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The Fibonacci Sequence and Numbers

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Abstract: The Fibonacci sequence is one of the most beautiful and febulas mathematical concepts. The Number is sequence turn in place that you have probably seen nature. The Fibonacci sequence is a series of numbers the follows a unique integers sequence. These numbers generate mathematical patterns that can be found in all real life. The Fibonacci numbers are also called the golden ratio. The golden section is used for architect, art, Space exploration, etc.

Keywords: Fibonacci Numbers, Golden ratio

I. Introduction

The Fibonacci numbers were describe by a man named Leonardo Pisano (1).He was known by his nickname, Fibonacci. The Fibonacci sequence is a sequence in which each term is the sum of the 2 numbers preceding it. The Fibonacci Numbers are defined by the recursive relation defined by the equations $F_n = F_{n-1} + F_{n-2}$ for all $n \geq 2$ where $F_1 = 1$; $F_2 = 1$ where Fn represents the nth Fibonacci number (n is called an index)(2)(3).

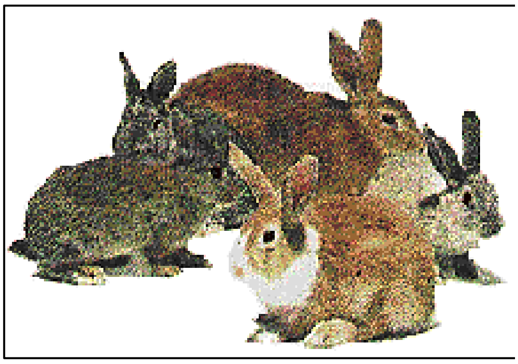
The Fibonacci sequence is the series of numbers:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34,...

The next number is found by adding up the two numbers before it:

- the 2 is found by adding the two numbers before it (1+1),
- the 3 is found by adding the two numbers before it (1+2),
- the 5 is (2+3),
- And so on!

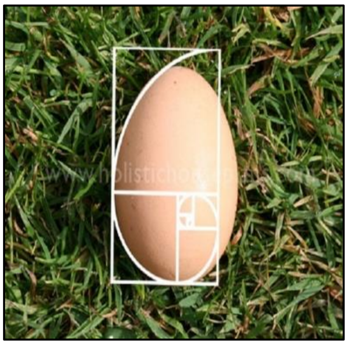
The original problem that Fibonacci investigated (in the year 1202) was about how fast rabbits could breed in ideal circumstances (4).

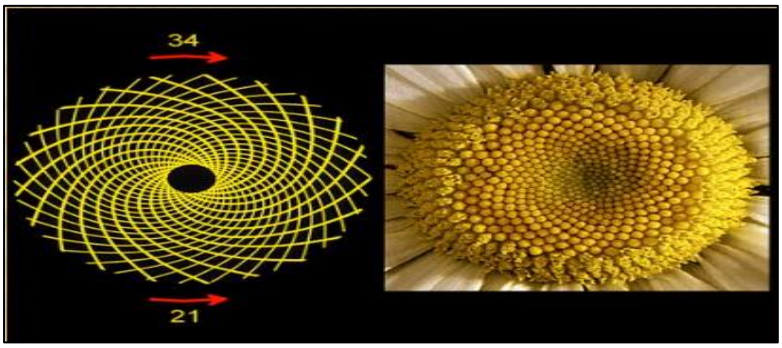


Suppose a newly-born pair of rabbits, one male, one female, are put in a field. Rabbits are able to mate at the age of one month so that at the end of its second month a female can produce another pair of rabbits. Suppose that our rabbits **never die** and that the female **always** produces one new pair (one male, one female) **every month** from the second month on. The puzzle that Fibonacci posed was (5)

II. The Fibonacci sequence in Nature

The Fibonacci sequence can also be seen in the way tree branches form or split. The number of petals in a flower consistently follows the Fibonacci sequence. The head of a flower is also subject to Fibonacci processes. Look at any seed head, and you will notice what look like spiral patterns curving out form the center left and right. If you count these spirals you will find a Fibonacci number. If you look at the spirals to the left and then the right you will notices these are two consecutive Fibonacci numbers





