Internet Draft **E. Terrell**
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The Mathematics of Quantification, and the Rudiments Of the Ternary Logical States of the Binary Systems

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Please note, some of the mathematical operators that cannot be represented in a 'txt' file format, such as the '^' Carrot sign for super-script, or 'v' for sub-script, that must be used to represent the Mathematical Operator involving an Exponential Operation.

This Internet-Draft will expire on October 28th, 2006.

Abstract

This paper provides the final clarification simplifying the Mathematical proof for the New Binary System, by proving that the mathematical operations defined in the Current Binary System are wrong. In other words, using an askew or mathematically incorrect Binary System, which pertains to the misinterpretation of ZERO, resulted in a substantial loss of available IP Addresses in the IPv4 IP Specification. Hence, from the foregoing foundation an unquestionable proof concludes; the Elementary Mathematical 'Resolution of the Counting Error in the Binary System' ("4. IANA Considerations"). [4]

Introduction

The investigation of the origin of the Binary System revealed that Leibniz, its principle author, is responsible for the askew error, because he never understood or actually developed a Binary System of counting. And this is clearly shown to be the handicap that not only resulted in the Loss of available IP Addresses in the IPv4 Specification, but it contributed to the difficulties preventing the development of the Binary and Ternary Relations defined by Boolean Algebra. That is, by clearly showing that this is a Closed Finite Mathematical System, which defines an incremental progression using ' 1's '. This greatly simplified the Boolean Mathematical Relationships for the 'Theory of Three State Logic', and corrected the error in Binary Enumeration, which generated the loss of IP Addresses in the IPv4 Specification. In other words, the proof of "Fermat's Last Theorem" defines a special case of the Distributive Law, which is defined in the mathematical logic of Set Theory as the Intersection of the two Universal Sets that represents the Binary and the Unary Systems. And this conclusively proves that there are only Two logical Systems of Counting, which are mathematically viable.

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1. The Beginnings of Binary Enumeration

The History of the Binary System has its recorded beginnings starting about the 5th century BC. But, there is a problem with this recorded date, because the historians have not defined, or established an agreement regarding what they mean jointly, or independently, when they are referencing the development of the Binary System. In other words, for many people, specifically mathematicians, when they speak or make reference to the Binary System, they are talking about mathematics. The Binary System, as a Mathematical System actually did not come into fruition until the 1600. That is, from the 5th Century to the 1600, what is thought to be a Binary System for Mathematical Enumeration, was in fact, either a system of Drum Beats for communications, a system of Open and Closed Bars used for counting, or a system for distinguishing musical notes in musical compositions. In any case, each of these so-called Binary Systems shared the same flaw; they skew the counting by the misrepresentation of the Binary equivalent of '1'.

1.1 Gottfried Wilhelm von Leibniz's Binary System

The general consensus regarding Leibniz would contend that he made significant contributions to the foundations of Mathematics, Philosophy, and the beginnings of Set Theory. However, because he was indeed, a man of the times; A broad range of subjects occupied Leibniz. Nonetheless, while he did make significant contributions to humanity, an investigation of some of his most noted contributions would show that he did not completely finish the work for closure of the proposed subject(s). That is, I am of the opinion that, for most of his life, Leibniz was looking for the pieces of his puzzle, the clues or solution to clarify the concerns involving his ongoing research in the areas of Philosophy, Logic, and Metaphysics (The Laws and Logic of Critical Thinking). Needless to say, my opinion is evinced more clearly by the study of the works from one of his contemporaries, Pierre de Fermat, and the man most profoundly influenced by his research in Metaphysics, George Boole.

Nevertheless, while Leibniz correctly translated the symbolisms for enumeration, as presented in the book of I Ching, into a Binary System of counting, which was similar to the Unary System. However, the reality of this accomplishment is that, his only achievement was the 'Ø' and the '1' solution to his problem concerning his Metaphysical Research, which pertained to the Logical Analysis for the presentation of 'The Laws and Logic of Critical Thinking'. In which case, had he either knew, or fully understood that Numerology, or Number Theory in general, involved the Logical Analysis of the Elementary Laws of Mathematics. He probably would have correctly completed his Numbering System, and 'Fermat's Last Theorem' would not have become one of the greatest, from a historical perspective, Mathematical Enigmas of all times. In any case, since 'Fermat's Last Theorem' was not solved until November 1979, there was no logical connection ever established between the works of Fermat and Leibniz. Hence, in the absence of a logical reason for a comparable analysis, there was no reason to question the validity of Leibniz's numerical translation. In other words, the Modern Binary System, as depicted in figure 1, is the direct consequence from the work of Leibniz and it remains logically incorrect. This because, the discovery of the solution to the problem that qualified as the logical reason for the comparable analysis questioning his results, from the mathematical perspective, it violates the laws from elementary mathematics, the Field Postulates, the Axioms for Equality, and the logical foundation of Set Theory.

Modern Binary System	Primitive Unary System
00	0
01	1
10	11
11	111
100	1111
101	11111
110	111111
111	1111111
1000	11111111
1001	111111111
1010	1111111111
1011	11111111111
1100	111111111111
1101	1111111111111
1110	11111111111111
1111	111111111111111
10000	1111111111111111

Figure 1

1.2 George Boole's Mathematical Logic

The influence of Leibniz upon George Boole is unquestionable, however, Boole's greatest contribution to mathematics overshadow considerably, his retake on objectives of Leibniz's life's work. In other words, Boole's work; "An investigation of the Laws of Thought on Which are founded the Mathematical Theories of Logic and Probability", is a mathematical and logical marvel that clearly renders a rational demystification of the Metaphysical rhetoric encompassing the logic of the 'Ø' and the '1' foundation, which was the hallmark of Leibniz pursuit to resolve 'The Laws and the Logic Foundation of Critical Thinking'. Still, George Boole was unaware of the contributions he made to Mathematics and the Mathematical Sciences, because it was imbedded in his most famous work; "An investigation of the Laws of Thought on which are founded the Mathematical Theories of Logic and Probability". Furthermore, while using the principle foundation of the '0'and the '1'concepts created by Leibniz, Boole correctly established an Algebraic and Logical Foundation that was later to have applications throughout the fields Computer Science and Electronics. However, the result from Boole's work was wrongly interpreted as the 'Logic of the Binary System', when in fact, it is actually 'The Logic of the Unary System', because only One State Works, or because only One Stated Condition can be True, as shown in Figure below: The Truth Relation of Two State Logic.

The Truth Relation of Two State Logic

Key to Truth Tables

The table on the right shows combinations of truth values for the two operands A and B to the truth function, in the position of the table which will be used for recording the result of the operation for those operand values.

A = T B = T	A = T B = F
A = F B = T	A = F B = F

true	or	if	A	implies	B	iff	and
T T	T T	T T	T T	T F	T F	T F	T F
T T	T F	F T	F F	T T	T F	F T	F F

nand	xor	not B	nimp	not A	nif	nor	false
F T	F T	F T	F T	F F	F F	F F	F F
T T	T F	F T	F F	T T	T F	F T	F F

Boolean Algebra; The Algebraic Laws and Logical Laws of Two State Logic

AND Operations (·)

0•0 = 0 A•0 = 0

1•0 = 0 A•1 = A

0•1 = 0 A•A = A

1•1 = 1 A•A' = 0

OR Operations (+)

0+0 = 0 A+0 = A

1+0 = 1 A+1 = 1

0+1 = 1 A+A = A

1+1 = 1 A+A' = 1

NOT Operations (')

0' = 1 A'' = A

1' = 0

Associative Law

(A•B)•C = A•(B•C) = A•B•C

(A+B)+C = A+(B+C) = A+B+C

Commutative Law

A•B = B•A

A+B = B+A

Distributive Law

A•(B+C) = (A•B) + (A•C)

A+(B•C) = (A+B) • (A+C)

Precedence

AB = A•B

A•B+C = (A•B) + C

A+B•C = A + (B•C)

Associate Law

(a) $(A + B) + C = A + (B + C)$

(b) $(A\,B)\,C = A\,(B\,C)$

Commutative Law

(a) $A + B = B + A$

(b) $A\,B = B\,A$

Distributive Law

(a) $A\,(B + C) = A\,B + A\,C$

(b) $A + (B\,C) = (A + B)\,(A + C)$

Identity Law

(a) $A + A = A$

(b) $A\,A = A$

DeMorgan's Theorem

(A•B)' = A' + B' (NAND)

(A+B)' = A' • B' (NOR)

Figure 2

Nevertheless, given that an argument can be made claiming the existence of Two States, '0' and '1'. However, not until it is realized that Boole's ascribes to a literal usage, using their actual numeral values, it will then become understood that a Unary System is a Two State System, because it is a System of Counting uses '1s' to represent something and a '0' to represent nothing: 'Hence, A Two State System'. So, the question of ponder that one might ask is: 'If the number of States in the Logic of the Modern Binary System equals that of the Unary System. How many States defined by Boolean Relationships does the True Binary System have ...??... Figure 3.

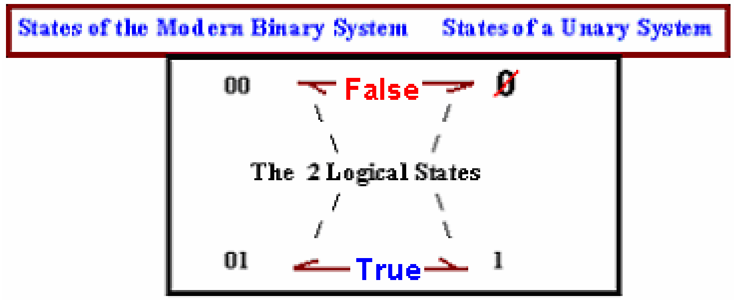


Figure 3

1.3 The Arithmetical Error and the flaw in Binary Enumeration

While it should be quite clear that a fundamental knowledge of Archaeology, Anthropology, and perhaps that of the early Languages, is a necessary perquisite to the study of any ancient Civilization. Still, there should never be any doubts that if there is, or was a Civilization whose first system of counting was a True Binary System, then this would probably be the most advanced Civilization in the Universe. In other words, because of the inherent complexities involved in the meaning and the interpretation of the concept of Zero, the development of a True Binary System by any Ancient or Primitive Civilization borders on the Highly Unlikely, or the Impossible. In which case, prior to Leibniz's discovery of the Two State Logical System for his Metaphysical Analysis of Critical Thinking, I cannot accept as being possible for any Civilization, before his time, to have either created, or fully understood the Mathematics of the Binary System. The case in point is the mathematical error discovered in 1999, which was an obvious mathematical discrepancy between two different Binary Mathematical Systems. However, it is also quite obvious that know one since Leibniz, could either rationalize this difference, or understood why a difference occurred. And while the most notable self-righteous and unspoken claims, under the guise of Religion, Politics, Racial, or Economic deprivation / discrimination, for every Civilization since mankind's beginnings, has been the horrifyingly torturous control and exploits of its people. Yet, even with the persistence of these living conditions today, it is still difficult not wonder, how, or why it is possible for a blunder having such simple a solution, could have lasted for so long. ...???...

