



# **(ENG) Everyday gold**

**Introduction**

**Step 1 - Motivational Stage**

**Step 2 - Investigational Stage**

**Step 3 - Consolidation Stage**

# Introduction

---



---

#Online activity #In-class activity #Inquiry-based learning  
#Gamified learning #Artwork

---

Pupils learn how to recognize and calculate the golden ratio (section) and find example proportions from the arts, nature and science. They then practise their knowledge by taking photos with their mobile phones that incorporate the golden ratio. The lesson will let pupils practise the calculation of ratios, enhance their visual literacy skills and help them incorporate mathematics in their everyday life.

## Learning Objectives



Skilfully calculate proportions of everyday objects



Show a better understanding of fractions and decimals and integers, rational and irrational numbers and experiment with them



Produce a photographic artwork that integrates their understanding of proportions and ratios

## ACTIVITY DETAILS

## Activity Details

### Connection of the activity with Art —

the basics of the golden ratio



## Link to local, national School Curriculum —

Accounting operations and their properties/Solving real life problems



## Equipment required —

- a pencil,
- a ruler,
- a smartphone.



## Duration of activity —

45 minutes





## Sources

Photo credits:

Pic. 1

Leonardo da Vinci (1452–1519)  
The Annunciation, (1472–1476)  
oil, tempera, panel, 98 x 217 cm  
Uffizi, Florence, Italy  
Public domain, Wikimedia Commons

Pic. 2

Mastercard credit card  
Mastercard.com

Pic. 3

Cone of Coulter Pine  
The "Henri Gaussen" Botanical Garden, Muséum de Toulouse, France  
Photo by: Didier Descouens  
CC BY-SA 4.0, Wikimedia Commons

Pic. 4–5

Superimposed golden section grid, 2022  
Courtesy of the National Gallery of Slovenia

Pic. 6

Conifer cones  
Adapted from the PNGkey website

Pic. 7

Basic golden section ratios  
Adapted from online sources, including Adobe.com



## Step 1 - Motivational Stage

---



Show pupils pictures 1-3 and present a task:

---



*"We usually say that beauty is in the eye of the beholder. But are there rational ways of finding out if something is pleasant to the eye? Try finding objective reasons as to why these objects are*

*considered beautiful on their own merit, without considering their usefulness."*

---



Pic 1: Leonardo da Vinci (1452–1519)  
The Annunciation, (1472–1476) oil,  
tempera, panel, 98 x 217 cm Uffizi,  
Florence, Italy Public domain,  
Wikimedia Commons



Pic 2: Mastercard credit card  
Mastercard.com



Pic 3: Cone of Coulter Pine The "Henri  
Gaussen" Botanical Garden, Muséum de  
Toulouse, France  
Photo by: Didier Descouens CC BY-SA  
4.0, Wikimedia Commons

Their answers (colour, size, meaning, usefulness) will probably vary and it is likely they, in the end, will not be objective. The main objective is to get them interested in the question.

Then remind them that you are in mathematics class and that maths, dealing with the abstract and eternal, was an important tool to determine beauty. Symmetry, certain geometric patterns and proportions were the main criteria on how people used to answer this question.

## Step 2 - Investigational Stage

---



### STUDENTS' TASKS

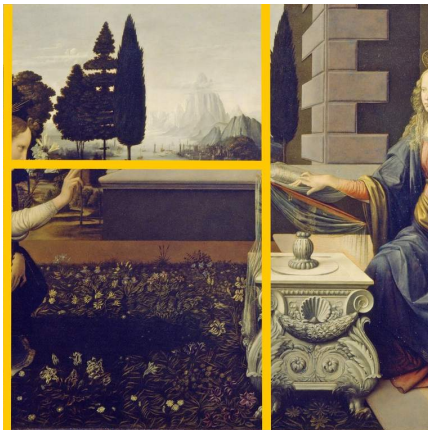
1

#### Task 1

Show the pupils **pictures 4–6** and explain that one of the tools to detect beauty is the golden ratio.

This ratio has been used in art and architecture for millennia; two quantities are in the? golden ratio if the following is true:  $a+b/a = a/b$ . The ratio is a constant and irrational number (like pi), with a value of

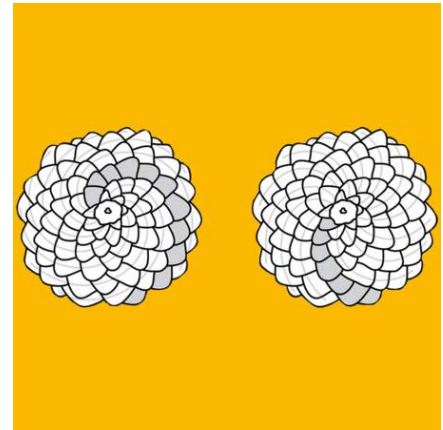
approximately 1.618.