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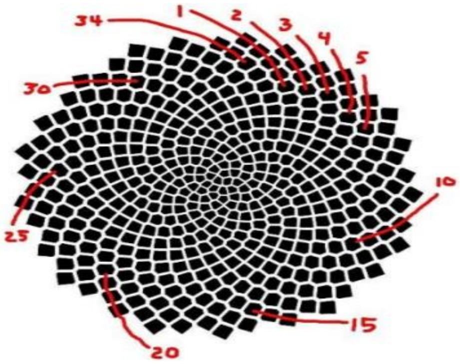
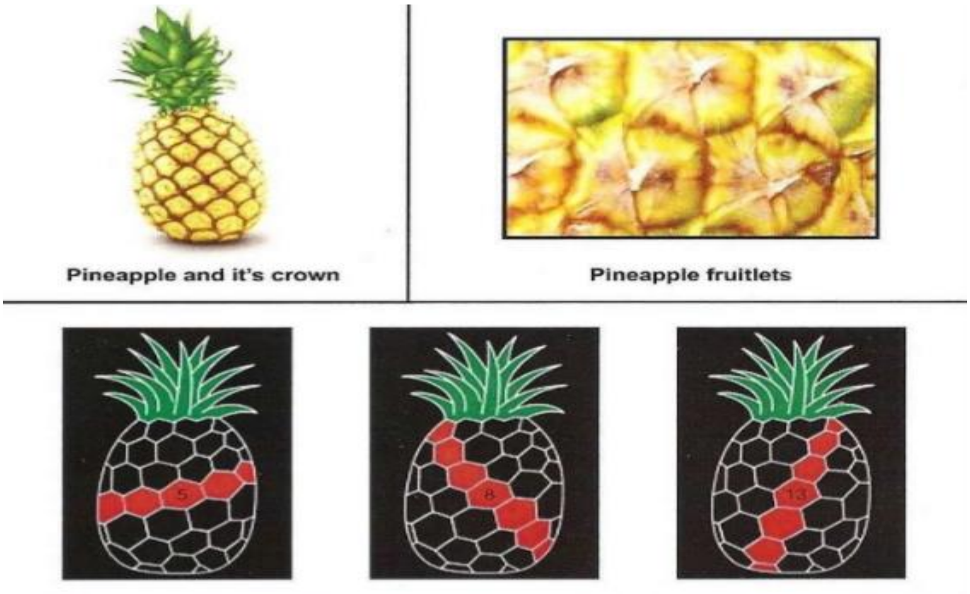


Spirals seen in the arrangement of seeds in the head of this sunflower number 34 in a counter clockwise direction



These can also be seen in pinecones, pineapples, cauliflower, and much more!

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III. More Fibonacci Numbers in Nature

Most of the time, the number of pedals on s flower is a Fibonacci number


1 **Pedal-calla lily**


2 pedals-euphorbia


3 **Pedal is trillium**


5 pedals-columbine

IV The Golden Section

One very famous piece. Known as the Mona Lisa, painted by Leonardo Da Vinci is drawn according to the golden ratio

The relationship of this sequence to the Golden Ratio lies not in the actual numbers of the sequence, but in the ratio of the consecutive numbers, Let's look at some of the ratios of these numbers: 1,1,2,3,5,8,13,21,34,55,89,144,233,377,610….

Since a ratio is basically a fraction we will find the ratios of these numbers by dividing the larger number by the smaller number that fall consecutively in the series.

2/1=2.0
3/2=1.5
5/3=1.67
8/3=1.6
13/8=1.625
21/13=1.615
34/21=1.619
55/34=1.618
89/55=1.618

The Golden Ratio is what we call an irrational number, it has an infinite number of decimal places and it never repeats itself! Generally, we round the Golden Ratio to 1.618 (10)

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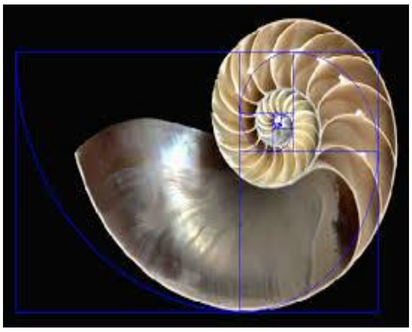
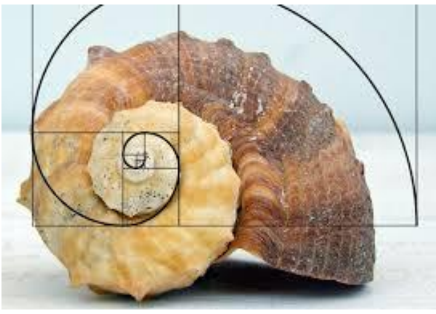
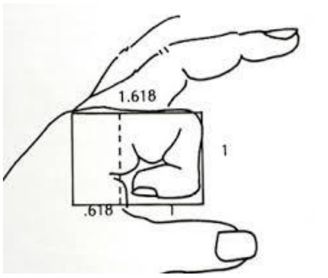
V. Golden Ratio In The Sea Shells

