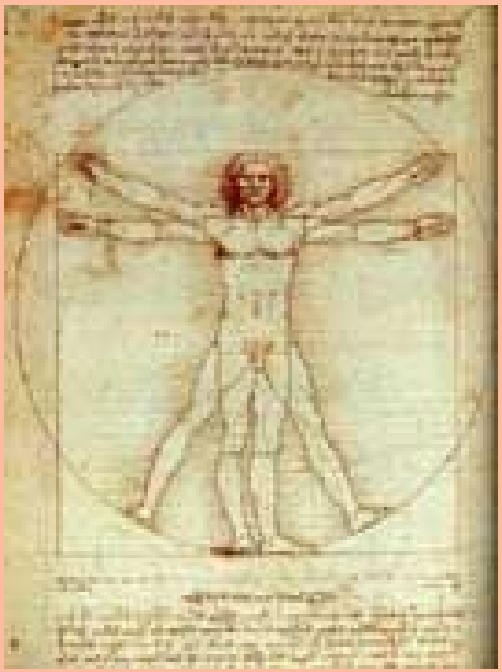
Does art serve mathematics or … does mathematics serve art?

The golden ratio - φ



by Irene Giarmenitou

We explore the relationship between mathematics and art and discover the wonders of mathematics in masterpieces of art.

Without mathematics there is no art.

Pacioli (1445-1517)

Where the spirit does not work with the hand there is no art.

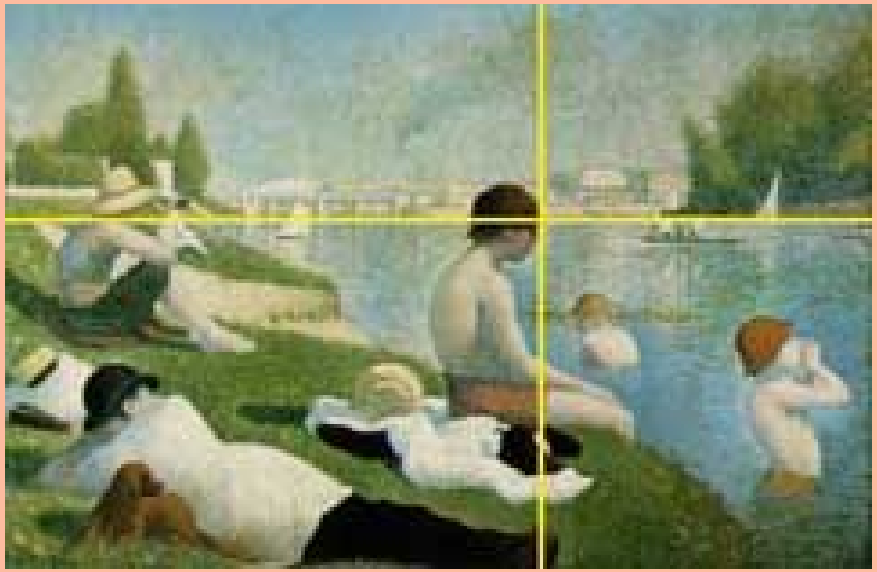
Leonardo da Vinci (1452-1519)

What's your opinion?

Leonardo Da Vinci the "Last Supper".

