Multiplication tables for non-prime odd numbers

The untouched tables which will give us a better understanding of the distribution of prime odd numbers

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Abstract

The sieve method is used to separate prime numbers from non-prime numbers. If the set of prime odd numbers cannot be written as multiplication tables, the set of non-prime odd numbers can be written as multiplication tables. Thus, each odd number that does not appear in these multiplication tables is certainly a prime odd number. Based on these tables, it was proved by the opposite method that the series of prime numbers are random series. Although they are random, they can be easily tracked using the opposite method. The counter-example is used to proof that it is not possible to write whole multiplication tables of prime odd numbers on formula of $[(a \times b) + c]$ or $[(a \times b) - c]$. Instead, partial multiplication tables can be used. It also was proved that the number 1 is a prime odd number.

1. Introduction

The number 2, because it is an even number, has made the prime numbers set look like a third set along with the even numbers and odd numbers set, and this is an illusion that should be gone. The number 2 as a prime number should be excluded when studying the distribution of prime numbers. The exact description is that the natural numbers are divided into two groups: the even numbers and the odd numbers, then the odd numbers are divided into two groups: the prime odd numbers and the non-prime odd numbers, which are two opposite sets. The neglect of the non-prime odd numbers turn off the light about the prime odd numbers and make it an unclear set. In this paper, we will provide multiplication tables for non-prime odd numbers. Based on these tables, the set of prime odd numbers will be revealed more clearly. The set of non-prime odd number may has the ability to solution some conjectures about prime odd numbers.

2. Multiplication tables for non-prime odd numbers

1.2 Axioms

Before writing multiplication tables for non-prime odd numbers, a set of axioms is required:

- 1- Odd numbers are divided into prime odd numbers and non-prime odd numbers.
- 2 - The product of each odd number by an even number is an even number, so we will exclude even numbers from multiplication tables.
- 3 - In the multiplication table for number 1, all prime odd numbers and non-prime odd numbers are appear. So, we will exclude the multiplication table for number 1 from the multiplication tables for non-prime odd numbers.
- 4 - The product of each odd number by an odd number is an odd number.
5. Each odd number resulting from multiplying two odd numbers greater than 1 is a non-prime odd number.

Based on previous axioms, we can write multiplication tables for non-prime odd numbers as follows:

1. Multiplication tables of non-prime odd numbers are infinite.
2. Each multiplication table starts by multiplying the individual number by itself, in order to prevent repetition.

Example: (7×3) is found in the multiplication table of 3, and (7×5) is found in the multiplication table of 5, so the multiplication table of 7 starts with (7×7) .

$3 \times 3 = 9$	$5 \times 5 = 25$	$7 \times 7 = 49$	$9 \times 9 = 81$	$11 \times 11 = 121$	$13 \times 13 = 169$	$15 \times 15 = 225$
$3 \times 5 = 15$	$5 \times 7 = 35$	$7 \times 9 = 63$	$9 \times 11 = 99$	$11 \times 13 = 143$	$13 \times 15 = 195$	
$3 \times 7 = 21$	$5 \times 9 = 45$	$7 \times 11 = 77$	$9 \times 13 = 117$	$11 \times 15 = 165$	$13 \times 17 = 221$	
$3 \times 9 = 27$	$5 \times 11 = 55$	$7 \times 13 = 91$	$9 \times 15 = 135$	$11 \times 17 = 187$		
$3 \times 11 = 33$	$5 \times 13 = 65$	$7 \times 15 = 105$	$9 \times 17 = 153$	$11 \times 19 = 209$		
$3 \times 13 = 39$	$5 \times 15 = 75$	$7 \times 17 = 119$	$9 \times 19 = 171$			
$3 \times 15 = 45$	$5 \times 17 = 85$	$7 \times 19 = 133$	$9 \times 21 = 189$			
$3 \times 17 = 51$	$5 \times 19 = 95$	$7 \times 21 = 147$	$9 \times 23 = 207$			
$3 \times 19 = 57$	$5 \times 21 = 105$	$7 \times 23 = 161$				
$3 \times 21 = 63$	$5 \times 23 = 115$	$7 \times 25 = 175$				
$3 \times 23 = 69$	$5 \times 25 = 125$	$7 \times 27 = 189$				
$3 \times 25 = 75$	$5 \times 27 = 135$	$7 \times 29 = 203$				
$3 \times 27 = 81$	$5 \times 29 = 145$					
$3 \times 29 = 87$	$5 \times 31 = 155$					
$3 \times 31 = 93$	$5 \times 33 = 165$					
$3 \times 33 = 99$	$5 \times 35 = 175$					
$3 \times 35 = 105$	$5 \times 37 = 185$					
$3 \times 37 = 111$	$5 \times 39 = 195$					
$3 \times 39 = 117$	$5 \times 41 = 205$					
$3 \times 41 = 123$						
$3 \times 43 = 129$						
$3 \times 45 = 135$						
$3 \times 47 = 141$						
$3 \times 49 = 147$						
$3 \times 51 = 153$						
$3 \times 53 = 159$						
$3 \times 55 = 165$						
$3 \times 57 = 171$						
$3 \times 59 = 177$						
$3 \times 61 = 183$						
$3 \times 63 = 189$						
$3 \times 65 = 195$						
$3 \times 67 = 201$						

2.2 Proof by opposite method that we can trace the prime odd numbers despite their random appearance

Based on multiplication tables for non-prime odd numbers, we can arrive at the following proof:

"Each odd number appear in the multiplication tables for non-prime odd numbers is a non-prime odd number; because its appearance indicates that it has denominators other than itself and the number 1. Meanwhile, each odd number that does not appear in the multiplication tables for non-prime odd numbers is a prime odd number; because its absence shows that it has two denominators only; itself and the number 1 ".