Pic 4: Superimposed golden section grid, 2022  
Courtesy of the National Gallery of Slovenia



Pic 5: Conifer cones Adapted from the PNGkey website



Pic 6: Basic golden section ratios  
Adapted from online sources, including Adobe.com

In **Pic. 1 and 4**, we see a famous work of Leonardo da Vinci, who used the golden ratio grid to place certain objects and enhance the story: the angel Gabriel is the messenger from God who informed Mary that she will give birth to the Son; both of them are connected, dependant on each other and touched by divine mystery - what better reason to arrange them according to this mysterious constant?

In **Pic. 2 and 5**, we see a plain credit card. The golden ratio is very important for graphic design; these plastic cards are the size of 54 x 86 mm, which create a ratio of 0.628, to a millimetre close to the reciprocal golden ration value of 0.618.

In **Pic. 3 and 6**, we see a large cone, whose scales are placed in a spiral.

This spiral derives its shape and values from the Fibonacci numbers, where each number is the sum of the two preceding ones: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144...



“What are the next Fibonacci numbers?”

---

233, 377, 610, ...

The Fibonacci sequence of values, if presented visually, creates a distinct spiral. This spiral is quite similar to the golden spiral, designed with the help of the golden ratio. These two spirals are seen in cones, snail shells, leaf arrangement, petals in a daisy, patterns of seeds in sunflower heads, so all around nature.

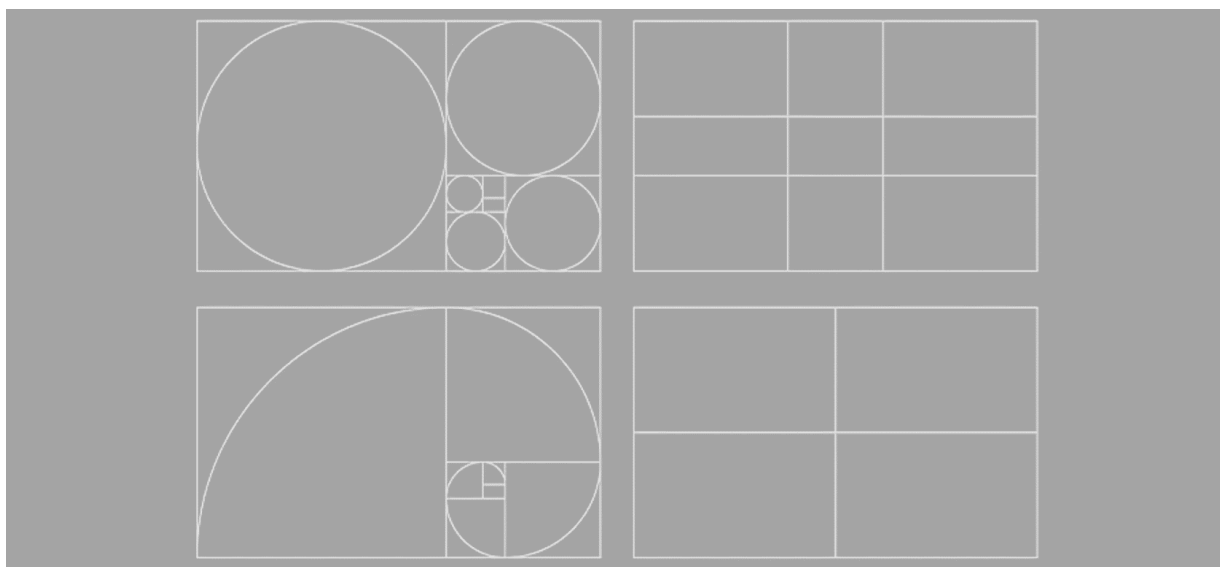
---

2

## Task 2

Show pupils **picture 7** that depicts basic golden section forms and ask them to think of objects that would be made to roughly correspond to these proportions. This exercise will get them measuring and observing everyday objects and help them develop a critical eye.

You then make a list of all of the objects they would change. You can also make a list of objects that incorporate the golden ratio, if the pupils found them.



Pic 7

---

## Task 3

The pupils look into the camera settings of their smartphones. In them, they will find rulers/grids that help them make nice photographs. One of the settings is usually called the Golden Section - they will use it to make an artsy picture of their own.



## Step 3 - Consolidation Stage

---



The pupils present and explain their photographs. Together with the rest of the class, you create a list of what made each of the photographs *interesting and different*. Thus, besides learning how to make an objectively proportional picture, they will also learn about subjective beauty.

---

### End of the activity

EXIT