step, seven is both the multiplicand and the multiplier (7•7). At the level of the second step, the number 49 becomes the multiplier and seven is the multiplicand, while at the level of the third step, the number 343 becomes the multiplier and seven the multiplicand.

However, in this case, we simply say that the number/term [x, 7], is being multiplied *by itself* a certain number of times [*n* or 4], where seven is the multiplicand and four is the multiplier in this case [7•7•7•7]. When actually the number seven is being multiplied by itself only *once* and, then after that, it is multiplied against the **products** of each subsequent multiplication step.

Language and notation are important, because they can hide reality from us, where we take for granted measures and procedures that may in fact vary. Even the previously cited procedure may be too abstract, since one is actually treating the **selfsame multiplication** of **7**, **[49, 343, 2401]**, which does not cover all of the selfsame ***multiples*** of seven for that range [1 through 2401]. More comprehensive is the concept of ***selfsame multiples through addition***, [7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, ...n2401], which long preceded the concept of symbolic multiplication in the algebraic notation used today [$\mathbf{x^n}$].

Obviously, ***selfsame multiplication*** represents only a few multiples within the complete range of ***selfsame addition*** of any given number. The selfsame ***addition*** of 7 plus 7 plus 7 plus 7 plus 7 plus... = 2401 represents the complete number of multiples of seven within the range of ***1 through 2401***. In other words, there are **three-hundred-and-forty-three 7s** in the numbers 1 through 2401. One may view the range inversely as ***seven 343s,*** but then the algebraic notation of terms and exponents is no longer adequate for expressing this particular set of multiples. The algebraic notation of terms and exponents of selfsame multiples within Fermat's Last Theorem and the Beal Conjecture reference certain limited selfsame multiples through *multiplication* within the complete range of selfsame multiples through *addition*. *[Consult the initial ranges of the numbers in the charts in the* **Addendum**, *where one may see the limited number of selfsame multiples through* ***multiplication*** *within the more complete range of selfsame multiples through* ***addition****.]*

Due to the history of mathematical and algebraic notation, we generally no longer think according to selfsame multiples through addition; nor do we speak in such terms; nor are many textbooks written in this manner. These are levels that are considered to have been long ago surpassed in mathematics and in the history of numbers. The procedure of multiplication with its corresponding algebraic notation [x^n] is viewed as being superior within the history of numbers. Nonetheless, today's symbolic mathematical and algebraic shorthand notation affects the computations. One has only to look at the literature of science today in order to see how we have come to emphasize the method of selfsame multiplication [x^n]. Powers and roots have become everything, when actually they are but a small fraction of the range of the possibilities in matter and energy.

Fermat's Last Theorem and the Beal Conjecture are not dealing with all of the possible products of the terms, but with only a chosen number of specified multiples (*n3, n4, n5, n6...nэ*) through selfsame multiplication. The terms may contain theoretically all prime numbers or composite numbers, but the next step in the procedure, that of effecting the selfsame multiplication of the terms, resolving the exponents, creates only a *very limited* range of products.

Therefore, if the Beal Conjecture is correct, then it does not necessarily mean that there are no counterexamples. On the contrary, the Beal Conjecture is correct, and there are also counterexamples. However, the relations of equivalency of the counterexamples are obtained through selfsame addition of the terms and not through the selfsame multiplication of the terms. Through *selfsame addition*, we shall find the ***counterexamples*** of the Beal Conjecture in which the terms have no common prime factor. The algebraic notation based on selfsame multiplication serves as a blindfold to comprehending fully the nature of these counterexamples.

In a sense, the algebraic notation stipulates a certain kind of counterexample. But this is not how the equations function. In our mind, the counterexamples that we illustrate below are the only ones that can exist. The notation of the Beal Conjecture stipulates a distinct kind of counterexample that in fact cannot exist by definition. In our view, as we shall illustrate, Mr. Andrew Beal's conjecture is correct, for the equation that he cites must have a common prime factor among the terms, as stipulated.

Below are the some of the nine examples of resolutions with a common prime factor followed by counterexamples of equations some that have no common prime factor. The counterexamples on the chart below have distinct powers in the third term from that of the corresponding example under which they appear.

Examples of Resolutions of the Beal Conjecture [Bold Lettering]
Counterexample Relations of Equivalency [Italicized Slant Lettering]

$2^9 + 8^3 = 4^5$ common prime factor [2]
example 256[2s] plus 64[8s] equal 256 [4s]

$2^9 + 8^3 = 2^{10}$ *256[**2**s] plus 64[**8**s] equal 512 [**2**s]*
$2^9 + 2^9 = 2^{10}$ *256[**2**s] plus 256[**2**s] equal 512 [**2**s]*

$3^9 + 54^3 = 3^{11}$ common prime factor [3]
example 6561[3s] plus 2916[54s] equal 59049[3s]

no common prime factor with relation of equivalency
*6561[**3**s] plus 78732[**2**s] equal 59049[**3**s] counterexample*

$7^6 + 7^7 = 98^3$ common prime factor [7]
example 16807[7s] plus 117649[7s] equal 9604[98s]
16807[7s] plus 117649[7s] equal 134456[7s]

no common prime factor with relation of equivalency
*16807[**7**s] plus 117649[**7**s] equal **470596[2s]** counterexample*
*16807[**7**s] plus 117649[**7**s] equal **235298[4s]** counterexample*

$33^5 + 66^5 = 33^6$ common prime factor [11]
example 1185921[33s] plus 18974736[66s] equal 39135393[33s]
*1185921[**33**s] plus 18974736[**66**s] equal **117406179[11s]***

$19^4 + 38^3 = 57^3$ common prime factor
example 6859 [19s] plus 1444 [38s] equal 3249 [57s]
6859 [19s] plus 1444 [38s] equal 9747 [19s]

no common prime factor with relation of equivalency

*6859 [**19**s] plus 1444 [**38**s] equal **20577 [9s]** counterexample*
*6859 [**19**s] plus 1444 [**38**s] equal **61731 [3s]** counterexample*

The previous chart could be extended to an almost infinite number of ***examples and counterexamples***. A more complete chart would show *the three possible resolutions: a) examples with* a common prime factor; b) counterexamples *with **no** common prime factor*; and, c) other examples that would reflect fractional expressions in the relations of equivalency.

Terms Without a Positive Integer: $A^x + B^y = C^z$

Below is an example of a resolution that is denied by the Beal Conjecture, because the third term is *not* expressed as a positive integer. Further, no common prime factor is shared by the three terms of the equations given this fact. Any numerical value for the terms shall suffice to illustrate this most obvious case.

$$\mathbf{17^3 + 18^4 = ?}$$

4913 + 104976 = 109889

109889 = 109889

Infinite resolutions are possible as follows. One simply chooses a particular root for the sum of the products of the first two terms, in order to find the corresponding value of the *selfsame multiplication* of the term.

First Term		Second Term		Third Term
17^3	+	18^4	=	$\mathbf{47.89807655^3}$
17^3	+	18^4	=	$\mathbf{18.20700684^4}$
17^3	+	18^4	=	$\mathbf{10.19039091^5}$
		etc.		
17^3	+	18^4	=	$\mathbf{27.55958253^{3.5}}$
17^3	+	18^4	=	$\mathbf{12.46980360^{4.6}}$
17^3	+	18^4	=	$\mathbf{7.662631376^{5.7}}$
		etc.		

The previous resolutions of the equation with examples of *fractional terms* and *fractional exponents* do represent relations of equivalency, but not the kind stipulated by the Beal Conjecture. *[Some of the ancient cultures, like the Maya of Mesoamerica, are said to have also avoided the fractions in their computations in a search for whole numbers, as has been the case various times over throughout history.]* The functional concept of ***fractional exponents*** has yet to be defined precisely. In fact, it is said that only a few mathematicians and physicists employed the concept in the past, while even today it is difficult to find a definition of the concept of fractional exponents and/or their uses.

In a sense, the Beal Conjecture takes for granted the existence of terms with fractional exponents, which would necessarily occupy the realm of resolutions denied by the stipulations of the conjectured equation, since their expression is not that of positive integers. However, as we shall examine in this essay, it is precisely within the realm of the terms with fractional exponents where "counterexamples" are to be found.

A Distinct Procedure:
Terms Without a Common Prime Factor: $A^x + B^y = C^z$

Let us visualize the relation of equivalency with regard to the procedure of selfsame multiplication (positive integer terms and their whole number powers).

7^4 + 10^3 = 3401

343 (7s) plus 100 (10s) equals __?__ (?s)

343 sevens plus one-hundred tens ***equal "how many" (units?")***

3401 / 7 = **485.8571429** ***sevens***

3401 / 10 = **340.1** ***tens***

343 sevens plus one-hundred tens ***equal*** **485.8571429** ***sevens***

343 sevens plus one-hundred tens ***equal 340.1 tens***

Neither of these answers is acceptable to the Beal Conjecture given its stipulations, where the terms must be expressed in positive integers, whole numbers. So, let us take up once again a previous example for the sake of illustration, and see what is actually happening within the **relation of equivalency** that is reflected in the fractional expression of the third term.

17^3 + 18^4 = 109889

4913 UNITS plus 104976 units equals 109889 UNITS

The algebraic notation expressed in a decimal number **18.20700684^4** or **47.89807655^3** for the third term may cause some to think that the relation of equivalency itself is unequal, not based upon complete unit numbers on either side of the equation. This occurs because two terms (*a* + *b*) are positive integers, while the third term (*c*) is a fractional expression. But, the fractional expressions reflect ***109889 units.*** If we consider the units in relation to the units of the first two terms, then fractional relationships appear.

