NatureGlo's eScience

The Golden Ratio & Fibonacci Numbers In Art, Architecture & Nature

Study Guide

NatureGlo's eScience
The Golden Ratio & Fibonacci Numbers
In Art, Architecture & Nature
Revised 12/18/16

Cover photography – Greek statue photographed by Eric Gaba. The Parthenon by Harrieta171 and the background transparency of the chambered nautilus spiral cross-section is by Chris 73.

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PowerPoint Interaction – Golden Ratio & Fibonacci Intro

Directions: Read through NatureGlo's PowerPoint, *Introduction & History of The Golden Ratio & Fibonacci Numbers*. Answer the questions below.

Slide #3 The Golden Ratio's Inspiration

1. List two professions that have held interest in the golden ratio for centuries.

_____

_____

Slide #4 The Mona Lisa the Golden Ratio

2. Mona Lisa's entire body shape fits within a _____ _____ with her arms as the base, her head as its tip, which draws attention to her face.

   a. Golden triangle b. Golden rectangle c. Hexagon

Slide #6 Fibonacci Numbers & the Golden Ratio in Nature

3. The golden ratio can be found in _____ and _____ cones.

Slide #8 The Golden Angle & Plant Phyllotaxis

4. A plant's _____ is the leaf arrangement on its axis or stem.

   a. ratio b. phyllotaxis c. spiral

PowerPoint Interaction – Golden Ratio & Fibonacci Intro

Slide #8 The Golden Angle & Plant Phyllotaxis

5. The Golden angle equals _____ degrees and is the angle found separating sunflower florets. Fill in the blank.

Slide #9 Golden Ratio in Architecture

6. The golden ratio is found in the famous _____ _____ Cathedral in Paris, France. Fill in the blank.

Slide #10 Golden Ratio in Art

7. The golden ratio is found in the art of _____ _____, *The Sacrament of the Last Supper* and *The Persistence of Memory.* Multiple choice.

a. Leonardo da Vinci's b. Rembrandt van Rijn's c. Salvador Dali's

Slide #12 The Golden Ratio & Fibonacci & Musical Instruments

8. A piano has ____ white keys and ____ black keys (grouped in 2 & 3) with 13 total keys, all Fibonacci numbers.

Slide #12

9. The Lady Blunt violin has golden ratio _____.

   a. Spirals b. triangles c. proportions

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Slide #14 More Examples of the Golden Ratio

10. Where else can the golden ratio can be found? List two from slide #14.

_____

_____

MathArt Journal Entry

Name: _____ Date:_____

Directions: Select a topic from the PowerPoint lesson or web resources. Complete the information about it below.

Sketch

1). **General Description**

_____
_____
_____
_____

2). **Size**

_____
_____
_____

3). **Color(s)**

_____
_____

4). **Other interesting facts**

_____
_____
_____
_____
_____
_____

Mathematician/MathArtist Journal Entry

Your Name: _____ Date: _____

Mathematician/MathArtist:_____

<u>Directions</u>: Select a mathematician or a "MathArtist" (one who used or uses mathematics in their artwork). Follow the guidelines below.

Sketch or Photos

Details

Life work:
1)._____
_____
_____
_____

Numbers & Geometric shapes used in work:
_____
_____
_____
_____

Additional Interesting facts:
_____
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Natureglo's eScience Student Project Rubric:

Usage: PowerPoints, posters & other written research projects

Category	Criteria				Points
	4 Exemplary	**3 Accomplished**	**2 Developing**	**1 Beginner**	
Accurate Research/ Inform-ation Gathering & Citation	All taken from several sources & cited in work	Most taken from sources & cited	Some taken from sources and cited	Little or none taken from sources and or not cited	
Content	Great number of interesting facts around topic	Many interesting or too many facts	Some important facts	Few or no facts	
Graphics/ Sound/ Animation	High quality; enhance understandin g on every page. All borrowed graphics with source cited.	Many enhance understanding on most pages; most borrowed graphics cited.	Some enhance understandi ng; some cited	Zero, unrelated, very few or poor quality graphics and/or none cited	
Organiz-ation & Attractive-ness	Well organized and very attractive; demonstrates creative & logical sequencing and sentence structure	Mostly well organized and attractive; demonstrates logical sequencing and sentence structure	Somewhat organized and attractive, but some illogical sequencing and sentence structure	Unattractive and or weakly organized or disorganized	
Grammar and Mechanics	All correct	1 – 5 errors	5 – 10 errors	Frequent errors	
Divide total points from 20 for grade.			**Total Points/Grade:**		

