International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Explanation for the Number Cycle that was Introduced by Mohammadreza Barghi

Mohammadreza Barghi

Independent Scholar
mreza7[at]yahoo.com

Abstract: ***Previously I introduced a number cycle that takes two consecutive integers and a third integer that after a cycle of some operations including adding and dividing, returns one of the two consecutive integers[1]. Here I am explaining how it works. If you add integer "a" to integer "b" and then divide it by two, the result could be written as follows i.e.: (b + a) / 2 = (b + a) /2 +(– a + a) = (b/2 + a/2 – a) + a = ((b-a)/2 + a. In the next operations, this result substitutes "b, and if you add this new "b" to "a" and divide it by 2,it will be:(((b - a)/2 + a) + a)/2→((b –a)/2 + a + a)/2→(b – a)/4 + (a + a)/2 -> (b – a) / 4 + a. Repeating this cycle causes that (b – a)/2^n (n is the number of repeating of (b -a)/2) ends to 1 or -1 depending if b>a or b<a (because in the above mentioned "number cycle", it takes two consecutive integers: one odd and one even and we add odd to odd and even to even, each time we will have an even integer that could be divided by 2).***

Keywords: number theory, integer, numerical, collatz

1. Introduction

A number cycle was introduced by the author of this article in "IJSR" [1]. In this number cycle, first we take two consecutive integers (any consecutive integers including positive and negative integers and zero considered as even), then we take a third integer (any integers including positive and negative integers and zero considered as even). In next step we add one of the two consecutive integers to third integer (odd to odd and even to even) and divide the result by 2 and putting the result as third integer and repeating the operation, it will return one of the two consecutive integers.

2. Explanation for the Cycle Number Mechanism

Here I will explain how this number cycle works:

1stwe take two consecutive integers ("a" and "a+1") and "b" as the third integer so that b >"a+1", then we add "a" or "a+1" to "b"(depending on the "a" and "b" we add odd to odd and even to even) and divide them by 2, for example if both "a" and "b" are odd or even: (a + b)/2. This could be written as: (b – a +a +a)/2 → (b -a)/2 + a and putting the result as "b" and then repeating the operations. These operations will result in: ((b -a)/2 +a)+ a)/2 → ((b – a)/4+ a. with repeating these operations, (b- a) will be divided until it returns 1.

When (b – a)/2 reach to 1, if the last integer that was added to (b -a) was "a", the next b will be (a + 1) and then we should add it to (a +1) (odd to odd and even to even) that gives: 2(a + 1) and dividing it by 2 will returns (a + 1) and it will be repeated again and again.

If the last integer that was added to (b – a) was (a + 1), the next "b will be (a +2) and then we should add it to "a" that gives: (a + 2 + a) → 2(a+1) and dividing it by 2 returns (a + 1) and it will be repeated again and again.

An example for first explanation:

We take two consecutive integers: a = 7 and (a + 1) = 8 and the third integer: b = 32.

We do operations on these integers as following (according to operations in the above mentioned "number cycle"):
(32+8)/2=20 → (20+8)/2=14 → (14+8)/2= 11 → (11+7)/2=9 → (9+7)/2=8 → (8+8)/2=8,………

Below I will present more details to clear how the above operations work:
(32 + 8)/2 → (32 – 8 + 8 + 8) → (24 + 8 + 8)/2 → (12 + 8) → ((12 + 8) + 8)/2 → (12 + (8 + 8))/2 → (6 + 8) → ((6 + 8) + 8)/2 → (3 +8) → ((3 + 8) + 7)/2 → (3 + 1 + 7 + 7)/2 → (2 + 7) → ((2 + 7) + 7)/2 → (1+ 7) → ((1 + 7) + 8)/2 → 8 → (8 + 8)/2 → 8,……

2^{nd} we take two consecutive integers ("a" and "a+1") and "b" as the third integer so that b < a and then we add "a" or "a+1" to "b"(depending on the "a" and "b" we add odd to odd and even to even) and divide them by 2, for example if both "a" and "b" are odd or even: (b + a)/2.This could be written as: (b+a)/2 -a+a→ (b-a)/2 + a, and again it substitutes for b and it is repeated. Because b < a and because we have two consecutive integers ("a" and "a+1") then the end result will be "-1".

If the last integer that was added to (b -a) was a, the next b will be (a - 1) and then we should add it to (a +1)(odd to odd and even to even) that gives: 2a and dividing it by 2 it returns "a" and adding it to "a" and dividing by 2, will result to "a" and it will be repeated again and again.

If the last integer that was added to (b – a) was (a + 1), the next b will be (a + 1 - 1) that is equal to "a" and then we should add it to "a" that gives: (a + a) → 2a and dividing it by 2 returns "a" and it will be repeated again and again.

An example for second explanation:

We take two integers: a = 7 and (a + 1) = 8 and the third integer: b = -32.

We do operation on these integers as following:
(-32+8)/ 2= -12 → (-12+8)/2= -2 → (-2+8)/2=3 → (3+7)/2= 5 → (5+7)/2= 6 → (6+8)/2= 7 → (7+7)/2= 7, …….

Below I will present more details to explain how the above operations work:
(-32+8)/2 → (-32-8+8+8)/2 → (-40+8+8)/2 → (-20+8) → ((-20+8)+8)/2 → (-10+8) →((-10+8)+8)/2→ (-5+8) → ((-5 +8)+7)/2 → (-5 +1 +7+7)/2 →(-2 +7)→((-2+7) +7)/2 →(-1 +7) → ((-1 +7) + 8)/2 →((-1 -1 + 1 + 7) +8)/2 → (-2 + 8 + 8)/2 → (-1 + 8) → ((-1 + 8) + 7)/2 → ((-1 +1 +7) + 7)/2 → (7 + 7)/2 → 7→ (7 + 7)/2 → 7, …..

According to primary article, when the third integer is bigger than the two consecutive integers, it will return the bigger one of two consecutive integers and when the third integer is smaller than two consecutive integer, it will return the smaller one of two consecutive integer.

3. Discussion

There are many number theories and conjectures in mathematic that suggest many number patterns and structures in numerical field. Number theory has always fascinated amateurs as well as professional mathematicians. In contrast to other branches of mathematics, many of the problems and theorems of number theory can be understood by laypersons [2]. Collatz's conjecture is one of the most famous unsolved problems in mathematics. It is also known as 3n + 1 problem. It was introduced by Lothar Collatz in 1937[3]. I was trying to find a solution for the collatz's conjecture and during one of these efforts, I found that there is another number cycle that after several simple math operation on three different integers; it will return one of these integers.

There is no solution for Collatz's conjecture until now, but I found the solution for my number cycle and explained it above.

References

[1] Mohammadreza Barghi , "An Interesting Number Cycle that takes Two Consecutive Integers (a, b) and Integer (c), and with any c, it Always Returns a or b.", IJSR Volume 11 Issue 12, December 2022, 555-556
[2] William Dunham, "Number Theory, mathematics", Britannica
[3] Zuojun Hu, The Analysis of Convergence for the 3X + 1 Problem and Crandall Conjecture for the aX + 1 Problem, Advances in Pure Mathematics, 2021, 11, 400-407.

Author Profile

Mohammadreza Barghi lives in Calgary, Alberta, Canada. I am interested in numerical math and I was trying to solve Collatz'S Conjecture that I found out the above mentioned numerical cycle. It seems to me that it might be interesting for other peoples. In this article I present how this number cycle works. Email address: mreza7[at]yahoo.com