THE MATHEMATICAL SOLUTION FOR THE BEAL CONJECTURE

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Abstract-

The Beal conjecture is an unsolved number problem. It was formulated in 1993 by Andrew Beal ,A Banker and an amature mathematician during investigating generalization of ***Fermats*** *Last Theorem [1] [2] since 1997. He offered a monentary prize for an impressive proof of this conjecture . At present no suitable proof has been produced . In this article I also provided the clear and a systematic proof of this conjecture .*

Keywords: *Proof ;Beal Conjecture: Number theory*

1.Introduction

IN 1993 , Andrew Beal , a Texas Banker and a number theory Mathematician formulated a number theory which he named "Beal conjecture" . After 4 years in In 1997 he publicly announced to offer a $ 5,000 prize money for the peer review proof. By now he increased the prize money to a sum of $ 1,000,000 . Many number of experts , mathematicians and scholars have published their research articles on the proof of this number problem but they could not present a suitable proof . I am also presenting a proof in this article .

2.The Beal conjecture

Let A,B,C,X,Y,Z be positive integers , with X,Y,Z greater than 2. The Beal conjecture states that

If :

$$\mathbf{A^X + B^Y = C^Z} \qquad (1)$$

Then A,B,C must have a common prime factor and all variables should have distinct value.

3. Conventions

Author has used symbols and conventions to proof the conjecture where $\mathbf{O_a}$, $\mathbf{O_b}$ and $\mathbf{O_c}$ are odd symbols . And $\mathbf{E_a}$,$\mathbf{E_b}$ **and** $\mathbf{E_c}$ are even symbols . where as 1,3,5,7…… represent odd no. and 2,4,6,8…… represent even numbers .

4. Conditions of addition operations

I observed three different conditions for solving conjecture

Condition 1:

$O_a + O_b = E_c$

Condition 2:

$O_a + E_b = O_c$

Condition 3 :

$E_a + E_b = E_c$

5.Verification

Here author has solved the equation very clearly , and found out a common prime factor in the equations as well as represented distinct exponents according to original definition of Beal conjecture which can be seen in the numerical examples . Hence Beal conjecture is quite true .

6.The proof

Below is given the proof for the Beal conjecture using the three conditions .

6.1 Condition 1

$O_a + O_b = E_c$

Let 'O_a' Represent A

Let 'O_b' Represent B

Let 'E_c' Represent C

$A + B = C$ (2)

Let A = 1 , Let $B \neq 1$ and Let $C \neq 1$ where $B = B_1^{\,y}$ and y=1

Let $C = C_1^{z}$ and $z \geq 3$

Equation 2 is an ordinary addition operation and variables are represented in exponential forms .

$1 + B_1^{\,y} = C_1^{z}$ (3)

According to author's observation equation is multiplied 3 times by $B_1^{\,z}$

$1 \times B_1^{\,z} \times B_1^{\,z} \times B_1^{\,z} + B_1^{\,y} \times B_1^{\,z} \times B_1^{\,z} \times B_1^{\,z} = C_1^{z} \times B_1^{\,z} \times B_1^{\,z} \times B_1^{\,z}$ (4)

By applying the laws of indices I can have

$(B_1)^{z+z+z} + (B_1)^{y+z+z+z} = (C_1 \times B_1)^{z+z+z+z}$

$(B_1)^{3z} + (B_1)^{y+3z} = (C_1 \times B_1)^{4z}$ (5)

Now after adjusting the exponents of equation 5 it can be formed Beal equation .

According to author's observation B_1 is a common prime factor in above equation.

Comment – condition 1 clearly proof the Beal equations .

6.1.1 Numerical examples

1. Derivation of Beal conjecture from the equation

1 + 7 = 8

Solution –

1 + 7 = 8

$1+7^1=2^3$

Multiplying through by $\mathbf{7^3}$ 3 times

$1\times7^3\times7^3\times7^3+7^1\times 7^3\times7^3\times7^3 = 2^3\times7^3\times7^3\times7^3$

Applying the rules of indices

$7^9+7^{10}=(7\times7\times7\times2)^3$

Adjusting the exponents of equation it can be proved Beal conjecture

$7^9+(49)^5=(686)^3$

Now 7 is common prime factor in the above equation.

Beal conjecture is true for condition 1

2. Derivation of Beal equation from example

$1+127 = 128$

Solution

$1+127=128$

$1+127^1=2^7$

Multiplying the equation three times by 127^7

$1\times127^7\times127^7\times127^7+127^1\times127^7\times127^7\times127^7 = 2^7\times127^7\times127^7\times127^7$

Applying the rules of indices

$(127)^{21}+(127)^{22}=(2\times127\times127\times127)^7$

$127^{21}+(16129)^{11}=(4096766)^7$

127 is a common prime factor of above equation.

6.2 Condition 2

$O_a+E_b=O_c$

Let 'O_a' represent A

Let 'E_b' represent B

Let 'O_c' represent C

$A+B=C$ (6)

Let $A = 1$, Let $B\neq 1$, and Let $C \neq 1$

Equation 6 is an ordinary addition operation and A ,B and C are an exponential format.

Let $B = B_1^{y}$, where $y \geq 3$

Let $C = C_1^{z}$ where z =1

$1+B_1^{y} = C_1^{z}$ (7)

c_1^{y} multiplies the equation two times .

