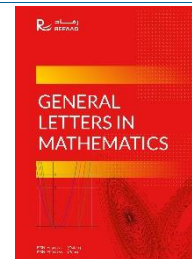




## General Letters in Mathematics (GLM)

Journal Homepage: <https://www.refaad.com/Journal/Index/1>

ISSN: 2519-9277 (Online) 2519-9269 (Print)



# A Conjecture from Collatz Conjecture: Elevation by Folding

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## Abstract

The Collatz Conjecture proposed in 1937 by German mathematician Lothar Collatz remains unsolved. It states that: let  $\mathbb{N}$  be the set of all positive integers and  $n \in \mathbb{N}$ , then: any positive integer  $n$  will collapse to 1 by applying the rules of the conjecture:  $3n+1$  (for odd numbers) and  $n/2$  (for even numbers). In this work, a new conjecture was stated from Collatz conjecture. Percentage crystallinity was defined and a unique solution of the elevation (reverse) of the cyclone part and the whole stem was suggested. The % Crystallinity of the 512-line on the stem is 100% while it is 68% for the 184-line. The only number,  $f(n) = 112n$ , resulting from multiplication of prime numbers, that satisfies the elevation of Collatz cyclone is 112 (i.e.,  $n = 1$ ), and for the elevation of the stem, the multiplications of 112 are valid (i.e.,  $n = 2, 4, 8, 16, \dots$ ). When 112 is folded, it gives the following pairs: 56, 28, 14, and 7, which correspond the 7<sup>th</sup>, 6<sup>th</sup>, 5<sup>th</sup>, 4<sup>th</sup>, and 3<sup>rd</sup> dimensions, respectively. This elevation conjecture will lead to many applications, for example, the 9<sup>th</sup> planet can be suggested to be devoured in a black Hole that may be resulted from the death of the symmetric sun of our solar system's sun.

**Keywords:** Collatz conjecture, Stem, Cyclone, Elevation, Crystallinity, Folding, Dimensions.

**MSC2020:** 11A41, 11B50, 11F23.

## 1. Introduction

The Collatz Conjecture proposed in 1937 by German mathematician Lothar Collatz remains unsolved. It states that [12, 3]: let  $\mathbb{N}$  be the set of all positive integers and  $n \in \mathbb{N}$ , then: any positive integer  $n$  will collapse to 1 by applying the rules of the conjecture:  $3n+1$  (for odd numbers) and  $n/2$  (for even numbers). Several research papers were published trying to find a solution to the conjecture using different methods, the most recent are [11, 5, 10, 7, 8, 2, 9, 4, 6]. To the best of our knowledge, there was no single research which tried to give a solution for the reverse of Collatz conjecture.

Research on this problem is still very active. The most recent previous literature can be summarized as follows:

- Thompson [11] tried to prove the Collatz conjecture exploring the rules of the conjecture and applying these rules to a system of two linear equations.
- Furuta [5] to prove the Collatz conjecture using a theorem proving system.
- Schwob et al. [10] proposed several novel theorems, corollaries, and algorithms that explore relationships and properties between the natural numbers, their peak values, and the conjecture.

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doi: <https://doi.org/10.31559/glm2023.13.1.1>

Received: 25 Feb 2023   Revised: 6 Mar 2023   Accepted: 14 Mar 2023



- Izadi [7] presented the proof of the Collatz conjecture for many types of sets defined by the remainder theorem of arithmetic.
- Koch et al. [8] used techniques of data science to examine the divisions by two that are performed within Collatz sequences.
- Barghout [2] described a new approach towards probabilistic proof of the convergence of the Collatz conjecture.
- Motta et al. [9] presented an analysis of the Collatz conjecture.
- Feinstein [4] presented that any proof of the Collatz conjecture must have an infinite number of lines and thus no formal proof is possible.
- Idowu [6] presented a novel theoretical framework formulated for information discovery from number system and Collatz conjecture data.

In this work, a new conjecture was stated from Collatz conjecture. Percentage crystallinity was defined and a unique solution of the elevation (reverse) of the cyclone part and the whole stem was suggested.