109889 / 17 = **6464.058824 [17s]**

109889 / 18 = **6104.944444 [18s]**

There are the fractions, but consider the following, which is suggested by the conjectural reasoning of the Beal equation. Let us use a prime number to divide the implied product of the third term, instead of simply finding one of the possible roots previously cited for terms *a* and *b.* Let us take the 109889 units of the relation of equivalency and then divide it by a prime number without a remainder:

109889 / 13 = 8453 [13s]

We have now found a multiple of a prime number through selfsame addition (employing the procedure of division). In other words, according to **selfsame addition**, setting aside the concept of **selfsame multiplication** for the moment, the relationship of equivalency may be stated as the addition of 8453 thirteens.

the sum of 289 [17s] plus 5832 [18s] equals 8453 [13s].

Or,

289 [7s] + 5832 [18s] = 8453 [13s]

With that, ***at the level of the procedural step of addition and equivalency*** [addends plus sum]**,** we have a **counter-example** of positive integers for the three terms [**7, 18, 13**]. Further, the **selfsame multiples** are also expressed in positive integers greater than **2** [289, 5832, 8453]. Plus, the relationship of equivalency exists at the level of the sums of the terms. And, most significantly, ***the terms have no common prime factor.*** For the equation is co-prime [7, 13]. Furthermore, the multiples [289, 5832, 8453] of the co-primes and composite term have no common prime factor. One may also read the addition of terms inversely as:

7 [289s] + 18 [5832s] = 13 [8453s]

Therefore, it is possible to find *equations of relations of equivalency* with terms that have no common prime factor. But**, they do not share a relational number of selfsame multiplication procedures among themselves in whole numbers.** In other words, the respective number of multiples of the terms [289, 5832, 8453] ---the exponents in the algebraic notation--- do not share a proportionate relationship in whole numbers. For example, two of the terms are multiplied by themselves a whole number of times, *while the third term is multiplied by itself a fractional number of times.*

In this sense, the counterexample does not obey the stipulations of the conjecture *at the procedural level of the algebraic expression of selfsame multiplication* [terms plus exponents], i.e., within the confines of selfsame multiples through multiplication. *The suggested counterexamples exist, only they* *do not exist in accordance with the implied algebraic notation of the conjecture.* The algebraic notation that restricts the conjecture to selfsame multiples through multiplication denies any understanding of the counterexamples and their corresponding relation of equivalency that does exist. The substance of the conjecture must concern the relation of equivalency, otherwise it is simply a matter of form, i.e., the particular algebraic notation employed in the statement of the stipulations.

Consider further the data taken from the previous example:

[6464.058824 (17s) /2 = 3232.029412] [6104.944444 (18s)/ 2 = 3052.47222]

3232.029412 (17s) plus 3052.47222 (18s) equal 8453 (13s)

3232.029412 / 8453 = **.3823529412%**

3952.944444 / 8453 **= .3611111108%** and,

.3823529412% plus .3611111108% does not equal 100%

Again, there is no equivalency in percentages because, **we are comparing apples (17s) and oranges (18s) with kiwis (13s).** Obviously, **8453 (13s)** represents a valid counterexample in positive integers. Note that the terms consist of a ***co-prime pair (13 - 17)*** and a ***composite number (18);*** and therefore have no common prime factor. Yet, this counterexample would be overlooked by the conjecture. Not because of the nature of the equation and the relation of equivalency, but because of the stated algebraic notation that stipulates the method of selfsame multiplication and the stipulation that the **number of multiples** [exponent] must also be expressed in whole numbers.

Without the counterexamples through selfsame addition, one might conclude falsely that no counterexamples exist ---as some mathematicians have already begun to conclude *[www.norvig.com/beal.htm].* However, when we view the following resolutions, we may observe the percentile ratios among their terms.

	Common Prime Factor	/ Percentile Ratio of Terms		
$2^3 + 2^3 = 2^4$	**2**	$2^3 / 2^4$	=	**.5**
$2^9 + 8^3 = 4^5$	**2**	$8^3 / 4^5$	=	**.5**
$2^9 + 8^3 = 2^{10}$	**2**	$8^3 / 2^{10}$	=	**.5**
$2^9 + 2^9 = 2^{10}$	**2**	$2^9 = 2^{10}$	=	**.5**
$3^3 + 6^3 = 3^5$	**3**	$6^3 / 3^5$	=	**.8888888889**
$3^9 + 54^3 = 3^{11}$	**3**	$54^3 / 3^{11}$	=	**.8888888889**
$27^4 + 162^3 = 9^7$	**3**	$162^3 / 9^7$	=	**.8888888889**

$7^6 + 7^7 = 98^3$	**7**	$7^7 / 98^3$	**=**	**.875**
$33^5 + 66^5 = 33^6$	**11**	$66^5 / 33^6$	**=**	**.9696969697**
$34^5 + 51^4 = 85^4$	**17**	$51^4 / 85^4$	**=**	**.1296**
$19^4 + 38^3 = 57^3$	**19**	$38^3 / 57^3$	**=**	**.2962962963**

In the previous ratios, one may begin to visualize the determinacy exercised by the nature of the common prime divisor for each equation. In a word, a specific percentile corresponds to a particular common prime divisor, and these percentile ratios establish relations of equivalency that may be expressed in positive terms and exponents for the cited equation. In the previous lists, the percentiles for examples of the primes **5** and **13** are lacking, and obviously for primes **23, 29, 31...** and beyond. *[In order to find the percentile for the first term of the equation one would simple take the reciprocal expression of the percentiles listed: .5; 1.125; 1.142857143; 1.03125; 7.716049383; and 3.375 respectively.]*

The fulfillment of the stipulations come at the level of ***selfsame multiples through addition***, that resolve the conjecture with counterexamples that *have no common prime factor among the terms.* The counterexamples are innumerable, consisting of as many as one can imagine, and reflect relations of equivalency among terms without a common prime factor.

***Selected Counterexamples of Relations of Equivalency with* No Common Prime Factor**

$2^3 + 3^3 =$

4 [2s] plus 9 [3s] equal 7 [5s] ["*primes*"]

$3^3 + 5^4 =$

9 [3s] plus 125 [5s] equal 326 [2s] [primes]

9 [3s] plus 125 [5s] equal 163 [4s] [co-primes 3,5]

$2^5 + 3^4 =$

16 [2s] plus 81 [3s] equal 55 [5s] [co-prime 2, 5]

16 [2s] plus 81 [3s] equal 25 [11s] [primes]

$5^3 + 7^4 =$

25 [5s]	**plus**	**343 [7s]**	**equal**	**1263 [2s]**	**[primes]**
25 [5s]	**plus**	**343 [7s]**	**equal**	**842 [3s]**	**[primes]**
25 [5s]	**plus**	**343 [7s]**	**equal**	**421 [6s]**	**[co-prime 5, 7]**

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288 [17s]	**plus**	**5832 [19s]**	**equal**	**57852 [2s]**	**[primes]**
288 [17s]	**plus**	**5832 [19s]**	**equal**	**38568 [3s]**	**[primes]**
288 [17s]	**plus**	**5832 [19s]**	**equal**	**28926 [4s]**	**[co-prime 17, 19]**
288 [17s]	**plus**	**5832 [19s]**	**equal**	**12856 [9s]**	**[primes]**
288 [17s]	**plus**	**5832 [19s]**	**equal**	**9642 [12s]**	**[co-prime 17, 19]**

$17^3 + 19^4 =$

289 [17s]	**plus**	**6859 [19s]**	**equal**	**67617 [2s]**	**[co-prime 17, 19]**
289 [17s]	**plus**	**6859 [19s]**	**equal**	**45078 [3s]**	**[primes]**
289 [17s]	**plus**	**6859 [19s]**	**equal**	**15026 [9s]**	**[co-prime 17, 19]**
289 [17s]	**plus**	**6859 [19s]**	**equal**	**12294 [11s]**	**[primes]**
289 [17s]	**plus**	**6859 [19s]**	**equal**	**7513 [18s]**	**[co-prime 17, 19]**

$41^3 + 47^3 =$

1681 [41s]	**plus**	**2209 [47s]**	**equal**	**86372 [2s]**	**[primes]**
1681 [41s]	**plus**	**2209 [47s]**	**equal**	**43186 [4s]**	**[co-prime 41, 47]**
1681 [41s]	**plus**	**2209 [47s]**	**equal**	**15704 [11s]**	**[primes]**
1681 [41s]	**plus**	**2209 [47s]**	**equal**	**13288 [13s]**	**[primes]**

etc.

To illustrate the point, the last counterexample of the list represents a relation of equivalency among terms that are expressed in positive integers [41, 47, 13], with their selfsame multiples [1681, 2209, 13288] expressed in positive integers that are greater than 2 in value, and, their terms do *not* share a common prime factor. Such is the nature of all of the previously cited counterexamples in the previous list.

These relations of equivalency meet the requirements of the conjecture, but through a distinct notation and method for obtaining multiples. In other words***, the relations of equivalency suggested in the conjecture's concept of "counterexamples" without a common prime factor do exist; the cited resolutions do not have a common prime factor.***

However, the algebraic notation based on *selfsame multiplication* denies the recognition of these "counterexamples", because they are based upon the method of *selfsame addition,* and produce ***fractional exponents***. Counterexamples do exist as of relations of equivalency with terms that have no common prime factor; but, the counterexamples do not exist without a common prime factor that would have all terms and exponents represented in an algebraic notation with positive integers.

