National Aeronautics and Space Administration

# LAUNCH INTO MATH

## Exercise 2: Volume and Geometric Solids

It takes a lot of space to go to space! In the exercise below, explore how volume is important to the construction and assembly of the Space Launch System (SLS) rocket and the Orion spacecraft.

**Feel free to use a calculator for these exercises... unless you really, really love long multiplication and division.**

### Volume of the Vehicle Assembly Building

Based out of Kennedy Space Center, **Exploration Ground Systems** (EGS) is the program that will prepare the SLS and the Orion spacecraft for launch. The **Vehicle Assembly Building** (VAB) is quite literally a huge part of that process. With its 525-foot-tall ceiling, the VAB is one of the only buildings in the world where the SLS and Orion can be assembled.

**Problem 1:** Let's say you want to turn one of the world's largest buildings into the world's largest stack of puzzle cubes. **If you were stacking the cubes on top of each other, approximately how many puzzle cubes would it take to fill the high bay of the VAB?** (The high bay is the super tall part of the VAB.) Use the formulas and measurements below to find your estimate. Round your answer to the nearest million.

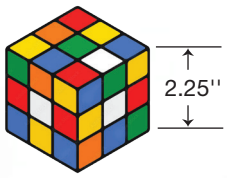
Height of the VAB high bay: 525 feet

Length of the VAB high bay: 440 feet

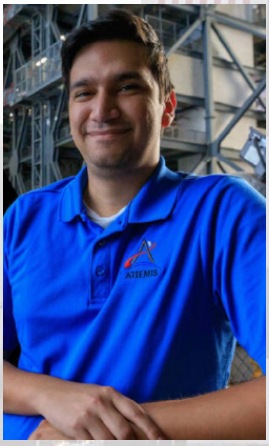
Width of the VAB high bay: 518 feet

Length/width/height of a puzzle cube: 2.25 inches

Inches in a foot: 12




Formula for the volume of a rectangular prism: *length* • *width* • *height*



### Meet the Artemis Team

Getting to the Moon is a team effort, and no one knows that better than Abdiel Santos-Galindo. Abdiel is a ground systems integration engineer for EGS. He spends most of his time at the VAB and the Rotation, Processing, and Surge Facility, where he ensures that the ground systems technology for the SLS and Orion are working properly. Read more about Abdiel's work *here*.

### Additional Resources

*Light but Strong: A Lesson in Engineering Activity*

*NASA's Vehicle Assembly Building Did you know?*

*Houston We Have a Podcast episodes: The Space Launch System: Part 1, Part 2*

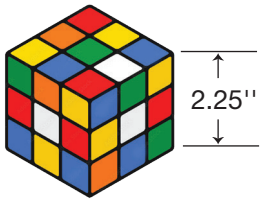
# Solutions to Exercise 2: Volume and Geometric Solids

### Volume of the Vehicle Assembly Building

**Problem 1:** If you are stacking puzzle cubes on top of each other, approximately how many will it take to fill up the high bay of the VAB? Round your answer to the nearest million.

**Measurements:**

Height of the VAB high bay: 525 feet
Length of the VAB high bay: 440 feet
Width of the VAB high bay: 518 feet
Length/width/height of a puzzle cube: 2.25 inches
Inches in a foot: 12




**Solution:**

Length/width/height of a puzzle cube in feet: $2.25 \text{ inches} \cdot \frac{1 \text{ foot}}{12 \text{ inches}} = 0.1875$ feet

Length of the stack: $\frac{\text{length of the high bay}}{\text{side of a puzzle cube}} = \frac{440 \text{ feet}}{0.1875 \text{ feet}} = 2{,}346.67 \approx 2{,}346$ *puzzle cubes*

Width of the stack: $\frac{\text{width of the high bay}}{\text{side of a puzzle cube}} = \frac{518 \text{ feet}}{0.1875 \text{ feet}} = 2{,}762.67 \approx 2{,}762$ *puzzle cubes*

Height of the stack: $\frac{\text{height of the high bay}}{\text{side of a puzzle cube}} = \frac{525 \text{ feet}}{0.1875 \text{ feet}} = 2{,}800$ *puzzle cubes*

Total number of cubes: $\text{length} \cdot \text{width} \cdot \text{height} = 2{,}346 \cdot 2{,}762 \cdot 2{,}800 = 18{,}143{,}025{,}600$
$\approx 18{,}143{,}000{,}000$ *puzzle cubes*

**Final solution: It will take a stack of about 18,143,000,000 puzzle cubes to fill the high bay of the VAB.**