2024

ELA AND MATH CONNECTIONS TO THE PARTHENON (POST-VISIT)



Includes Post-Visit Activities (new for 2024):

- ELA Connections: Redesigning and Retelling the Story of Pandora
- Math Connections: Parthenon Architecture

Helen Sanders, Director of Education, the Parthenon helen.sanders@nashville.gov



Redesigning and Retelling the Story of Pandora on the Athena Statue Base

Objective:

This activity connects Social Studies standards and practices with English Language Arts, using principles of STEAM integrated learning.

It introduces the myth of Pandora and allows students to evaluate the archaeological evidence for the myth on the statue base of the Athena inside the Parthenon. After reviewing this evidence and Alan LeQuire's recreation inside the Nashville replica, students design and retell the scene with a drawing and story of their own.

Standards and STEAM principles:

This post-visit activity links an ELA essential question to Social Studies Standards and practices.

ELA Essential Question: What drives people to explore?

We will connect to this essential question by focusing on what drives people to explore the past. This exercise asks, "What makes people want to investigate and recreate art from long ago? What do we learn by investigating an ancient work of art?

Students additionally employ the visual arts by analyzing a work of art and producing their own design.

This activity uses the 4Cs: creativity (students create their own drawing and story); critical thinking (students evaluate historical sources); communication (students explain their conclusions); and collaboration (students benefit from sharing ideas with their classmates).

Students address this SS Standard:

6.49 Describe the purposes of major Greek Architecture, including the Parthenon and the Acropolis.

Students use these SS Practices:

SSP.02 Critically examine a primary/secondary source.

SSP.04 Construct and communicate arguments citing supporting evidence.

Introduction to the Pandora Myth:

For Teachers:

Read and review this section with your students. The goal is to demonstrate that Greek myths exist in many versions, with different possible interpretations of their meaning.

When you visited the Parthenon for your STEAM Expedition, your guide may have told you the story of Pandora depicted on the statue base of Athena:

- In Greek myth, Pandora was the first woman. She was made of clay by Hephaistos and other gods. Hephaistos was the Greek God of the forge and a god of arts and craft. Zeus gave Pandora a storage jar (called a *pithos* in Greek). In later versions of the story, the jar became a box. The gods had gathered the evils of the world into the box and told Pandora not to open it. When she became curious and peeked inside, all these evils escaped. Only the figure of hope ("*Elpis*" in Greek) was left.
 - Have you heard the expression, "Opening a Pandora's box"? It's similar in meaning to opening a "can of worms." It means something that seems okay at first, but turns out to create a lot of problems!
 - Since it was a story that was told many times before it was written down, it exists in different versions, and it means different things to different people.

Here are additional sources about the Pandora myth to share with your students:

- Optional: Read more on the website, Theoi: Greek Mythology: <u>https://www.theoi.com/Heroine/Pandora.html</u>
- Optional: Share Newsela articles about Prometheus and Pandora (written at three reading levels): <u>https://newsela.com/view/ck9nooeby034f0igjeexe9w72</u>
- Optional: View a video from World History Encyclopedia on "The Greek Myth of Pandora's Jar," <u>https://www.youtube.com/watch?v=2PQdAFjChNA&t=280s</u>
 - Discussion question: This was a story the Greeks told to explain why there are evils in the world, while giving the message that there is still always hope. Sometimes, Pandora was viewed as a good person, and sometimes as a weak person. What do you think?
 - Discussion question: Why do you think the Athenians chose to represent Pandora on the base of the Athena statue?

Archaeological and Historical Sources for the Athena Statue Base:

For teachers:

You will introduce students to some important primary and secondary sources used for the reconstruction of the Pandora scene on the Athena Parthenos statue, listed below. Ask students to evaluate the reliability of these sources, and what evidence they provide. You may decide to lead a discussion yourself, or to divide students into small groups.

Sources:

Atsma, Aaron J. "Pandora—the First Woman of Greek Mythology," written 2002, from Theoi: Greek Mythology. Accessed Nov. 24, 2023. <u>https://www.theoi.com/Heroine/Pandora.html</u>

Baldwin, James, "Myths and Legends: The Story of Prometheus and Pandora's Box," written 11.07.16, from Newsela Instructional Content Platform. Accessed Nov. 24, 2023. <u>https://newsela.com</u>

World History Encyclopedia, "The Greek Myth of Pandora's Jar." Video. Posted by World History Encyclopedia, Nov. 11, 2022. Accessed Nov. 27, 2023. <u>https://www.youtube.com/watch?v=2PQdAFjChNA&t=280s</u>

Lapatin, Kenneth. "The Statue of Athena and Other Treasures in the Parthenon," in *The Parthenon: from Antiquity to the Present*, ed. Jennifer Neils, 261-291. Cambridge: Cambridge University Press, 2005.