Now, because of the stipulated notation of the selfsame multiplication of terms in the Beal conjecture, ***these counterexamples therefore lack a positive integer in the algebraic notation.*** The exponent of the third term would not be expressed as a positive integer, but rather as a fractional exponent. However, in any and all cases, it must be realized that the ***relation of equivalency*** among the terms consists of positive integers, whole numbers ---*even though the algebraic notation is represented by a fractional exponent.*

The fact that the Beal Conjecture concerns itself mainly with a question of algebraic notation may be viewed in the following alternatives for the examples offered by Professor Mauldin, which supposedly resolve the equation. As may be seen below, the original example of the resolution also has expressions above and below itself with either terms or exponents with fractional expressions ---yet *the essential relation of equivalency remains the same*. The resolution examples represent a ***point of equilibrium*** within the system of algebraic notation whereby whole numbers appear in both the terms and the exponents. However, the resolution examples may also be expressed with fractional exponents while the relation of equivalency remains unchanged. We have arbitrarily chosen a natural range of alternative expressions to illustrate different presentations of the same relation of equivalency for each of the previously cited nine examples.

In the following examples, it may become clear that the Beal Conjecture does not question so much the relation of equivalency, but rather the stipulations of the notation. For in each of the following variations of each resolution, the same relation of equivalency is present, only the algebraic notation changes for each corresponding variation.

A Natural Range of Alternative Expressions

$1.414213562^{6} + 1.414213562^{6} = 1.414213562^{8}$

$2^{3} + 2^{3} = 2^{4}$ => *$2^{3} + 2^{3} = 2^{4}$ point of equilibrium*
$4^{1.5} + 4^{1.5} = 4^{2}$
$16^{.75} + 16^{.75} = 16^{1.0}$

$1.414213562^{18} + 2.828427125^{6} + 2^{10}$

$2^{9} + 8^{3} = 4^{5}$ => *$2^{9} + 8^{3} = 4^{5}$ point of equilibrium*
$4^{4.5} + 64^{1.5} = 16^{2.5}$
$16^{2.25} + 4096^{.75} = 256^{1.25}$
$256^{1.125} + 16777216^{.375} = 65536^{.625}$

$1.732050808^{6} + 2.449489743^{6} = 1.732050808^{10}$

$3^{3} + 6^{3} = 3^{5}$ => *$3^{3} + 6^{3} = 3^{5}$ point of equilibrium*
$9^{1.5} + 36^{1.5} = 9^{2.5}$
$81^{.75} + 1296^{.75} = 81^{1.25}$
$6561^{.375} + 1679616^{.375} = 6561^{.625}$

$1.732050808^{18} + 7.348469228^{6} = 1.732050808^{22}$

$3^{9} + 54^{3} = 3^{11}$ => *$3^{9} + 54^{3} = 3^{11}$ point of equilibrium*
$9^{4.5} + 2916^{1.5} = 9^{5.5}$
$81^{2.25} + 8503056^{.75} = 81^{2.75}$

$5.196152423^{8} + 12.72792206^{6} = 3^{14}$

$27^{4} + 162^{3} = 9^{7}$ => *$27^{4} + 162^{3} = 9^{7}$ point of equilibrium*
$729^{2} + 26244^{1.5} = 81^{3.5}$
$531441^{1.0} + 688747536^{.75} = 6561^{1.75}$

$2.645751311^{12} + 2.645751311^{14} = 9.899494937^{6}$

$7^{6} + 7^{7} = 98^{3}$ => *$7^{6} + 7^{7} = 98^{3}$ point of equilibrium*
$49^{3} + 49^{3.5} = 9604^{1.5}$
$2401^{1.5} + 2401^{1.75} = 92236816^{.75}$

$5.744562647^{10} + 8.124038405^{10} = 5.744562647^{12}$

$33^{5} + 66^{5} = 33^{6}$ => *$33^{5} + 66^{5} = 33^{6}$ point of equilibrium*
$1089^{2.5} + 4356^{2.5} = 1089^{3}$
$1185921^{1.25} + 18974736^{1.25} = 1185921^{1.5}$

$5.830951895^{10} + 7.141428429^{8} = 9.219544457^{8}$
$34^{5} + 51^{4} = 85^{4}$ point of equilibrium

$\mathbf{34^5 + 51^4 = 85^4}$ => $1156^{2.5} + 2601^2 = 7225^2$
$\mathbf{1336336^{1.25} + 6765201^1 = 52200625^{1.0}}$

$\mathbf{4.358898944^8 + 6.164414003^6 = 7.549834435^6}$
$19^4 + 38^3 = 57^3$ *point of equilibrium*
$\mathbf{19^4 + 38^3 = 57^3}$ => $361^2 + 1444^{1.5} = 3249^{1.5}$
$\mathbf{130321^{1.0} + 2085136^{.75} = 10556001^{.75}}$

In the previous examples, one may observe how the same relation of equivalency may have distinct notations, and thereby question why would one concentrate upon a particular expression. The stipulations of the Beal Conjecture single out the *point of equilibrium* of the range, concentrating upon the notation that contains *whole terms and whole exponents*. When, in fact, the same equation consists of a range of alternative expressions, from fractional terms with whole exponents to the other extreme of whole terms and fractional exponents. The expression, based on whole terms and whole exponents, is centered in the middle as a perceived point of equilibrium. However, it is best to know the complete range of the variations in the notation for each specific relation of equivalency, and not concentrate on a single variation as though it represented a special case. In other words, all alternative examples are actually points of equilibrium in that each reflects the same relation of equivalency. The balance may be perceived in the conjecture from simply considering positive integers as some kind of favorable relationship in the algebraic notation, inasmuch as the relation of equivalency is unaffected by the notation.

There is nothing special about the perceived point of equilibrium, other than it appears to be avoiding the fractional expressions. For the substance of the relation of equivalency remains the same for all expressions, whether they be in whole numbers or in fractional expressions. In this sense, the conjecture's concern revolves around the *algebraic notation* of the relation of equivalency (which may have alternate expressions) and not around the substance of the relation of equivalency.

A problem may arise when, due to the type of notation stipulated, one might conclude erroneously that that particular notation is the only way in which the relation of equivalency may exist. For the examples of resolution of the Beal Conjecture can themselves be presented with a notation that reflects either fractional terms or fractional exponents. *It is simply a case of the conjecture stipulating a certain kind of notation as being acceptable or not*. The substance comes in knowing which particular relation of equivalency exists or does not exist.

In this sense, one might conclude, again erroneously, that the nine examples of resolution of the Beal Conjecture represent some special case of equivalency. When in fact they may be presented in a notation that would even keep them from being included as examples of a resolution, were their notation to contradict the stipulations of the conjecture, as shown above in their fractional expressions. For example, were one to present the example $\mathbf{1.414213562^6 + 1.414213562^6 = 1.414213562^8}$ as a resolution of the Beal Conjecture, it would be immediately rejected. This would occur because its terms are not positive integers, even though it does represent a valid alternate expression to the relation of equivalency stipulated by the conjecture: $\mathbf{2^3 + 2^3 = 2^4}$.

From this perspective, there is nothing special about the examples of resolution of the Beal conjecture. For the nine examples may also be presented in alternate notations, meaning that *even the cited relations of equivalency do not necessarily require a common prime factor*, since they may also be expressed with fractional terms, and hence with no common prime factor. On the other hand, some variations must have a common prime factor even if the exponents are not themselves positive integers. In that, even the "examples" of resolution become a certain kind of "counterexample" to the conjecture.

The above analysis about the range of the examples illustrates how the Beal Conjecture is essentially concerned with the algebraic notation, because it stipulates the alternative relating to whole terms and whole exponents, and appears less concerned with the substance of the relation of equivalency. The same relation of equivalency may be presented in a notation that consists of fractional terms and whole exponents; whole terms and whole exponents; and, whole terms and fractional exponents. One could even extend the range to include examples of the same relation of equivalency ($2^3 + 2^3 = 2^4$) expressed in a notation that would reflect *fractional terms and fractional exponents*; the alternatives are limitless. For example,

$$\mathbf{1.587401052^{4.5} + 1.587401052^{4.5} = 1.851749425^{4.5}}$$

The notation chosen to express the relation of equivalency does not necessarily affect the latter, other than determine the parameters of measurement used in expressing said relationship. In this regard, the stipulations of the Beal Conjecture do not affect substance, but reflect the more immediate level of notation. Consider some alternative expressions of the same relationship of equivalency **[8 + 8 = 16]**:

$\mathbf{1.25992105^9 + 1.25992105^9 = 1.36079^9}$
$\mathbf{1.587401052^{4.5} + 1.587401052^{4.5} = 1.851749425^{4.5}}$
...
$\mathbf{1.189207115^{12} + 1.189207115^{12} = 1.189207115^{16}}$
$\mathbf{1.414213562^6 + 1.414213562^6 = 1.414213562^8}$

$2^3 + 2^3 = 2^4$ ***[= Level of the Beal Conjecture]***

$4^{1.5} + 4^{1.5} = 4^{2}$
$16^{.75} + 16^{.75} = 16^{1.0}$
$256^{.375} + 256^{.375} = 256^{0.5}$
$65536^{.1875} + 65536^{.1875} = 65536^{0.25}$
$4294967296^{.09375} + 4294967296^{.09375} = 4294967296^{0.125}$
...

These are distinct algebraic notations but each represents the same relation of equivalency. [Undoubtedly, the use of an equation such as **$4294967296^{.09375} + 4294967296^{.09375} = 4294967296^{0.125}$** to make the statement that 8 + 8 = 16 may be somewhat of a mathematical overkill.]

