***Exploring the Intersection of Arts and Mathematics***

***with Digital Tools in the Spirit of Leonardo.***

***By Irene Giarmenitou***

**The fraction that connects mathematics to art «golden ratio φ»**

**School subjects:** Mathematics

**Level:** 2nd-3rd grade of junior high school (13-14 years- old)

**Language:** English

**Short description:** **We explore the relationship between matthematics and art,** particularly in terms of aesthetics **and discover the wonders of mathematics in masterpieces of art.** Τhrough artwork, students will discover the golden ratio, a mathematical formula behind creating visually appealing works of art.

**Estimate time**: 45min (part 1+2) + 45 min (part 3+4) (in classroom) + 30min homework

**Tags:** Da Vinci, Pacioli, Golden ratio, φ, arts, “Last Supper” , Mona Lisa, “Salvator Mundi”

**Learning objectives:**

* Exploring the Relationship between Art and Mathematics.
* Unveiling the Mathematical Essence in Art and Nature.
* Understanding golden ratio through art.

**Process:**

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| **scheduling** | **discription** | **activity** | **materials** |
| Part 1. - 15 min  Arousing interest. | 1. We have prepared a presentation of the course wirh bookcreator.  We start with questions about the relationship between mathematics and art and show paintings (Mona Lisa, Last Supper etc).    2. Video Mona Lisa | -Students try to discover mathematical facts in the paintings.    -development of observation and communication.  -Discussion after the video | Projectors, |
| Part 2. -30 min  The concept of the golden ratio in mathematics | 1.Introducing the mathematical concept of the golden ratio.  2.Historical evidence, Euclid - questions about the golden ratio.  3.the theater of Epidaurus as a trigger the calculation of φ. | -Students prove the value of φ .  -Development of observation and mathematical thinking. | Projectors,  And off line tools as paper, pencil. |
| Home work | 1.dividing the students into groups  2.students look for information about Vitruvian Man, Luca Pacioli, Da Vinci, Fibonacci. | -Post the tasks in the workbook  ( bookcreator)  -cooperation development  -digital skills | Projectors, tablets , internet, |
| Part 3 -. 25 min  the golden rectangle as an application of the golden ratio. | 1.We show the painting  « Salvator Mundi» and the video.  2. discovery of the golden rectangle in paintings, and Parthenon  Each group studies a project. | -Students watch the video and identify the existence of the golden ratio in works of art.  -cooperation development  -Development of observation and mathematical thinking. | Projectors, tablets , internet, |
| Part 4.- 20 min  Maths is everywhere  Crossword. | 1.Presentation of the golden ratio in music.  2.Listening to a piece of music.  3. Play crossword | -students find information about the golden ratio in nature, the human body, sculpture, etc  -Play in the classroom and they make crosswords | Projectors, tablets , internet, |
| Homework. | each group can make their own crossword with words from the lesson . | Post the tasks in the workbook  ( bookcreator)  cooperation development  digital skills |  |

**Digital applications:**

1. Google
2. Bookcreator
3. crosswordlabs

**Useful Links:**

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

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

1. Informations about

golden ratio- Histroy

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

1. [**"Reflets   dans   l'eau"**](https://www.youtube.com/watch?v=NTUF747-sZE)

<https://www.youtube.com/watch?v=NTUF747-sZE>

1. **Golden rectangular parallelepiped in art**

<https://www.youtube.com/watch?v=nXDmAtTJ6JY>

1. Crossword

<https://crosswordlabs.com/>

**Conclusion:**

Students using resources and digital tools they come into contact with art but also relate mathematics to it.

They recognize connections between Mathematics and other fields of human knowledge and action and appreciate Mathematics as an accessible and interesting field of study.

They use confidently Mathematics to understand critically the world around them.