Ancient Sources:

Pausanias, <u>Description of Greece</u>, Book 1.24.7, translated by W.H.S. Jones, 1954. Accessed at Theoi: Greek Mythology's library of ancient texts: <u>https://www.theoi.com/Text/Pausanias1B.html</u>

Pliny the Elder, <u>The Natural History</u>, Book 36.4, translated by John Bostock and H.T. Riley, 1855. Accessed through the Perseus Project's library of ancient texts at: <u>https://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.02.0137%3Abook%3D36%3Achap</u>ter%3D4

Student Handout

The Athenian Parthenon was a temple that honored the Greek goddess Athena. The statue inside was a focal point of the building. There is good archaeological evidence for much of the Athena statue inside the Parthenon. Alan LeQuire consulted with archaeologists to reconstruct the statue as accurately as possible.

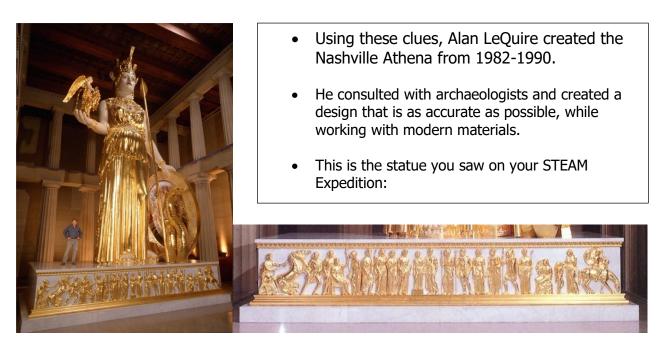
- However, the front of the statue base is one area where we know the least!
- That means many representations are possible. Consider the historical evidence—some primary and secondary sources listed below. Think about what they tell us, what they leave out, and where there might be conflicting evidence.
- These will be the clues you need to make your own design of the statue base!
- 1. Cuttings of the statue base have been preserved. It measured roughly 8.06 meters by 4.10 meters, or a little more than 26 feet wide by 13 feet deep.
- 2. This is a description by Pausanias, a Roman writer from the 2nd century CE, who wrote a guide book to Greece for other travelers. He mentions the subject matter on the base, which he saw himself.
 - Excerpt from Pausanias, <u>Description of Greece</u>, Book 1.24.7, translated by W.H.S. Jones, from Theoi, Greek Mythology's library of texts at: <u>https://www.theoi.com/Text/Pausanias1B.html</u>
 - [1.24.7] The statue of Athena is upright, with a tunic reaching to the feet, and on her breast the head of Medusa is worked in ivory. She holds a statue of Victory about four cubits high, and in the other hand a spear; at her feet lies a shield and near the spear is a serpent. This serpent would be Erichthonius. On the pedestal is the birth of Pandora in relief. Hesiod and others have sung how this Pandora was the first woman; before Pandora was born there was as yet no womankind. . .
- 3. Pliny the Elder, a Roman author writing in the 1st century CE, gathered information in an early encyclopedia, although he did not see the statue himself.
 - Pliny the Elder, <u>The Natural History</u>, Book 36.4, trans. By John Bostock and H.T. Riley, accessed through the Perseus Project's library of texts at: <u>https://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.02.0137%3Abook%3D36%3Achapter%3D4</u>
 - "To the story chased [chiseled] upon the pedestal of the statue, the name of the "Birth of Pandora" has been given; and the figures of. . . gods to be seen upon it are no less than twenty in number."
- 4. A small, marble, later version of the statue is called the "Lenormant Athena," and has a few markings on the base. It was made in Roman times about 500 years after the Parthenon, probably while the original Greek statue was still standing inside the Parthenon. Look carefully—what do you see?



Statuette of Athena, called the "Lenormant Athena." Marble, 1st Century CE, 16 inches high. Found in Athens, now in the National Archaeological Museum of Athens. Photo credit: Marsyas, 2007, <u>CC BY-SA 2.5</u> via Wikimedia Commons.

5. It is possible that the scene was framed by the sun god Helios and moon goddess Selene in their chariots. This is similar to the sculptures of the East pediment that you saw as plaster casts in the Treasury room.