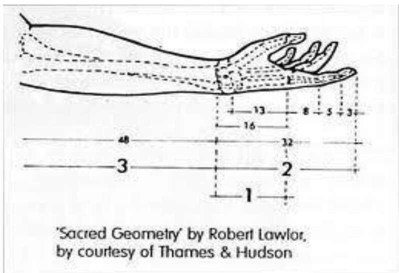




The shape of the inner and outer surfaces of the sea shells and the curves fit the golden ratio.

VI. Golden Ratio in Human Hand and Arm

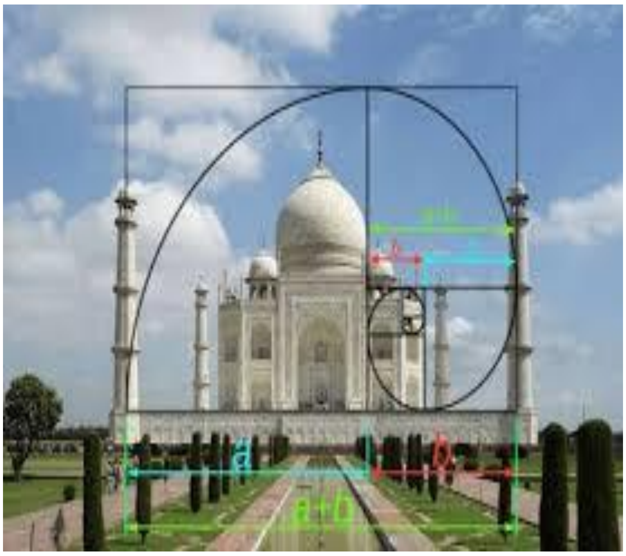




The length of
different parts in your arm
also fits the golden ratio

Look at your own hand
You have…
2 hands each of which has…
5 fingers each of which has…
3 pats separated by
2 knuckles

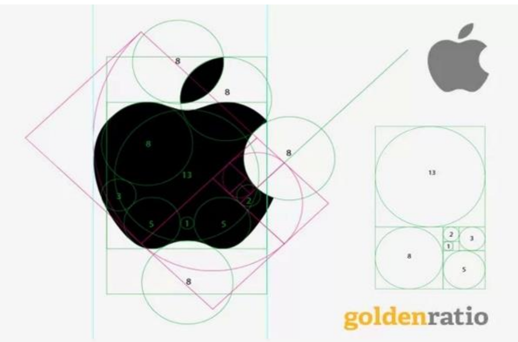
The Taj Mahal

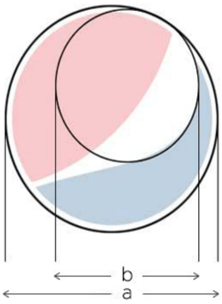


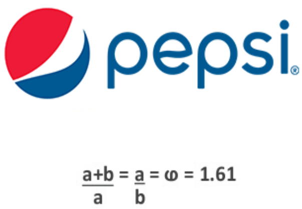
The main building of the Taj Mahal was designed using the Golden Ratio (7)

VII. Logo Design

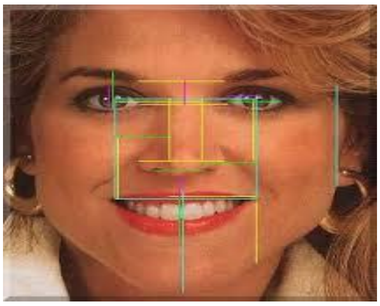
When designing a logo, you can even imagine the Fibonacci sequence as a series of circles, then rearrange them to form a grid as the foundation for your logo design. (8)







Golden Ratio in the Human Face



The dividence of every long line to the short line equals the golden ratio (09)

Conclusion

This sequence is amazing because Fibonacci discovered is everywhere. Fibonacci numbers in real life which creates strange among us. The study of nature is very important for the learners. Finish by the words of Leonardo da Vinci "Learn how to see, Realize thateverything connects to everything else". Fibonacci number and golden ratio were used architecture are difficult to prove without original documentary evidence. Modern architects have been inspired by Fibonacci numbers and golden ratio. (10) (11)

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