

Golden Ratio in Human Bodies, Arts and Architecture

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1. Fibonacci numbers

- **Fibonacci sequence** is one of the most famous sequences in history.

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

$$x_n = x_{n-1} + x_{n-2}$$

Sun Flowers



A Cactus Tree



3 spirals

5 spirals

ภาพจาก <http://www-gap.dcs.st-and.ac.uk>

Finger Bones and Romanesco



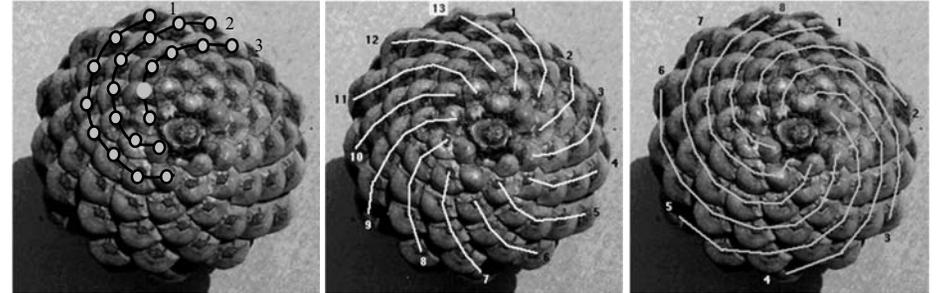
Length of each finger bone



Spiral rotation of the peak of the Romanesco cauliflower is consistent with Fibonacci numbers.

Source: <http://wwpub.naz.edu:9000>

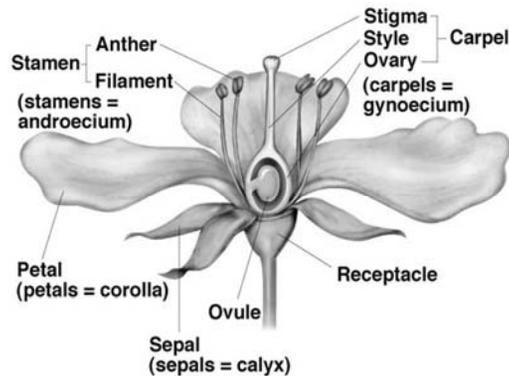
Pine Cones



The button of the pine cone is arranged neatly with the number of buttons corresponding to Fibonacci numbers.

Source: <http://www.mcs.surrey.ac.uk>

2. Flowers and Fibonacci Numbers



Flower composition (Source: <http://learners.in.th>)

- 1.Sepal (กลีบเลี้ยง) 2.Petal (กลีบดอก) 3.Stamen (เกสรตัวผู้)
- 4.Pistil (เกสรตัวเมีย) 5.Receptacle (ฐานรองดอก)
- 6.Ornamental leaves (ใบประดับ) 7.Blossom (ดอกย่อย)

Golden ratio

- If we write Fibonacci sequences 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, ... as the following ratio

$$\frac{1}{1}, \frac{2}{1}, \frac{3}{2}, \frac{5}{3}, \frac{8}{5}, \frac{13}{8}, \frac{21}{13}, \frac{34}{21}, \frac{55}{34}, \dots, \frac{x_{n+1}}{x_n}, \dots$$

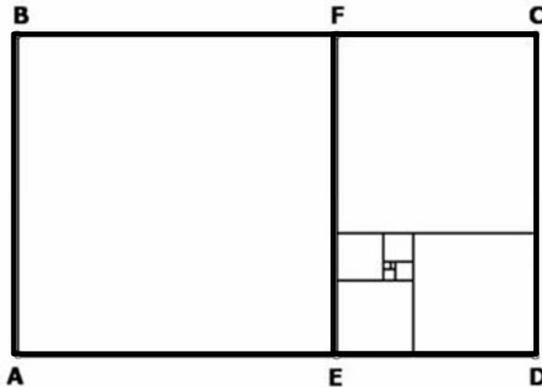
$$1, 2, 1.5, 1.667, 1.6, 1.625, 1.615, 1.618, 1.618, \dots$$

We found that this sequence will converge to **Phi** (Φ) or Golden Ratio which is **1.618...**

- The exact value of **Phi** is $\frac{1 + \sqrt{5}}{2}$ or about 1.61803398874989...

Golden Rectangle

is a rectangle where the ratio between the length and the width is the golden ratio or Phi.



$$\frac{BC}{BA} = 1.618 \dots$$

$$\frac{FE}{FC} = 1.618 \dots$$

What are related to Phi ?