https://en.wikipedia.org/wiki/Leonardo_da_Vinci

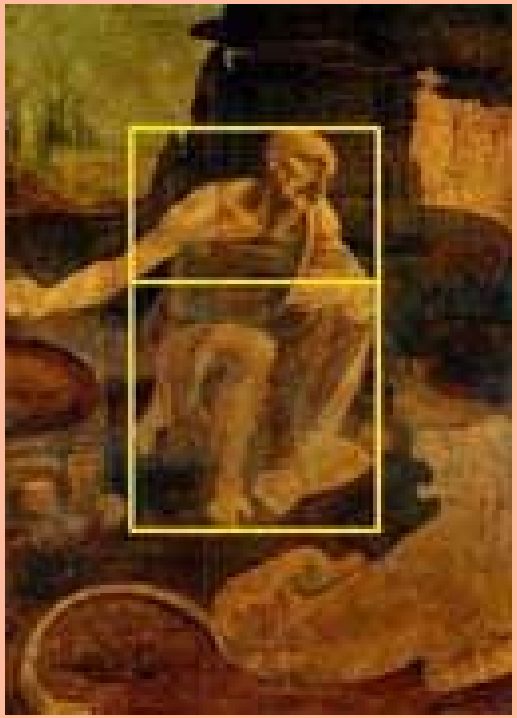
Da Vinci's ***Mona Lisa***

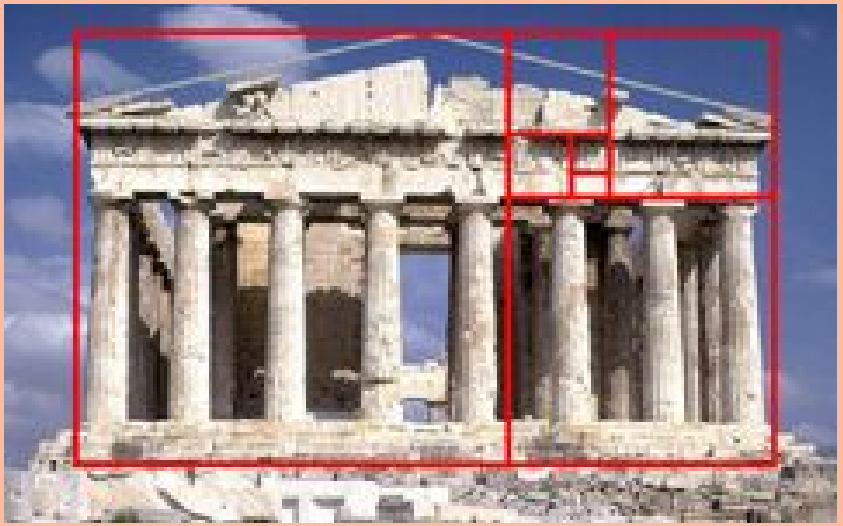


Bathers
by Seurat

https://en.wikipedia.org/wiki/Leonardo_da_Vinci
https://web.archive.org/web/20091125203146/http://britton.disted.camosun.bc.ca/goldslide/jbgoldslide.htm

WHICH RELATION CONNECTS THE DA VINCI PAINTINGS OR "TEMPLE OF ATHENA" - PARTHENON?

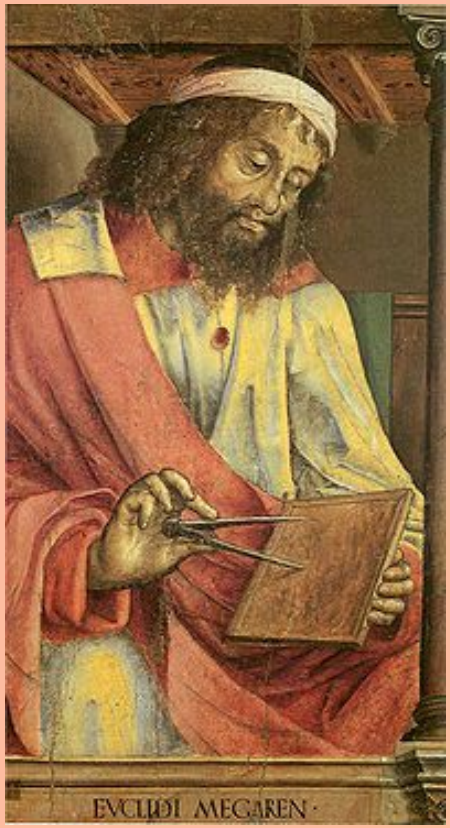




Leonardo's unfinished canvas ***Saint Jerome***
shows the great scholar with a lion lying at his feet.

