MATHEMATICS CAN BE SIMPLE, EASY, INTERESTING AND BEAUTIFUL

PART ONE

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1.INTRODUCTIN

Pascal's triangle is a famous one in mathematics. It has many interesting properties such as self similarity, and many others. We can also conclude Fibonacci series from it. The simple structure of Pascal's triangle based on sequential addition as follows:

1

1 1

1 2 1

1 3 3 1

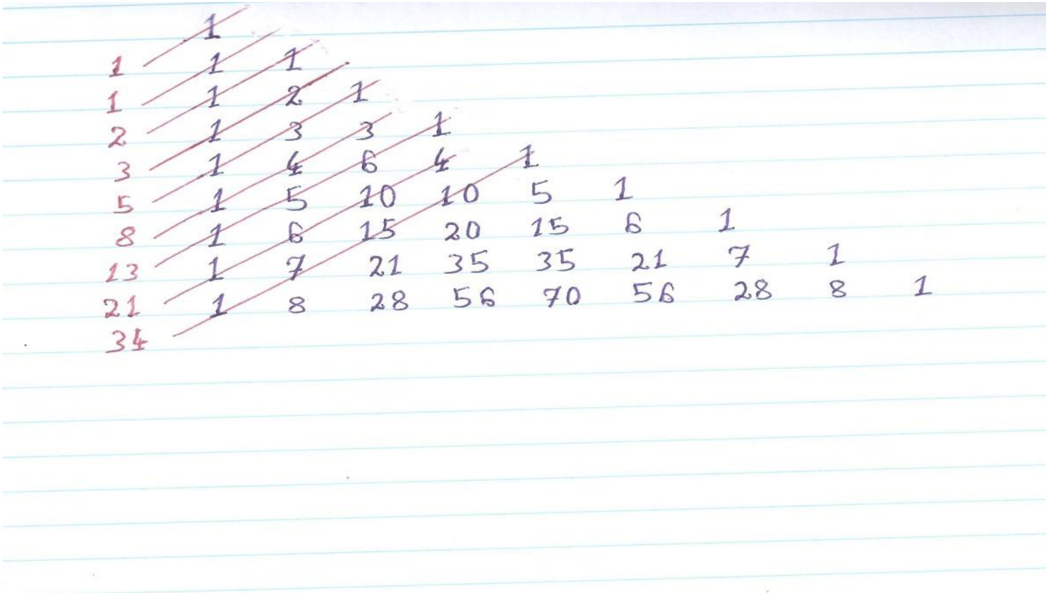
1 4 6 4 1

1 5 10 10 5 1

By putting Pascal's triangle as a right angled one we obtain:

1					
1	1				
1	2	1			
1	3	3	1		
1	4	6	4	1	
1	5	10	10	5	1

By this position we can conclude Fibonacci series from Pascal's triangle by adding numbers of the same color linked by line segments:



The Fibonacci series:

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ……… etc.

2. MY FIRST TRIANGLE AND FIRST SERIES

Thinking about Pascal's triangle, I had an idea to replace the addition with subtraction. I can form a triangle by taking the absolute value of the subtraction of the two numbers, not the addition. By other words I map the operation (exclusive-OR) on the two numbers:

