

# The Art and science of Golden proportion

AG.Rao



# Art and Science of Golden proportion

## A.G.Rao

We use mathematics in our daily life. Let us find out simple maths of ratio and proportion. Then we can also discover the Mystery of Golden proportion in Nature and Art.

What is ratio?

Ratio is a way of comparing any two quantities measured in numbers.

Ratio can be between.

- Milk and water
- Apples and Rupees
- Days and work (like planting trees)
- Many more

Ratio is sometimes called proportion, often when referred to measures in the same item.

Proportion of a square is its ratio between sides. (equal to 1).

Proportion of a rectangle is its ratio between width and height.

Proportion can be between two ratios.

Take an example: Your mother is cooking Rice (for 3 persons). She takes 1 cup of Rice and 2 cups of water. Your uncle phones and says his family (3 persons) is coming for lunch. Your mother takes 2 cups of Rice and 4 cups of water.

This we can be written as

**Cups of Rice**    | 1 | 2 | |

-----  
**Cups of Water**    | 2 | 4 | |

Now your father's friend from Delhi joins you with his family (of 3).  
How much Rice & water your mother has to put?

**Cups of Rice 3**  
**Cups of water 6.**

It is simple. Every time you multiply with '2'. If one more family joins, it will be

Cups of Rice 4

Cups of water 8.

<b>Cups of Rice</b>	1   2   3   4	
<b>Cups of Water</b>	2   4   6   8	
<b>Multiplication factor</b>	2	2 2 2 2

This is called direct proportion. If mother cooks Dal. She puts 1 small cup to 3 small cups of water. Then we can write Ratio Table

<b>Small Cups of Dal</b>	1   2   3   4	
<b>Small cups of water</b>	3   6   9   12	
<b>Multiplication Factor</b>	3	3 3 3 3

Here we have increased water in the ratio of 1 to 3, or multiplied by 3. This is also direct proportion.

Do plants grow in direct proportion to time?

Do human being grow in direct Proportion?

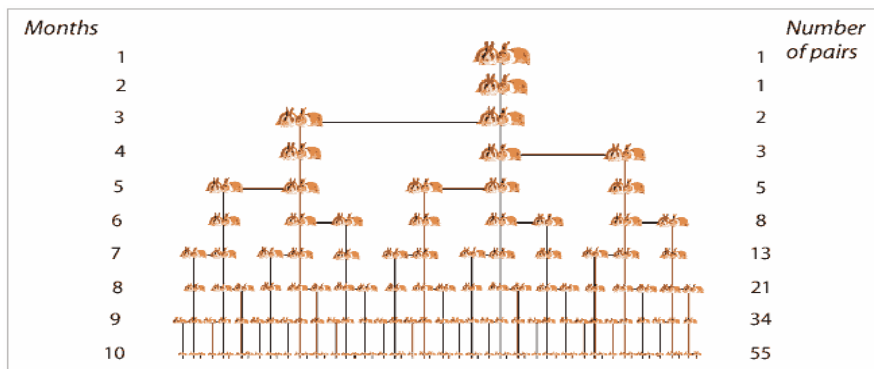
Let us assume height of 1 year old baby is 1 ft. If the baby grows in direct proportion. After 2 year baby will be 2 ft. After three years 3 feet and soon.

Height of baby	1   2   3   4   5   6   7   8   9   10
Age in years	1   2   3   4   5   6   7   8   9   10
Multiplication factor	1 1 1 1 1 1 1 1 1 1

This does not happen,

Fibonacci, an Italian Mathematician in 1200 A.D. studied population growth in rabbits in a year and found interesting series of proportion.

## Rabbits



This can be put into a 'Mathematical series.

**0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55**

Here you have to add previous number to each number to get next number.

This is called Fibonacci Series.

If you look at the proportion between each consecutive numbers after a while it remains same as 1.618. This is called Golden Proportion.

# Constructing a golden spiral



## Step 1

Make a square of any size



## Step 2

Draw an arc in the inside of the square



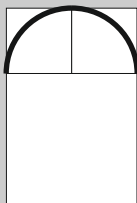
## Step 3

Draw another square of same length



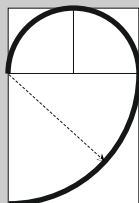
## Step 4

Draw an arc along the second square as shown



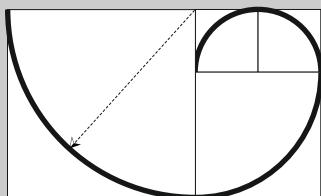
## Step 5

Make another square of length equal to the previous two squares...