The previous examples of the different *points of equilibrium* (whole terms and whole exponents) consist of a common prime factor and fulfill the stipulations of the Beal Conjecture. In the example below, the range consists of fractional terms and whole exponents; whole terms and fractional exponents or; fractional terms with fractional exponents, with a common prime factor [2 or 3], but no point of equilibrium. By definition, due to the terms being co-prime and/or with a composite third term, with a common prime factor, the multiples do not occur in proportionate multiples of terms that may be expressed in whole numbers (exponents) in relation to one another. For example,

$177^{3} + 159^{4} = 644674194 / 3 = 214891398$ ***[CPF 3]***

5545233 + 639128961 = 644674194 / 3 = 214891398

31329 [177s] + 4019679 [159s] = 214891398 [3s]

$13.3041347^{6} + 12.60952021^{8} = 1.732050808^{36.92705028}$
$177^{3} + 159^{4} = 3^{18.4635251496}$ *[apparent point of equilibrium]*
" $= 9^{9.231762575}$
" $= 81^{4.615881288}$
" $= 6561^{2.307940644}$
etc.

$177^{3} + 159^{4} = 644674194 / 2 = 322337097$ ***[No CPF]***

31329 [177s] + 4019679 [159s] = 322337097 [2s]

$13.3041347^{6} + 12.60952021^{8} = 1.414213562^{58.5279899}$
$177^{3} + 159^{4} = 2^{29.2639949487}$ *[apparent point of equilibrium]*
" $= 4^{14.63199747}$
" $= 16^{7.315998737}$
" $= 256^{3.657999369}$

etc.

[The terms are incremental values of selfsame multiples (3 x 3, 9 x 9, 81 x 81, etc.; 2 x 2 , 4 x 4 , 16 x 16, etc.) and/or square roots for decremental values, and the fractional exponents are incremental by doubling or decremental by halving the value. N.B.-In some examples throughout this essay, the fractional exponents are approximations given the difficulty in achieving an exact decimal expression with a pocket calculator that rounds off the last few digits.]

In the previous example, each resolution represents the same relation of equivalency, yet there is no possibility of producing a notation with whole terms and whole exponents due to the disproportional relation of the numbers of the multiples of the terms. The previous example has terms with a common prime factor [3]. The examples that we are interested in for now concern those with terms that have no common prime factor.

In order to contemplate the substance of the relation of equivalency, one must consider the method of multiples (exponents), which is yet another analytical perspective for examining the Beal Conjecture.

The Counter Examples Have Terms with Fractional Exponents $A^x + B^y = C^z$

In order to consider the counterexamples, one must know what is being counterposed. The Beal Conjecture would appear to be counterposing terms that have a common prime factor and terms that have no common prime factor in the cited equation. Then the counter examples are derived as explained herein. If one counterposes the number of multiples of the terms, along with that level, then there are no counter examples possible in the stipulated terms of the conjecture.

The actual "counterexample" suggested by the stipulations of the Beal Conjecture (with whole terms and whole exponents and no common prime factor) represents an impossible procedure *as of the chosen algebraic notation based on selfsame multiplication.*

As we have seen, the so-called counterexamples do exist in terms of relations of equivalency. Some previous counterexamples, whose terms have no common prime factor, may now be translated back into the symbolic notation of today's algebraic expression stipulated by the Beal Conjecture. The translation of these relations of equivalency back into the algebraic notation of terms and exponents of selfsame multiplication produces expressions without a positive integer in the *exponent* of the third term. The numbers of the relationship of equivalency are fine, but the procedural notation of selfsame multiplication contradicts those numbers.

The relation of equivalency, which contains terms 17, 18 and 13 ---the **co-prime** pair being 13 and 17--- may be presented as follows:

289 [17s] plus 5832 [18s] equal 8453 [13s]

The terms and multiples of the terms are all positive integers, although the selfsame multiplication procedure produces a **fractional exponent** for the third term of the equation. This relationship could be translated into today's symbolic algebraic notation with a fractional exponent in the third term:

$$\mathbf{17^3 \quad + \quad 18^4 \quad = \quad 13^{\underline{4.525323672}}}$$

4913 + 104976 = 109889

The terms and their multiples are all **positive integers** [289 (17s); 5832 (18s); 8453 (13s)], while the procedural method of selfsame multiplication produces a notation whereby a fractional exponent appears in one of the terms [$13^{\underline{4.525323672}}$]. In other words, the *symbolic* procedural numbers of the algebraic notation, $13^{\underline{4.525323672}}$ **,** reflect **8453 [13s]** just as 47.89807655^3 , 47.89807655^3 , 18.20700684^4 10.19039091^5 , 6.920843630^6, ...n, each ***represents* 8453 *thirteens*.** The conjecture's notation is based on the method of selfsame multiplication of the terms and their exponential expression for the number of multiples of the terms. The discourse may cause one to believe that relations of equivalency, whose terms have no common prime factor, do not exist or, that only "fractional" expressions may exist. But, as we have seen above in both the cases of examples and counterexamples, *the fractional term and/or the fractional exponent does not affect the relation of equivalency*. It only affects the stipulated number of multiples of the terms. The terms $17^3 + 18^4$ have whole number multiples through selfsame multiplication. The term $13^{\underline{4.525323672}}$ does not have a whole number multiple through selfsame multiplication ---but it does have a whole number multiple through selfsame addition.

For example, the equation that derives 8453 thirteens illustrates how it reflects a number (8453) of selfsame multiples of 13 that lies between the selfsame multiples by multiplication of 13 (between 2197 and 28561 thirteens).

	$\mathbf{13^3}$	**=**	**169**	*[13s]*
	$\mathbf{13^4}$	**=**	**2197**	*[13s]*
289 [17s] plus 5832 [18s] equal			*<u>8453</u>*	*[13s]*
	$\mathbf{13^5}$	**=**	**28561**	*[13s]*

Logically enough, the algebraic notation of 8453 thirteens shall represent a fractional exponent. The multiples of 169, 2197 and 28561 in this case represent selfsame multiples by multiplication and 8453 represents a selfsame multiple by addition.

There exist then two distinct **methods for deriving selfsame multiples** and subsequent relations of equivalency. The conjecture made by Mr. Andrew Beal employs the method of ***selfsame multiples through multiplication*** [$\mathbf{x^n}$]. The second method is that of ***selfsame multiples through addition*** [as represented in 8453 thirteens] ---which is excluded in the algebraic notation of the Beal Conjecture***.*** The end result of selfsame addition is the obtaining of relations of equivalency whose terms are positive integers, their multiples are positive integers greater than 2, and they may or may not share a common prime factor. If one wishes to obtain **counterexamples** *within the nature of the conjecture*, then, one must abandon the method of algebraic notation based on selfsame multiplication used in the conjecture. One must employ selfsame addition in order to view the numerous examples *where no common prime factor* is shared by the terms of the equation. The notation of selfsame multiplication becomes a straight jacket for the resolutions based on selfsame addition. For these *are* the counterexamples to the resolutions that have no common prime factor.

The counterexamples with no common prime factor with all terms and exponents with positive integers are simply impossible. They are but a mirror image of the stipulated resolution examples, but not in accordance with the behavior of co-prime equations.

In the previous example, the exponential power $\mathbf{13^{\underline{4.52532672}}}$ is not a defined positive integer ---although the unit reflected by that exponent derives a relationship of equivalency and involves only whole numbers! Hence, the term 13 is represented as being ***4.52532672 times*** its selfsame multiple factor of 13. The Beal Conjecture is seeking answers or counter-examples where the exponent reflects *a whole number for the numerical procedure of the selfsame multiplication notation.* In other words, 13 multiplied by itself (for example) 4 times; ***not 13 multiplied by itself 4.5253267 times.***

Selfsame addition states that $\mathbf{13^{\underline{4.52532672}}}$ means **8453 thirteens** [added together]. And, when we add 289 seventeens to 5832 eighteens, we obtain 8453 thirteens: positive integers, all greater than 2, and no common prime factor among the terms [17, 18, 13] or their multiples [289, 5832, 8453].

$$\mathbf{17^3 \quad + \quad 18^4 \quad = \quad \begin{matrix} 3.605551275^{9.050647344} \\ 13^{\underline{4.525323672}} \end{matrix}}$$

[4913 + 104976 = 109889] $\mathbf{169^{2.262661836}}$
$\mathbf{28561^{1.131330918}}$
$\mathbf{815730721^{.565665459}}$

Again, the apparent point of equilibrium arises at the level where the third term has a positive integer, but a fractional exponent:
$17^3 + 18^4 = 13^{\underline{4.525323672}}$ *[apparent point of equilibrium]*

The number of cases for relations of equivalency for the counterexamples, as stipulated in essence by the conjecture, would appear to be limited only by imagination:

$\mathbf{41^3 + 47^3 = 13^{4.701678017}}$

1681 [41s] plus 2209 [47s] equal 13288 [13s] [= $\mathbf{13^{\underline{4.701678017}}}$]

1681 [41s] plus 2209 [47s] equal 15704 [11s] [= $\mathbf{11^{\underline{5.0292296522}}}$]

Etc.

A reading of the *fractional exponent* as of the algebraic notation is quite difficult to imagine: ***thirteen to the 4.701678017th power, or eleven to the 5.0292296522nd power!***

On the other hand, a reading as of the relation of equivalency is quite easy. ***1681 forty-ones plus 2209 forty-sevens equal 13288 thirteens***. However, we are not used to reading, much less thinking relations of addition in this manner. The practical use of a fractional exponent as shown may cause wonderment and discouragement at the same time. However, once again, this is how the numbers perform. The desire is to avoid the fractional exponents and find counterexamples that would have terms with no common prime factor and yet have all the exponents expressed in whole numbers. That is simply a wish list, and contradicts the way in which co-prime equations perform.

