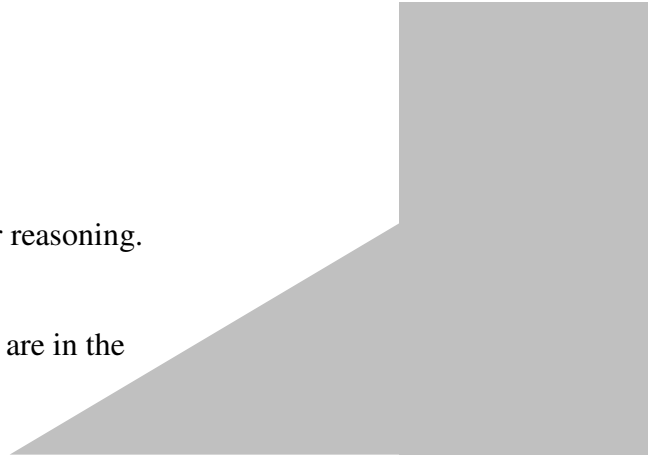


## Museum Exhibits Math



1. What is the shape of the entrance bridge?
2. Classify it as concave or convex and explain your reasoning.
3. There are several flower pots on the bridge. They are in the shape of a \_\_\_\_\_.
4. Use the appropriate measuring tool(s) to calculate the following for the small and large flower pots:
  - a. Diameter
  - b. Radius
  - c. Circumference
  - d. Volume
  - e. Surface area of the dirt
  - f. Height
5. How many cylinders are on the bridge?
6. List as many different shapes that you can find in the “*Featherstone Kite, Open Work Basket-Weave Mark Two Gentleman’s Flying Machine*”?


7. The most sensitive seismograph magnifies the ground motion by as much as 10 million times. Write this number in standard notation as well as scientific notation

Standard

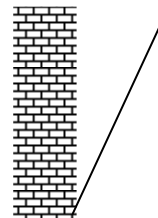
Scientific

8. At the penny smasher, pressure is being exerted on the penny to smash it flat and turn it into a souvenir penny. Pressure equals the amount of force exerted divided by the area over which it is applied.

$$P = f/a$$

The difference between pressure and force can be illustrated with an analogy based on a 10-penny nail, a hammer, and a piece of wood. By resting the nail on its point, and hitting the head with the hammer, we can drive the nail into the wood. But what happens if we turn the nail over and rest the head of the nail against the wood? If we hit the nail with the same force, we can't get the nail to stick into the wood. When we hit the nail on the head, the force of this blow is applied to the very small area of the wood in contact with the sharp point of the nail, and the nail slips easily into the wood. But when we turn the nail over, and hit it on the point, the force is distributed over a much larger area. The force is now distributed over the surface of the wood that touches any part of the nail head. As a result, the pressure applied to the wood is much smaller and the nail just bounces off the wood.

- (a) Calculate the pressure exerted by a 200-lb man wearing size 10 shoes, if the area of each shoe in contact with the floor is 20 square inches.
- (b) Calculate the pressure exerted by the heels of a 100-lb woman in high heels, if the area beneath the heel of each shoe is 0.25 square inch.
9. Structures – **Exhibit 5A - Brace** In this section we explore various structures including walls, bridges, and domes
- Estimate the measurement of the *angle* that is formed when the brace wall is extended out completely.
  - Now use your protractor to calculate the *angle* measurement
  - How close was your estimation?



- d. If you were to drop a *perpendicular line* from the top of the wall to the floor, what would be the measurement of the angle formed by the wall and the perpendicular line?
- e. What property did you use to calculate the measurement of the angle in d?
- f. Estimate the height of the brick wall.
- g. Use the appropriate tools to calculate the height of the brick wall.

10. Structures – **Exhibit 5C – Arch Bridge**

- a. Draw the line of symmetry for the Arch Bridge

11. Structures – **Exhibit 5D – X-Brace Bridge**

- a. Describe the triangles that are created by the X-Brace

- b. Draw the triangles created by the X-Brace and label them

- c. Indicate which sides are congruent.

- d. Indicate which angles are congruent.

- e. Indicate the angle measurement of each angle.

- f. Measure each side of the square and calculate the area.

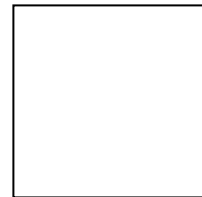
- g. What is the area of each triangle created by the X-Brace?

- h. Assume that each side of the square used at the X-Brace exhibit measures 10 inches. How long must the X-Brace be in order to create congruent triangles and keep the square from leaning. Hint: Use the Pythagorean Theorem.

- i. What is the diagonal line called?

- j. Draw a picture of the following structures and indicate the line(s) of symmetry for each structure.

- i. Flying Buttress



ii. Voussoir Arch

iii. Corbelled Arch

12. Structures – **Exhibit 5E – Pneumatic Pressure**

- a. Draw three exhibits in this area and show the line(s) of symmetry.

13. **Exhibit 19 – Earth vs. Sun Scale**

- a. Work with students in the class to create a chart recording at least 10 people's weight on the Sun and on Earth.
- b. What is the algebraic expression that represents the formula for converting your weight on Earth to your weight on the Sun?

14. **Exhibit 13 – Plasma Sphere**

Using the formula  $V = \frac{4}{3} \pi r^3$  for volume calculate the amount of gas that the small plasma sphere can hold.

15. **Exhibit 29 – Pedal Power**

Given the formula for calculating the distance you travel within a given time period while traveling at a constant rate as  $\text{rate} * \text{time} = \text{distance}$  ( $rt = d$ ) calculate the following:

- a. Assume that you are pedaling at a constant rate of 15 ft per second. How long will you have to pedal in order to travel 150 yards.
- b. Convert your answer to minutes.