

# A Study Project on Observation, Appearances and Application of Golden Ratio ( $\Phi$ )

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**Abstract:** The purpose of this JIGNASA students study was to describe and analyze the Golden Ratio in Mathematics, Nature, Human body, Architecture, and professional development project. This project's primary goal has been to provide them to design or build any item with the tools of Golden Ratio and Golden Ratio to help make the vision of mathematics content accessible in Nature, Human Body and in the society. This Student study project used Observation, Appearances and applications orientated methodology. In this project all observation and appearance and some case study data collected in our M.V.S. Govt. Degree College and Mahabubnagar Dist. The results and analysis of this study project observed in the internet facility. The project is then analyzed to determine if it is an exemplary model for professional developments like build our houses, make some architecture, Make some Interior designs and the discussion of this study offers to improve our leadership skills, students' performance skills and to develop the appearances in our body and surrounding places. This project recommendation for future research and considers the role of the beauty of the systemic change in rural places.

**Keywords:** Fibonacci sequence, Golden Ratio.

## I. INTRODUCTION

**SEQUENCE:** A SEQUENCE OF REAL NUMBERS IS ANY FUNCTION  $s : \mathbb{N} \rightarrow \mathbb{R}$ .

### **Fibonacci sequence:**

The Fibonacci sequence is probably one of the most famous — and most widely written-about — number sequences in all of the mathematics. So why write about it, if it's been written about so much already? Well, because I can, and because it's fun — there are good reasons it's so popular! I plan to spend the next five posts (at least) talking about the Fibonacci sequence and its connections to other areas of mathematics.

The Fibonacci sequence is defined by the recurrence relation  $F_1 = F_2 = 1, F_n = F_{n-1} + F_{n-2} (n > 2)$ .

In English, this says that the first two Fibonacci numbers are both equal to 1, and any Fibonacci number from the third onward can be obtained by adding the previous two Fibonacci numbers. So the third Fibonacci number is  $1 + 1 = 2$ ; the fourth is  $1 + 2 = 3$ ; then  $2 + 3 = 5$ ; and so on. The first fifteen Fibonacci numbers are 1,1,2,3,5,8,13,21,34,55,89,144,233,377,610

As you can see, they get large fairly quickly. The 31st Fibonacci number is the first to exceed one million, and the 45th is already bigger than one billion.

The definition of the Fibonacci sequence is quite simple, but there's a LOT more here than meets the eye, which I hope to expand on in subsequent posts. For now, we'll start with this simple observation: what happens if you sum all the Fibonacci numbers up to a certain point? For example, let's add up all the Fibonacci numbers up to 5:  $1 + 1 + 2 + 3 + 5 = 12$ . Okay. How about going one further:

### **Golden Ratio:**

The division of a line segment whose total length is  $a + b$  into two parts  $a$  and  $b$  where the ratio of  $a + b$  to  $a$  is equal to the ratio  $a$  to  $b$  is known as the golden ratio. The two ratios are both approximately equal to 1.618..., which is called the golden ratio constant and usually notated by  $\Phi$ :

$$\frac{a+b}{a} = \frac{a}{b} = 1.618 \dots = \frac{1+\sqrt{5}}{2} = \Phi.$$

The concept of golden ratio division appeared more than 2400 years ago as evidenced in art and architecture. It is possible that the magical golden ratio divisions of parts are rather closely associated with the notion of beauty in pleasing, harmonious proportions expressed in different areas of knowledge by biologists, artists, musicians, historians, architects, psychologists, scientists, and even mystics. For example, the Greek sculptor Phidias (490–430 BC) made the Parthenon statues in a way that seems to embody the golden ratio; Plato (427–347 BC), in his Timaeus, describes the five possible regular solids, known as the Platonic solids (the tetrahedron, cube, octahedron, dodecahedron, and icosahedron), some of which are related to the golden ratio.