1

1 1

1 0 1

1 1 1 1

1 0 0 0 1

1 1 0 0 1 1

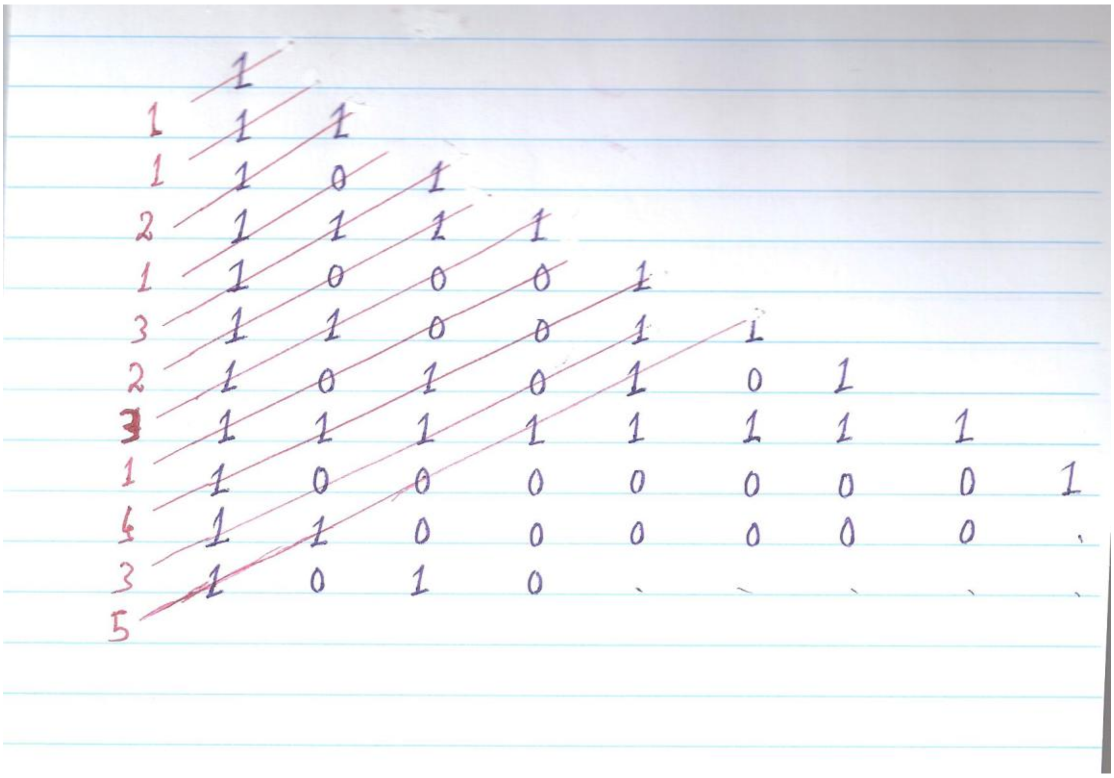
1 0 1 0 1 0 1

In this triangle it is obvious that we have the property of self similarity formed by the zeros. So the parts which we should delete are the zero positions.

By putting this triangle as a right angled one we obtain:

1						
1	1					
1	0	1				
1	1	1	1			
1	0	0	0	1		
1	1	0	0	1	1	
1	0	1	0	1	0	1

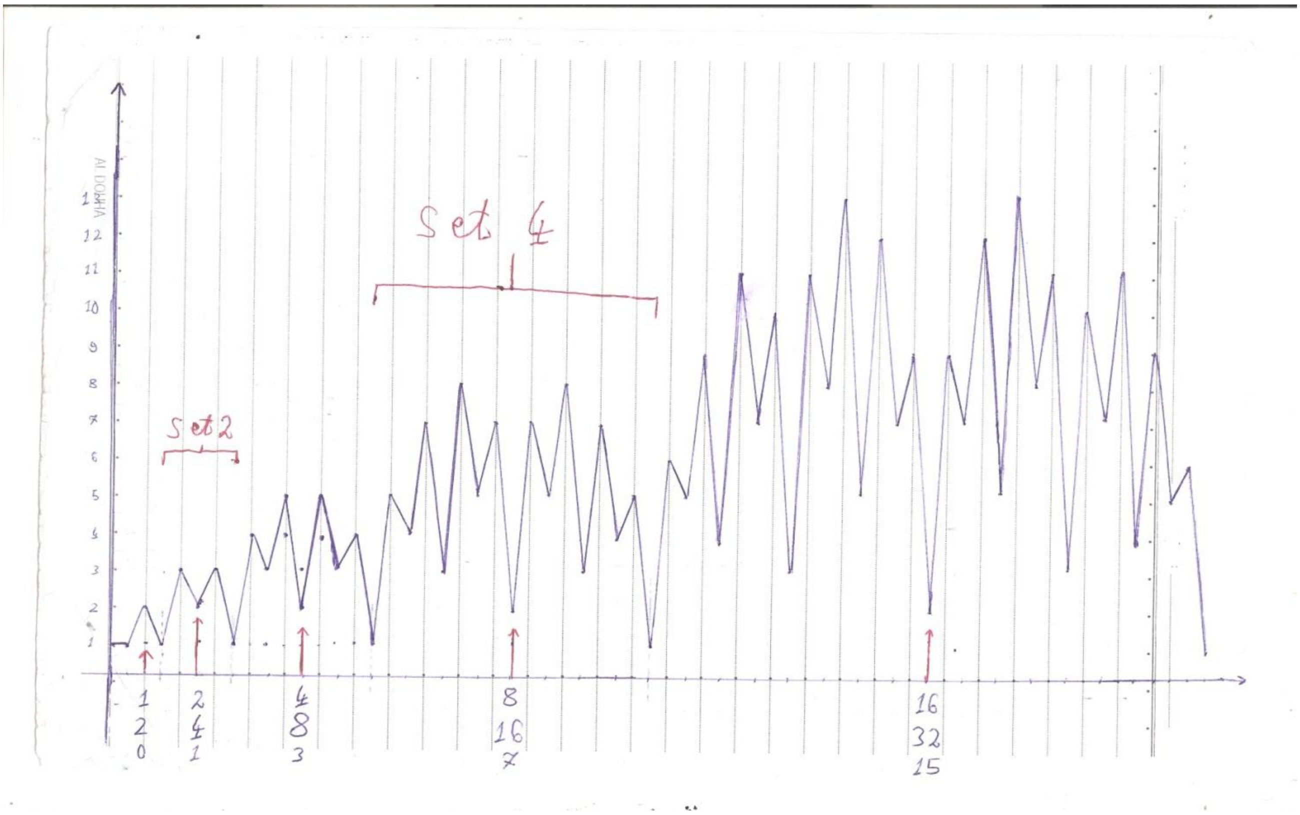
By this position we can conclude a series from this triangle by adding numbers of the same color linked by line segments:



The series:

1,1, 2, 1, 3, 2, 3, 1, 4, 3, 5, 2, 5, 3, 4, 1, 5, 4, 7, 3, 8, 5, 7, 2, 7, 5, 8, 3, 7, 4, 5, 1, 6, 5, 9, 4, 11, 7, 10, 3, 11, 8, 13, 5, 12, 7, 9, 2, 9, 7, 12, 5, 13, 8, 11, 3, 10, 7, 11, 4, 9, 5, 6,1,………..etc.