Alan LeQuire's Representation:



Alan LeQuire with Athena statue

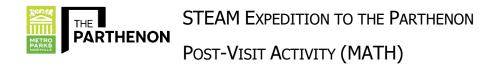
Detail of the base with Pandora relief

Assignment:

1. First, describe 3-5 key elements of Alan LeQuire's statue base.

2. Next, draw your own version of the statue base. Think about what evidence there is for the scene, and what you will include.

3. Finally, explain your drawing of the Pandora story and the choices you made. When you are done, share your ideas with a classmate.



Math Connections and the Parthenon's Architecture

Objective:

We can use the Parthenon to do math! This worksheet asks students to do word problems involving the architecture of the Parthenon. By completing these problems, students apply mathematical skills and deepen their real-world problem-solving abilities. They develop a better understanding of how the Parthenon was built, and experience how architects, artists and engineers use math in their work.

Math Connections and STEAM principles:

This activity connects Social Studies standards and practices with Math and Engineering, by using the architecture of the Parthenon to demonstrate authentic problem-solving. Applying mathematics to the Parthenon reinforces the on-site learning of the architecture challenge.

These problems involve subtraction, solving an equation, understanding scale and ratio, and making calculations to understand connections to visual models.

Challenging students to apply mathematical principals to examples of historical architecture exemplifies STEAM integrated learning.

For Students and Teachers:

This worksheet asks students to do word problems involving the architecture and measurements of the Parthenon. By completing these problems, students will better understand how to apply mathematics to architecture. They will enhance their understanding of mathematical principals and operations. They will deepen their understanding of ancient construction techniques.

Students can complete the first three problems on this worksheet, with pencil. For the fourth problem, students will need graph paper, a ruler, and a pencil.

An answer key is provided at the end. Teachers can provide the answer key to students so that the activity is self-guided. Or, they can provide answers at the end of the activity in discussion with the class, or assign as homework.

Student Worksheet (page 1)

Problem 1 (Subtraction).

How long did it take to build the Parthenon in Athens and in Nashville?

- The Athenian Parthenon was begun in 447 and finished in 432 BCE.
- The Nashville Parthenon that stands in Centennial Park today was constructed from 1921 until 1931.
- Hint: Although these dates come from different eras of the timeline (BCE and CE), In both cases, take the larger number first, then subtract the smaller number, to find the answer.
- Show your work here:
- Does this answer surprise you? Explain why or why not.

Problem 2 (Solving Equations).

Can you calculate and predict the number of columns on the outside of a Greek temple?

- By the time the Greeks built the Parthenon, they had developed a standard for the number of columns on the outside of the building. These are called peripteral columns or the colonnade. The resulting proportions of the temple were considered harmonious and pleasing to the eye.
- The typical number of columns is represented by the formula 2(w) + 1 = L (w=width and L=length). Using words, we would say: 2 times the columns on the width, plus one, equals the number of columns on the length.
- Hint: It is much easier to use the formula than to count columns one at a time. If you count columns, you must count the corner column twice. Count it once when counting the columns on the façade (width) or short side, and again when counting columns down the length or long side.
- Solve these problems, using the equation 2(w) +1= L
 - In a typical Greek temple, there are 6 columns across the width. How many columns are down the length? Show your work:
 - The Parthenon is especially wide. It has 8 columns across the front. Can you calculate how many columns are down the length? Show your work:

 If you were an archaeologist excavating an even bigger temple, and you found 25 columns along the length of the building, can you predict how many there would have been across the width? (Even if you had not uncovered them yet). Show your work:

Problem 3 (Understanding Scale):

Learn to calculate the height of a model crane at one-tenth scale.

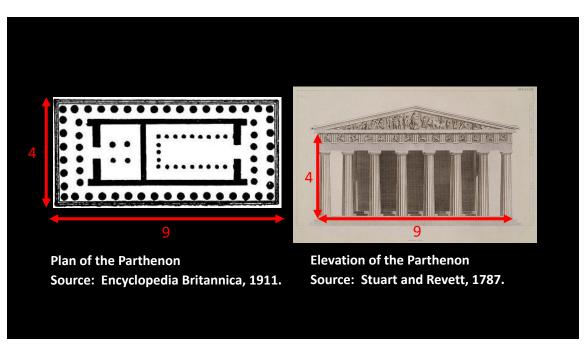
- The Nashville Parthenon is a full-scale replica of the ancient building (represented as 1:1; 1/1; or 1 to 1). This means it is the same size. Each element of the building is the same measurement as the ancient building.
- Sometimes it is not practical to replicate a building at full-scale. Architects, sculptors, and builders may use drawings or models that recreate the proportions of a building in relation to one another, but in a smaller size. This reduction (or enlargement) is called "scale."
- Let's look at an example of how this works.
 - The sculptor Belle Kinney Sholtz created plaster models of the pediments on display in the Treasury room. These are one-third scale (1:3; 1/3; 1 to 3). For every one-foot measurement on the model, the ancient building used three feet. She needed to take the original measurements and divide by three to create her own new measurements at one-third scale.
- We have a model in the Parthenon of a crane used to build the ancient Parthenon. It is an exact replica built at one-tenth scale (1:10; 1/10; 1 to 10), based on drawings by the Greek archaeologist Manolis Korres.
 - If the ancient crane is estimated to have measured 90 feet tall, how high is our model? Show your work here:

Problem 4 (Using Ratios)

Learn how a 4:9 ratio was important to the builders of the Parthenon.

- The builders of the Parthenon relied on a 4:9 ratio between certain elements of the building, including the width and the length of the stylobate (the top step) and the height (from stylobate to cornice) and the width, among other elements.
- A ratio is a relationship in quantity or amount. To maintain this fixed ratio, a unit of measurement is multiplied by 4 and by 9. The measurement itself is less important than the unit of measurement. Imagine using a stick of a certain length and using the stick to measure 4 and 9 units. If you change the length of the stick, but still measure 4 and 9, you are preserving the proportions and the ratio.

• This is what that looks like, in two drawings called a plan (from above) and elevation (from the front). The units of measurement are different in the plan and elevation, but the ratio is the same.



- This ratio of 4:9 is called a harmonic proportion, and it was visually pleasing to the Athenians.
 - It is incorrect to think that the Athenians were using a "golden mean" or "golden proportion." (That is a ratio represented by the number 1.618, related to the Fibonacci sequence found in nature). The Athenians were close observers of nature, but they were not driven to find a single, perfect measurement. There was a lot of experimentation in building Greek temples, and some temples use other units and ratios, different from the Parthenon.

Now, apply this concept, using graph paper. Can you represent on graph paper different versions of the Parthenon's plan, maintaining a 4:9 ratio between width and length?

- First, choose as a unit of measurement one square. Draw a rectangle 4 units across and 9 long.
 - You just drew a very small plan of the Parthenon!
- Now, choose a larger unit of measurement. For example, you could choose 2 or 3 squares as your unit. Multiply your unit by 4 and by 9, here. Now, use the answers to draw a larger Parthenon plan!
- On your graph paper, what is the largest unit of measurement you can use to draw a very big plan of the Parthenon, at a 4:9 ratio? How did you figure this out? Describe your thinking here:

Sources:

- Coulton, J. J. Ancient Greek Architects at Work: Problems of Structure and Design. Ithaca, N.Y.: Cornell University Press, 1977.
- Dinsmoor, William Bell. *The Architecture of Ancient Greece: An Account of Its Historic Development*. New York: W. W. Norton, 1975.

Korres, Manolis. The Stones of the Parthenon. Oxford University Press, USA, 2000.

Lawrence, A. W. Greek Architecture. New Haven: Yale University Press, 1984.

Answer Key:

Problem 1 (Subtraction)

447 minus 432 = 15 1931 minus 1921 = 10

Isn't it amazing that the Greeks built the ancient Parthenon out of stone in only 15 years? Think about all that work: they were quarrying the stone, transporting it a long way, and finishing the blocks on the Acropolis. They introduced many architectural refinements that added complexity to the building process! Even with modern materials and the use of concrete in the Nashville Parthenon, it still took 10 years to build in modern times!

Problem 2 (Solving Equations)

2(6) + 1 = 13 (Solve in two steps: 2x6=12; 12+1=13)

2(8) + 1 = 17 (Solve in two steps: 2x8 = 16; 16 + 1 = 17)

Solve for the width, where length is 25

25= 2(w) +1. (Solve in two steps, both sides of the equation: 25-1 is 24 = 2(w); 24/2=12; w=12)

Problem 3 (Understanding Scale)

90 feet divided by 10 = 9 feet. So, the model is 9 feet tall (and 1:10; 1/10; 1 to 10)

Problem 4 (Using Ratios).

To multiply by 2: 2 x 4=8 squares wide; 2 x 9=18 squares long To multiply by 3: 3 x 4=12 squares wide; 3 x 9=27 squares long

The length of 8 ¹/₂ by 11 graph paper is typically 43 or 44 squares; width is 33 whole squares.

 4×9 is 36; this is the largest whole number possible that is a multiple of 9. (for the length). 4×4 is 16; this will be the corresponding width.

 5×9 is 45; this is one or two squares too many to fit the length.