The properties of the golden ratio were mentioned in the works of the ancient Greeks Pythagoras (c. 580–c. 500 BC) and Euclid (c. 325–c. 265 BC), the Italian mathematician Leonardo of Pisa (1170s or 1180s–1250), and the Renaissance astronomer J. Kepler (1571–1630). Specifically, in book VI of the Elements, Euclid gave the following definition of the golden ratio: "A straight line is said to have been cut in extreme and mean ratio when, as the whole line is to the greater segment, so is the greater to the less". Therein Euclid showed that the "mean and extreme ratio", the name used for the golden ratio until about the 18th century, is an irrational number.

In 1509 L. Pacioli published the book *De Divina Proportione*, which gave new impetus to the theory of the golden ratio; in particular, he illustrated the golden ratio as applied to human faces by artists, architects, scientists, and mystics. G. Cardano (1545) mentioned the golden ratio in his famous book *Ars Magna*, where he solved quadratic and cubic equations and was the first to explicitly make calculations with complex numbers. Later M. Mästlin (1597) evaluated  $1/\phi$  approximately as 0.6180340... J. Kepler (1608) showed that the ratios of Fibonacci numbers approximate the value of the golden ratio and described the golden ratio as a "precious jewel". R. Simson (1753) gave a simple limit representation of the golden ratio based on its very simple continued fraction  $\Phi = 1 + \frac{1}{1 + \frac{1}{1 + \dots}}$ . M. Ohm (1835) gave the first known use of the term "golden section", believed to have originated earlier in the century from an unknown source. J. Sulley (1875) first used the term "golden ratio" in English and G. Chrystal (1898) first used this term in a mathematical context.

The symbol  $\Phi$  (phi) for the notation of the golden ratio was suggested by American mathematician M. Barrwas in 1909. Phi is the first Greek letter in the name of the Greek sculptor Phidias.

Throughout history many people have tried to attribute some kind of magic or cult meaning as a valid description of nature and attempted to prove that the golden ratio was incorporated into different architecture and art objects (like the Great Pyramid, the Parthenon, old buildings, sculptures and pictures). But modern investigations showed that these are mostly misconceptions: the differences between the golden ratio and real ratios of these objects in many cases reach 20–30% or more.

"The **Golden Ratio** is a universal law in which is contained the ground-principle of all forms striving for beauty and completeness in the realms of both nature and art" Wikipedia. The golden ratio otherwise known as the Divine Proportion or Phi is a mathematical ratio with special properties and aesthetic significance. An enormous number of things in the universe are engineered around the ratio, ranging from the human. The divide ratio and golden rectangles appear throughout the ancient architecture and art. The golden ratio is believed to be the most aesthetically pleasing and harmonious means of design. Statistical analysis indicates that "the people involuntarily give preference to proportions that approximate to the Golden Section (Golden ration)", See [1]. The Fibonacci numbers are Nature's numbering system. They appear everywhere in Nature, from the leaf arrangement in plants to the pattern of the florets of a flower, the bracts of a pinecone, or the scales of a pineapple. The Fibonacci numbers are therefore applicable to the growth of every living thing, including a single cell, a grain of wheat, a hive of bees, and even all of mankind. It plays a vital role in the arrangement of petals in flowers, the structure of DNA and various proportions in the human face, the structure of seashells etc. The occurrence of this proportion in zoology is frequent, viz in the clock cycle of brain waves, in hearing and balance organ etc. Here we wish to explore the mysterious secrets of the golden ratio concealed in the human anatomy.

The golden mean (shown by Greek letter phi ( $\phi$ ) with value 1.618033987499..) and the Fibonacci numbers are among those mysterious numbers that have fascinated mathematicians, philosophers, and artists for more than 2000 years. While the golden mean has always existed in mathematics, it is unknown exactly when it was first discovered and applied by mankind. It is reasonable to assume that it has perhaps been discovered and rediscovered throughout history. Phi and the Fibonacci numbers can be found in many places throughout the universe. A study revealed that the shape of the universe may, in fact, be a dodecahedron based on the golden mean. A self-funded research organization (ELFRAD) which tracks radiation on Earth through an array of antennas, has found an extremely low-frequency signal at phi. Another study has shown that the dimensions of the Earth and Moon are in phi relationships, forming a golden triangle. In January 2010 Science Daily and Physics World announced the discovery of a golden mean in a solid state matter. The golden mean also seems to be appearing in several places in quantum physics.