In other words, the pointed reality of this discrepancy asks the question: 'Is it possible for a 1 to 2 ratio in a one-to-correspondence between two Sets, the Set X and the Set of Integers, I, to yield a distribution in which each member of the Set X was equal to two different members contained in the Set I?' {Where, A ≠ B, but, X = A, and X = B ... No!} That is, it is not possible for any one-to-one pairing between the members of two Sets, the Set X, and the Set I, for any member contained in any one of the two Sets to have more than one pairing with the members of the other Set. And this is because; such a pairing establishes a count that can be translated into equality, when both Sets, given in Table I, are said to represent the same (Identical) method for enumeration.

TABLE I

1 Modern Binary System	2 Modern Positive Integers	3 Primitive Unary System
00	0	0
01	1	1
10	2	11
11	3	111
100	4	1111
101	5	11111
110	6	111111
111	7	1111111
1000	8	11111111
1001	9	111111111
1010	10	1111111111
1011	11	11111111111
1100	12	111111111111
1101	13	1111111111111
1110	14	11111111111111
1111	15	111111111111111
10000	16	1111111111111111

In any case, to say the very least, it should be quite clear from the examination of Table I, that if a given Binary Number, say, '11111111', has two Integral Values, '255' and '256', there is an undeniable problem with the Binary System when it is used as a System of Counting. Still, anyone, and with good reason, could quite easily present the excuse; "It is a Typo-Graphical Error!", as a viable opposing argument. However, such an argument would easily fail, because there is absolutely No proof, if {a, b} = {0, 1}, which would now account for the existence of the 4 conditions that must clearly represent a number; Substitution Law for Equality now yields,{a, a}, {a, b}, {b, a}, and {b, b} given in Table II. Especially since, it is evident in this scenario that Zero cannot be equal to either '0', or the Null Set, (Out of Sight, Out of the Consciences thought ... Does not exist!) because 'a' references something in the real sense. Furthermore, when comparing the three columns from Table I, it is also evident that there is a common coefficient between different numerical representations that are equal to the same number. But, this assessments is only valid between the members of columns 2 and 3 in Table I, and conditionally valid between the members of columns 1, 2, and 3, in Table II.

Note: The unfortunate reality of Table II, is that, the New Binary System impacts Gregor Mendel's work in Genetics. In other words, from an 'A a' and 'B b' paring, {A, a, B, b}, Mendel's results referenced only 6 of the possible 16* combinations; {A, A}, {B, B}, {A, B}, {B, b} {A, a}, and {a, b}. However, while I have not wrote the New Foundation representing Finite Chemistry, the reality of the mathematical results from the Mathematics of Quantification now questions the validity of Mendel's claims. In any case, it has been proven, using the current foundation, that the order of the addition of Chemicals is a vital consideration for the determination of the Chemistry of the resulting Chemical Compound (10 combinations are missing*). Still, what's alarming? Well. ...considering the 'X' and 'Y' Chromosomes that represent this relationship. This also suggest the possibility of an error in the Chromosome Count defining the Base Pairs; A = adenosine, C = cytosine, G = guanine, and T = thymine, given that they current identify 23 + 23 = 46 Chromosomes. That is, from the Mathematics of Quantification this defines, $2^5 + 2^5 = 2^6 = 64 = 8^2$ Chromosomes, four pairs of 8 Bit Bases Pairs, or 32 + 32 = 64, that yields about 2^{32} = 4,294,967,296 Bases, which translates into two 8^{10} pairs of 8 Bit Bases Pairs per Cell of human DNA. (et 2004)

TABLE II

1 Another Binary System Representation	2 Modern Positive Integers	3 Primitive Unary System
0	0	0
aa	1	1
ab	2	11
ba	3	111
bb	4	1111
baa	5	11111
bab	6	111111
bba	7	1111111
bbb	8	11111111
baaa	9	111111111
baab	10	1111111111
baba	11	11111111111
babb	12	111111111111
bbaa	13	1111111111111
bbab	14	11111111111111
bbba	15	111111111111111
bbbb	16	1111111111111111

Nevertheless, while studying the analysis from Tables III and IV, recall the former proofs, because it was clearly shown that if '00 = aa = 1', and '01 = ab = 02', and the Exponent 'F = either a Rational or Irrational Number, then the Binary Translation could only equal the Binary Representation for the Number. This meant, the exponent 'F' was not a whole Number. However, when the result from the sequential variable of the exponent having a of base '2' equaled the value of a whole number, and the exponent was also a whole number, then given that 'Multiplication is the Quantified Sum of Addition', the value of the exponent equaled the sum of the Binary 1's and the Product of the Binary 1's equaled the Binary Number and the Unary Number. That is,

because '2 x 2 x 2 x 2 x 2 x 2 x 2 = 128 = 1111111 = 2^{7}

and '2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 = 256 = 11111111 = 2^{8},

there is clearly a relationship between the columns in Table IV, and since (2 + 2) = (2 x 2), it shall be proven in Part II not only that the established proof for the New Binary System remains correct. But, that its validity is derived from the proof of 'Fermat's Last Theorem' and the discovery of the 'Distributive Law for Exponential Functions'. Nevertheless, this proves that the differences between Tables III and IV clearly do not represent a Contradiction, the necessary requirement as stated by "Chief Executive Administrator for The Electronic Library of Mathematics", Aleksandar Perovic, when he said: "Mathematicians do not accept claims at truth of any possible, non-self-contradictory (= consistent) mathematical system". Needless to say, while this difference is not a Contradiction, it is indeed a troubling Inconsistency which at the very least, warrants an investigation.

TABLE III
"The Modern Interpretation of the Binary System of Enumeration" Counting, using only "1's" and "0's" Depicting the Results from its current Presentation

Exponential Enumeration	Binary Representation	Positive Integer
1. 0^0 = 0	00000000 = 0	0
2. 2^0 = 1	00000001 = 01	1
3. 2^1 = 2	00000010 = 10	2
4. 2^F = 3	00000011 = 11	3
5. 2^2 = 4	00000100 = 100	4
6. 2^F = 5	00000101 = 101	5
7. 2^F = 6	00000110 = 110	6
8. 2^F = 7	00000111 = 111	7
9. 2^3 = 8	00001000 = 1000	8
	. . .	
129. 2^7 = 128	10000000 = 10000000	128
	. . .	
257. 2^8 = 256	100000000 = 100000000	256

TABLE IV
"The Reality of the New Binary System of Enumeration"
And the Series Generated when Counting, using the
"1's" and "0's", and from the Axioms for Equality, "a's" and "b's"

Exponential Enumeration	Binary Representation	Positive Integer
1. 0^0 = 0	0	0
2. 2^0 = 1	00 = aa	1
3. 2^1 = 2	01 = ab	2
4. 2^F = 3	10 = ba	3
5. 2^2 = 4	11 = bb	4
6. 2^F = 5	100 = baa	5
7. 2^F = 6	101 = bab	6
8. 2^F = 7	110 = bba	7
9. 2^3 = 8	111 = bbb	8
	.	
	.	
	.	
129. 2^7 = 128	01111111 = bbbbbbb	128
	.	
	.	
	.	
257. 2^8 = 256	11111111 = bbbbbbbb	256

2. The Unary and The Binary Mathematical Systems

Throughout mankind's beginnings, there have been several different Systems of Counting, several different methods for performing elementary arithmetic, and an equal number symbols for those that were written, as well as the variety of sounds for those that were only spoken. However, only one numbering system, which is nearly complete, survived the trials of mankind's journey towards civilization; 'The Unary System'. And while the Laws from the Axioms for Equality, the Field Postulates, and Logic of Set Theory, which are an essential part of Unary System, was not developed until long after its discovery, sometime during the early and mid 1800's. Still, it is doubtful that anyone before 1979, tested the validity of the Unary System. Needless to say, it should be quite clear now, that every System of Enumeration must comply with the Laws from the Axioms for Equality, the Field Postulates, and Logic of Set Theory before it can ever be accepted as a valid System of Counting, which conforms to the elementary laws of arithmetic. In other words, the additional requirement, which any civilization must meet to claim the creation or the development of a True Binary System, is one that requires a prior the knowledge of the Unary System. If not, how could anyone justify the use of two objects to account for only one material possession... Hence, to use a Stick to represent the summation of an arithmetic progression incremented by the addition of 1, is far simpler than the use, or discovery of the 'Stick and a Rock', which would be used to represent the same incremented addition. Clearly, if this were not the case, then the Binary System would not have, after its initial claim of discovery, to wait 2500 years to become a True Binary System.

2.1 "Two Distributive Laws & The Binary System Proves Fermat's Last Theorem"

It is extremely amazing that it required more than 300 years after 'Pierre de Fermat' composed, before his death in 1665, a riddle involving an elementary algebraic equation, which eluded everyone, including the greatest mathematicians, until 1979, when a solution was found that solved the riddle. A joke? Perhaps. But, Fermat was the first to claim while writing this riddle, that he knew the simple solution. And clearly, if this were true, which I believe that it is, then perhaps, "Fermat's Last Theorem" should rightfully be called; the greatest joke of all times. However, while I accept Fermat's claim, I do not believe that he actually knew, or fully understood, the profound implications of his discovery.

Especially since, it may be concluded, as presented below, there are only 3 logically viable 'Interconnected Complimentary Solutions' that would solve the riddle regarding why;

"There are No solutions in Whole Numbers to the Equation, $X^N + Y^N = Z^N$, when $N > 2$".

1. **There is no Common Coefficient between the Variables representing the Sum of Two Exponents, the Exponent equaling their Result, and their respective Roots, when 'N > 2' , and 'N' defines the Exponent of the base variables. (Equal Number of Parts Contained in the Whole.)**

2. **Fermat's Solution defines how he interpreted the problem, which is based upon the current mathematical knowledge known during his time: Pythagoras Theorem, and the (Analytical Geometric) solution explaining the Difference regarding 'Why', when 'N = 2'; 'The Sum of the Area of two Perfect Squares Equals the Area of another Perfect Square'. And why, when 'N = N: "The Sum of the Areas of two Perfect Nth Powers is not Equal to the Area of the Root of a Perfect Nth Power'. Nevertheless, this assumption builds an explanation that Explains this difference, which it is believed to be the foundation for the proof that Fermat claimed would not fit in the margin of his paper, but would explain why, when 'N > 2', his theorem is true.**

3. **In Exponential Operations, there is No equal Distribution of Multiplication over Addition when 'N > 2', and 'N' defines the value of the Exponent. (The Discovery of the Distributive Law for Exponential Functions, and the Foundation for the Finite Mathematical Field: "The Rudiments of Finite Algebra; The Results of Quantification".)**

Nevertheless, deliberation of the proof that it is assumed Fermat knew, would be something like this, when 'N = 2':

An Interpretation of the proof Fermat probably knew:

""If the Length of the Side of a Perfect Square inscribing another Perfect Square is equal to 'X + Y', then the Sum of the Areas of Two Perfect Squares is equal to the Area of the Perfect Square inscribing another Perfect Square, and since the Area of a Square is given by;

1. 'L × W = Area'

the Area of the Inscribing Perfect Square, from the Mathematics of Quantification is given as;