## 2. Elevation Conjecture

### 2.1. Definition of crystallinity

Figure (1) (Adapted and developed from [2]) shows Collatz conjecture and the definition of its stem and cyclone. The straight lines resulting from  $(n/2)$  collapsing of the even numbers can be considered as the crystalline part of the conjecture. Taking the elevation direction of Collatz conjecture, the only fully crystalline line is the line of 1, 2, 4, 8, 16, ... upward. This is what can be called the stem. The part of the stem that is reached before any branching is what can be called the cyclone (i.e., 16, 8, 4, 2, 1). Percentage crystallinity (% crystallinity) can be defined as follows:

$$\%Crystallinity = \frac{\text{Numbers resulted from } (n/2)}{\text{Total numbers of the collapsing line}} \times 100 \quad (1)$$

For example, the % crystallinity of the 512-line on the stem is 100% while the % crystallinity is 68% for the 184-line. In some areas, the chains align and pack together to form crystals (i.e., divisible on 2); in other areas (i.e.,  $3n+1$ ), the chains are disordered and cannot pack together (amorphous regions).

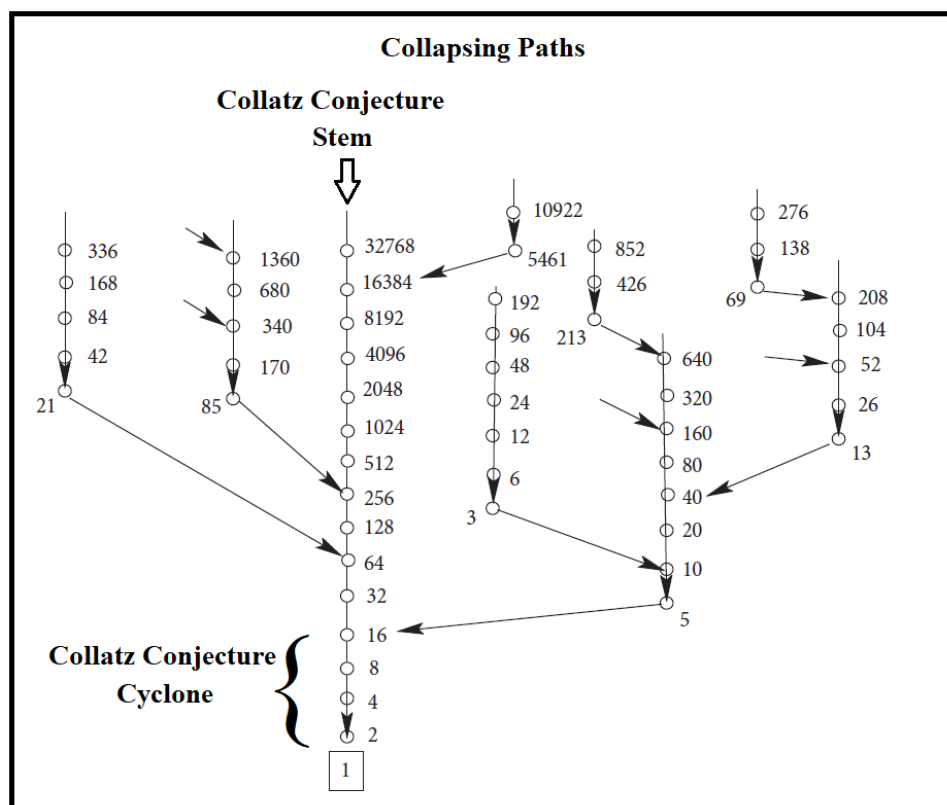


Figure (1): Collatz conjecture and the conjecture's stem and cyclone (Adapted and developed from [2]).

### 2.2. The new conjecture

**Conjecture** The only number,  $f(n) = 112n$ , resulting from multiplication of prime numbers, that satisfies the elevation of Collatz cyclone is 112 (i.e.,  $n = 1$ ), and for the elevation of the stem, the multiplications of 112 are valid (i.e.,  $n = 2, 4, 8, 16, \dots$ ), according to the following:

$$f(n) = 112n = \begin{cases} n = 1, & \text{for the Cyclone} \\ n = 2^k, & \text{for the Stem } (k = 1, 2, 3, \dots) \end{cases} \quad (2)$$

Table (1) shows the details of the 112-elevation line (cyclone part), and for 224- elevation line in Table (2), which goes upward the rest of the Stem. For more details on the other lines, Table (3) shows the details of the 114-line. The idea behind that is folding. When 112 is folded, it gives 56 pairs, another folding resulting by 28 pairs of the 56 pairs, and so on (i.e., 14, and 7). This means: the whole number (112) is in the seventh dimension (16 pairs), and the fold of it is in the sixth dimension and so on (i.e., 5<sup>th</sup>, 4<sup>th</sup>, and 3<sup>rd</sup> dimensions) and it is fully crystalline (100%). According to Al-Rawajfeh [1], the seven groups of the 16 symmetric pairs were called the seven Mathani (Pairs) of the 112-Surahs of the Holy Qur'an.