4.09 Minutes video about Mona Lisa (Monna Lisa) -- Leonardo Da Vinci's Use of Sacred Geometry

https://www.youtube.com/watch?v=JFTSAjZEqPw



Euclid

The fraction that connects mathematics to art

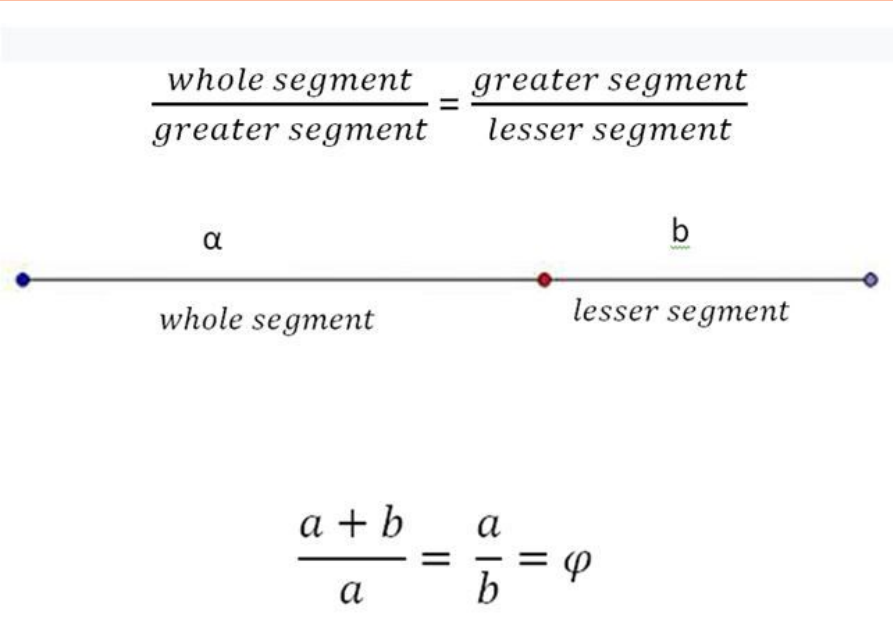
golden ratio φ
as..... in Phidias

(ph= φ in greeks)

https://en.wikipedia.org/wiki/Euclid

Golden ratio φ

- ***A straight segment is said to be divided into an end and a middle ratio, when as the whole (segment) has to the greater, so has the greater to the lesser.***

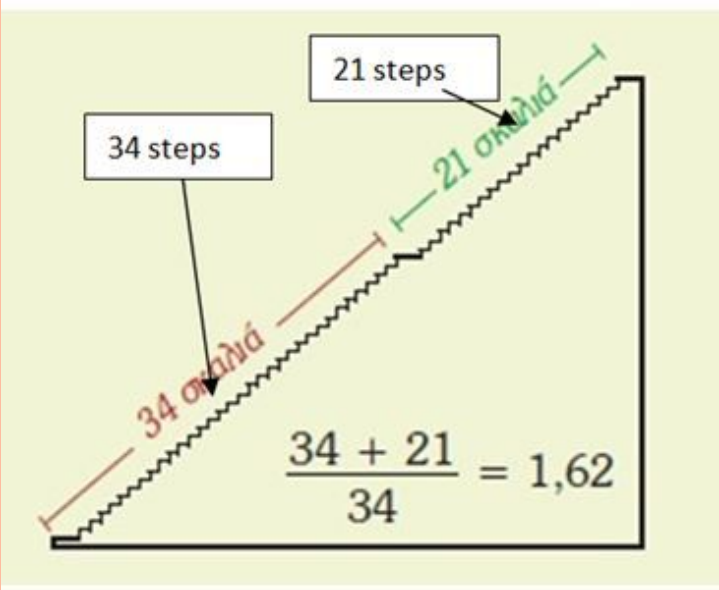


How can we divide a straight segment into two unequal parts, so that the result of this division creates a sense of harmony?