2. $(X + Y) \times (X + Y) = (X + Y)^2 = X^2 + 2XY + Y^2$

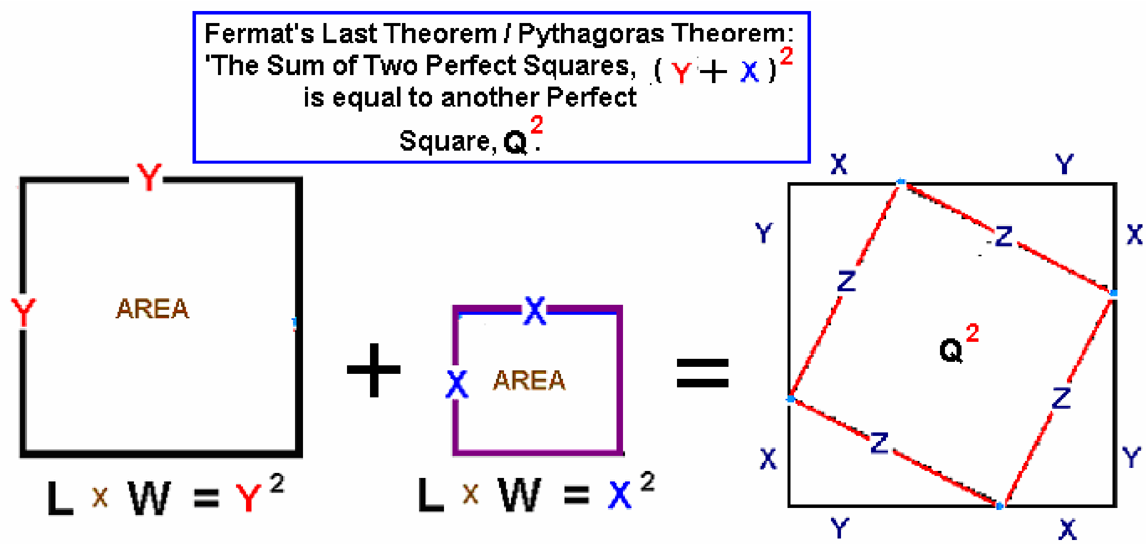


Figure 4

And if the Length of the Side of the inscribed Perfect Square is equal to 'Z', and the Area of this Perfect Square is given by equation 1, then from Pythagoras Theorem, 'Z' is the Root of the equation given by;

3. $X^2 + Y^2 = Z^2 = L \times W = Z \times Z$

Hence, the 'X, Y, and Z' variables, by Pythagoras Theorem now equals the Sides of the 4 Right Triangles forming, or Creating the Boarders of the Inscribing Perfect Square and the Perfect Square it inscribes. That is, if the Length of the Two Sides joining the 90 degree angle of the Right Triangle equals 1/4 the Length of the Perimeter of the Inscribing Perfect Square, then the Sum of the X and Y variables defining the Two Sides of the Right Triangle equals the Length of the Side of the Inscribing Perfect Square. And given by equation 4, we have;

4. $X + Y = Y + X$**, which means:**

If the Sum of the Length of the Two Sides, 'X + Y' of any Right Triangle forming the Right Angled boarder of any Perfect Square having Four Equal Sides, is equal to 1/4 the Length of its Parameter, then the Sum of the Length of the Two Sides joined at the Right Angle of the Right Triangle is equal to the Length of One Side of the Perfect Square.
(The Commutative Law for Addition; "X + Y = Y + X".)

‘And clearly, I can now conclude, Fermat, being the co-discoverer of Analytic Geometry was only the master of some of the methods of Euclidian Geometry and the methods of Algebra known during his time. Furthermore, the foregoing is evinced more clearly when it is realized that Fermat never associated the Two Digit System of Plotting a One Number Point with Binary Enumeration, yet, he clearly understood the association between algebraic system for enumeration and the definition of the point presented by Euclid. In other words, while he clearly understood the algebra and the geometry defining the shapes of the objects involved in his proof, he never grasps the connection between algebra and geometry established by Analytic Geometry.’

Furthermore, if the Sum of the Length of the Two Sides, 'X + Y' of any Right Triangle forming the boarder of any Perfect Square equals the Length of One of its Sides, and if a Perfect Square defines the Closed shape of a figure having the 4 Sides defined by the shape of a Rectangle, but equal, then the boarders of the Perfect Square is defined by Four Equal Right Triangles. Hence, from Pythagoras Theorem, if of the Two Sides of the Right Triangles forming the boarders of the Perfect Square join to form the 90 degree Right Angles connecting the 4 Sides of the Perfect Square, then the Two Sides of the Right Triangles must respectively Equal the Adjacent Side and the Side Opposite the Hypotenuse. Therefore, since the Right Triangles join the Sides of the Perfect Square, the connection of the Side forming the Hypotenuse of the Right Triangles must also meet, and be joined at 90-degree angles. And if the Four Right Triangles are equal, then the Length of Hypotenuse equals the Length of One Side of an Inscribed Perfect Square.

In other words, this means that: The Sum of the Areas of Two Perfect Squares equal the Area of the Perfect Square Inscribing another Perfect Square, if and only if, The Sum of the Areas of the Four equal Right Triangles forming the boarders of the Inscribing Perfect Square and the Area of the Perfect Square it Inscribes, equals the Area of the Perfect Square Inscribing another Perfect Square. And from equation 5, the Area of a Triangle is given by;

5. $1/2(b \times h)$

And given that only the Adjacent Side and the Opposite Side of the Right Triangles can, respectively equal the Base, b, and the Height, h, since there are 4 Right Triangles having equal sides, X and Y, by equation 5, the Area of the 4 Right Triangles is given by;

6. $4((1/2(X \times Y) = 4/2(XY) = 2XY$

And from these results, he would have easily discern that the equation for Sum of Areas of the 4 Right Triangles, as given by the equation;

7. $(X - Y) \times (X - Y) = X^2 - 2XY + Y^2$;

8. $X^2 + Y^2 = 2XY$

Hence, the Area of the Perfect Square Inscribing a Perfect Square, which is equal to the Sum of the Areas of Two Perfect Squares, is given by;

9. $(X + Y) \times (X + Y) = X^2 + 2XY + Y^2 = 2XY + Z^2$

Therefore;

10. $X^2 + Y^2 = 2XY - 2XY + Z^2 = X^2 + Y^2 = Z^2$

Thus, the equation, $X^2 + Y^2 = Z^2$, which is defined by Pythagoras Theorem states, 'the Sum of the Areas of Two Perfect Squares is equal to the Area of a Perfect Square'.

And clearly, from his analysis, Fermat would have concluded the X and Y relations:

11. **If X = Y, then X and Y are Two equal Perfect Squares, and If X > Y, or Y > X, then X and Y are Two different equally Perfect Squares.**

Hence, would have also known that since Area of Cube is given by equation 12, the Sides of a Perfect Cube are equal to that of a Perfect Square, when 'N = 3', must be equal, that the change in equation 12 is given by equation 13;

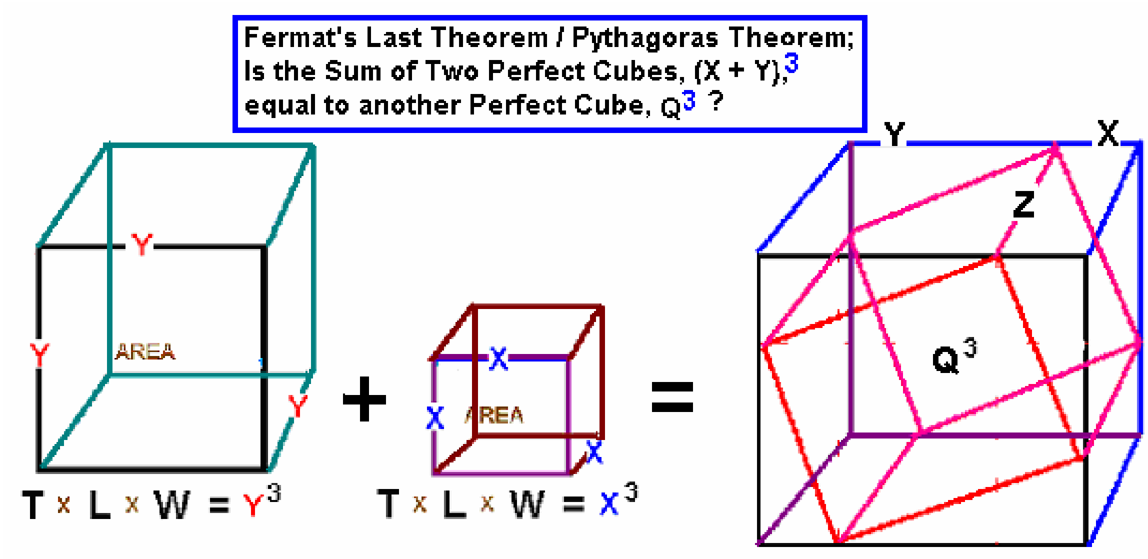


Figure 5

12. $L \times W \times T = \text{Area}$

13. $L \times W \times T = \text{Area} = X \times Y \times R = Z^3$

Hence, If the Root of Z^3 is equal to (X + Y), then the Area of a Perfect Cube, which inscribes another Perfect Cube is equal to the equation given by;

14. $(X + Y) \times (X + Y) \times (X + Y) =$

$$(X + Y) \times (X^2 + 2XY + Y^2) =$$

$$X^3 + 3X^2Y + 3XY^2 + Y^3$$

Furthermore, he would have quickly noticed that a Perfect Cube has 8 90 degree Angles forming its boarders, or 4 pairs of 3 dimensional Right triangles, Prisms having 5, 2 dimensional face. This he would have reasoned further, meant that, only a Pyramid could have 4 equal lengths measuring its sides. In other words, Fermat would have quickly concluded that, it is not possible for either any one of the 8, or 4 pairs of Right Triangles forming the boarders of a Perfect Cube, could have equal sides, and still be a Right Triangle. Needless to say, he would have also known that this did not mean that the Sum of the Areas of these 3 dimensional Right Triangles did not equal the Area of a Perfect Cube.

Nevertheless, he would continue to follow the logic from the conclusions involving 'N = 2' by first, confirming the formula for the Area of a 3 dimensional Triangle, to determine if the Sum of the Areas of Two Perfect Cubes is equal to the Area of another Perfect Cube. However, he would eventually notice, that there is an additional measurement to consider, the Volume and the Area of a 3 dimensional Triangle, or Prism, represented 2 different formulas. Where by, the Area of a 3 dimensional triangles is given by equation 14a, the Volume of the same Triangle is given by equation 14b;

14a. **Area of a Prism** $= A = 2(b^2) + 3b(h)$,
where b^2 **= Area of base,**
$3b = b + b + b$ **= Perimeter of base,**
and h **= Height of the Prism**

14b. **Volume of Triangle** $= V =$
Area of the Base $(B^2) \times$ **the Height** $(h) =$
$b^2h = b^2(h) = B^2 \times h$,
$V = b^2(h)$

Clearly, while an argument can be made regarding the difference between the formulas in equations 14a and 14b, which represents the two distinct results that respectively measure the 'Area of a Prism' and the Volume of 3 dimensional Triangle. Even still, Fermat would have probably continued to follow the logical patterns reasoning derived from the conclusions when 'N = 2', because he could quite easily test for the conclusions that would verify either one, or both of these formulas. Thus, following the logical reasoning concluding equations 6, 7, and 8, in an attempt to derive the results that would conclude the Perfect Cube, which logically concludes results similar to those involving equations 9 and 10.