It would appear, since the numbers do not obey the algebraic notation in a manifestation of whole numbers, then the interest in the relations of equivalency is diminished. In this case, the algebraic notation serves as a way of denying the relation of equivalency, as though the fractional exponent represented a tainted relationship, something to be avoided. The ancients appear to have avoided the fractional expressions and their use of selfsame multiples by addition and remainder math, may have represented a way in avoiding the apparently illogical expressions as illustrated here.

In our view, the significant point behind the conjecture posed by Mr. Andrew Beal is the question regarding the *common prime factor* of the terms.

The selfsame multiplication procedure, however, has become significant in Fermat's Last Theorem, and in the Beal Conjecture even more so, because of today's symbolic algebraic notation. While selfsame multiples through addition and the method of *duplatio / mediatio,* and even trebling numbers, along with elementary remainder math, have all gone by the wayside in a sense*. [Many of these themes are treated in our studies on ancient math and geometry in the science of ancient artwork:* ***www.earthmatrix.com.*** *We invite you to visit our website.]*

Mr. Andrew Beal, in our view, is correct in his conjecture. If one employs the algebraic notation of the conjecture based on selfsame multiplication, then, the proof of the conjecture is as stated by Mr. Beal, and there are no counterexamples as stipulated. However, by using selfsame addition, one may observe the innumerable counterexamples based on terms that have no common prime factor.

The fractional exponent reflects the relationship of the three terms in the equation for relations of equivalency among co-prime terms that have no common prime factor among the terms. Fractional exponents are generally not used in algebraic problems of relational equivalency. Further, it is not the fractional exponent that is significant, nor knowing what particular fractional number is represented by the selfsame multiplication procedure as we have illustrated here. The more significant aspect, in our mind, is an understanding of *the relations of equivalency*. However, the system of algebraic notation based upon selfsame multiplication discourages not only knowing the fractional exponents, but even their use and what they represent in terms of relations of equivalency.

Examples of Resolutions of the Beal Conjecture [Bold Lettering]
Counterexample Relations of Equivalency [Italicized Slant Lettering]

$2^9 + 8^3 = 4^5$ common prime factor [2]
example 256[2s] plus 64[8s] equal 256 [4s]

$2^9 + 8^3 = 2^{10}$ ***256[2s] plus 64[8s] equal 512 [2s]***
$2^9 + 2^9 = 2^{10}$ ***256[2s] plus 256[2s] equal 512 [2s]***

$3^9 + 54^3 = 3^{11}$ common prime factor [3]
example 6561[3s] plus 2916[54s] equal 59049[3s]

no common prime factor with relation of equivalency

$3^9 + \mathbf{2^{17.26466250691}} = 3^{11}$
*6561[**3**s] plus **78732[2s]** equal 59049[**3**s]* counterexample

$27^4 + 162^3 = 9^7$ common prime factor [9]
example 19683[27s] plus 26244[162s] equal 531441[9s]
19683[27s] plus 26244[162s] equal *1594323[3s]*

$7^6 + 7^7 = 98^3$ common prime factor [7]
example 16807[7s] plus 117649[7s] equal 9604[98s]

$7^6 + 7^7 = 7^{7.0686215613}$ ***16807[7s] plus 117649[7s] equal 134456[7s]***

no common prime factor with relation of equivalency

$7^6 + 7^7 = \mathbf{2}^{\mathbf{19.8441295323}}$
*16807[**7**s] plus 117649[**7**s] equal **470596[2s]*** counterexample

$7^6 + 7^7 = \mathbf{4}^{\mathbf{9.9220647662}}$
*16807[**7**s] plus 117649[**7**s] equal **235298[4s]*** counterexample

$33^5 + 66^5 = 33^6$ common prime factor [11]
example 1185921[33s] plus 18974736[66s] equal 39135393[33s]

$33^5 + 66^5 = 11^{8.74894146}$
1185921[33s] plus 18974736[66s] equal 117406179[11s]

$34^5 + 51^4 = 85^4$ common prime factor
example 1336336[34s] plus 132651[51s] equal 614125[85s]

no common prime factor with relation of equivalency

$34^5 + 51^4 = \mathbf{5}^{\mathbf{11.04149771085}}$
*1336336[**34**s] plus 132651[**51**s] equal **10440125 [5s]*** counterexample

$19^4 + 38^3 = 57^3$ common prime factor

example 6859 [19s] plus 1444 [38s] equal 3249 [57s]
6859 [19s] plus 1444 [38s] equal 9747 [19s]

no common prime factor with relation of equivalency

$19^4 + 38^3 = \mathbf{9}^{\mathbf{5.52021578899}}$
*6859 [**19**s] plus 1444 [**38**s] equal **20577 [9s]*** counterexample

$19^4 + 38^3 = \mathbf{3}^{\mathbf{11.0404315775}}$

*6859 [**19**s] plus 1444 [**38**s] equal **61731 [3s]*** *<u>counterexample</u>*

The Counterexample
A Distinct Notation: $A^x + B^y = z(C)$

Based upon the above, possibly one may create a distinct notation for expressing the method of selfsame addition in the counterexamples, the terms of which obey relations of equivalency and have no common prime factor.

289 [17s] plus 5832 [18s] equal 8453 [13s]

One could express this example as $^{x}A + {}^{y}B = {}^{z}C$

$$^{289}17 + {}^{5832}18 = {}^{8453}13$$

in order to differentiate it from today's algebraic notation, thus reading:

289 <u>seventeens</u> plus 5832 <u>eighteens</u> equal 8453 <u>thirteens</u>.

For at the level of simple addition, and in reality, ***there is a relation of equivalency among positive integer terms and exponents, with no common prime factor*.** The Beal Conjecture seeks a positive integer in the number of times the procedural step of selfsame multiplication is effected (the exponential number). In our view, a primary significance is to understanding that the relations of equivalency exist among the positive integers of the prime/prime and prime/composite, and composite/composite terms (for the first two terms) ***with no common prime factor among the three terms of the equation.***

The algebraic notation of the Beal Conjecture is designed to account for the *selfsame multiplication* of the terms. Were the notation to be designed in another manner, based upon selfsame addition, then possibly it might diminish the notation of selfsame multiplication, as occurs in the distinct notation suggested above. In either case the notation would distract from the task at hand: that of comprehending the relations of equivalency.

As occurs then in the notation of the Beal Conjecture, when it is based on selfsame multiplication and then equations of a distinct nature are applied to that notation, one might conclude erroneously that the relation of equivalency itself is incorrect. When just the opposite occurs: the relation of equivalency is fine, but its symbolic notation needs to be modified in order to portray the relation properly. For the notation of selfsame multiplication cannot accommodate the equation based upon selfsame addition. The algebraic notation of the Beal Conjecture is designed *only* for selfsame multiplication, when a notation of selfsame addition is required.

For example, there is absolutely nothing wrong with the relation of equivalency of *4913 [17s] plus 5832 [18s] equal 8453 [13s].* In order to be faithful to its substance, one must write the symbolic notation as follows, where ***A, B, C*** are the terms and ***x, y, z*** are representative of multiples of selfsame addition:

x(A) + y(B) = z(C)

4913 (17s) + 5832(18s) = 8453(13s)

And, if one wishes to retain the symbolic notation of the Beal Conjecture in its original form, then one would state the **counterexample** in the following manner. Where ***A, B, C*** are the terms and ***x, y*** are exponents of selfsame multiplication, and ***z*** is representative of a multiple of selfsame addition:

$$A^x + B^y = z(C)$$

$$17^3 + 18^4 = 8453(13)$$

The notation of the Beal Conjecture, if not modified in this sense to accommodate what is happening within the relation of equivalency, would be forcing the wrong formula upon a different procedure. There is no need obviously to force relations to obey a specific notation. Rather, it is significant to know that when a common prime factor exists in *some resolutions* of the cited equation, then the notation may follow

$$A^x + B^y = C^z$$

as occurs in the stipulations of the Beal Conjecture.

On the other hand, and in opposition to the previous statement**, the counterexamples of the Beal Conjecture** may require a distinct notation for some resolutions that have no common prime factor, as in the following manner.

$$A^x + B^y = z(C)$$

When we employ this particular notation, the sum of the first two *terms* yields the value of the third term, in certain resolutions. So, even though there is no apparent relationship among the selfsame multiplication of the terms, one is able to visualize a relationship among *selected* multiples of the terms. Note the following **counterexamples**.

$2^3 + 2^3 = 4(4s)$	**2 + 2 = 4**
$2^3 + 3^7 = 439(5s)$	**2 + 3 = 5**
$3^3 + 4^3 = 13(7s)$	**3 + 4 = 7**

4^3 + 5^3 = 21(9s)	**4 + 5 = 9**
6^3 + 6^3 = 36(12s)	**6 + 6 = 12**
6^3 + 7^3 = 43(13s)	**6 + 7 = 13**
6^5 + 7^5 = 1891(13s)	**6 + 7 = 13**
6^9 + 7^9 = 3879331(13s)	**6 + 7 = 13**
17^3 + 18^3 = 307(35s)	**17 + 18 = 35**
17^5 + 18^5 = 94555(35s)	**17 + 18 = 35**
159^3 + 177^3 = 28467(336s)	**177 + 159 = 336**
159^5 + 177^5 = 819488421(336s)	**177 + 159 = 336**
" = 273162807 (3s)	**etc.**
" = 91054269 (9s)	**etc.**

etc.

The possibility of finding counterexamples based upon selfsame addition is infinite in a sense, with variations for each one as shown in the last example of the list. The above counterexamples, expressed as selfsame multiplication and selfsame addition, follow a similar pattern of multiples: for example, note how the addition of multiples 3 and 4 equal multiples of 7. And, the equation is expressed in positive integer terms, positive integer multiples and, in cases *with or without* a common prime factor.