This series of numbers forms unlimited unique shape of line segments as the next figure:



I have one word to describe this shape: Beautiful. It has independent sets of line segments. Set zero contains one segment, set one contains two segments, set two contains four, set three contains eight, set four contains sixteen, set five contains thirty-two,……etc.

There are other properties such as: Every set has a center of symmetry. Set four contains eight tops and seven bottoms, set two contains two tops and one bottom. (The numbers under the shape represents: number of tops, number of segments, number of bottoms respectively).

So number of tops are: 0, 1, 2, 4, 8, 16,……etc. Number of segments are: 1, 2, 4, 8, 16, 32,……etc. Numbers of bottoms are: 0, 0, 1, 3, 7, 15, ……etc.

3. MY SECOND TRIANGLE AND SECOND SERIES

Pascal's triangle based on addition starting from the neutral of addition plus one:

$$0+1=1$$

Ok. What if I want to build a triangle based on multiplication starting from the neutral of multiplication plus one:

$$1+1=2$$

2

2 2

2 4 2

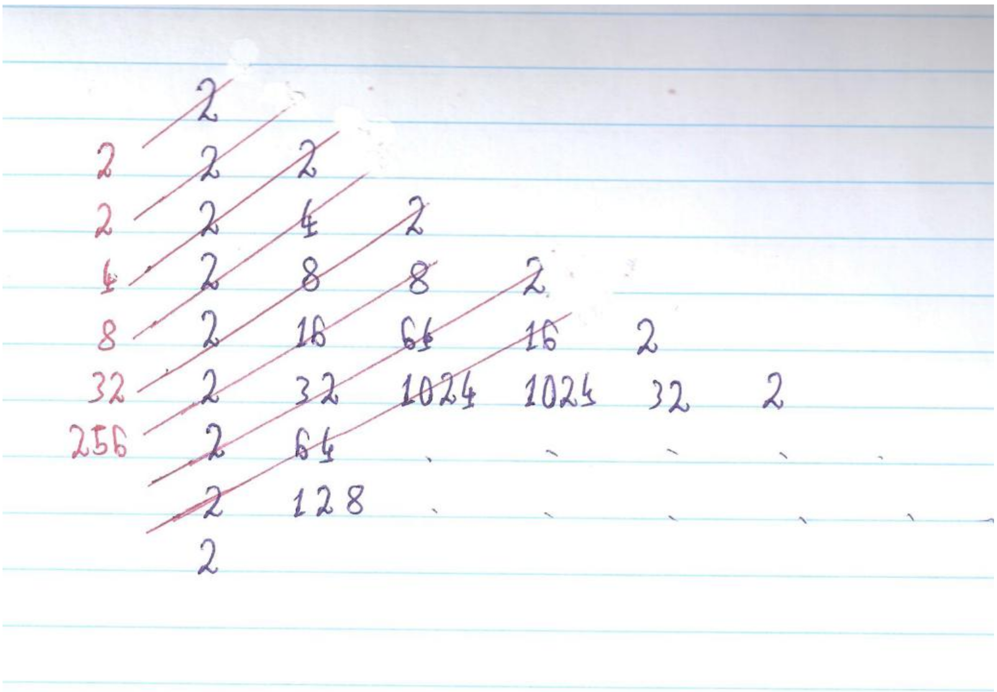
2 8 8 2

2 16 64 16 2

By putting this triangle as aright angled one we obtain:

2				
2	2			
2	4	2		
2	8	8	2	
2	16	64	16	2

By this position we can conclude a series from this triangle by multiplying numbers of the same color linked by line segments:



The series:

2, 2, 4, 8, 32, 256, 8192, ……….etc.

Every element is the multiplication of the previous two elements.

Taking the logarithm of every number in the last triangle of the base two we obtain Pascal's triangle. And taking the logarithm of every number in the last series we obtain Fibonacci series.

Third number in line five is 64.

$$\log_2 64 = 6$$

Number six is the third number of line five in Pascal's triangle.

The logarithm makes a link between the two series

2	2	4	8	32	256
1	1	2	3	5	8

4. THE GENERALIZATION OF THE SECOND TRIANGLE AND THE SECOND SERIES

We can –instead of starting the second triangle from number two- start a triangle from any number we want(X), and we can build the triangle by multiplication, then we take the logarithms of all its elements of the base (X), to obtain Pascal's triangle, so all these infinite numbers of triangles have all the properties of Pascal's triangle in addition to other properties concerning every triangle in itself.