Needless to say, I am hard pressed to imagine, but I seriously doubt that Fermat was surprised by his discovery, when trying to confirm equations 14a and 14b, that there are actually 5 different formulas, which must be used in the logical analysis that would determine the validity of; 'The Sum of the Areas / Volume of Two Perfect Cubes are equal to the Area, or Volume of another Perfect Cube'. In any case, it should be understood that the Cubes of the 'X, Y, and Z' variables must be Positive Integers, because their respective Cube Roots must be a Positive Integer. Where by, given below, we have;

15. $[(X + Y) \times (X + Y)] \times (X - Y) = X^3 + X^2Y - XY^2 - Y^3$

16. $[(X - Y) \times (X - Y)] \times (X + Y) = X^3 - X^2Y + XY^2 + Y^3$

17. $[(X - Y) \times (X + Y)] \times (X - Y) = X^3 - X^2Y - XY^2 + Y^3$

18. $[(X - Y) \times (X + Y)] \times (X + Y) = X^3 + X^2Y - XY^2 - Y^3$

And since by Definition;

> **<u>Exponent</u>: Any symbolic representation, 'Q', which is used in conjunction with the Number, 'X', representing a Multiplicand, represents the count of the number of Identical Multiplicands used in the equation representing the Product of Q Multiplicands;**
>
> $$X^Q = (X_1 \times X_2 \times X_3 \times \ldots \times X_Q).$$

Hence, given by equation 19, we have;

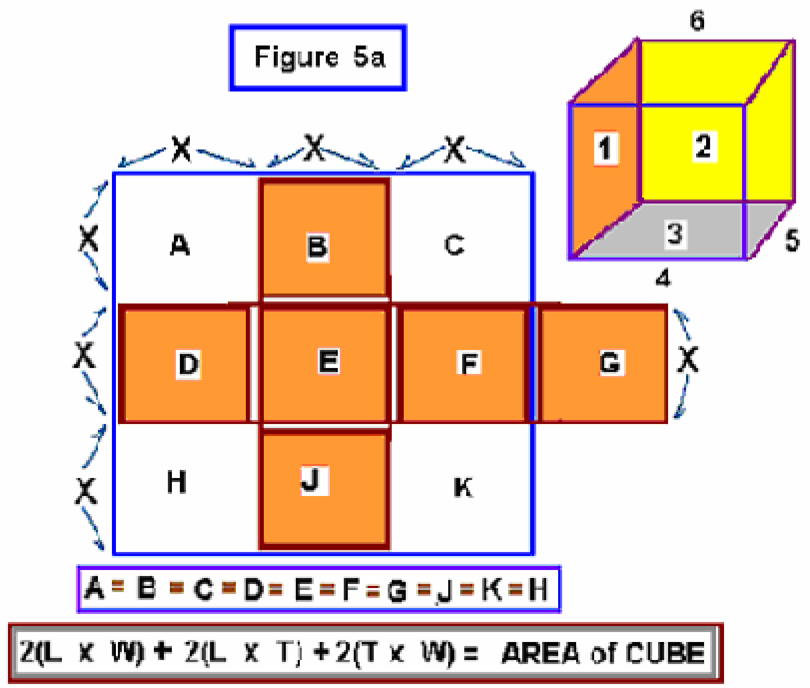
$$19.\quad [(X - Y) \times (X - Y)] \times (X - Y) = X^3 - 3X^2Y + 3XY^2 - Y^3$$

Clearly, once Fermat realized, upon inspection of equations 14a through 19, that; neither the Sum of the Areas, or the Volumes of the Right Angled Prisms forming the Perimeter of the Perfect Cube were equal to the factors from equation 12, '$3X^2Y + 3XY^2$', whose difference would yield the same conclusions established by, equation 18, were not equalities that would result in a cancellation. He would have reasoned that, 'The Sum of either the Area, or the Volume of Two Perfect Cubes did not equal another Perfect Cube', because the Cube Root is not equal to the Square Root of the Perfect Square, which is equal to the Sum of two Perfect Cubes. And further testing, he would have concluded an increasing divergence between factors, because their Terms increases for every unit of increase of the Exponent, 'N'. Hence, he would finally conclude, since (2 + 2) = (2 × 2), "There are No solutions in Whole Numbers to the Equation, $X^N + Y^N = Z^N$, when N > 2", because the Operation of Multiplication, M, is Equal to the Operation of Addition, A, M = A, except when the number Variables involved in each of these operations equals; TWO. And the translation, or interpretation of this conclusion yields; 'The Whole Number sought cannot be equal to the Cube Root of the Perfect Cube, which is the Sum of Two perfect Cubes, because then it will be equal to the Root of a Perfect Square when it equals the Product of Two Equal Whole Numbers. And since an equation of Multiplication is equal to an equation of Addition only when each of these operations involves two variables, then only an equation equaling the Sum of Two Variables could equal the Product of the Two equal variables that is equal to a Perfect Square'.

In which case, from Pythagoras Theorem, there is no Integer that can equal the Nth Root of the Nth Power that is equal to the equation of the Sum of Two Nth Powers. "In other words, since an equivalency between the Operations of Multiplication and Addition only exists between the numbers having a Power of 2 (denoting the number of Variables involved in both of these operations), then only the Sum of (in this case; Two) Perfect Squares can equal the product of the two equal multiplicands, which is equal to another Perfect Square, and still retain an integer solution for the values of the Variables representing Power of the Exponent and the respective Roots"".

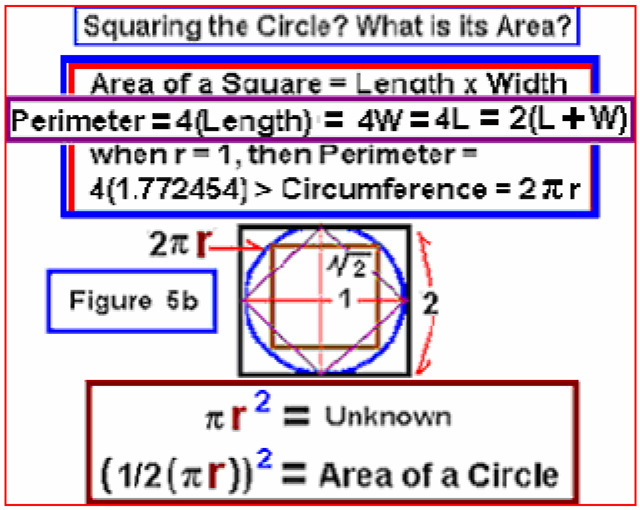
Area of Cube having Equal Sides:

$$\{(X^2 + 4XY + Y^2) = Z^3\}$$



Note: I investigated the same conditions, in the proof entitled; "The Proof of Fermat's Last Theorem; The Revolution in Mathematical Thought". However, I concluded, from the same data, that "If 'N > 2' in the equation, $X^N + Y^N = Z^N$, then there are no Whole Number Solutions for the Nth Power of the Sum of Two Nth Powers and their respective Nth Roots. That is, because there is No incremental (Additive) progression using ' 1's ' defined by Fermat's Equation, the Integer Coefficient, which is the Common Coefficient between the Powers of N and their respective Nth Roots, do not exist. Nevertheless, this concludes the rendering of the proof, that I believe, Fermat understood to be True. Still, while

this says nothing about the Rhind Papyrus, and the 10,000 year old quest involving "Squaring the Circle". It should be quite clear nevertheless, absolutely know one knew the correct equation, or method to determine the Area of the Circle. In other words, it should be obvious that the Straighten ¼ ARCs of any Unit Circle, transforms the Circle into a Square, and each of its equal side's measures ($\pi \div 2$) in length.



Nevertheless, from the analysis of the forgoing conclusions and the realization that equation 8 and the equation from "Fermat's Last Theorem", represented a special case defining the 'Distributive Law', as given by equations 20 through 25: I concluded that there was a hidden and more profound interpretation of the proof for "Fermat's Last Theorem". In other words, I now realized that; 'Any complete proof of "Fermat's Last Theorem" must be founded upon the 'Distributive Law', and conclude with the discovery of a New 'Distributive Property'. And this meant that when 'N > 2' in the equation, $X^N + Y^N = Z^N$, the Operation of Multiplication was not equally Distributed over the operation of Addition. Hence, from the results of equations 20 through 25, it is was easy to conclude, since the Operation of Multiplication is not equally Distributed over Addition in the case where 'N > 2': There is no Common Coefficient between the Nth Power of the Sum of Two Nth Powers, and their respective Nth Roots, was indeed valid. In which case, because the solution of "Fermat's Last Theorem" required only the knowledge of Algebra and Geometry, I concluded with absolute certainty relative to Fermat's mathematical knowledge, that he actually knew the proof. However, because Fermat's conjecture is of a limited mathematical scope, I also concluded that he did not understand fully the profound implications his riddle maintained.

Special Case of the Distributive Law is the conclusion of Equation 25:

20. $(X - Y)^2 =$

$(X - Y) \times (X - Y) =$

$X^2 - 2XY + Y^2$

21. $X^2 + Y^2 =$

$2XY =$

$XY + XY$

22. $(X + Y)^2 =$

$(X + Y) \times (X + Y) =$

$X^2 + 2XY + Y^2$

23. $X^2 + 2XY + Y^2 =$

$2XY + Z^2$

24. $X^2 + Y^2 =$

$Z^2 + 2XY - 2XY =$

$X^2 + Y^2 = Z^2$

25. $Z^2 = 2XY$: hence, $X^2 + Y^2 = Z^2$

$X^2 + Y^2 = 2XY$

$X^2 + Y^2 = XY + XY = X(Y + Y)$

Furthermore, because the conclusion from the proof and the equation involved in "Fermat's Last Theorem", represented an Algebraic Expression of the Exponential Function concluding the existence of the 'Distributive Law for Exponential / Non-Linear Functions. I knew, or reasoned, since the Distributive Law is also logically valid in 'Set Theory', that an Exponential Expansion of the Mathematical Logic of Set Theory must also sustain logical validity, and conclude the logical support for the conclusions derived from the foregoing proof: The Discovery of a New Distributive Property. Still, the clarification and definition of the Exponent, and the Exponential Operations employed in the Mathematical Logic of Set Theory, required more precise definitions of the familiar operations involving Addition, Subtraction, Multiplication, and Division. In other words, the Exponential Expansion of Set Theory, which also logically sustains only the operations of Addition and Subtraction, nearly mirrors the proof of the 'Distributive for Exponential / Non-Linear Functions. And the Exponential Expansion of the Field Postulates, concluded the existence of the Mathematics of Quantification, which is defined as a Finite Mathematical Field, conditionally closed over the Set 'R' for the Operations involving Addition, Subtraction, Multiplication and Division.

Special Note: It should be clear now, A. Wiles* and R. Taylor:

1. **Do not understand fully, the Basic Theory of Mathematics**
2. **Did not understand Fermat's question: Why is the Sum of Two Perfect Squares equal to another Perfect Square?**
3. **Hence, his* entire approach, and his solution, because he used the Systems of Mathematics that were not Closed, to resolve a conclusion from the improper use of a comparative analysis; He and his colleague were wrong! [Noting more specifically the use of the Prime Number Concept in the development of the logical foundation of his argument. Thus ignoring the logical fact that the Sum of Two Perfect Cubes is equal to a Perfect Square having an Integer Root; $X^3 + Y^3 = Z^2$, but $Z^2 \neq Z^3 = X^3 + Y^3$; His limited investigation also ignored the existence of the Counting Series Generated by an incremental growth that changes the Common Coefficient(s) of the Variables in Fermat's / Pythagoras Equation, which in fact, may represent any combination of Prime and Non-Prime Numbers. e. terrell 1979]**

The Definitions

Multiplication: The Quantified Sum of the equal distribution of the Multiplicand, which is equal to the Addend that is used in the Summation of the equal Addends, which are equally distributed by a factor equal to the other Multiplicand that is used in the equation representing a product. "Hence, Multiplication is the Quantified Sum of Addition.