Now, the first two terms have exponents greater than 2, while the third term would have a fractional exponent less than 2. But that is the way in which the addition of two terms to the power of three perform. That is the counterexample in the notation of selfsame multiplication. In order to rise above the exponent of two for all three terms, then one would proceed to the addition of higher exponents for all three terms. However, for any and all counterexamples chosen, the third term would continue to be expressed as a fractional exponent. That is the way the counterexample performs once translated back into the notation based on selfsame multiplication.

As a corollary to the Beal Conjecture, and as part of its proof one may state. When the terms of a relation of equivalency have no common prime factor, and the method of selfsame multiplication is employed to derive said relationship, then at least one term shall have a *fractional exponent in the notation proposed* *by the Beal Conjecture*. When all three terms of the equation have positive integers and their multiples are positive integers, then they cannot be expressed in the algebraic notation of selfsame multiplication with positive integers. And so on. As we have emphasized throughout, the problem arises because of the algebraic notation, and is not due to anything related to the relation of equivalency.

The proof of the conjecture, then, lies in recognizing the relationship of equivalency among the co-prime terms as in the cited examples. For, if the cited relationship of equivalency reflects **prime terms with no common prime divisor** (as in the previous example), then, one can expect that no such counterexample shall exist as suggested by the Beal Conjecture, since the counterexamples exist as illustrated. Relations of equivalency, with terms that have no common prime factor, exist as shown in the above analysis. These relations are based upon selfsame multiples through addition. These are in fact the counterexamples posed by the Beal Conjecture. However, they are contradicted and denied by the notation method of selfsame multiplication stipulated in the Beal Conjecture.

What is being stated is simply that 17 x-number of times itself plus 18 y-number of times itself equal 13 z-number of times itself. Multiples of the same prime plus multiples of that same prime equal multiples of the same prime. Hence, the presence of a common prime factor. Multiples of the same prime plus multiples of a distinct prime or a multiple of a composite of another prime equal multiples of another prime. Hence, the absence of a common prime factor. The previous two statements are basically redundant and reflect the nature of the Beal Conjecture.

A proof of the conjecture may come from the consideration of inverting the multiples of the terms.

$3^9 + 54^3 = 3^{11}$ **common prime factor [3]**
example **6561[3s] plus 2916[54s] equal 59049[3s]**

3 [6561s] plus **54 [2916s]** equal **3 [59049s]**

no common prime factor with relation of equivalency

$3^9 + \mathbf{2}^{\mathbf{17.26466250691}} = 3^{11}$
*6561[**3**s] plus **78732[2s]** equal 59049[**3**s]* *counterexample*

3 [6561s] plus **2 [78732s]** equal **3 [59049s]**
3 [6561s] plus **3 [52488s]** equal **3 [59049s]**

Here, a common prime factor exists among exponent multiples, because the term 54 is divisible by *primes 2* [78732] and *3* [52488].

<u>$34^5 + 51^4 = 85^4$ common prime factor</u>
example 1336336[34s] plus 132651[51s] equal 614125[85s]

34 [1336336s] plus **51 [132651s]** equal **85 [614125s]**

<u>no common prime factor with relation of equivalency</u>

$34^5 + 51^4 = \mathbf{5^{11.04149771085}}$
*1336336[**34**s] plus 132651[**51**s] equal **10440125 [5s]** <u>counterexample</u>*

34 [1336336s] plus **51 [132651s]** equal **5 [10440125s]**

The counterexamples suggested by the Beal Conjecture do not exist within the method of selfsame multiplication of the terms, for they already exist within the method of selfsame addition of the terms. A proof of this statement may be obtained by simply adding the selfsame multiples of any two numbers together and dividing their sum by the prime numbers, until relations of equivalency are found in whole numbers. It shall become readily visible that terms of the cited equation that have no common prime factor lie within the realm of selfsame addition and not within that of selfsame multiplication of the terms.

A pair of co-prime terms and a composite term, or three prime terms, exist as relationships of equivalency based upon selfsame multiples of addition and not as of selfsame multiples through multiplication. The proof of the conjecture may consist then in recognizing that the *examples* do exist as shown. Also, the *counterexamples* do exist at the level of selfsame multiples through addition, whereby no examples can therefore exist (of those same prime/composite number combinations) as of the method of selfsame multiples through multiplication. In order to have terms without a common prime factor, then, one must recur to multiples of addition, and in so doing violate the system of notation based on selfsame multiplication stipulated by the Beal Conjecture.

Nature herself may have chosen similar relations of equivalency in matter and energy with regard to co-primes. Consider how the randomly chosen numbers of 17, 18 and 13 from our previous example produce an almost exact multiple of the gravitational constant:

17 x 18 x 13 *=*	*3978*	*[doubles to:]*
	7956	
	15912	
	31824	
	...	
	6.6739*76525*[10]	*[Gravitational constant **6.6739**]*

Additional Observations by Definition

"If , $a^x + b^y = c^z$, where A,B,C, x, y and z, are positive integers x, y and z are all greater than 2, then A, B and C must have a common prime factor." [Mauldin, 1997] A distinct wording may be found as follows:

In our view, then, the original wording of the Beal Conjecture, as cited above, is true**.** To support our case, we have drawn attention to the reasoning behind the examples illustrated in this essay that offer a possible explanation as to why the equation behaves as it does in different variations. When there is no common prime factor among the terms of the cited equation, then, either the third term or, its exponent shall not have a positive integer --as the notation of the conjecture determines it so. However, in the case of the exponent not being a positive integer, the terms are co-prime and accompanied by a composite term, or all three are prime numbers. Further, in any and all cases, even with a fractional expression in the third term *notation* or in the *notation* of its exponent, *the relation of equivalency among the terms is in whole numbers*, with exponents greater than 2. And, most importantly, at times, the terms of the equation do not share a common prime factor.

However, in general, the examples suggested by the Beal Conjecture are a self-fulfilling prophecy. If the three terms are even numbers, then they are divisible by 2 (a prime number) and therefore have a common prime divisor. If the three terms are multiples of 3, then, they are obviously divisible by the prime number three and therefore have a common prime factor. If the three terms are a prime with its composite multiples, then they are divisible by that common prime number. But, if the three terms are co-prime, or they are all different prime numbers, then by definition, they are not divisible by a common prime factor. The only counterexamples thus possible are when the three terms have a pair of co-prime numbers and one composite number; or, they have all three prime/composite numbers. For if two are co-prime and the third is composite then there is no common divisor for all three. *"Numbers are prime to each other when they have no common factor that will divide each without a remainder; as 6, 13, 29, etc." [From **Soule's Philosophic Mathematics**, Revised edition, 1946, page 146.]*

For example, 6, 29 and 13 are prime to each other; and, 13 and 29 are co-prime: $\mathbf{6}^{13} + \mathbf{29}^{3} = 1004670647$ [**13**s]

The Beal Conjecture states:

"If , $a^x + b^y = c^z$, where A,B,C, x, y and z, are positive integers x, y and z are all greater than 2, then A, B and C must have a common prime factor."

Response: The conjecture is correct because when A,B,C have no common prime divisor, and they are whole numbers, then one exponent of one of

the three terms is a fractional exponent, due to the number of the selfsame multiples of the terms.

If A,B,C do not have a common divisor, then the three terms are co-prime or all distinct prime/composite numbers because a prime is divisible only by 1 and itself. For the absence of the common prime factor to exist then *by definition* the equation must be at least co-prime.

*6859 [**19**s] plus 1444 [**38**s] equal **61731 [3s] co-prime***

To have A,B,C as co-prime and still have all three exponents in positive integers, is a contradiction of terms. Co-primes and their multiples are not divisible by any other number than one and themselves.

To have A,B,C as **three prime numbers** and still have their three exponents in positive integers is a contradiction of terms, for the same reason given immediately above.

289 [**17**s] plus 6859 [**19**s] equal 12294 [**11**s]

On a more general note, the terms of the nine examples offered by the Committee of the Beal Conjecture, cited at the beginning of this essay, are either prime/prime/prime numbers; prime/composite/prime numbers; prime/prime/composite numbers; prime/composite/composite numbers or; composite/composite/composite numbers. In this sense, **all of the terms in the example equations are multiples of primes, be they primes, multiples of primes, or composite numbers (= multiples of primes) ---by definition of primes.**

prime +	**prime =**	**prime /**	**Common Prime Factor**
(multiple)	**(multiple)**	**(multiple)**	**[Divisible by...]**

In that sense, the proof of the Beal conjecture is obvious to many since *"from likes one obtains likes".* Likes produce likes and, therefore, all prime/composite terms are divisible by a common prime factor by definition of the very concepts of prime and composite. Primes derive into composite numbers and therefore any composite number used as a term in the equation is basically a (multiple of a) prime. And since the equations show relationships of equivalencies among multiples of those same primes (and their composites), then they must have a common prime factor among themselves.

The common prime factors, shown in the above cited nine examples from the committee about the resolution of the conjecture, involve the common prime divisors of **2, 3, 7, 11, 17**, and **19**. [The prime numbers **5** and **13** are lacking in examples for now.] Consider, however, the **last-digit termination** aspect of the division in math. Half of all numbers that exist are divisible by the prime number **2** (i.e., all the even numbers). One third of all the numbers is divisible by the prime number **3**. One-fifth of all numbers is divisible by the prime number **5**. Now, without considering the duplication of numbers divisible by these three prime numbers (2, 3, 5), simply consider the fact that the rest of all numbers is divisible by the remaining prime numbers themselves in respectively distinct proportions. With that, then, one has probably covered all of the possible prime/composite combinations in the terms of the Beal Conjecture.