Table (1): Shows the details of the 112-elevation line (The Cyclone).

112/Prime Numbers		Pairs by folding	Cyclone	Dimension <sup>1</sup>
112/2x2x2x2x7	112/16x7	112/112	1	3
112/2x2x2x7	112/8x7	112/56	2	4
112/2x2x7	112/4x7	112/28	4	5
112/2x7	112/2x7	112/14	8	6
112/7	112/1x7	112/7	16	7

<sup>1</sup> See reference [1] for details.

Table (2): Shows the details of the 224-elevation line (The Stem).

224/Prime Numbers		Pairs by folding	Stem (Incl. Cyclone)
224/2x2x2x2x2x7	224/32x7	224/224	1
224/2x2x2x2x7	224/16x7	224/112	2
224/2x2x2x7	224/8x7	224/56	4
224/2x2x7	224/4x7	224/28	8
224/2x7	224/2x7	224/14	16
224/7	224/1x7	224/7	32

Table (3): Shows the details of the 114-elevation line (not valid).

114/Prime Numbers		Pairs by folding	Cyclone
114/2x3x19	114/6x19	114/114	1
114/3x19	114/3x19	114/58 (Failed)	(114/2=57) Odd

This elevation conjecture will lead to many applications including polymer crystallinity and mathematical astrophysics.

Depending on this proposed conjecture and according to the results of Al-Rawajfeh [1], the 9<sup>th</sup> planet can be suggested to be devoured by a black hole that may be resulted from the death of the symmetric sun of our solar system's sun, as shown in Figure (2).

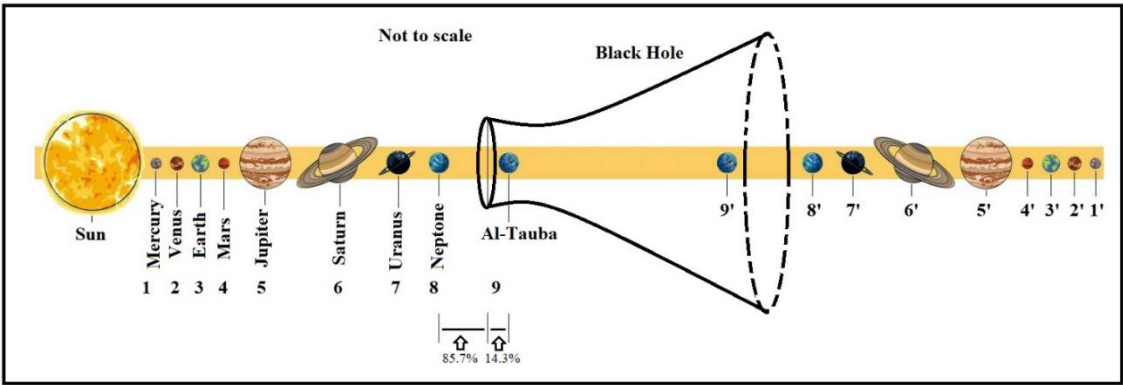


Figure (2): The suggested theory on the 9<sup>th</sup> planet in our solar system.

### 3. Conclusion

In the sights of this study, the following can be concluded:

- A new conjecture was stated from Collatz conjecture by elevation.
- Percentage crystallinity was defined and a unique solution of the elevation of the cyclone part and the whole stem was suggested.
- The conjecture states that the only number,  $f(n) = 112n$ , resulting from multiplication of prime numbers, that satisfies the elevation of Collatz cyclone and stem is 112 and its multiplications (i.e.,  $n = 2, 4, 8, 16, \dots$ ).
- As an application, the 9<sup>th</sup> planet can be suggested to be devoured in a black Hole that may be resulted from the death of the symmetric sun of our solar system's sun.

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