https://en.wikipedia.org/wiki/Ancient_Theatre_of_Epidaurus

The ancient Greeks ingeniously tackled the challenge of constructing two aisles in the theater of Epidaurus (end of the 4th century BC). They skillfully divided the theater steps into two unequal sections, creating an aesthetically pleasing outcome.

classwork



a) Calculate the ratios of the steps $\frac{34+21}{34} = \frac{34}{21}$

What do you observe?

Has the division been done randomly?

classwork

The problem can be stated as follows:

"Divide a line segment AB into two unequal parts AT=α and TB=b such that the ratio of the whole to the larger part is equal to the ratio of the larger part to the remaining segment."

b) Show that the solution of this problem boils down to solving the fractional equation $\frac{\alpha+b}{a} = \frac{\alpha}{b}$

c) Solve the fractional equation (1) and calculate α as a function of b.

d) Prove that the ratio $\phi = \frac{\alpha}{b}$ is equal to

$$\varphi = \frac{1+\sqrt{5}}{2} = 1.61803\,39887\ldots$$

Find information about :

group 1.
Vitruvian Man

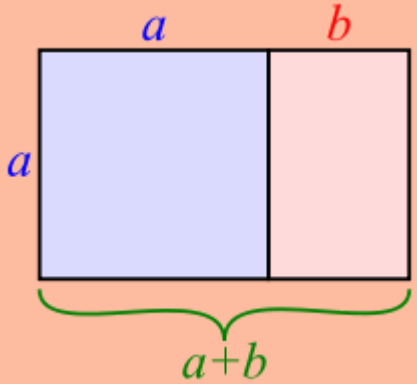
group 2.
Luca Pacioli

group 3.
Da Vinci

group 4.
Fibonacci

Write a small paragraph and post it on the workbook named Maths and Art.

Golden rectangular parallelepiped

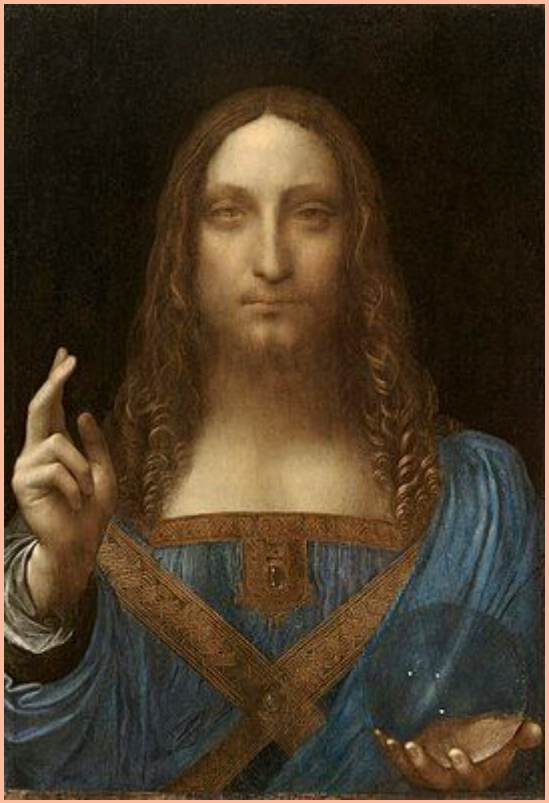


A rectangular parallelepiped of golden ratio, with longer side a and shorter side b, when placed next to a square with sides of length a, will produce a similar rectangular parallelepiped of golden ratio with longer side a + b and shorter a. This is what the relationship represents

$$\frac{a+b}{a} = \frac{a}{b} = \varphi.$$

https://el.wikipedia.org/wiki/%CE%A7%CF%81%CF%85%CF%83%CE%AE_%CF%84%CE%BF%CE%BC%CE%AE