From the prime/composite number terms of the conjecture, one shall obtain a common prime factor for all three terms ---in the nine examples cited by the committee. In a word, when one adds primes/composites (and their multiples) to primes/composites (and their multiples) one obtains sums of primes/composites (and their multiples), and consequently, all of these are divisible by a common prime factor. In this sense, all numbers (primes/composites) are divided by primes. And, a product that is not divisible by any other prime (number) is divisible by itself and therefore is a prime.

Now, in the case where the terms are co-prime pair, in relation to a third composite number, as in some of the examples that we have offered above in the counterexamples of selfsame addition, then no common prime factor is being shared by the terms. In such cases, one is viewing examples of:

co-prime + <u>composite</u> = co-prime / <u>No Common Prime Factor</u>
(multiple) (multiple) (multiple)

or,

prime + prime = prime / <u>No Common Prime Factor</u>
(multiple) (multiple) (multiple)

Again, "unlikes produce unlikes". The decimal notation of this relationship appears in the exponent of the third term. Given the appearance of these cases, it is impossible to think of an underlying relationship of equivalency of the three terms (co-prime and composite numbers) that could produce positive integers in the three exponents as well, given the method of algebraic notation employed in the conjecture. When the numbers fit one way, they are essentially stating that they cannot fit any other way, *without modifying the notation system or the method of selfsame multiplication/addition*. The relationship of equivalency is the relationship of equivalency; the notation of that relationship represents a distinct level of reasoning.

The symbolic algebraic notation of the Beal Conjecture reflects the procedural method of *selfsame multiplication of terms*. At this level, it is impossible to derive co-prime/composite numbers without a common prime factor whose terms and exponents would be expressed in positive integers within the system of notation chosen for said expressions. The co-prime/composite numbers ***without a common prime factor*** in relations of equivalency may be expressed in a distinct symbolic notation, through the procedural method of *selfsame addition* of the terms as illustrated in this essay.

Consider then, one of the original nine equations:

$19^4 + 38^3 = 57^3$

130321 + 54872 = 185193

6859 [19s] plus 1444 [38s] equal 3249 [57s][common prime factor 19]

6859 [19s] plus 1444 [38s] equal 9747 [19s] [**co-prime pair 19, 19; gcd = 1**]
6859 [19s] plus 1444 [38s] equal 20577 [9s] [**no common prime factor**]
6859 [19s] plus 1444 [38s] equal 61731 [3s] [**co-prime pair 3, 19; gcd = 1**]

Now, consider the **counterexamples** of that relational equation:

Algebraic notation: $19^4 + 38^3 = \mathbf{19}^{\underline{4.1193429}}$

The relation of equivalency represented in the notation:

6859 [19s] plus 1444 [38s] equal 9747 [19s] [**co-prime pair 19, 19; gcd = 1**]

Again, the algebraic notation appears to be 'wrong', according to the stipulations of the conjecture, but the *relation of equivalency* 6859 [19s] plus 1444 [38s] equal 9747 [19s]is performing just fine: positive integers in the terms and in the selfsame multiples of addition, plus, no common prime factor other than 1.

Consider yet another relational counterexample of the same equation:

Algebraic notation: $19^4 + 38^3 = \mathbf{9}^{\underline{4.5202157889}}$

6859 [19s] plus 1444 [38s] equal 20577 [9s] [**no common prime factor**]

Again, the algebraic notation appears to be 'wrong', according to the stipulations of the conjecture, but the *relation of equivalency* 6859 [19s] plus 1444 [38s] equal 20577 [9s] is performing just fine: positive integers in the terms and in the selfsame multiples of addition, plus, no common prime factor other than 1. *And so on.*

In conclusion, the Beal Conjecture is seeking a counterexample with no common prime factor in a specified sense of algebraic notation based upon the method of selfsame multiples through multiplication $\mathbf{A^x + B^y = C^z}$. Such relations of equivalency with no common prime factor exist, but at the level of selfsame multiples through addition $\mathbf{A^x + B^y = z(C)}$. The whole number (positive integers) of terms and their selfsame multiples through addition (not multiplication), share no common prime factor among the terms. To seek counterexamples at the level of exponents greater than two based upon selfsame multiplication represents a contradiction of terms, and ultimately, a contradiction of the relation of equivalency. In the final analysis, the relation of equivalency in positive terms, with or without a common prime factor, determines the nature of the conjecture.

Terms with a common prime divisor produce whole number terms with whole number multiples (exponents). Terms without a common prime divisor produce whole number terms and whole number multiples but fractional proportions among the multiples. Terms without a common prime divisor with whole number terms and whole number exponents with whole number proportions among the multiples do not exist.

According to our findings, then, Mr. Andrew Beal is correct in his conjecture based upon of selfsame multiplication, because counterexamples exist only in the terms identified by selfsame addition.

The argument made in this essay is directed at the system of notation that we have inherited throughout history, based upon, in this case, the limiting method of selfsame multiplication of terms. In that sense, these observations go beyond the Beal Conjecture. The insight posed by Mr. Andrew Beal in his conjecture serves as encouragement for looking at old problems in a new light. We are simply attempting to peel back the first layer of algebraic notation in order to emphasize the relations occurring behind the symbolic language. And, in our mind, that is precisely what Mr. Beal has afforded in launching such a critical conjecture.

When one thinks about the meaning behind this particular essay, we may conclude that the method of selfsame multiples through *addition* is more ancient than the modern system of algebraic notation reflecting the selfsame *multiplication* of terms. In this sense, the timeline of the procedures would mean that the whole numbers in the relation of equivalency came first (obviously), and the decimal numbers have been imposed upon the actual relationships of equivalency because of the notation and the chosen method behind the algebraic notation. In ancient times, the computations of the Maya reckoning system appear to have revolved around the positive integers of the terms and selfsame multiples through addition, ***avoiding any fractional expressions,*** much like the Beal Conjecture stipulates avoiding the fractional expressions.

The algebraic notation of today, in a sense, imposes solutions with fractions, somehow avoiding the whole numbers, and by choosing the method of selfsame multiplication of terms presents an extremely limited number of possibilities in the resolution of the equation. The method of selfsame addition presents the entire universe of possible, a much more expansive analytical consideration.

This may be better understood when we show surprise at finding whole numbers in some of the computations. History is strange like that. When mathematics was in its infancy, prejudice had it that everything in Nature was thought to be whole numbers. When fractions were first discovered, they were suppressed in the name of whole numbers and order. Today, we marvel at mathematical expressions of whole numbers; we are terribly used to the precision of fractional expressions. In fact, as we have attempted to illustrate in this essay, we have even designed our algebraic notation and its computational methods to reflect the fractions more than the whole numbers.

Therefore, today's view on math might cause us to think that a counterexample like **6859 [19s] plus 1444 [38s] equal 20577 [9s]** is quite primitive and simplistic. Consider how this particular relation of equivalency comes into conflict with the algebraic notation based on selfsame multiplication and finds its symbolic expression as $\mathbf{19^4 + 38^3 = 9^{\underline{4.5202157889}}}$ in today's algebraic language. Possibly, we may have developed a scientific algebraic notation that hides such elementary truths as the counterexamples illustrated in this essay. Think about it: we are ready to throw the relations of equivalency out the window because of the notation of the chosen method of computation. For if we do not want to see solutions such as $\mathbf{19^4 + 38^3 = 9^{\underline{4.5202157889}}}$, then, that means we shall not see such relations of equivalency as those likening to **6859 [19s] plus 1444 [38s] equal 20577 [9s], or as $\mathbf{A^x + B^y = z(C)}$**.

In our mind, it is more important to teach that relations of equivalency, such as **6859 [19s] plus 1444 [38s] equal 20577 [9s]** exist, rather than emphasize concepts such as $\mathbf{19^4 + 38^3 = 9^{\underline{4.5202157889}}}$, which may suggest even the impossibility of such equivalencies. The Beal Conjecture stipulates the terms and their exponents through today's algebraic notation of selfsame multiples through multiplication. Had the equation been written in terms of the method of selfsame multiples through addition, then one would observe the infinite number of counterexamples that exist where the terms have no common divisor.

If the difference between selfsame addition and selfsame multiplication were commonly perceived, then one would not propose the idea of counterexamples through selfsame multiplication, knowing the infinite number of counterexamples in selfsame addition. Furthermore, today's algebraic notation concentrates upon selfsame multiples through multiplication, which is an extremely limited number of possible relations of equivalency, a fraction of the possibilities attainable through selfsame addition. For a more exhaustive treatment of any mathematical subject, we should be teaching our students selfsame addition, which embraces the total universe of possibilities in these analyses.

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Additional Reading
Earth/matriX: Science in Ancient Artwork Series

Essays written by Charles William Johnson, between 1995 and 2000, about themes of the Beal Conjecture, Fermat's Last Theorem, and the Extension of the Pythagorean Theorem to the Cube.

