

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

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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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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

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

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

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:		

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

<u>Sketch</u>	1). General Description
	2). Size
	3). Color(s)
	4). Other interesting facts

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Mathematician/MathArtist Journal Entry

Your Name: _____ Date: _____

Mathematician/MathArtist:_____

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

Sketch or Photos	Details
Sketch or Photos	Life work: 1)

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Natureglo's eScience Student Project Rubric: Usage: PowerPoints, posters & other written research projects

4321ExemplaryAccomplishedDevelopingBeginnerAccurateAll taken from severalMost taken from sources & citedSome taken from sources and citedLittle or none taken from sources and or not citedInform- ationcited in work cited in workContentGreat number facts around too many factsSome factsFew or no factsGraphics/ Sound/High quality; g on every page. All borrowed graphics with source cited.Many enhance interesting on most pages; most borrowed graphics cited.Some ingraphicsZero, unrelated, very few or poor quality graphicsZero, and/or none citedOrganiz- ation & weryMostly well organized and organized and attractive; attractive; attractive;Some attractive; andMostly well organized orMess attractive; attractive;Mostly well attractive; andSome attractive, attractive, attractive, attractive,Mostly well attractive, attractive, attractive, attractive,Cone attractive, attractive, attractive, attractive,
Accurate Research/ Inform- ationAll taken from severalMost taken from sources & citedSome taken from sources and citedLittle or none taken from sources and or not citedInform- ationcited in workcitedSome taken from sources and citedLittle or none taken from sources and or not citedGathering & CitationGreat number of interesting facts around topicMany interesting or too many factsSome important factsFew or no factsGraphics/ Sound/ AnimationHigh quality; understandin g on every page. All borrowed graphics with source cited.Many enhance understandin graphics cited.Some important factsZero, unrelated, very few or poor quality graphics and/or none citedOrganiz- ation & Attractive- nessWell organized and attractive; demonstratesMostly well organized and attractive; attractive, attractive;Some taken from sources and sources and citedUnattractive and or weakly
ContentGreat number of interesting facts around topicMany interesting or too many factsSome important factsFew or no factsGraphics/ Sound/ AnimationHigh quality; enhance g on every page. All borrowed graphics with source cited.Many enhance understanding on most pages; most borrowed graphics cited.Some important factsFew or no factsOrganiz- ation & Attractive- nessHigh quality; enhanceMany enhance understandin on most pages; graphics cited.Some enhance understandin ng; some citedZero, unrelated, very few or poor quality graphics and/or none citedOrganiz- ation & Attractive; nessWell attractive; demonstratesMostly well attractive; andSomewhat organized and attractive, attractive, organized or
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Grammar and MechanicsAll correct 1 – 5 errors5 – 10 errorsFrequent errorsDivide total points from 20 for grade.Total Points/Grade:

Introduction & History of the Golden Ratio & Fibonacci Numbers Quiz

PowerPoint Interaction – Golden Ratio & Fibonacci Intro		
 List two professions that have held interest in the golden ratio centuries. 	for	
 Mona Lisa's entire body shape fits within a with her arms as the base, her head as its tip, draws attention to her face. a. Golden triangle b. Golden rectangle c. Hexagon 	which	
3. The golden ratio can be found in and and		
 A plant's is the leaf arrangement on its axis stem. 	бог	

- 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.

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

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

PowerPoint Interaction & Quiz Answer Key

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

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.

<u>Slide #12</u>

9. The Lady Blunt violin has golden ratio proportions.

a. Spirals b. triangles c. proportions

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