"(3 x 5) = (5 + 5 + 5) = (3 + 3 + 3 + 3 +3)

(2.5 x 3.5) =
((2.5 + 2.5 + 2.5) + (0.5 + 0.5 + 0.5 + 0.5 + 0.5)) =

((3.5 + 3.5) + (0.05 + 0.05 + 0.05 + 0.05 + 0.05) +
(0.05 + 0.05 + 0.05 + 0.05 + 0.05) +
(0.05 + 0.05 + 0.05 + 0.05 + 0.05) +
(0.05 + 0.05 + 0.05 + 0.05 + 0.05) +
(0.05 + 0.05 + 0.05 + 0.05 + 0.05))"

Division: The Quantified Difference of an ever changing Dividend, which becomes the Subtrahend that is used in the repeated Subtractions performed on a Constant, which is the Divisor the becomes the Minuend in the equation. "Hence, Division is the Quantified Difference of the Repeated Subtraction performed on a Constant, which results in the Count of the Number of Parts Contained in the Whole. 18/2 = 9, and Nine Subtractions of 2 from 18 equals;

"(((((((((18 - 2) -2) -2) -2) -2) -2) - 2) - 2) - 2)"

Given Equation: 2/5 = .4, where 2 is the Dividend and 5 is the Divisor

From the Axioms of Equality, Substitution Law for Equality we have:

.1 x 5 = 1 x .5 = .5

Which yields the Ratio 1 : .1, since

2.0 - .5 = 1.5

1.5 - .5 = 1.0

1.0 - .5 = .5

.5 - .5 = 0

Given Equation: 22 ÷ 9 = 2.44444..., where 22 is the Dividend and 9 is the Divisor,

then;

22.0 – 9.0 – 13

13.0 - 9.0 = 0

In which case, the Total Number of Subtraction performed equals '2', but

because the Remainder 4.0 changes the value of the Dividend, 4.0 ÷ 9.0, which is the

continuation of the original problem, it has the results from its subtractions added

to the results in the Quotient represented in the above.

Hence, from the Axioms of Equality, Substitution Law for Equality we have:

.1 x 9 = 1 x .9 = .9

Which yields the Ratio 1 : .1, since

4.0 – 0.9 – 3.1

3.1 – 0.9 = 2.2

2.2 – 0.9 = 1.3

1.3 – 0.9 – 0

In which case, the Total Number of Subtraction to be added to the results from

above equals '4', and the process is repeated because the Remainder 0.4 changes the

value of the Dividend; given by the Substitution Law for Equality we have;

0.4 ÷ 0.09, which is the continuation of the original problem having its results added

to the results from the Quotient represented in the above.

0.4 – 0.09 = 0.31

0.31 – 0.09 – 0.22

0.22 – 0.09 = 0.13

0.13 – 0.09 = 0

This is the final result because the Remainder, '0.04', changes the Dividend:

Nevertheless, because the count representing the Total Number of Subtractions, 4,

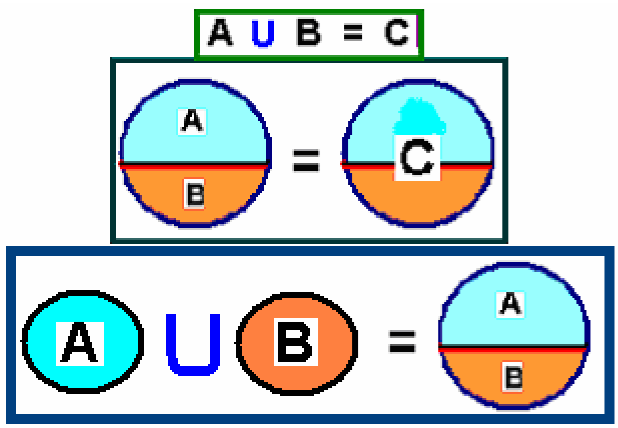
is the Repeating Result derived from the consistency in the value of the Remainder

it can be concluded that the Sum of the subtractions comprising the original

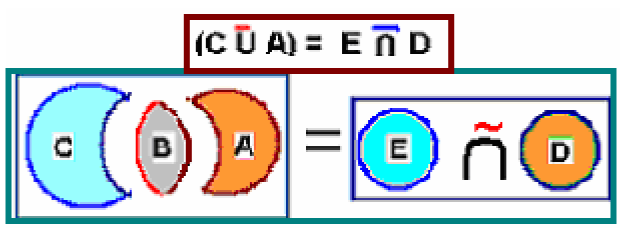
equations equals: (2 + .4 – .04 + .004 + .0004 – .00004) = 2.44444...

The Definitions

Addition: The mathematical operation representing a Summation, indicating a growth, or an increase in the number of the members contained in the Whole, by the inclusion of new members: The Union of Sets; ‘U’.



Subtraction: The mathematical operation representing a Difference, indicating a depreciation, or a reduction in the number of the members contained in the Whole, by the exclusion of members: The Disunion of Sets; ‘Ū’.



The Theorems

Disjoint: **If there are two sets, A and B, such that, A and B share no common members, then the two sets are said to be Disjoint; A ñ B, (read; A is not connected to B: 'A ñ B = Ø'.**

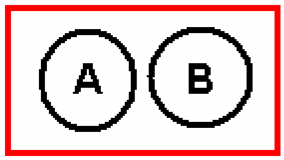


Figure 6

Dis-Union: **If A U B = C and C ∩ A = A is true, then the Dis-Union of the Set A from the Set C, C Ū A = B, (read; C dis-union A) is the exclusion of the members from the Set C, which are common to the Sets C and A, iff, A ñ B = Ø.**

2. **If A ≠ C and C ∩ A = B, then C Ū A = E ñ D.**

3. **If every Set A is a Sub-Set of itself, and A ∩ A = A, then A Ū A = Ø.**

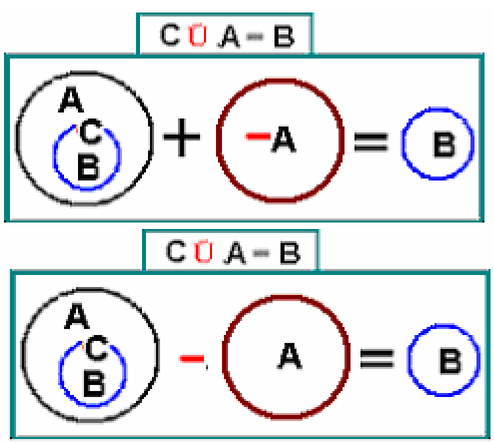


Figure 7

The Theorems

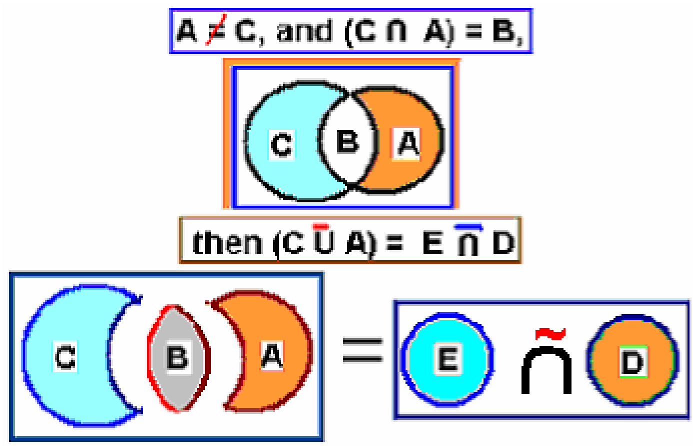


Figure 8

Exponential Cardinal: If for every X, where X Є U, there is a condition, such that;

> **$X \cap X = X$,**
> **$X \cap X \cap X = X$,**
> **$(X_1 \cap X_2 \cap X_3 \cap \ldots \cap X_Q) = X$, and**
> **$X^Q = X$ is True.**
>
> **Then there is a Exponential Number, Q, called the Exponential Cardinal of X, which is the number that represents the occurrences of X in the equation representing it's Intersection.**

$$X^{\cap^{Q}} = X_1 \cap X_2 \cap X_3 \cap \cdots \cap X_Q$$

Figure 9

Set: If a Unit Whole contains a collection of Objects, and each Object defines, one and only one, Part belonging to the Unit Whole, then the Unit Whole defines a Set as a Collection of Objects, iff, each Object defines one and only one Element, or Member, that defines the Part belonging to the Unit Whole.

The Theorems

Sub-Set: If every element, Є, of a Set B is a Є of the Set A, then the Set A is said to contain every Є of the Set B, and the Set B is said to be a Sub-Set of the Set A. Hence, every Set is a Sub-Set of itself, iff, $A \cap A = A$.

Cardinal Number: If it may be concluded that the Multiplicative Identity Law is True, and $X \times 1 = X$, where X does not change, then from Set Theory, X is the Multiplicative Identity of Itself. And if this defines X, when $X = X^Q$, then X defines the Identity Element as the Unit Base, or the Cardinal Number = 1 defines the Common Coefficient as the Multiplicative Identity Element for all X| X Є U.

Therefore, if $\{U_1 \cap U_2 \cap U_3 \cap \ldots \cap U_Q\} = U^Q = U^Q{}_N = U$, and given that Multiplication is the Quantified Sum of Addition, where $X^Q = U^Q{}_N$ is True. Then for all X| X Є $U = U^Q{}_N = U_N$, the Cardinality of any Set U_N, is the Sum or Union of Cardinal Numbers, or $U_N = \{X_1 \cup X_2 \cup \ldots \cup X_Q\} = (1_1 + 1_2 + \ldots + 1_Q)$, iff, for all X| X Є U, X = 1 defines the Cardinal Number for the Є of every Set as a Sub-Set of I | I = Set of Integers.

In which case, the Unary Set, {1}, defines the Cardinal for the Є X of the Set I for all X| X Є I, given that I = {X}, when X = 1, and the Cardinal for every Є X of the Set I for all X| X Є I, when I = {X, X, X … X}, and X = 1, $I = (1_1 + 1_2 + 1_3 + \ldots + 1_Q)$.

Hence, the definition of a Cardinal Number is given by:

Cardinal Number: The Cardinal Number is the Multiplicative Identity Element for all X| X Є I, which represents the Element of the Unary Set that is used to determine the Cardinality of every Set from the Sum or Union of the Multiplicative Identity Element for every Є X of the Set I: iff $X^Q = X$.

Note: This defines the Unit Base X, for all X| X Є I as the Element of the Unary Set, because X is the Multiplicative Identity of Itself that defines, X = 1.

