Title: Solution for Goldbach's Conjecture

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Abstract: For any given even number 2X, there exists prime numbers which can be noted as X – A. If X – A (mod Pq) =/= 2X for all q's, then X + A is a prime number, and the sum of X – A and X + A is 2X for all even numbers bigger than 4. This is shown with Arbitrary Modular Arithmetic and Fermat's Infinite Descent Method. Then, it is shown that the number of possible X – A such that guarantees X + A to be a prime number is at least 1 for any X >= 4. In other words, all even numbers can be represented as the sum of two odd prime numbers.

Proof: I am going to start by creating another theorem Victoria Hayanisel Theorem 4: For any positive integer X >= 4, there exists at least one prime number smaller than X that does not divide X.

Proof: Suppose that X is the multiple of all prime numbers smaller than X. Then, X – 1 is a prime number. But if X – 1 is included in the set of the prime factors of X, then it cannot be X – 1 (obviously, some positive integer multiplied by X – 1 cannot be X). Hence, there is at least one prime number smaller than X that doesn't divide X for all X >= 4.

Let's get back to the proof for Goldbach Conjecture:

Consider all even numbers 2X such that X > = 4. For 2X when X = 2 and X = 3, 4 = 2 + 2 and 6 = 3 + 3 hence the conjecture is true. For 2X when X >= 4, consider Victoria Hayanisel Theorem 4. Consider the following arbitrary modular arithmetic. Consider e + 1 prime numbers less than X + A. Let:

X – A (mod P1) = J1	X (mod P1) = I1	A (mod P1) = I1 – J1
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X – A (mod X - A) = 0	X (mod X - A) = 0	A (mod X – A) = A
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X – A (mod Pe) = Je	X (mod Pe) = Ie	A (mod Pe) = Ie - Je

Then:

X + A (mod P1) = 2I1 – J1

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X + A (mod X - A) = 2A

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X + A (mod Pe) = 2Ie – Je

Now, the question is whether there exists X + A which is a prime number given some X – A which is a prime number, for some A at given X. In other words: Given j1, …, je are not 0, 2Iq – Jq =/= 0. In other words, 2Iq (mod Pq) =/= Jq.

Suppose 2Iq (mod Pq) = Jq. If this were true, 2Iq (mod Pq) = X – A since X – A (mod Pq) = Jq.

Let's rearrange this equation: X – A (mod Pq) = 2Iq.

But, X (mod Pq) = Iq, which means 2X (mod Pq) = 2Iq.

Hence, X – A (mod Pq) = 2X.

Hence, if there exists X – A such that X – A (mod Pq) =/= 2X, then Goldbach's Conjecture is true.

The last piece of the puzzle: Is there such X – A for a given X such that X – A (mod Pq) =/= 2X for all q's?

I am going to create a three-dimensional sequence called Victoria Hayanisel Sequence:

T	1	2	3	4	5	6	7	8	9	10	…
2	1	0	1	0	1	0	1	0	1	0	…
3	1	2	0	1	2	0	1	2	0	1	…
5	1	2	3	4	0	1	2	3	4	0	…

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The first row is just the sequence of positive integers. The first column is the sequence of prime numbers. The other rows are the sequence of the remainders when the first column divides the first row.

Given i prime numbers, there are P1 x P2 x … x Pi number of combinations of the remainders. Given a specific set of remainders, there are (P1 – 1) x (P2 – 1) x … x (Pi – 1) number of different possible combination of remainders.

The last piece of the puzzle was "is there such X – A for a given X such that X – A (mod Pq) =/= 2X for all q's?" The answer is yes, and there are (P1 – 1) x (P2 – 1) x … x (Pi – 1) number of them. Since 2X is an even number, we can forget about 2. Hence, let's consider only from 3. Now, the question is "is one of them a prime number?" The answer is yes. There are at least (P2 – 2) x … x (Pi – 2) of them, which is always bigger than 1, because whatever the given set of remainders are, exclude them and 0's from each rows. so that it would be prime because its remainders are set of non-zeros and each element is different from the given set of remainders.

Hence, given $X – A \pmod{Pq} =/= 2X$ for all q's, $X + A$ has to be a prime number, and their sum is 2X for all $X >= 4$. For 2X when $X = 2$ and $X = 3$, 2X can be assigned $2 + 2$ and $3 + 3$ to it. For the rest, the proof is applicable. Hence, Goldbach's Conjecture is true for all even numbers.