Introduction & History of the Golden Ratio & Fibonacci Numbers

Quiz

PowerPoint Interaction – Golden Ratio & Fibonacci Intro

1. List two professions that have held interest in the golden ratio for centuries.

_____

_____

2. Mona Lisa's entire body shape fits within a _____ _____ with her arms as the base, her head as its tip, which draws attention to her face.

   a. Golden triangle b. Golden rectangle c. Hexagon

3. The golden ratio can be found in _____ and _____ cones.

4. A plant's _____ is the leaf arrangement on its axis or stem.

   a. ratio b. phyllotaxis c. spiral

PowerPoint Interaction – Golden Ratio & Fibonacci Intro

5. The Golden angle equals _____ degrees and is the angle found separating sunflower florets. Fill in the blank.

6. The golden ratio is found in the famous _____ _____ Cathedral in Paris, France. Fill in the blank.

7. The golden ratio is found in the art of _____ _____, *The Sacrament of the Last Supper* and *The Persistence of Memory*. Multiple choice.

a. Leonardo da Vinci's b. Rembrandt van Rijn's c. Salvador Dali's

8. A piano has ____ white keys and ____ black keys (grouped in 2 & 3) with 13 total keys, all Fibonacci numbers.

9. The Lady Blunt violin has golden ratio _____.

a. Spirals b. triangles c. proportions

PowerPoint Interaction –
Golden Ratio & Fibonacci Intro

10. Where else can the golden ratio can be found? List two from slide #14.

_____

_____

PowerPoint Interaction & Quiz Answer Key

PowerPoint Interaction – Golden Ratio & Fibonacci Intro

Slide #3 The Golden Ratio's Inspiration

1. List two professions that have held interest in the golden ratio for centuries.

Student answers will vary but should include any two from the following list:

Mathematicians, artists, musicians, architects, biologists, historians, psychologists, mystics, stock brokers

Slide #4 The Mona Lisa the Golden Ratio

2. Mona Lisa's entire body shape fits within a a. golden triangle with her arms as the base, her head as its tip, which draws attention to her face.

   a. golden triangle b. golden rectangle c. hexagon

Slide #6 Fibonacci Numbers & the Golden Ratio in Nature

3. The golden ratio can be found in sunflowers and pine cones.

Slide #8 The Golden Angle & Plant Phyllotaxis

4. A plant's b. phyllotaxis is the leaf arrangement on its axis or stem.

   a. ratio b. phyllotaxis c. spiral

PowerPoint Interaction – Golden Ratio & Fibonacci Intro

Slide #8 The Golden Angle & Plant Phyllotaxis

5. The Golden angle equals **137.5** degrees and is the angle found separating sunflower florets. Fill in the blank.

Slide #9 Golden Ratio in Architecture

6. The golden ratio is found in the famous **Notre dame** Cathedral in Paris, France. Fill in the blank.

Slide #10 Golden Ratio in Art

7. The golden ratio is found in the art of **c. Salvador Dali's**, *The Sacrament of the Last Supper* and *The Persistence of Memory*. Multiple choice.

a. Leonardo da Vinci's b. Rembrandt van Rijn's c. Salvador Dali's

Slide #12 The Golden Ratio & Fibonacci & Musical Instruments

8. A piano has **8** white keys and **5** black keys (grouped in 2 & 3) with 13 total keys, all Fibonacci numbers.

Slide #12

9. The Lady Blunt violin has golden ratio **proportions**.

a. Spirals b. triangles c. proportions

PowerPoint Interaction – Golden Ratio & Fibonacci Intro

Slide #14 More Examples of the Golden Ratio

10. Where else can the golden ratio can be found? List two from slide #14.

Student answers will vary but should include any two of the following answers:

- **Human body**
- **DNA spirals**
- **Human embryo**
- **Human teeth**
- **Penrose tiling**
- **Honeybees**
- **Tiger's face**