"**An Alternative to the Pythagorean Theorem $w^3 + x^3 + y^3 = u^3$**" Earth/matriX: Science in Ancient Artwork Series, ISSN-1526-3312, New Orleans, Louisiana. *www.earthmatrix.com/pythagorean/alternativetheorem.htm*

"***The Beal Conjecture Submission Number Two***", Earth/matriX: Science in Ancient Artwork Series, ISSN-1526-3312, New Orleans, Louisiana. *www.earthmatrix.com/beal/submission.htm*

"**Fermat's Last Theorem**", Earth/matriX: Science in Ancient Artwork Series, ISSN-1526-3312, New Orleans, LA, *www.earthmatrix.com/fermats/fermatla.htm*

"**Fermat's Last Theorem: Powers and Last-Digit Patterns (Relations of Non-Equivalency and Approximate Equivalency**", Earth/matriX: Science in Ancient Artwork Series, ISSN-1526-3312, New Orleans, Louisiana. *www.earthmatrix.com/fermats/powers_and_patterns.html*

"**Fermat's Last Theorem: A Summation**", Earth/matriX: Science in Ancient Artwork Series, ISSN-1526-3312, New Orleans, Louisiana. *www.earthmatrix.com/fermats/brief_summation.htm*

"***Last-Digit Terminations and the Beal Conjecture: An Explanation***", Earth/matriX: Science in Ancient Artwork Series, ISSN-1526-3312, New Orleans, Louisiana. *www.earthmatrix.com/beal/conjecture.htm*

"***The Maya Long Count: an Extension of the Pythagorean Theorem and an Enmendation to Fermat's Last Theorem***", Earth/matriX: Science in Ancient Artwork Series, ISSN-1526-3312, New Orleans, Louisiana. *www.earthmatrix.com/series56/maya56.htm*

"***The Pythagorean Theorem and the Maya Long Count***", Earth/matriX: Science in Ancient Artwork Series, ISSN-1526-3312, New Orleans, Louisiana. *www.earthmatrix.com/Pitagoras3.htm*

"**Summation of Fermat's Last Theorem (x^n + y^n = x^n)",** Earth/matriX: Science in Ancient Artwork Series, ISSN-1526-3312, New Orleans, Louisiana. *www.earthmatrix.com/fermats/summation.htm*

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Addendum

The Beal Conjecture, similarly to Fermat's Last Theorem, appears to be treating all possible numbers. In regards to the possibilities of the terms, this is true; for any term may be any number from one to infinity. Yet, when one stipulates that those infinite numbers of terms may be only selfsame multiples through multiplication, then one is dealing with only the cases that have powers marked next to them in the following selected cases. The multiples through addition of the following terms for each number are left out of the Beal Conjecture.

For example, if the term 2 is employed, then it is the number two to the third, fourth, fifth, sixth power, etc.; but, the remaining numbers of multiples is denied by the stipulations of the conjecture. And, so it goes with all other remaining numbers; any term is considered only as of its selfsame multiple through multiplication and not through selfsame addition.

Terms and Powers

2	n1	70		136	The method of **selfsame multiples**
4	**n2**	72		138	**through multiplication** concerns only
6		74		140	the powers shown (**n2, n3, n4, n5...**)
8	**n3**	76		142	for the prime number 2. Their
10		78		144	respective products are highlighted.
12		80		146	
14		82		148	
16	**n4**	84		150	The remaining numbers are obtained
18		86		152	through **fractional exponents** of the
20		88		154	factor 2.
22		90		156	
24		92		158	
26		94		160	
28		96		162	
30		98		164	
32	**n5**	100		166	
34		102		168	
36		104		170	
38		106		172	
40		108		174	The method of **selfsame multiples**
42		110		176	**through addition** involve each and
44		112		178	everyone of the numbers listed as
46		114		180	a multiple of 2
48		116		182	
50		118		184	
52		120		186	
54		122		188	
56		124		190	
58		126		192	
60		**128**	**n7**	194	
62		130		196	
64	**n6**	132		198	
68		134		200	**...256 n8**

The Beal Conjecture treats only the cases pertaining to **n3, n4, n5**,...shown in bold lettering. In these cases of selfsame multiples through multiplication there are no equations whose terms have no common prime divisor. In the remaining cases, there are an infinite number of equations possible whose terms may not share a common prime divisor as illustrated in this essay.

Terms and Powers

3	n1	105	204	The method of **selfsame multiples**
6		108	207	**through multiplication** concerns only
9	**n2**	111	210	the powers shown (**n2, n3, n4, n5**)
12		114	213	for the prime number 3. Their
15		117	216	respective products are highlighted.
18		120	219	
21		123	222	
24		126	225	
27	**n3**	129	228	
30		132	231	
33		135	234	
36		138	237	
39		141	240	
42		144	**243**	**n5**
45		147	246	
48		150	249	
54		153	252	
57		156	255	
60		159	258	
63		162	261	The method of **selfsame multiples**
66		165	264	**through addition** involve each and
69		168	267	everyone of the numbers listed as
72		171	270	a multiple of 3.
75		174	273	
78		177	276	
81	**n4**	180	279	
84		183	282	
87		186	285	
90		189	288	
93		192	291	
96		195	294	
99		198	297	
102		201	300	**...729 n6**

The Beal Conjecture treats only the cases pertaining to **n3, n4, n5**,...shown in bold lettering. In these cases of selfsame multiples through multiplication there are no equations whose terms have no common prime divisor. In the remaining cases, there are an infinite number of equations possible whose terms may not share a common prime divisor as illustrated in this essay.

Terms and Powers

4	n1	144		276	
8		148		280	
12		152		284	
16	**n2**	156		288	
20		160		292	
24		164		296	
28		168		300	
32		172		304	
36		176		308	
40		180		312	
44		184		316	
48		188		320	
52		192		324	
56		196		328	
60		200		332	
64	**n3**	204		336	
68		208		340	
72		212		344	
76		216		348	
80		220		352	
84		224		356	
88		228		360	
92		232		364	
96		236		368	
100		240		372	
104		244		376	
108		248		380	
112		252		384	
116		**256**	**n4**	388	
122		260		392	
126		264		396	
130		268		400	
136		272		404	**...1024** **n5**

The method of **selfsame multiples through multiplication** concerns only the powers shown (**n2, n3, n4, ...**) for the composite number 4. Their respective products are highlighted.

The remaining numbers are obtained through **fractional exponents** of the factor 4.

The method of **selfsame multiples through addition** involve each and everyone of the numbers listed as a multiple of 4

The Beal Conjecture treats only the cases pertaining to **n3, n4**,...shown in bold lettering. In these cases of selfsame multiples through multiplication there are no equations whose terms have no common prime divisor. In the remaining cases, there are an infinite number of equations possible whose terms may not share a common prime divisor as illustrated in this essay.

Terms and Powers

5	**n1**	175	345	**...625 n4**
10		180	350	
15		185	355	
20		190	360	
25	**n2**	195	365	
30		200	370	
35		205	375	
40		210	380	
45		215	385	
50		220	390	
55		225	395	
60		230	400	
65		235	405	
70		240	410	
75		245	415	
80		250	420	
85		255	425	
90		260	430	
95		265	435	
100		270	440	
105		275	445	
110		280	450	
115		285	455	
120		290	460	
125	**n3**	295	465	
130		300	470	
135		305	475	
140		310	480	
145		315	485	
150		320	490	
155		325	495	
160		330	500	
165		335	505	
170		340	510	

Terms and Powers

7	**n1**	245		483	**...2401**	**n4**
14		252		490		
21		259		497		
28		266		504		
35		273		511		
42		280		518		
49	**n2**	287		525		
56		294		532		
63		301		539		
70		308		546		
77		315		553		
84		322		560		
91		329		567		
98		336		574		
105		**343**	**n3**	581		
112		350		588		
119		357		595		
126		364		602		
133		371		609		
140		378		616		
147		385		623		
154		392		630		
161		399		637		
168		406		644		
175		413		651		
182		420		658		
189		427		665		
196		434		672		
203		441		679		
210		448		686		
217		455		693		
224		462		700		
231		469		707		
238		476		714		

Terms and Powers

13	**n1**	455	897	**...2197**	**n3**
26		468	910	**...28561**	**n4**
39		481	923	<u>**...109889**</u>	<u>**n4.5..**</u>
52		494	936		
65		507	949	**...371293**	**n5**
78		520	962	**...4826809**	**n6**
91		533	975		
104		546	988		
117		559	1001		
130		572	1014		
143		585	1027		
156		598	1040		
169	**n2**	611	1053		
182		624	1066		
195		637	1079		
208		650	1092		
221		663	1105		
234		676	1118		
247		689	1131		
260		702	1144		
273		715	1157		
286		728	1170		
299		741	1183		
312		754	1196		
325		767	1209		
338		780	1222		
351		793	1235		
364		806	1248		
377		819	1261		
390		832	1274		
403		845	1287		
416		858	1300		
429		871	1313		
442		884	1326		

The Beal Conjecture, then, is concerned in relation to the multiple of 13 with the term 13 as of its selfsame multiples through multiplication beginning with 13^3 and the powers thereafter... **...2197 n3**
...28561 n4
...371293 n5
...4826809 n6
etc.

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Any and all numbers/multiples in between these terms and their powers are denied by the Beal Conjecture, other than as multiples of other terms, and then the same rule of selfsame multiplication applies in each case.

Term 3

21		123	222	
24		126	225	
27	**n3**	129	228	
30		132	231	
33		135	234	
36		138	237	
39		141	240	
42		144	**243**	**n5**
45		147	246	

Term 4

56		196	328
60		200	332
64	**n3**	204	336
68		208	340
72		212	344
76		216	348

Term 5

105		275	445
110		280	450
115		285	455
120		290	460
125	**n3**	295	465
130		300	470
135		305	475

The Beal Conjecture, for example, treats only the terms and powers in red listed above, which are selfsame multiples (of 3, 4, 5) through multiplication. And, all of the remaining numbers are denied by the Beal Conjecture, which are selfsame multiples (of 3, 4, 5) through addition. We chose random numbers from the more extensive lists relating to terms and powers in the appendix. By stipulating selfsame multiples through multiplication in the Beal Conjecture, only a very selected number of multiples are chosen for the computations.

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