[The next proof presented, is the interpretation of the Proof, or implications, that Fermat never understood, or could not explain. This is the accepted rationalization because Set Theory, the complete Logical Model of Mathematics, was not finished for nearly 200 years later. However, because he Co-Discovered the Cartesian Coordinate System representing the Mathematics of Analytic Geometry. The mathematical relationships from the foregoing, he should have maintained an above average understanding of the foundational theory of the proof presented. Still, for me, these results initially implied the existence of: the 'Distributive Law for Exponential / Non-Linear Functions'; an alternate Mathematical Field that was Finite and Closed / True as defined by the Axiom for Equality, the Field Postulates, and Set Theory. In which, it was later discovered, actually defined the Binary Set and the {Binary Enumeration & Mathematics} Mathematics of the Binary System. - e. Terrell 1983]

Nevertheless, since the foregoing conclusions proves that because the 'Multiplicative Identity Element' defines the Universal 'Common Coefficient', which is the same for all Objects, as the element, 1, defined in the Unary Set. And since it may also be concluded that counting is actually the assignment of a '1' to every object to be counted, and then, adding the "1's" that represent the objects, determines the Cardinality of the Set containing the objects being counted. Clearly, if the Set I, the Set of Integers defines the Set of all Symbols used to represent the result of the addition, inclusion, or incremental progression using the element, 1, defined in the Unary Set (given by Table II), then the (Arabic Numerals / Positive Integers) Modern System of Counting is defined by the Unary Set: As a Unary System.

Note: Gregor Cantor's conclusion, in his 'Theory of Cardinality', validating the existence of a Difference between Infinities, where '$\infty \neq \infty$' is True, was clearly wrong. Hence, '$\infty = \infty$' is the Logical Truth, because the Number Set is a Unary System, which equating the Identity element to every object concludes the Law establishing this Truth; 'The Axiom for Equality', which also defines A Ū A = Ø, and concludes that the "Continuum Hypothesis", is an illogical postulate founded upon fallacious reasoning.

In other words, since the Cardinal Number, by definition, must define the Neutral Multiplicative Identity Element that represents the Unit Base X of X^Q, then any change in the Count of the Number of Members contained in the Set X, must define the Union (or Sum) of the members belonging to the Disjoint Set representing the Set $X_{2 \text{ thru } N}$, iff $X = X^Q$, the Cardinality of the Set equals the Sum of the Cardinal Numbers representing each of the its Members. In which case:

If the Unit Base X of X^Q is defined ONLY when $X = X_N = X^Q$ remains valid, and;

I. 2 Members in a Binary Set = $(A \cup B)^Q = X_{2 = (A \cup B)} = X^Q$, or

II. 3 Members in a Ternary Set = $(A \cup B \cup C)^Q = X_{3 = (A \cup B \cup C)} = X^Q$, or

III. 4 Members in a Quaternary Set = $(A \cup B \cup C \cup D)^Q = X_{4 = (A \cup B \cup C \cup D)}$

$= X^Q$, or

IV. N Members in a N-nary Set = $(A \cup B \cup \ldots \cup N_N)^Q = X_{N = (A \cup B \cup \ldots \cup N)}$

$= X^Q$, is TRUE,

THEN:

I.a 2 Members in a Binary Set = $X_{2 = (A \cup B)} = X^2 = X^Q$, or

II.a 3 Members in a Ternary Set = $X_{3 = (A \cup B \cup C)} = X^3 = X^Q$, or

III.a 4 Members in a Quaternary Set = $X_{4 = (A \cup B \cup C \cup D)} = X^4 = X^Q$, or

IV.a N Members in a N-nary Set = $X_{N = (A \cup B \cup \ldots \cup N)} = X^N = X^Q$,

Must also be TRUE.

In other words, the Proof for the existence of any Numbering System involving the Unit Base X of X^Q, would conclude the definition for the existence of another system of counting. And this defines a Unit Base X of X^Q containing more Base elements than Unary System, as the UNION of More than One Element; Confirms Fermat's Last Theorem only for the Binary System for all $N > 2$. That is, given by the foregoing proof of Fermat's Last Theorem, which is translated into the rigor from the Mathematical Logic of Set Theory, and confirms the Conditions for

$(A^{\cap N} \cup B^{\cap N}) = (A \cup B)^{\cap N}$; given below, we have:

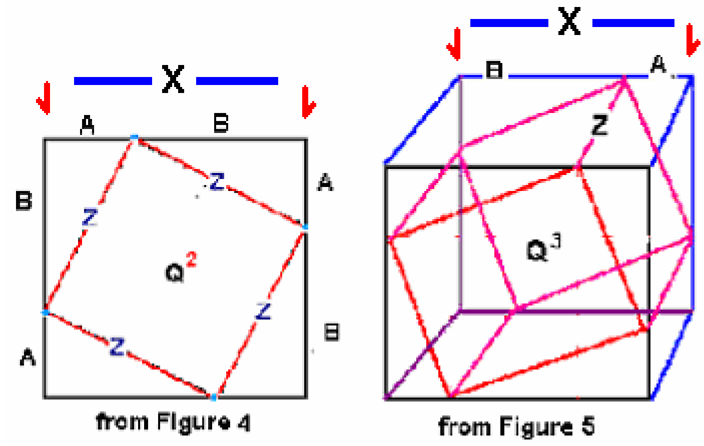


Figure 10

If for all $X \mid X \in I$, $X = X$ for every $X_U = X^Q$, and when $X = X_U$ there is a $X_N \mid X_N = X^Q$, which also True for all $X \mid X \in I$ for every $X = X_N$ when $X = X$ and $X_N = (A \cup B \cup C \cup \cdots \cup N)$, then $X_N = X_U$, if and only if (iff):

$$X^Q{}_U = X_U = X^Q = \text{‘}X\text{’} = X^Q = X_N = X^Q{}_N, \text{ or } X_N \neq X_U, \text{ because } X \neq X_N.$$

Proof: Since the Theorem concluding the definition for the Cardinal Number defines the $\in$ of Unary Set as the Unit Base X of X^Q for all $X \mid X \in I$, then the Multiplicative Identity Element for all $X \mid X \in I$ defines $X_N = X_U$ when $X = X_U$.

Therefore, when $X_N = X_U$, and $N = 2 = Q$, $X \cap X = X^{Q=2} = (A \cup B) \cap (A \cup B)$

$$X^{Q=2} = (A \cup B) \cap (A \cup B) = (A \cap A) \cup [(A \cap B) \cup (A \cap B)] \cup (B \cap B)$$

And from the Distributive Law;

$$(A \cap A) \cup (B \cap B) = [(A \cap B) \cup (A \cap B)] = (A\ B) \cup (A\ B) = A\ (B \cup B)$$

Hence, from the Substitution Law for Equality; $X = X_U = (X \cup Y)$, equation 25;

$[(A \cap B) \cup (A \cap B)] = (X \cap Y) \cup (X \cap Y) = (XY) \cup (XY) = X\ (Y \cup Y)$: which

concludes; $X_N = X_U$, $X = (A \cup B)$, and the Unit base X of $X^{Q=2}$ defines $X = X$,

which means, by definition; $X\ (Y \cup Y) = X\ (Y + Y)$.

In other words, this proves Fermat's Last Theorem and confirms the definition of the Cardinal Number, '1', for the Binary Set; given by:

<u>Cardinal Number</u>: The Cardinal Number is the Multiplicative Identity Element for all X| X $\in$ I, which represents the Elements of the Binary Set that is used to determine the Cardinality of every Set from the Sum or Union of the Multiplicative Identity Element for every $\in$ X of the Set I: iff $X^Q = X$.

And from the foregoing (excluding the rigor from the Mathematical Logic) it can be easily proven that since A, B, C, D, … N must be Disjoint initially, when defining the elements, $\in$, contained in the Unit Base X of X^Q; by the equations given below, $X = X^Q$ is not valid. In other words, because there is no confirmation by the Distributive Law for $X_N = X_U$ for all X | $X = X^Q$ when $Q = N$, and $N > 2$.

II.a 3 Members in a Ternary Set = $X_{3\,=\,(A \cup B \cup C)} \neq X^2 \neq X^3 \neq X^Q \neq X$, or

III.a 4 Members in a Quaternary Set = $X_{4\,=\,(A \cup B \cup C \cup D)} \neq X^2 \neq X^4 \neq X^Q \neq X$, or

IV.a N Members in a N-nary Set = $X_{N\,=\,(A \cup B \cup \ldots \cup N)} \neq X^2 \neq X^N \neq X^Q \neq X$,

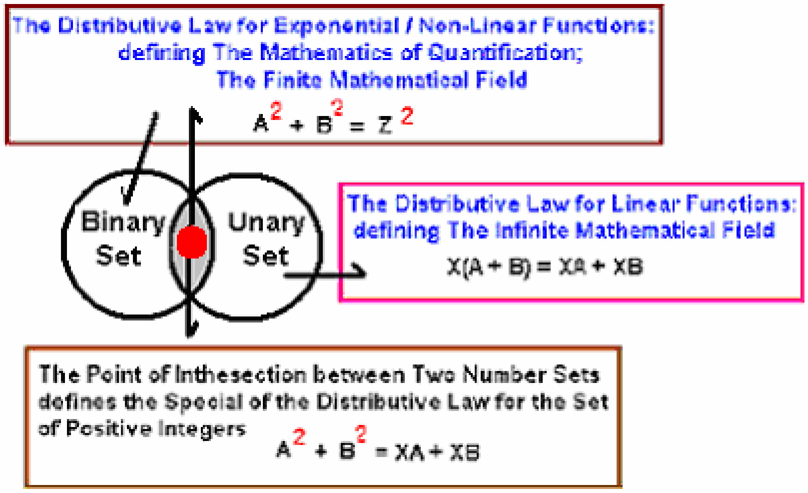


Figure 11

Nevertheless, these conclusions confirm the existence of the Two Systems of counting defining; 'The Unary Set' and 'The Binary Set', they also support the conclusion defining these Sets, by Figure 11, as; 'The Infinite Set = Unary System' and 'The Finite Set = Binary System'. Furthermore, it should be clearly understood:

When X = (A U B), X defines the Binary pair {a, b}

And reasoned further that if either 'a', or 'b' is equal to the Null Set {Ø}, then the foregoing conclusions would be invalid. Moreover, since the Cardinal Number, the Multiplicative Identity Element of the Unary Set, is same for Binary Set, the Binary pair, {a, b}, must represent, by Figure 12, a unique combination of the Binary Pair incrementing in units of '1', which defines the Cardinality of any Set, also defined by the Unary System.

The Combinations Of Binary Pair; {a, b}

Binary Set		Unary Set	Positive Integer Set
{a, a}	=	1	= 1
{a, b}	=	11	= 2
{b, a}	=	111	= 3
{b, b}	=	1111	= 4

Figure 12

In other words, from the definition of the Cardinal Number, the Cardinality of the Unary and the Binary Sets represents a 1 : 11 ratio, which denotes the number of Elements each Set contains. Nevertheless, the defining expression representing this relationship given by;

'Unary Set = 1', 'Binary Set = 11', or '1 = 2' - 'Prime Numbers'

Note: A 'Prime Number' or 'Prime Integer', is a positive integer, '$p \geq 1$', that has no positive integer divisors other than itself, 'p', and '1'.

And if, from the Substitution Law for Equality; {0, 1} = {a, b}, where '1 = {00}, and {00} ≠ {Ø}', then the correct Binary System and its associated method for enumeration, given by Table IV, confirms '11111111 = 256 = 2^8, because $2^8 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$ = 11111111 = 256'. Hence, the definition of the Cardinal Number, by figure 11, defines the special case of the Distributive Law as the intersection of the Distributive Properties defining the Binary and the Unary Sets, for all X | for every ∈ of I, the Cardinal Number X, defines the Cardinality of both Sets.

