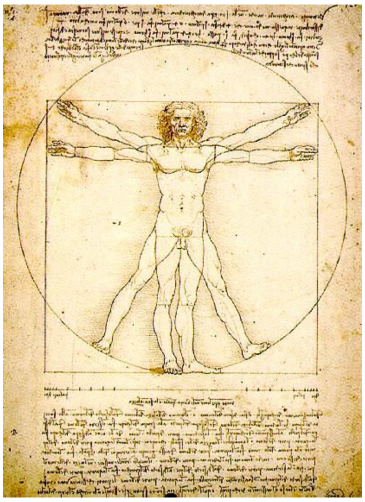
The GOLDEN RATIO in ARTS

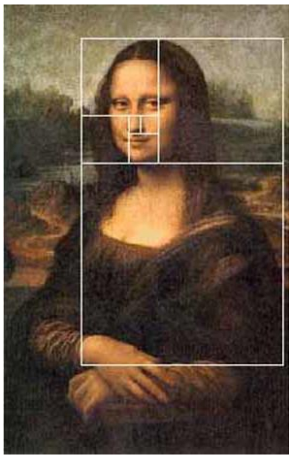
Though the tendency to look for an ideal proportion in art is perceptible in the Ancient Greek art, the genuine relationship between art and beauty was established during Renaissance.

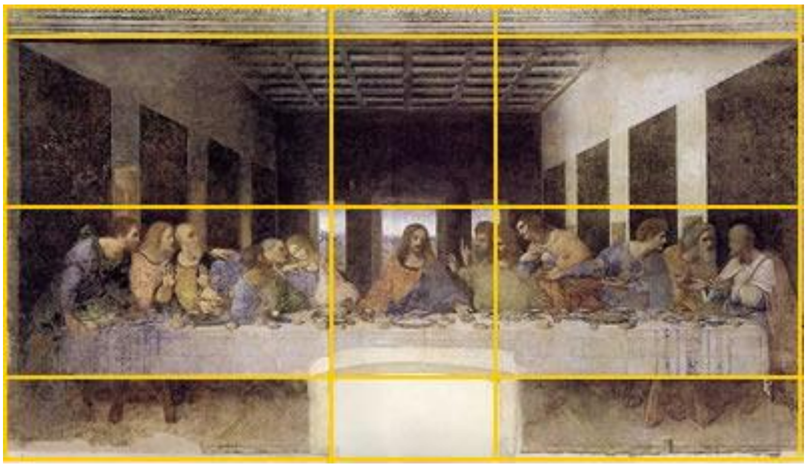


Leonardo Da Vinci and other artists and scholars of medieval Europe were fascinated by maths. They thought shapes involving ϕ had the most visually pleasing proportions, so they often worked them on paintings.

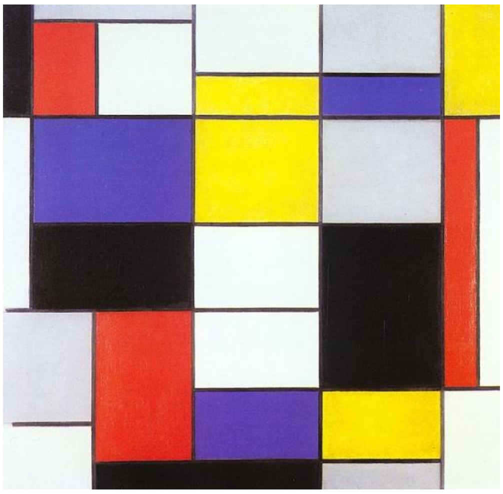
Da Vinci designed the Vitruvian man that shows the ideal proportions of the human body. The drawing depicts a male figure in two superimposed positions with his arms and legs apart and simultaneously inscribed in a circle and square. The ratio of the side of the square to the radius of the circle corresponds to the golden ratio.

Despite no evidence of the use of the divine proportion in Leonardo's works of art, the analysis of his paintings tremendously reveals the utilisation of the golden rectangle, whenever they depict a portrait (e.g. the *Mona Lisa*) or a scenery (e.g. *The Last Supper*).





Later, in the early XXth century, as the abstract art movement arose, artists showed a new interest for maths in general, and particularly the golden ratio, in their non-figurative artworks: Mondrian, in his Composition A (besides) is one of them.



The GOLDEN RATIO in ARTS- Student A

Task 1

Choose some of the rectangles drawn on the paintings and work out the ratio of their lengths to their width.

Painting	Length	Width	Ratio

Task 2 Fill in the gaps with the words in the box:

property	ratio	golden rectangle	ϕ	square

When a rectangle is constructed so that the _ _ _ _ _ of its sides is _, you get what is known as a "_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _". This rectangle has the convenient _ _ _ _ _ _ _ that if you were to cut it vertically so that one side is a _ _ _ _ _ , then the other side is also a golden rectangle.

Task 3

Highlight the rectangles from the paintings that tend to be golden rectangles.

Task 4 Dictate the following protocol of construction to Student B.

Let ABCD be a square and M the midpoint of [AB]. Draw an arc of circle with centre M and radius MC. It intersects the line (AB) at E. Draw the perpendicular to (AB) through E. It intersects the line (DC) at F.

Task 5 : Follow Student B's advices to build a pentagram.

Task 6

In task 4, Student B built a rectangle. Let's prove it's a golden rectangle, i.e. the ratio of its length to its width is ϕ.

Suppose the side of the square ABCD is 1 unit. We have AE=AM+ME=___+ME.

The hypotenuse of the right-angled triangle is ____, whose length is equal to ME. From Pythagoras's theorem, we deduce ME^2=______^{2}+________^{2}

Therefore $ME^2=(\_\_)^2+1^2=\_\_+1=\_\_\_$.

Hence ME=$\sqrt{-} = \frac{\sqrt{5}}{2}$; We infer AE= __ + ___=__________.

The ratio of the length to the width is $\frac{AE}{AD}$ ___________, that is to say __.

The GOLDEN RATIO in ARTS- Student A

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Task 3

Highlight the rectangles from the paintings that tend to be golden rectangles.

Task 4 Follow Student B's advices to build a rectangle

Task 5 :. Dictate the following protocol of construction to Student B.

Draw a circle $\mathscr{C}$ with centre O and two perpendicular diameters [AB] and [CD]. The midpoint of [OD] is M. Draw the arc of circle with centre M passing through A. It intersects (CD) at X. The circle with centre A passing through X intersects circle $\mathscr{C}$ at N and P. The circles with centres N and P passing through A intersect circle $\mathscr{C}$ at Q and R. Connect the points A, N, P, Q and R properly so that you draw a 5 branches star: this shape is called pentagram.

Task 6

In task 4, you built a rectangle. Let's prove it's a golden rectangle, i.e. the ratio of its length to its width is ϕ.

Suppose the side of the square ABCD is 1 unit. We have AE=AM+ME=___+ME.

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The ratio of the length to the width is $\frac{AE}{AD}$ ____________, that is to say __.