#### **Saturn reveals a Golden Ratio $\phi$ relationship in several of its dimensions:**

The diameter of Saturn is very close to  $\phi$  relationship with the diameter of ring around the planet

Diameter of Saturn = 1,16,464 km

Diameter of Saturn ring = 1,90,348 km

$$\phi = \frac{1,90,348}{1,16,464} \approx 1.618$$

From this our observation is similarly in all planets in the universe are in the Golden Ratio, so the entire Universe appears like getting stars in one's eyes

## **II. PROJECT METHODOLOGY**

### **Introduction:**

This Student study project used observation and case study methodology to describe and analyze the Golden Ratio in Human Body, Nature, Architecture and Society for Beauty of Mathematics professional development project. This Golden Ratio project's primary goal has been to provide Beauty with the knowledge, tools, and materials to help systematic arrangements of our Panes and surroundings in real life. By using this methodology the Mathematics content easily accessible to other subject students. This Student study project focused on the implementation of Mathematics Application in World for the professional development of the students. This section outlines the student study project methodologies and procedures of this qualitative student study. By observing the golden ration each and every student to be set their life as wonder. A description of the setting of the study, research design, data collection, and data analysis are included in this section.

### **Description of Setting:**

The professional development this project serves all over the world for example if a contractor or an engineer utilize the application of Golden ratio for build a building he will succeed the comparatively other companies. The golden ratio system is used

all over the world but they don't know about the golden ratio. In the rural area, most of the people observed the beauty of nature but not observed the golden ratio in it. Nearly 50% of people have used Golden Ratio Length. This kind of situation I observed and attain a problem of and we find a solution. This project is improving the application-oriented teaching profession skills in undergraduate and graduate college Mathematics teacher. If the government observes the golden ratio then they will successes in future ruling for the beauty of the government policies. The commitment of this project is "to provide a comprehensive educational opportunity in the life sciences, Mathematical Sciences, and Physical Sciences within a context of enlightened liberal education. This project intent is to educate students who will communicate relatively and shape the public's perceptions of issues and events easily. In this observed professional development covered specific mathematical content knowledge, teaching strategies, and implementation tips specific to the curriculum.

**Data Collection:**

We are observed the Fibonacci Series numbers and Golden ratio numbers for getting ideas to build our life as a beauty. We observed and appearances of the student faces our B.Sc Mathematics student and all teaching staff of M.V.S Govt. Degree College (A), Mahabubnagar from August 2018 for JIGNASA student study project those who are coming college regularly and collected photos, and observed college campus building trees, playground, and flower in the college. We have collected some different type pics of the flower which are situated in Mahabubnagar Dist. and also we are observed some constructed buildings which are situated in Mahabubnagar Dist. We interviewed 20 B.Sc(MPC & MPC) II year Students life cycle of education from the beginning classes. We conducted survey on golden ratio by taking three type of ratios Square, Rectangle and, Golden Ratio We also read stories about Dirubai Ambhani, Tata Birla, Laxmi Mittal and Flipkart, AMAZON. We also collected some videos on dance.

**Collection of Data On Good looking by asking question sheet with students signature:**



**Collection Student and Faculty Photos for observing Golden Ratio:  
This photos Collection during Mathematics Day celebration on 22-12-2018  
Faculty**



**Students**







**Collection of Different type Ratios**

Square, Rectangular, Golden Ratio, Circle, Sphere, Spiral, Triangles, etc.

**Collection of Different type of Flowers and tree Photos in Mahabubnagar Dist. and our College.**



**Collection of Numbers:**

**0, 1, 2, 3, 4, 5, 6, 7, 8, 9**

**Observation on Dance:**

We observed dance videos in some parties, YouTube and TV Shows.