So Beal conjecture can be made .

$1 \times C_1^{y} \times C_1^{y} + B_1^{y} \times C_1^{y} \times C_1^{y} = C_1^{z} \times C_1^{y} \times C_1^{y}$ (8)

By applying laws of indices I have

$(C_1)^{y+y} + (B_1 \times C_1 \times C_1)^{y} = (C_1)^{z+y+y}$

$C_1^{2y} + (B_1 \times C_1 \times C_1)^{y} = (C_1)^{2y+z}$ (9)

C_1 is a common prime factor of above equation .

After adjusting the exponents of equation 9 Beal conjecture can be formed .

Comment – Beal conjecture is true for condition 2

6.2.1 numerical example

Derivation of Beal conjecture from equation 1+16 =17

Solution –

1+16=17

$1+2^{4}=17^{1}$

Multiplying the equation 2 times by 17^{4}

$1 \times 17^{4} \times 17^{4} + 2^{4} \times 17^{4} \times 17^{4} = 17^{1} \times 17^{4} \times 17^{4}$

By applying the law of indices I can get

$17^{4+4} + (2 \times 17 \times 17)^{4} = 17^{1+4+4}$

$17^{8} + (578)^{4} = 17^{9}$

Adjusting the powers of equation we can get Beal conjecture

$17^8 + (578)^4 = (4913)^3$

Comment – 17 is the common prime factor in the above equation.

Solution 2 –

1+256=257

$1+4^4=257$

Multiplying through by 257^4

$1\times257^4\times257^4 + 4^4\times257^4\times257^4 = 257^1\times257^4\times257^4$

By applying the rules of indices

$257^{4+4}+(4\times257\times257)^4=(257)^{1+4+4}$

$257^8 + (264196)^4 = (257)^9$

Or $(257)^8+(264196)^4= (16974593)^3$

Comment – 257 is the common prime factor in the above equation .

Other examples-

81 + 256 =337

$3^4+4^4=337$

Multiply the equation two times by 337^4

$3^4\times337^4\times337^4+4^4\times337^4\times337^4=337^1\times337^4\times337^4$

By applying the law of indices I can get

$(3\times337\times337)^4+2^8\times337^8 =337^{1+4+4}$

$(340707)^4+(674)^8=(337)^9$

Comment – 337 is common prime factor in above equation.

Example 2-

729+616=1409

$9^3+6^3=1409$

Multiplying through 1409^3 two times

$9^3\times1409^3\times1409^3 + 6^3\times1409^3\times1409^3 = 1409^1\times1409^3\times1409^3$

Applying the rules of indics we can get

$3^6\times1409^6+(6\times1409\times1409)^3=(1409)^{1+3+3}$

$(4227)^6+(11911686)^3=(1409)^7$

Comment – 1409 is a common prime factor in the above equation.

6.3 Condition 3

$E_a+E_b=E_c$

Let 'E_a' Represent A

Let 'E_b' Represent B

Let 'E_c' Represent C

A+B=C (10)

Let A $\neq$1 , Let B$\neq$1 and Let C $\neq$1

A=B and C=2A=2B

Where x $\geq$3 ,y $\geq$3 and z $\geq$4

Where equation 10 is an ordinary addition operation and variables are in an exponential form

$A_1^x + B_1^y = C_1^z$ (11)

According to author observation C_1^x or C_1^y or A_1^x or B_1^y multiplies through the equation two times.

$A_1^x\times A_1^x \times A_1^x + B_1^y\times B_1^y \times B_1^y = C_1^z\times B_1^y\times B_1^y$ (12)

Applying the rule of indices

$(A_1)^{x+x+x}+(B_1)^{y+y+y}=(C_1)^{z+y+y}$

$(A_1)^{3x}+(B_1)^{3y}=(C_1)^{z+2y}$ (13)

A1= B_1= C_1 is the common prime factor of above equation.

Comment- $A_1 = B_1 = C_1$ are common prime factor in above equation and Beal conjecture is true for condition 3 .

6.3.1 Numerical example

Derivation of Beal conjecture from equation

8+8=16

Solution –

8+8=16

$2^3+2^3=2^4$

Multiplying through 2^3 two times.

$2^3\times2^3\times2^3+2^3\times2^3\times2^3=2^4\times2^3\times2^3$

Applying the rule of indices I can get

$2^{3+3+3}+2^{3+3+3}=2^{4+3+3}$

$2^9+2^9=2^{10}$

Adjusting the exponents of the equation I can get a suitable Beal equation with different powers.

$8^3+2^9=4^5$

Comment- 2 is common prime factor of above equation .

Example 2-

32+32=64

$2^5+2^5=2^6$

Multiplying two times by 2^5

$2^5\times2^5\times2^5+2^5\times2^5\times2^5=2^5\times2^5\times2^6$

Now applying the rules of indices

$2^{5+5+5}+2^{5+5+5}=2^{5+5+6}$

$2^{15}+2^{15}=2^{16}$

Or

$8^5+2^{15}=4^8$

Comment- 2 is common prime factor in the above equation and it also satisfies truly the Beal conjecture.

7. conclusion-

Author very clearly proved the Beal conjecture. According to real definition of theorem represented a common prime factor with distinct exponents. So Beal conjecture is quite true for all three conditions.

References

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