2.2 The Mathematics of Quantification and Binary Arithmetic System

It should be clearly understood that the forgoing conclusions, and the new definitions and theorems from the Logic of the Mathematics of Quantification, defines the closure Laws for the operations of Subtraction and Division. And this completes the Set of Laws defining the operations of Addition, Multiplication, Subtraction, and Division, which governs the Mathematics and the Mathematical Logic defined by Set Theory, the Field Postulates, and the Axioms for Equality. That is, given by Table V, we have:

Axion for Equality: **Table V**

The Fundamental Law for Equality: $A + (-A) = \emptyset$
The Additive Identity Law for Equality: $A + \emptyset = A$
The Multiplicative Identity Law for Equality: $A \times 1 = A = A \div 1$
The Common Coefficient Law for Equality: $A \div 1 = A = A \times 1$
The Substitution Law for Equality: If $A = B$, and $B + C = D$, then $A + C = D$
The Reflective Law for Equality: $A = A$
The Transitive Law for Equality: $A + B = B + A$, and $(B + C) + A = C + (A + B)$

The Closure Laws for the Field Postulates

Unary	Binary	Set Theory
Associative Laws	Associative Law	Associative Law
$A + (C + B) = (A + C) + B$	$A^2 + (C^2 + B^2) = (A^2 + C^2) + B^2$	$A \cap (C \cap B) = (A \cap C) \cap B$
$A(C \times B) = (A \times C)B$	$A^2(C^2 \times B^2) = (A^2 \times C^2)B^2$	$A \cup (C \cup B) = (A \cup C) \cup B$
Commutative Laws	Commutative Laws	Commutative Law
$A + B = B + A$	$A^2 + B^2 = B^2 + A^2$	$A \cup B = B \cup A$
$A \times B = B \times A$	$A^2 \times B^2 = B^2 \times A^2$	$A \cap B = B \cap A$
Distributive Law	Distributive Law	Distributive Law
$A(C + B) = AC + BA$	$C^2(A^2 + B^2) = CA + CB$	$A \cap (B \cap B) = (A \cap B) \cup (A \cap B) = (A \cup D) \cap (A \cup B)$
Identity Laws	Identity Laws	Identity Laws
$A + (-A) = 0$	$A^2 + (-A^2) = 0$	$A \,\bar{\cup}\, (A) = 0$
$A + 0 = A$	$A^2 + 0 = A^2$	$A \cap A = A$
$A \times 1 = A$	$A^2 \times 1 = A^2$	$A = A$
$A = A$		

Table V.a

The Fundamental Law for Equality introduces new closure laws

$A + (-A) = \cancel{0}$

Addative Law for Equality :

$A + \cancel{0} = A$

Associative Law :

$(-B) + (C + A) = A + ((-B) + C)$

$(-B) \times (C \times A) = A \times ((-B) \times C)$

$(-B^2) \times (C^2 \times A^2) = A^2 \times ((-B^2) \times (C^2)$

$(-B^2) + (C^2 + A^2) = A^2 + ((-B^2) + (C^2)$

Commutative Law :

$(-B) + A = A + (-B)$

$(-B) \times A = A \times (-B)$

$(-B^2) + A^2 = A^2 + (-B^2)$

$(-B^2) \times A^2 = A^2 \times (-B^2)$

Table VI Boolean Algebra

Binary Set	Note: $0 = \cancel{0}$	Unary Set
00 + 00 = 01	00 = 1	0 + 0 = 1
00 + 01 = 10	$\cancel{0} + \cancel{0} = \cancel{0}$	0 + 1 = 10
01 + 01 = 11		1 + 1 = 11
$\cancel{0}$ + 01 = 01		$\cancel{0}$ + 1 = 1

SUBTRACTION

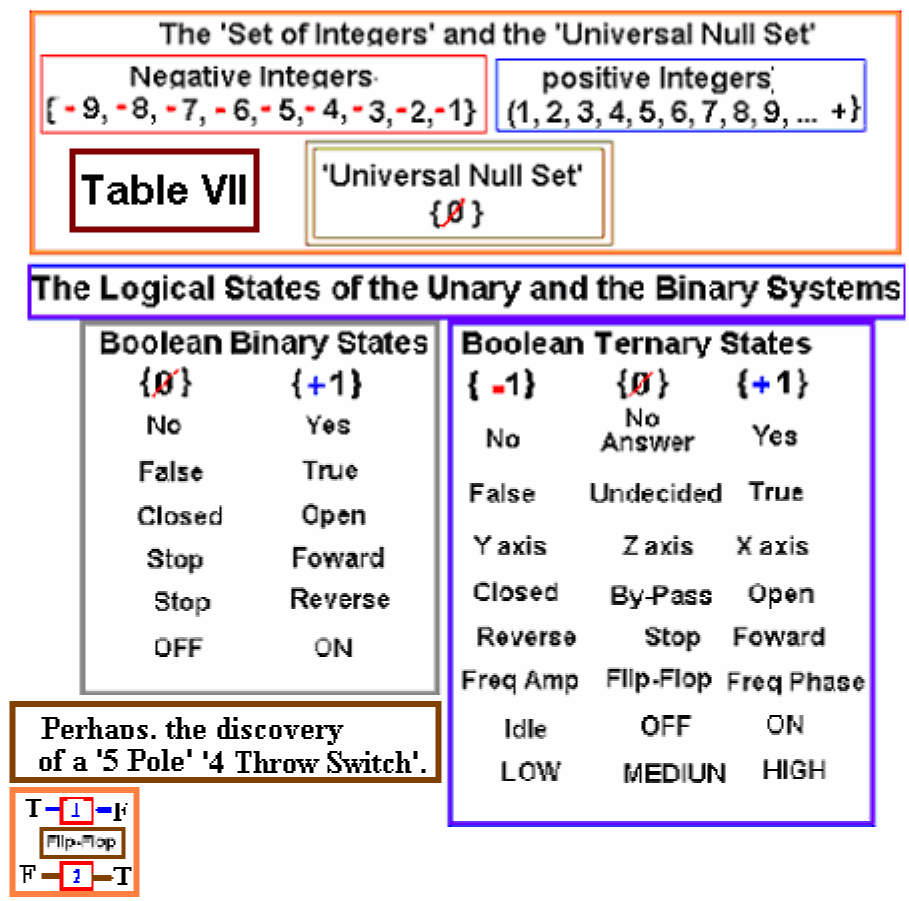
111 = 8 110 − 7 1 00 = 1	1111 = 16 1010 − 11 5 100	11111 = 32 10110 − 23 9 1000
111111 = 64 101011 = 44 20 10011	100 − 5 100 = 5 0 0	1000 = 9 1000 = 9 0 0
10010 − 19 10010 = 19 0 0	11011 − 28 11011 = 28 0 0	

ADDITION

111 = 8 110 = 7 15 1110	1111 = 16 1010 = 11 27 11010	11111 = 32 10110 = 23 55 110110
111111 − 64 101011 = 44 108 1101011	100 − 5 100 = 5 10 1001	1000 − 9 1000 = 9 18 10001
10010 = 19 10010 = 19 38 100101	11011 = 28 11011 = 28 56 110111	

2.3 The Binary and Ternary Systems and George Boole's Mathematical Logic

It should readily be concluded, because it has been mentioned that the Boolean, or Leibniz, Operators are Unary; they are both logically valid for the Unary and the Binary Systems. Furthermore, since Zero, Ø, or the Null Set, is not defined by the Cardinal Number, which is equal to the Unit Base X of X^Q for all X| X Є I, then Ø, is not an element of the Set of Integers, 'I'. Hence, Binary and Ternary Logic, or 3 State Logic is defined by the Unary Set, and contains the elements {Ø, +1} and {-1, Ø, +1}, which are governed by the Closure Laws. Given by Table VII, we have;



Note: It should be understood nevertheless, these conclusions confirms that the Binary System is Finite and Closed over R (not true for all values of the Base Variables over 'R'), and the Unary System is Infinite, and it is also Closed over R. [VIMP - e. terrell Nov. 1979 to Aug 1983]

3. Security Considerations

This document, whose only objective was the deliberation of the final explanation of the new foundation for the Binary System, which resulted from the Mathematics of Quantification, does not directly raise any security issues. Hence, there are no issues that warrant Security Considerations.

4. IANA Considerations - 'Resolution of the Counting Error in the Binary System'

I. IPv4 Address Loss Table

	Exponential Enumeration	Binary Representation	IPv4 Address Specification
1.	$0^{0} = 0$	0	0
2.	$2^{0} = 1$	00 = aa	0
3.	$2^{1} = 2$	01 = ab	1
4.	$2^{F} = 3$	10 = ba	2
5.	$2^{2} = 4$	11 = bb	3
6.	$2^{F} = 5$	00 = baa	4
7.	$2^{F} = 6$	101 = bab	5
8.	$2^{F} = 7$	110 = bba	6
9.	$2^{3} = 8$	111 = bbb	7
...	...	...	...
...	...	...	...
129.	$2^{7} = 128$	01111111 = bbbbbbb	127
...	...	...	...
257.	$2^{8} = 256$	11111111 = bbbbbbbb	255
Totals:	256	256 = 256	255

IPv4 Address Loss using an askew Binary System;

$256^{4} - 255^{4} = 66{,}716{,}671$ IP Addresses

II. Using Extended ASCII CODE & Binary '00' = 1

In the Extended ASCII CODE character Set, True Zero is defined as the Null Set Character, ' Ø '. However, because Binary equivalent of ' 1 ' is ' 00 ', I believe that it would be easier if the Character Set were changed to represent the Binary equivalent of ' 1 ' as ' 0 ', as opposed to '00', because '00' is 2 Bits and '0' is '1' Bit.

	Binary System	Zero	Exponential System of Counting
	No Definition	0	0^{X} = 0 = 0EX
1.	00 = aa	No Definition	2^{0} = 1 = 2E0
2.	01 = ab	No Definition	2^{1} = 2 = 2E1
3.	10 = ba	No Definition	2^{F} = 3 = 2EF
4.	11 = bb	No Definition	2^{2} = 4 = 2E2
	:		:
	:		:
	:		:
8.	111 = bbb	No Definition	2^{3} = 8 = 2E3
9.	1000 = baaa	No Definition	2^{F} = 9 = 2EF
10.	1001 = baab	No Definition	2^{F} = 10 = 2EF

[Given that: E = Exponential Operator; F = Variable Irrational Number; and X = Any Variable defined as a Member of the Real Number Set]

III. Equating the Exponent from a Base 2 Exponential Operation to the Binary Translation that Equals the Result *

More importantly, when rationalizing these conclusions, their validity becomes even more evident when any mathematical comparison between the 'Bit-Mapped' lengths, or Displacement of an IP Address, is made with the Equation representing the Total Number of Available IP Addresses - the Address Pool representing the Addressing Specification; e.g. IPv4, or IPv6.

That is; If the Bit Length is Equal to 32, in the IPv4 Specification, or 128 Bits in the IPv6 Specification, and their respective Address Pool Totals is given by:

IPv4 = 32 Bit Length (Bit-Mapped Displacement)
32 Bit = 2^{32} Address Pool Total
2^{32} = 4,294,967,296 IP Addresses

IPv6 = 128 Bit Length (Bit-Mapped Displacement)
128 Bit = 2^{128} Address Pool Total
2^{128} = 3.4028236692093846346337460743177e+38 IP Addresses

Then it becomes quite obvious that the Total Number of IP Addresses available in the Address Pool for either the IPv4, or the IPv6 Specification, is a function of the Address's Bit-Mapped Displacement, or Bit Length. In other words, a Bit Length Regression to Progressively smaller Address Bit-Mapped Displacement Units, just as the foregoing conclusions revealed, accounts for the total number of available IP Addresses in the Address Pool - and this also determines, equals, and represents, the exact number of Bits equal to the Number representing the IP Address Pool Total. In other words, this Number or Integer, which equals the Result from an Exponential Base 2 Operation, has a 'Binary Translation' that is equal to the Exponent in the Equation.