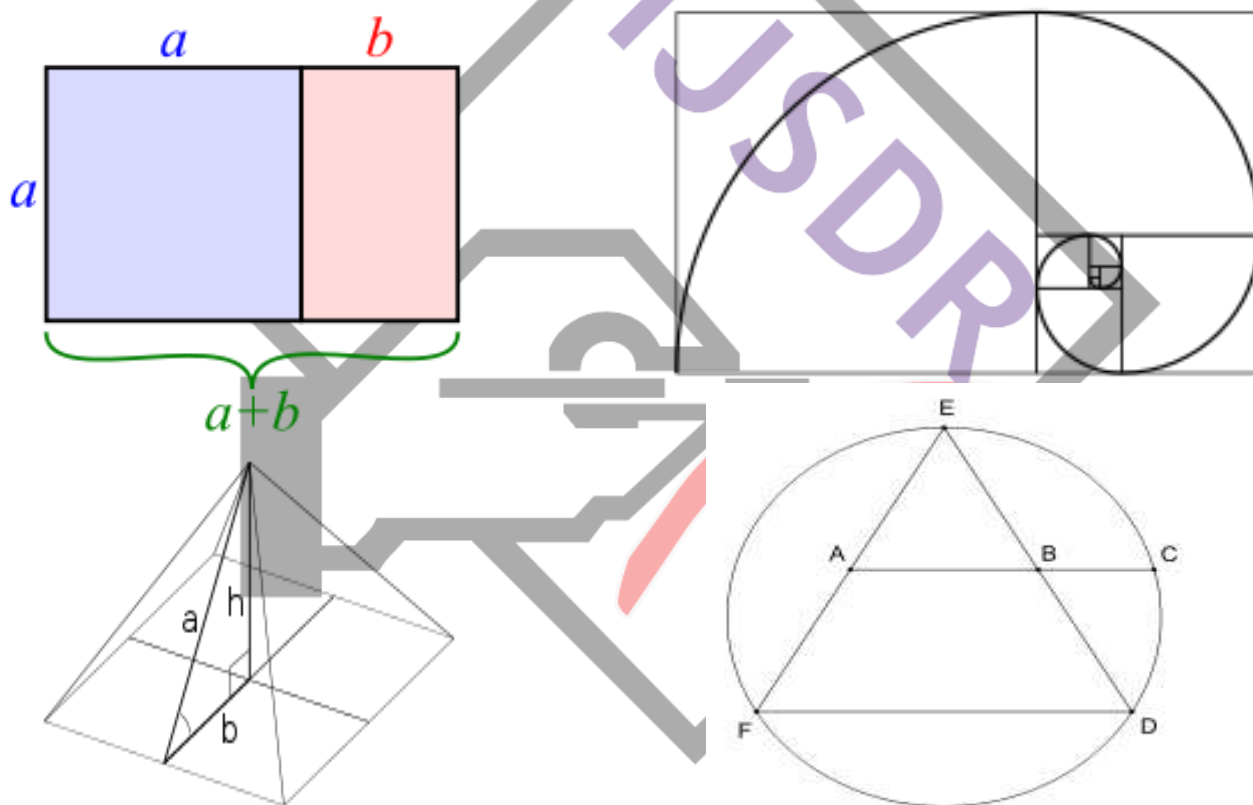
**3. Main Section**

**Data Analysis:**

The JIGNASA Study project data analysis, observations, and appearances occurred both during and after data collection. The data collection for this study project occurred over a four-month period and generated a considerable amount of data. Field notes were taken during observations of faces of students and faculty of our college, Nature, Trees, building, Architecture and which is looking beautiful for our eyes. For the professional development of the students and while reviewing archival records. Reflective notes were recorded immediately after each interview, and again after the interviews, a follow-up conversation allowed for any necessary clarification of the data. Our students in the project and my relationship with the data sources allowed easy access to follow up data that were needed. "There is no standard format for the reporting case study for this project. In organizing my data and selecting our approach to the analysis, we decided to present this case study using a framework that I designed and constructed