Golden rectangular parallelepiped in art

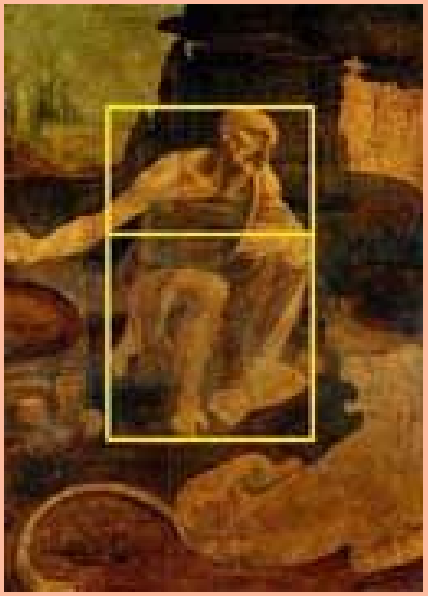


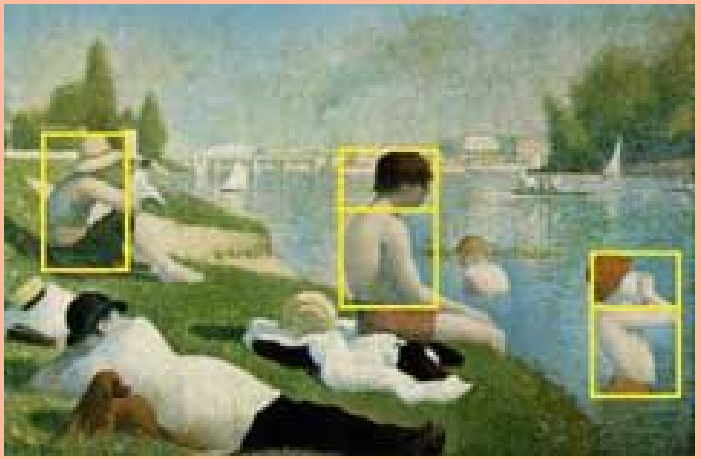
Salvator Mundi (latin for "Savior of the World') is painting attributed in whole or in part to the Italian high Renaissance artist Leonardo da Vinci , dated to c. 1499-1510.

watch the video here

Now , we can answer the question

What relation connects the paintings or "Temple of Athena" - Parthenon?





Golden ratio and ....music

The golden ratio can also be seen in the arrangement of sections in Claude Debussy's composition "Reflets dans l'eau" (Reflections in the Water) from his work "Pictures" (1st series, 1905). In this piece, the sequence of keys follows the intervals 34, 21, 13, and 8, with the main peak occurring at the position of the golden ratio. Renowned musicologist Roy Howat has noted that the standard limits of Debussy's "La Mer" align precisely with the golden ratio.

You can listen to it!

"Reflets dans l'eau"

Homework

Find a photograph of one

monument,
sculpture,
painting
element of nature or ……body

and write in a few words the relation with golden ratio.

post them on the workbook

LETS PLAY

CROSSWORD

each group can make their own crossword with
words from the lesson and post it on the workbook

https://crosswordlabs.com/

https://web.archive.org/web/20091125203146/http://britton.disted.camosun.bc.ca/goldslide/jbgoldslide.htm

https://en.wikipedia.org/wiki/Golden_ratio

https://en.wikipedia.org/wiki/Vitruvian_Man

https://en.wikipedia.org/wiki/Euclid

http://ebooks.edu.gr/ebooks/v/html/8547/2212/Mathimatika_G-Gymnasiou_html-empl/

https://el.wikipedia.org/wiki/%CE%9B%CE%BF%CF%8D%CE%BA%CE%B1_%CE%A0%CE%B1%CF%84%CF%83%CE%B9%CF%8C%CE%BB%CE%B9