Dear Team Chaperone,

This is the STEAM Architecture Challenge. Please help your team of students discover architecture by reading the guide. The rules and tips are listed here to help you assist your group.

**STEAM Architecture Challenge Rules:**
- Stay with your Team.
- Complete as much of the Architecture Challenge as possible in approximately 30 minutes.
- Be ready for your next STEAM experience on time.

**STEAM Architecture Challenge Directions:**
- Gather on the porch of the Parthenon (above museum entrance).
- Welcome to the Parthenon! Today during your STEAM Expedition, you will be doing an Architecture Challenge, a STEAM Sketch Activity, and a Mythology Tour inside the museum.
- We will try to stay in the sun—if you’re cold/wet do some jumping jacks or huddle up for warmth.
- Team chaperones have the Architecture Challenge guide on their clipboard.
- Team chaperones will be leading your team through the Architecture Challenge.
- Parthenon staff will be helping all teams with any questions!

**Quick Architecture Challenge overview:**
- The Architecture Challenge has 4 Stops.
- Stop 1 is right here—you made it, yay!
- Stop 2 is up near that corner column *(gesture).*
- Stop 3 is halfway down the long side of the Parthenon.
- Stop 4 is all the way down at the other corner.
  - Hint: At Stop 4, we will be looking for the sign that says “Can You See Me?” Does everyone see this sign? At Stop 4 you will be all the way down the other end of the Parthenon playing peek-a-boo with this sign. Now you know what the sign looks like. Got a mental picture of this sign? Good!

- Let the Architecture Challenge begin!
Dear Chaperone,

Your team will study the architecture of the Parthenon. You will lead the Architecture Challenge by reading this out loud!

Tips: *Italicized=tips*  *Underlined=vocabulary*  *Red=safety*

Start reading:

Welcome to the Architecture Challenge!

There is a lot of STEAM hidden in the architecture of the Parthenon. Our mission today is to discover the engineering feats of the Parthenon, built over 2,400 years ago in Athens, Greece! We will study this exact replica here in Nashville, Tennessee, to learn about how ancient Athenians solved problems in construction.

**Stop 1**

From here, look up to find a big, long triangle. This is called a pediment.

What gods do you see in this pediment? Hint: look in the middle of the triangle to see two famous Greek gods!

Next, I need everyone to notice long lines on the building. Can you see:
- The long horizontal line at the base of this triangular pediment?
- The long horizontal lines of the base steps of the building?
- The vertical lines of the columns?

These long lines are actually curved! There are zero straight horizontal lines in the Parthenon.

The Athenians used advanced architectural refinements to trick our eyes. They understood STEAM concepts and designed the Parthenon to have corrections to correct how the human eye sees lines. You are seeing slight curves everywhere! The Parthenon curves up in the middle—very slightly—to help it look exactly, perfectly straight to our human eyes.

Come gather around me to see an example.
On my clipboard, I have a laminated page full of drawings so you can see these curves for yourself. *(show laminated page)*

*Image credit: www.greece-is.com/the-optical-illusions-that-make-the-parthenon-perfect/

Let’s look to our left and right to find tall buildings in the distance. Do they look like they are slightly sagging in the middle? They are not curved like the Parthenon.

We must stay together and walk together up only one flight of steps to Stop 2 near the corner columns.

*Proceed to Stop 2— walk up ONE set of steps (human-sized steps are in the middle) to the corner toward the LEFT when facing the Parthenon (closer to parking lot). Gather inside the columns.*

**Stop 2**

We are now at a corner of the Parthenon. Are these *Doric columns* larger or wider than you expected? Where do they look the widest to you?

*Give your group a minute to make observations out loud.*

These *Doric columns* are widest about 1/3 of the way up. It can be hard for our eyes to notice this small curve. I have a test to find the widest part.

Here’s how you do this test:
- Look at a column that is far away.
- Use both hands to divide the column in three equal parts.
- Your lower hand will be at the widest part of the column!

These curves in architecture is called *entasis* (EN-tah-siss). We just discovered *entasis* on the columns!

Now let’s think about the distance between columns. Do you think all the columns are the same distance apart? We must find a way to measure the distance between this corner column and its neighbor, then later we will measure the distance between two columns on the long side.