based on our collection. This project experiential learning model has been adapted and used by students who have participated in this JIGNASA Student project. The Project designers believed that the house and architecture models would address students need for a manageable framework to integrate the project's major curriculum areas—standards-based mathematics, they were transcribed. Transcripts of each interview were shared with each student and a follow-up conversation allowed for any necessary clarification of the data. Our students in the project and my relationship with the data sources allowed easy access to follow up data that were needed. "There is no standard format for the reporting case study for this project. In organizing my data and selecting our approach to the analysis, we decided to present this case study using a framework that I designed and constructed based on our collection. This project experiential learning model has been adapted and used by students who have participated in this JIGNASA Student project. The Project designers believed that the house and architecture models would address students need for a manageable framework to integrate the project's major curriculum areas—standards-based mathematics, then the model provides a framework for the development of lessons which begin with concrete experiences, followed by reflection on those experiences to lay the foundation for students to be able to integrate their prior knowledge with the new concept being about the concept and provides guided practice and opportunities for students to creatively apply the new concepts to other situations. The project uses the instructional model as a guide for designing student instructional tasks, and also as a template for organizing the professional learning presented. The teacher then draws on students' prior knowledge to inform them about the concept and provides guided practice and opportunities for students to creatively apply the new concepts to other situations. The project uses the instructional model as a guide for designing student instructional tasks, and also as a template for organizing the professional learning experiences of teacher participants. I believed our models could be used as both an as the framework for data analysis and as a framework for presenting the case study.

We took the following shape of Golden Ratio and observed on Faces, Flowers, Trees, Step of the Dance and Numbers.



## Summary:

This student study project method to collect data on the students and faculty of our college since August 2018. Data was collected from students observations, Appearances, interviews with Students and collection of pics of Nature flowers, teacher, buildings, and architecture, project facilitators, and the students project director, and from an analysis of project artifacts during the time period studied. The data is presented and analyzed in this study. Lessons learned from this study and implementations for models of beauty are discussed in this study project.

## FINDINGS OF THE STUDY:

We have been conducted survey on the following questions.

1. Take a quick survey of students. Ask them “Which of the three pictures is the most naturally appealing?” You can easily crop your own pictures. One is a square, one is about twice the length as the width, and the other is close to the Golden Ratio (we used 5x7).
2. In class, have the students’ measure five more rectangular objects. Fill in the last five rows on the worksheet they completed for homework. Bring in things they can measure. (Or find things in the classroom)
  - DVD note cards o textbooks
  - Magazines
  - Desk
  - cell phone screen
  - computer screen
  - door frame o posters