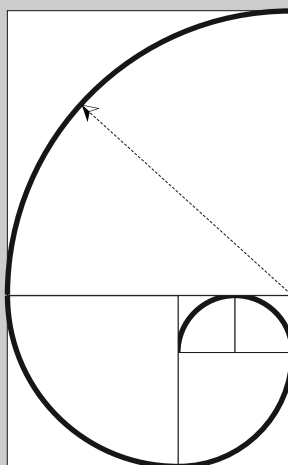
## Step 6

...and draw an arc as shown in the figure



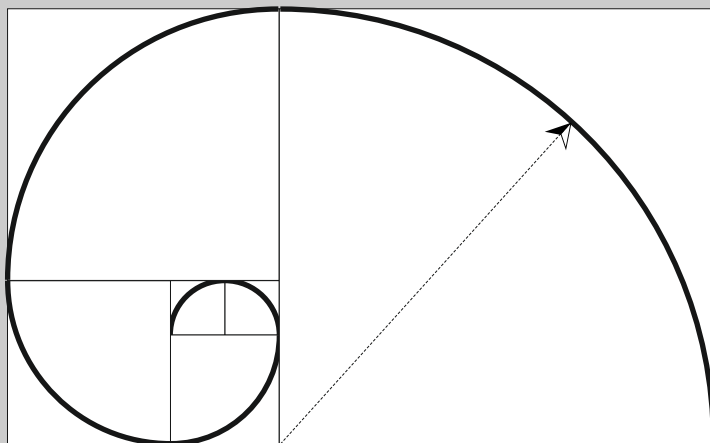
### Step 7

Draw another square as shown in the figure and an arc inside it



### Step 8

Continue to draw another square and the arc.



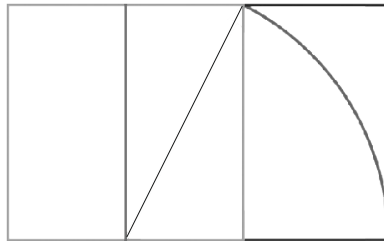
### Step 9

You can go on extending the spiral as you want by continuing to draw arcs.

## What is Golden Proportion?

Take a Square Divide it into 2 equal parts. Join mid point to top corner. Draw an arc with this length. Complete the Rectangle as shown in the next page.

This rectangle has a Golden Proportion.



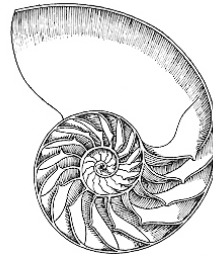
Fibonacci Series of Proportions can be constructed into a spiral as shown in the middle pages. This spiral is called Fibonacci Spiral.

We can see Fibonacci Spirals in nature ie. Sun Flower, Pine apple, Pine Cone, Horns of animals and sea Shells.

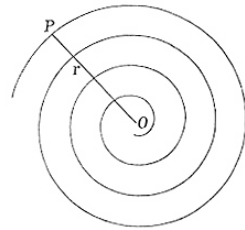
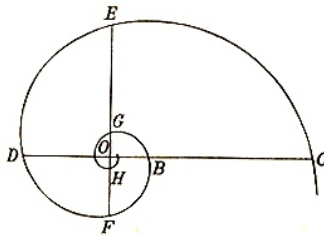
Pine cone has 5 spirals in one direction and 8 in other. The pine apple has 8 & 13. The daisy and cone flower both have 21 and 34. The sun flower has amazing 55 and 89



How is a shell formed. A snail or Nautilus builds its house around it. In one season it increases its size. It leaves the old house and builds a new house. Again next season it grows longer and build bigger house next to the previous. This becomes a spiral. All shells have spiral forms. Some shells follow golden spiral.



There are other spirals like Archimedean spiral, equi-angular spiral and logarithmic spiral.



The Mosquito coil you use has a Archimedean Spiral. .

Golden Spirals are also seen in the Cosmos.

Golden proportion in Art and architecture

Greeks used golden proportion in the famous temple of Parthenon.

Leonardo da Vinci used golden proportion in his famous painting of 'Mona Lisa' and others. His vitruvian Man with golden proportion is Famous. In recent times the famous French architect and city planner Introduced the concept of "Modular" in Architecture based on Golden proportion. He also planned the city of Chandigarh on the invitation of Pandit Jawaharlal Nehru.

We will learn about golden proportion and Fibonacci series through stories, talks, play nature- decoding, painting and building models.



Now that you know golden proportion and Fibonacci Series, solve the 'word puzzle' given below!

This

Message

Has a

Code which reveals

A hidden number series to

All those who attend the golden proportion workshop



AG BAMBU STOLE