Let’s start measuring! We have 0 tools and need to figure out what we to use as a unit of measurement. What can we use to measure? How can we get this done? You have two minutes to decide what you will use to measure and get the first measurement done.

*Take time to solve this problem by getting measurements with any unit you choose. Note: you cannot use the "Can You See Me?" sign—it must stay in place. Give the group some time reminders to keep them on track: You have two minutes! One minute left... 30 seconds... Come gather near me!*

One minute left... 30 seconds... Come gather near me!

Let’s take a second to all hear the measurements we made—who has a measurement, and what did you use to measure?

Let’s move toward the middle of the long side to get our measurement between two middle (non-corner) columns. Let’s pick two columns near Stop 3 to measure as our comparison.
Let’s start measuring again, this time between two middle columns! Use the same measurement units, but now we need a new number.

Come gather near me! This is important, so please listen up. You just did two great tests, getting two different measurements. What is the difference between the middle and corner column measurements?

*When this is wrapping up, you will likely be near Stop 3—the middle area of the long side. Gather the group together and find a spot near the middle of the long side of the building.*

Okay, let’s get ready for Stop 3.

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**Stop 3**

The Doric columns of the Parthenon lean slightly inward. We’re going to test this to see how they tilt toward the walls of the building.

I need two volunteers to try this next test.

Each volunteer needs to find a column and stand exactly at its side, not at any sort of angle but exactly in the middle.

*Example:* Each green square on this example represents a student. They are standing exactly between columns (not in the colonnade where the red X’s are).

Here’s how you do this test:

- Stand up against the column, without touching it or leaning on it.
- Face the column.
- Standing up as straight and tall as you can.
- Raise your arms as straight and tall as you can.
- The palms of your hands should be facing each other, almost as if you are clapping your hands.
- Move your palms wider, just wider than your shoulders.
- Tilt your head back, and notice how the columns narrow at the top.
- Slowly move your palms toward each other. Slowly.
- Does one palm visually hit a side of the column before the other? This may be a visual clue that the column is slightly leaning toward the interior of the building.

If anyone else would like to try it, feel free. The student volunteers who did this first can help you see this visual clue.

Moving on to our next stop!

*Proceed to Stop 4: The whole group will walk down the colonnade to the far corner then go to the middle. Walk to the middle of the short side to use the human-sized stairs to get to ground level. *Using extra care and caution, you can step down the giant steps at the corner.*
Once on the ground, bring the whole group over to the corner of the lowest giant step. Make sure you are at the corner near the parking lot, as shown in the Stop 4 image.

Our final stop will show us the curvature of the floor.

The **stylobate** is the highest giant step, and the **stereobate** is the lowest giant step.

From corner to corner on the long side of the Parthenon, the **stylobate** and **stereobate** slope up 7 inches higher in the middle than on the sides. Did anyone feel this while walking over here?

To see this with our own eyes, we are going to get down to eye level with the **stereobate**, this lowest giant step. We are going to look down the length of this giant step toward that special “Can You See Me?” sign and observe how much of it we can see, and how much is blocked by the curvature of the **stylobate**.

Here’s how you do this test:
- Approach the **stereobate**.
- Squat down to place your eyes to be even with the step, almost as if you are playing peek-a-boo.
- When your eyes are low enough, look down the **stereobate** to find that sign that you know is there.
- How much of the “Can You See Me?” sign do you see?

Please take turns and try this out 1-2 at a time. Can anyone see part of the sign? Let’s go find it up close.

*Walk back toward Parthenon entrance along the long side toward that sign. Walking on the **stereobate** or **stylobate** is fine.*

This is a regular-sized piece of paper, 8.5 inches wide by 11 inches tall. How much of it could you see? The 7-inch curve of the **stereobate** can prevent you from seeing most or all of the sign when you are down at eye level!

Any questions about the Parthenon, or its architecture? We can ask the Parthenon staff person.

Congratulations! Together, we have finished today’s Architecture Challenge. We need to stay in our team and prepare for our next STEAM Expedition experience (Tour or STEAM Sketch Activity) so let’s head to Lizzie the mosaic dragon to prepare for our next station.

*Please return paper, clipboard, and laminated page to Parthenon staff.*