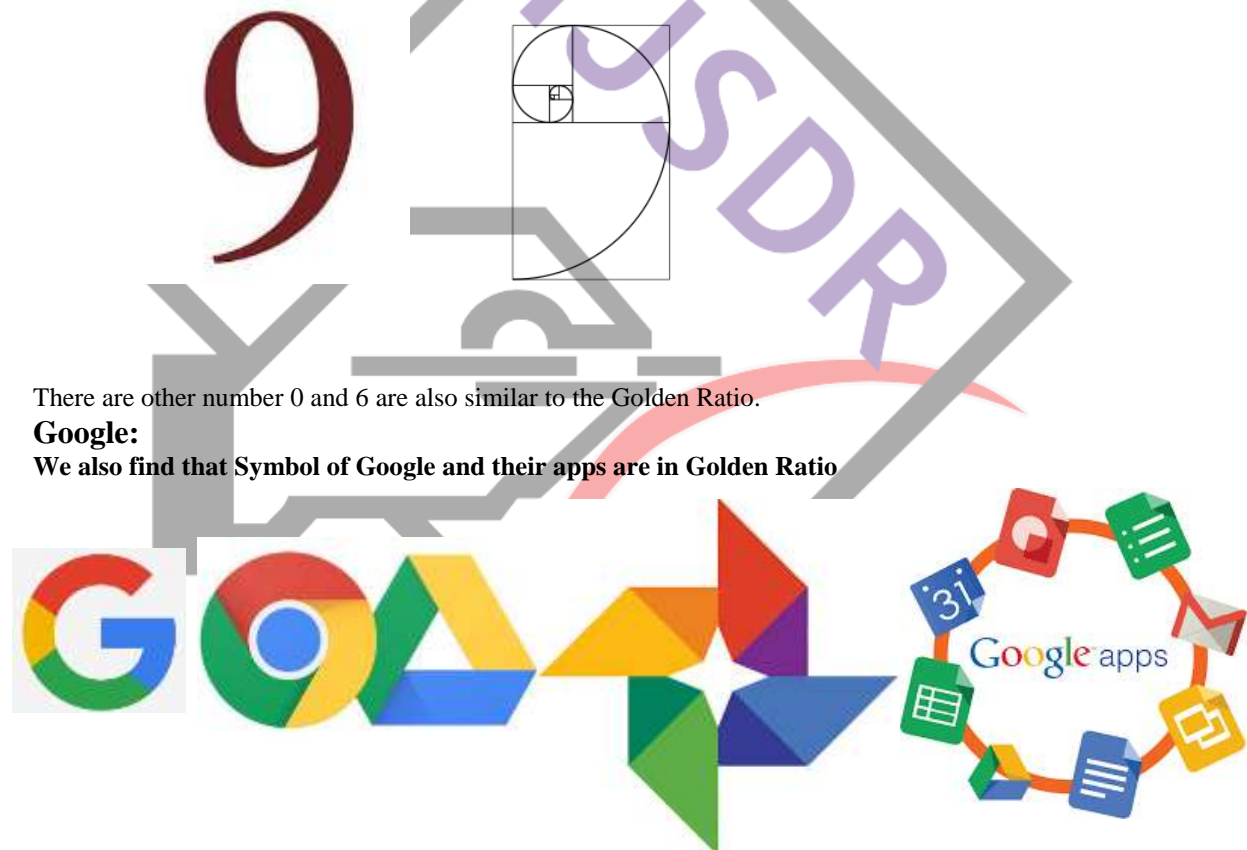
Once their worksheet is filled out, have them find the mean of all of their ratios. Write their ratios on the board so they can see that they are all similar.

Have a small discussion on why they think the ratios are similar. If they are stuck tell them that the ratios of the “visually appealing” photographs they looked at earlier all have a ratio that is similar to theirs.

3. We observed and asked some question to the student by seeing some videos on YouTube.

**Numbers:** Why crazy about Number 9 ?.

Most of the people are interested on nine for this we have observed that the number 9 is similar to Golden ratio shape and most of Fibonacci numbers are Odd.



- **Car Wheels and designs:**  
We find those good looking cars are in Golden Ratio.
- **Dance:**  
By observing the stage dance and Video dance if the movements of the dance are Golden ratio form (map) then that dance looking good. Most of the successful dances are in Golden Ration which are Solo Dance, Dual Dance, Circle formation Dance and Curve formation Dance.





▪ **Fibonacci sequence in nature:**

Fibonacci can be found in nature not only in the famous Rabbits experiment but also in beautiful flowers. On the head of Sunflower and the seeds are packed in a certain way so that they follow the pattern of Fibonacci sequence. The petals of flowers and other plants may also related to Fibonacci sequence in this way they create new petals. Probably most of us have never examined very carefully the number or arrangement of petals on a flower we observed that appearances Golden ratio in.

- 1 petal : White Cally Lily
- 3 petals : Lily, Iris
- 5 petals : Buttercup, Wild Rose, Larkspur
- 8 petals : Delphiniums
- 13 petals : Corn Marigold
- 21 petals : Aster, Black- eyed susan
- 34 petals : Plantain
- 55 & 89 petals : Michaelmas Daisies

We have collected some pics and we observed which are in golden ratio at our college and in Mahabubnagar Dist. We found the following flower Ipomoea nil (Kolli Vittulu, Krishna Beeja) in Kakarlapahad village, Mahabubnagar dist. Which is eight petals flower.