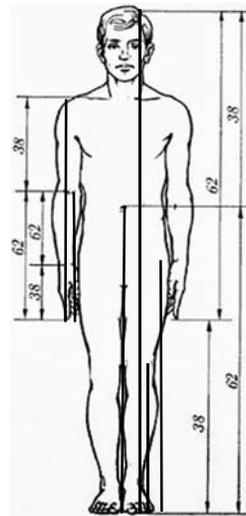
People have found that Phi is related to nature and many things such as

- Symbolism in the Arts
- Architecture such as Egyptian Pyramids
- Music
- Black hole
- Supernova
- String Theory

What are related to Phi ?

Ratio of body composition, human body structure such as

- Distance from head to floor divided by distance from the navel to the ground
- The distance from shoulders to fingertips is divided between the elbow and the tip of the finger.
- The distance from hips to floor is divided by the distance from the knee to the floor.



<http://fitnessandhealthforyou.blogspot.com>

Notre Dame de Paris

Notre Dame de Paris is also related to Phi.



(ภาพจาก <http://us.geocities.com/jyce3/leo.htm>)

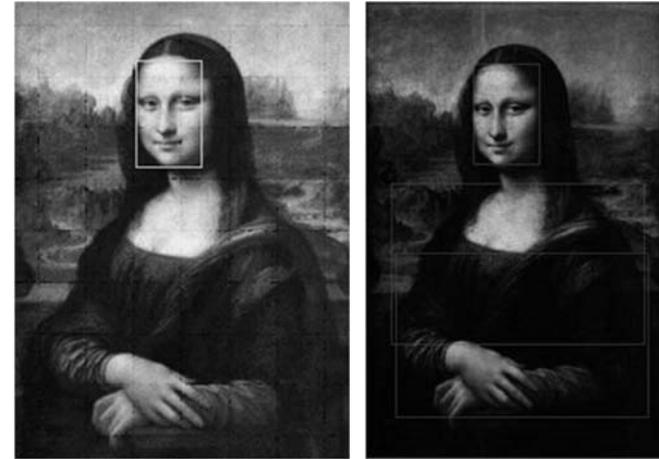
Parthenon in Athens



Parthenon in Athens with hidden golden rectangles.

(Source: <http://britton.disted.camosun.bc.ca/goldslide/jbgoldslide.htm>)

Mona Lisa Portrait

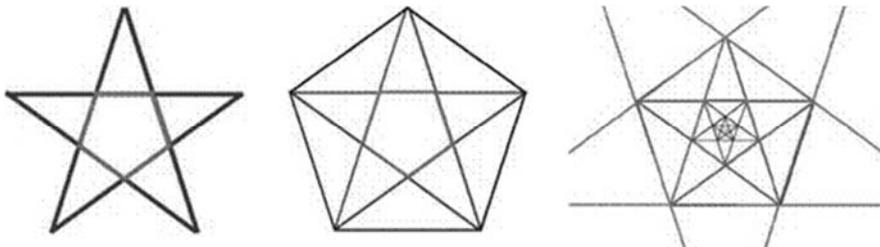


Golden rectangles appearing on the face and parts of Mona Lisa.

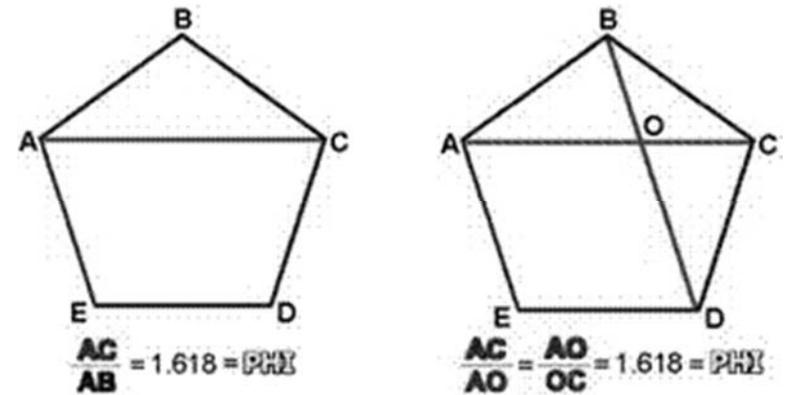
(source: <http://us.geocities.com/jyce3/leo.htm>)

Pentacle

- Pentacle or five-pointed star A symbol of religion BC was meant to represent a female.

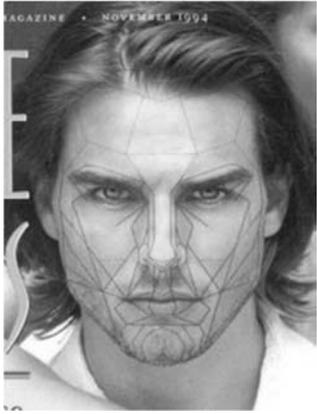


Pentagon



Pentagon is also related to Phi as well.

Facial Surgery



Tom Cruise



Angelina Jolie