Hence, Enumerating, or Counting using only the Exponent reveals:

1) An 8 Bit-Mapped Length = 2^{8} = 256 IP Addresses = 256 = 11111111

2) A 7 Bit-Mapped Length = 2^{7} = 128 IP Addresses = 128 = 1111111

3) A 6 Bit-Mapped Length = 2^{6} = 64 IP Addresses = 64 = 111111

4) A 5 Bit-Mapped Length = 2^{5} = 32 IP Addresses = 32 = 11111

5) A 4 Bit-Mapped Length = 2^{4} = 16 IP Addresses = 16 = 1111

6) A 3 Bit-Mapped Length = 2^{3} = 8 IP Addresses = 8 = 111

7) A 2 Bit-Mapped Length = 2^{2} = 4 IP Addresses = 4 = 11

8) A 1 Bit-Mapped Length = 2^{1} = 2 IP Addresses = 2 = 01

9) '0' Bit-Mapped Length = 2^{0} = 1 IP Address Pool = 1 = 00

So, how then is it possible for anyone to use an Askew Binary System of Counting, when the Exponent representing the Bit-Mapped Displacement in the Base 2 Exponential Equation, equals the Binary Translation representing the " Equation's " Result?

- The Binary Translation Comparison Table -

Computer Operating Systems, Electronic..., and Software is Wrong!

4 = 100 - Binary Translation: How...?	When 2^{2}	= 4 = 11
3 = 11 - Binary Translation: How...?	When 2^{F}	= 3 = 10
2 = 10 - Binary Translation: How...?	When 2^{1}	= 2 = 01
1 = 01 - Binary Translation: How...?	When 2^{0}	= 1 = 00

IV. Binary Zero { 00 } Representing an Irrational Number...??

If every Base 2 Exponential Equation Representing the Product of 2 or more Identical Multiplicands, defines the Result as a Function of the Square Root of 2 when '00' = 1. Then, from the "Proof of Fermat's Last Theorem", and the Mathematics of Quantification; when "00" = 1, "00" defines an Irrational Number, which is a Member of the "Real Number Set" – Where by;

$$" 00 " = 1$$

$$X(0 + 0) = (0^{2} + 0^{2}) = 1$$

$$= (2^{1/2}) \div 2 [((2^{1/2}) \div 2) + (2^{1/2}) \div 2)]$$

$$= (2^{0.5}) \div 2 [(2^{0.5}) \div 2) + (2^{0.5}) \div 2)]$$

$$= (2^{0.5}) \div 2)^{2} + (2^{0.5}) \div 2)^{2}$$

$$" 1 " = (0.707106)^{2} + (0.707106)^{2}$$

$$" 1 " = 0.5 + 0.5 = X(0 + 0)$$

Where; if " $1^{0.5}$ " = " 1 ", and " F = 0 " ;

then " F = Variable Irrational Number ".

Hence;

$$(2^{0.5}) \div 2 = 0.70710678118654752440084436210485$$

$$0.5 = (0.70710678118654752440084436210485)^{2}$$

[* - See page 41; Figure 12; [12]; 'Exponential Cardinal' page 32]

Work(s) in Progress;

These drafts represent the twelve chapters of the Networking Bible, designing a Network IP Addressing Specification that maintains a 100 Percent backward compatibility with the IPv4 Specification. In other words, this is a design specification developed from the Theory of the Expansion of the IPv4 IP Addressing Specification, which allowed the representation of the Network for the entire World on paper, and the possibility of an Infinite IP Address Pool. Nevertheless, the Internet-Drafts listed below, "Cited as Work(s) in Progress', explain the design Specification for the development of the IPtX (IP Telecommunications Specification) Protocol Addressing System and the correction of the Mathematical Error in the Binary System.

Computer Science / Internet Technology:

http://www.ietf.org/internet-drafts/draft-terrell-logic-analy-bin-ip-spec-ipv7-ipv8-10.txt
(Foundational Theory for the New IPtX family IP Addressing Specification, and the Binary Enumeration error discovery after the correction.) - "Work(s) in Progress'

http://www.ietf.org/internet-drafts/draft-terrell-simple-proof-support-logic-analy-bin-02.txt
(The 2nd proof for the existence of another Binary System, resulting from the Error Correction.)
- "Work(s) in Progress'

http://www.ietf.org/internet-drafts/draft-terrell-visual-change-redefining-role-ipv6-01.pdf
(Argument against the Machine dependant IPv6 deployment.)
- "Work(s) in Progress'

http://www.ietf.org/internet-drafts/draft-terrell-schem-desgn-ipt1-ipt2-cmput-tel-numb-02.pdf
(The foundation of the New IPtX Addressing Spec compared to the Telephone Numbering System.)
- "Work(s) in Progress'

http://www.ietf.org/internet-drafts/draft-terrell-internet-protocol-t1-t2-ad-sp-06.pdf
(The IPtX Addressing Specification Address Space / IP Address Allocation Table; establishes the visual perspective that actually represents Networking Schematic Networking the entire World on Paper.) - "Work(s) in Progress'

http://www.ietf.org/internet-drafts/draft-terrell-iptx-spec-def-cidr-ach-net-descrip-01.pdf
(Re-Defines CIDR) {Classes Inter-Domain Routing Architecture} and introduces the Network Descriptor for the IPtX Addressing Standard.) - "Work(s) in Progress'

http://www.ietf.org/internet-drafts/draft-terrell-math-quant-new-para-redefi-bin-math-04.pdf
(The 3rd Proof for the New Binary System, correcting the error in Binary Enumeration.)
- "Work(s) in Progress'

http://www.ietf.org/internet-drafts/draft-terrell-gwebs-vs-ieps-00.pdf
(Defining the GWEBS – The Global Wide Emergency Broadcast System)
- "Work(s) in Progress'

http://www.ietf.org/internet-drafts/draft-terrell-iptx-dhcp-req-iptx-ip-add-spec-00.pdf
(The development of the DHCP {Dynamic Host Configuration Protocol} for the IPTX IPSpec)
- "Work(s) in Progress'

http://www.ietf.org/internet-drafts/draft-terrell-iptx-dns-req-iptx-ip-add-spec-03.pdf
(The development of the DNS {Domain Naming Specification} the for IPTX IPSpec)
- "Work(s) in Progress'

http://www.ietf.org/internet-drafts/draft-terrell-math-quant -ternary-logic-of-binary-sys-03.pdf
(Derived the Binary System from the proof of "Fermat's Last Theorem", and Developed the Ternary Logic for the Binary System) - "Work(s) in Progress"

http://www.ietf.org/internet-drafts/draft-terrell-cidr-net-descrpt-expands-iptx-add-spc-10.pdf
- "Work(s) in Progress"
(An application of Quantum Scale Theory, the 2^X : 1 Compression Ratio, the Expansion derived from the 'CIDR Network Descriptor, and the Mathematics of Quantification provided the foundation for the development of the "Intelligent Quantum Tunneling Worm Protocol"; A Routable Mathematical Exponential Expression, Backend IP Addressing Protocol that provides an (nearly) Unlimited IP Address Space using the Compression Ratio 2^X : 1.)

Note: These Drafts has Expired at www.ietf.org Web Site. However, you can still find copies posted at Web Sites all over the World. {Suggestion; Perform Internet search using "Yahoo" or "Google", Key word: "ETT-R&D Publications"}.

4. Normative References:

Pure Mathematics:

1. The Proof of Fermat's Last Theorem; The Revolution in Mathematical Thought {Nov 1979}
Outlines the significance of the need for a thorough understanding of the Concept of Quantification and the Concept of the Common Coefficient. These principles, as well many others, were found to maintain an unyielding importance in the Logical Analysis of Exponential Equations in Number Theory.

2. The Rudiments of Finite Algebra; The Results of Quantification {July 1983}
Demonstrates the use of the Exponent in Logical Analysis, not only of the Pure Arithmetic Functions of Number Theory, but Pure Logic as well. Where the Exponent was utilized in the Logical Expansion of the underlining concepts of Set Theory and the Field Postulates. The results yield another Distributive Property that is Conditional, which supports the existence of a Finite Field (i.e. Distributive Law for Exponential Functions) and emphasized the possibility of an Alternate View of the Entire Mathematical field.

3. The Rudiments of Finite Geometry; The Results of Quantification {June 2003}
Building upon the preceding works from which the Mathematics of Quantification was derived. Where by it was logically concluded that there existed only 2 mathematical operations; Addition and Subtraction. In other words, the objectives this treatise maintained, which was derived from the foundation of the Mathematics of Quantification; involves not only the clarification of the misconceptions concerning Euclid's Fifth Postulate, and the logical foundation of his work, or the existence of 'Infinity in a Closed Bound Finite Space'. But, the logical derivation of the Foundational Principles that are consistence with the foundation presented by Euclid, which would establish the logical format for the Unification of all the Geometries presently existing.

4. The Rudiments of Finite Trigonometry; The Results of Quantification {July 2004}
The development of the concepts for Finite Trigonometry from the combined foundations derived from numbers 3 and 5, and the Mathematics of Quantification.

5. The Mathematics of Quantification and the Metamorphosis of $\pi : \tau$ { October 2004}
The logical derivation of the exact relationship between the Circumference and the Diameter of the Circle, which defines the measurement of the exact length of the Circle's Circumference,τ when the Radius is equal to '1'.

Physics:

1. The Mathematics of Quantification & The Rudiments of Finite Physics
The Analysis of Newton's Laws of Motion…the Graviton' { December 2004}
Through the use of Finite Algebra, Geometry, Trigonometry, and # 5, investigation of the Laws of Classical Physics were found to be erroneous. This allowed the presentation of the initial work, which correct the flaws in Classical Physics, and establishes the foundation upon which there exist the possibility of a Grand Unified Field Theory for the Natural Sciences.

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1. **G Boole (Dover publication, 1958) "An Investigation of The Laws of Thought" On which is founded The Mathematical Theories of Logic and Probabilities; and the Logic of Computer Mathematics.**

2. **R Carnap (University of Chicago Press, 1947 / 1958) "Meaning and Necessity" A study in Semantics and Modal Logic.**

3. **R Carnap (Dover Publications, 1958) " Introduction to Symbolic Logic and its Applications"**

Author:

Eugene Terrell,
ETT-R&D Publications
3312 64th Avenue Place
Oakland, CA. 94605
Voice: 510-636 – 9885
E-mail: eterrell00@netzero.net

Note: Illinois Institute of Technology, University of Chicago, Northeastern Illinois University, University of Illinois Chicago Circle Campus, Stanford University, UCLA, Kennedy-King College, Canada, United States, Russia, Germany, France, Scientific American, and several other popular magazines received a copy of one, or both, of the proofs are listed above; 1 and 2, the notarized proofs that were sent for review between, 1980 and 1983 (to name, just only a few recipients).

"This work is Dedicated to my first and only child, 'Princess Yahnay', because she is the gift of Dreams, the true treasure of my reality, and the 'Princess of the Universe'. (E.T. 2006)"

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