The following example set shows the series of odd numbers less than 200. We removed the non-prime odd numbers, where non-prime odd numbers appear in small print, the prime odd numbers remained in bold. In this paper, we tracked the prime odd numbers manually, But if we turn the non-prime odd number tables into an algorithm, this will make the prime odd numbers appear at once.

1,3,5,7,9,11,13,15,**17,19,**21,**23,**25,27,**29,31,**33,35,**37,39,41,**
43,45,**47,**49,51,**53,**55,57,**59,61,**63,65,**67,**69,**71,73,**75,77,**79,**81,
83,85,87,**89,**91,93,95,**97,**99,**101,103,**105,**107,109,**111,**113,**115,
117,119,121,123,125,**127,**129,**131,**133,135,**137,139,**141,143,145,147,
149,151,153,155,**157,**159,161,**163,**165,**167,**169,171,**173,**175,177,
179, 181,183,185,187,189,**191,193,**195,**197,199**

2.2Proof by exclusion method and confirmation method that the number 1 is a prime odd number.

a- Proof by exclusion method

If the odd numbers are either prime odd numbers or non-prime odd numbers, if it is proved that the number (1) does not belong to the set of non-prime odd numbers, then it certainly belongs to prime odd number set. Returning to the multiplication tables for non-prime odd numbers, we find that the number 1 does not appear in it, if the number 1 does not appear in it, then it doesn't belong to it, if the number 1 does not belong to non-prime odd numbers, then it certainly belongs to prime odd numbers.

B-Proof by confirmation method

Based on multiplication tables for non-prime odd numbers, we can prove two conditions for prime odd number:

- 1 - Prime number is an odd number.
2. The prime number does not appear in the multiplication tables of the odd non-prime numbers.

Thus, these two conditions that apply to all prime odd numbers, also they are apply to number 1, this proves that the number 1 belongs to prime odd numbers set.

2.3 Two opposite series that must be studied together

Despite the similarity that both the non-prime odd numbers (see set a) and the prime odd numbers (see set b) where sets are appear as randomly distributed, and that the difference between any two successive numbers is 2 or its multiples ,In spite of this similarity, the two series are completely opposite.

a- Non-prime odd numbers series

9,15,21,25,27,33,35,39,45,49,51,55,57,63,65,69,75,77,81,85,87,91,93,
95,99,105,111,115,117,119,121,123,125,129,133,135,141,143,145,
147,153,155,159,161,165,169,171,175,177,183,185,187,189,195...

b- Prime odd numbers series

1,3,5,7,11,13,17,19,23,29,31,37,41,43,47,53,59,61,67,71,73,79,83,89,
,97,101,103,107,109,113,127,131,137,139,149,151,157,163,167,173,
179,181,191,193, 197,199...

- a- Where (a) is not number (1), and (b) not the number itself .The set of non-prime odd numbers is regular in multiplication tables on the formula $(a \times b)$, because the set has denominators other than number 1 and the number itself.
- b- Where (a) is not number (1), and (b) not the number itself, the set of prime odd numbers is irregular in multiplication tables on the formula $(a \times b)$, because the set has only two denominators number 1 and the number itself.

From the foregoing, we can form a proof by opposite method proving that the prime odd numbers is irregular.The following is the text of the proof:

"If non-prime odd numbers and prime odd numbers are opposite sets, because first set has denominators larger than number 1, and have denominators smaller than the number itself, While second set has no denominators larger than number 1, and it does not have denominators smaller than the number itself. Then, if the first set is regular only because of those denominators, the second set will surely be an irregular set due to the lack of those denominators."

Here, is another proof using the counter-example that it is not possible to write whole multiplication tables of prime odd numbers on the formula $[(a \times b) + c]$, or the formula $[(a \times b) - c]$, but partial multiplication tables can be written.

Example 1: where (a, b) are two odd numbers

$[(a \times b) + c]$	$[(a \times b) - c]$
$[(3 \times 3) + 2] = 11$ $[(3 \times 39) + 2] = 119$ non-prime (7×17)	$[(3 \times 3) - 2] = 7$ $[(3 \times 39) - 2] = 115$ non-prime

Example 2: where (a) odd number, and (b) even number

$[(a \times b) + c]$	$[(a \times b) - c]$
$[(3 \times 2) + 1] = 7$ $[(3 \times 12) + 1] = 37$ $[(3 \times 16) + 1] = 49$ non-prime	$[(3 \times 2) - 1] = 5$ $[(3 \times 12) - 1] = 35$ non-prime $[(3 \times 16) - 1] = 47$

Example 3: where (a, b) are even numbers

$[(a \times b) + c]$	$[(a \times b) - c]$
$[(2 \times 2) + 1] = 5$ $[(2 \times 4) + 1] = 9$ non-prime $[(2 \times 8) + 1] = 17$	$[(2 \times 2) - 1] = 3$ $[(2 \times 4) - 1] = 7$ $[(2 \times 8) - 1] = 15$ non-prime

Example 4: where (a) an even number and (b) an odd number

$[(a \times b) + c]$	$[(a \times b) - c]$
$[(2 \times 3) + 1] = 7$ $[(2 \times 5) + 1] = 11$ $[(2 \times 7) + 1] = 15$ non-prime	$[(2 \times 3) - 1] = 5$ $[(2 \times 5) - 1] = 9$ non-prime $[(2 \times 7) - 1] = 13$