We have collected different type of petal flowers and trees in various places





**The following trees and flowers found at of M.V.S Govt. Degree College (A), Mahabubnagar**



**he following Building located in Marlu Mahabubnagar and which is in Golden Ratio.**



**The following church located in Christianpally which is Golden Ratio**



**Double bedroom Plane to Telangana Government in Golden Ratio:**

We are also taken golden ratio length and build a model house for Telangana Government for double bedroom houses in villages.



▪ **Organs of human body:**

**Human body exhibit Fibonacci characteristics:**

If we examine human face each part to its another part will be in 1.618 ratio. So some faces of humans appear attractive. Not only human face but also other body parts as well as some human structures appear attractive because of existing Golden Ratio. Several ratios in human face : Total width of two front teeth in upper jaw over their height gives Golden Ratio Width of first tooth from the center to the second tooth gives Golden Ratio. Length of face to the width of the face Distance between the lips and where the eyebrows meet or length of the nose Every human has two hands each one hand has five fingers and each finger has three parts which are separated by two knuckles. All of these numbers fit into the sequence. In this way the length of the bones in a hand are in Fibonacci numbers and exhibit Golden Ratio. We are collected some student photos which are in Golden ratio.



**Golden Ratio in universe:**

We have observed and discussed every beautiful creature is definitely formed through Golden Ratio, every planet in the universe is formed on the basis of Fibonacci numbers will be in the ratio 1.618. We observed that It can be clearly explained through planet Saturn.

**Golden Ration in Architecture:**

We have Made some item which are in golden ratio. We are planning to give some companies this kind of design are useful to build their techniques for sale items..





## Fibonacci in Music:

The Fibonacci sequence of a numbers and the Golden ratio are manifested in music widely. The numbers are presented in the Octave, the foundational unit of melody and Harmony used the Golden ratio to make greatest string in instrument ever created. 8 white and 3 blacks , 13 blacks and 1 white produces melodious music.

## Conclusion:

While some may dispute the significance of the Golden Ratio, it is apparent that through our history there has been a fascination with it. Many will speculate on the validity of it in nature, as well as in our history. It's important to realize that, while although some of these examples mentioned are in fact not quite perfect to Golden Ratio, there still is a significance to the approximate value. We have come to conclude that it is not the "holy grail" of numbers, but merely a great measurement to start from. There happens to be an uncanny appeal to the aesthetics of this ratio and we intend to keep using it in my works. If you are looking for an improvement in your own aesthetics, the Golden Ratio will be a great resource. The Fibonacci numbers are Nature's numbering system. They appear everywhere in nature, from the leaf arrangement in plants to the pattern of the florets of a flower, the bracts of a Pinecone, or the scales of a Pineapple. Therefore, the Fibonacci numbers are applicable to the growth of every living thing, including a single cell, a grain of Wheat, a hive of Bees and even all of mankind.

Nature follows the Fibonacci numbers astonishingly. If we study the pattern of various natural things minutely, we observe that many of the natural things around us follows the Fibonacci numbers in real life which creates strange among us. The topic is chosen so that learners could be interested in the study of nature around them.

Security in a communication system is an interesting topic at present as INDIA is going towards digitalization. A little bit of concept for securing data is also provided in this model.

Let us finish by the words of Leonardo-Da-Vinici "Learn how to see, realize that everything connects to everything else." While only a few examples are illustrated in this paper, it can be seen that the Fibonacci sequence and golden mean appear repeatedly, from the quantum level to the entire universe. Surely, the pervasiveness of these numbers is not a coincidence and, perhaps, even illustrates a larger connection that has yet to be discovered. Any further study of Phi and the Fibonacci sequence is appreciated and will help lead to a deeper understanding of beauty and spirituality in life.

Finally in the world beautiful items and which are in golden ratio form are in golden ratio.

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