LESSON PLAN

How Much Stuff Can The Ship Hold? Calculating Area & Volume

Overview & Major Themes

The lowest part of USS *Constitution* was called the hold, and it was there that *Constitution*'s sailors stowed the many goods needed to keep the ship afloat, and to feed the 480 men who served aboard for months at sea. In this lesson, students use the dimensions of *Constitution*'s hold to figure out how much it really could hold.

Objectives

- Students use *Constitution*'s dimensions to find the volume of the hold (in cubic feet).

- Students measure and use household or classroom objects (rectangular objects).

- Students use other measurements and algebra to understand how much can realistically fit in *Constitution*'s hold, and compare the measurements in an outdoor space or to their own classroom.

Outcomes

- Students will learn and apply the mathematical equation of a rectangular prism, Volume = Length*Width* Height or (V=l*w*h).

- Students will use measurements to understand size and volume in real living spaces, and compare them to the size of *Constitution*'s hold.

Materials & Resources

- Illustrations of Constitution's hold and cross-section

- Household/Classroom 3-dimensional object (bookcase, shoebox, thick textbook)

- Calculator

- Outdoor space or a classroom

- Measuring tape, yardsticks, string

Instructional Activity

5 min.

Show students the illustration of the hold. Explain the USS *Constitution* had several decks for living and working for the hundreds of sailors who served aboard her in 1812. It was the Captain's duty to see that before the ship left port, there was plenty of food and water to feed them all. Many of these goods were

stored in *Constitution*'s hold, aptly named because it held the supplies needed to keep the ship and her sailors in tip-top shape! Make sure to point out the barrels (some of these held the ship's fresh water supply for sailors to drink).

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2 min.

Explain to students they are going to learn how to find the volume of a 3-dimensional shape (a rectangular prism and a cylinder). *Constitution*'s hold was not a perfect rectangle, but it was pretty close! Introduce students to the concept of surface area vs. volume: surface area is flat (2-dimensional polygon), while volume is the amount of space inside a unit. Compare a wall of your classroom to the space inside the classroom. Surface area is in units squared, while volume is in units cubed.

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5 min.

Use the illustration of *Constitution*'s cross-section and label the hold's dimensions with the students:

Length: 40' (feet)
Height (floor to ceiling): 14' (feet), 3" (inches)
Width (breadth): 36 ' (feet)

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5 min.

First, students need to convert 14' 3" to a decimal.

Answer Key:
14' 3" = 14.25'
3/12 = 0.25

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5 min.

Next, give students the Volume = Length*Width* Height equation to find the volume. Have them use their calculators, if needed.

Answer Key:
40' * 14.25' * 36' = 20,520 cubic feet
Constitution's hold is 20,520 cubic feet.

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10 min.

Pick a rectangular object in the classroom for students to measure the length, width, and depth. Once they find the volume in cubic feet, divide the hold's volume by the volume of whatever object you have chosen. Your answer will be how many of that object can fit in *Constitution*'s hold. Students are now applying equations.

For example, a bookcase:

Length: 5' (feet)
Height: 1.5' (feet)
Width 3' (feet)
5' * 1.5' * 3' = 22.5 cubic feet

To find volume:
20,520 cubic feet / 22.5 cubic feet = 912 bookcases can fit into *Constitution*'s hold.

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20 min.

Try applying the volume equation to measure your classroom's volume.

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20 min.

Bring students outside and measure the length and width of *Constitution*'s hold for a fun activity – letting students see the size in a real-life space.

Homework or follow-up activity

Have students apply what they have learned to their bedroom, living room, and bathroom in their own homes.