Mathematics: The Language of STEM
Harry's Cupboard II
volume - grade 5
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CONTENT AND TASK DECISIONS

Grade Level(s): 5

Description of the Task:

Indiana Mathematics Content Standards: 5.M.6 Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems and other mathematical problems.

Indiana Mathematics Process Standards: PS.4 Model with Mathematics. Students will use grids to model area(s) and compare areas. PS. 8 Look for and express regularity in repeated reasoning. Students will derive formula for volume of rectangular prism.

Mathematics Content Goals: Students will understand that by finding the volumes of contiguous, non-overlapping rectangular prisms, one can use the sum of these parts to find the volume of the whole.

Language Objectives: Students will verbally define volume using cubes to represent cubic feet. Students will verbally defend their method of finding the area of *Harry's Cupboard*.

Materials:
Centimeter grid paper
Centimeter cubes
Centimeter grid paper on card stock
Diagram of the Dursley's staircase (Harry's cupboard)

THE LESSON

Before:

- **Activate prior knowledge** (prerequisite: Harry's Cupboard I)
  How did we determine the amount of "space" in our classroom?
  How did the volume of Dudley's room compare you yours?
  *Display information concerning the volume/capacity of some modern/trendy auto. *How does this volume compare with your room?*
  How do auto manufactures determine the capacity of a car?

  We considered the floor area of Harry's Cupboard. What can we say about its volume?

  Distribute grid paper and centimeter cubes. Invite students to use these tools to investigate how we could find the volume. Discuss.

Distribute diagram of Harry's Cupboard. Assign the task of determining the volume under the staircase.

During:

- **Let go,** Students are to work in pairs to determine the volume of Harry's Cupboard. Students should have sketches, drawings, figures and/or models to justify/defend their thinking.
- **Listen actively,** At some point students should become stuck. The units are not in whole feet, but in inches as well.
- **Provide appropriate support**
  How are you creating rectangular prisms in order to find the volume of each?
  How can we find volume when some of our dimensions are in inches and not feet?
  Is there a pattern to take advantage of?

- **Provide worthwhile extensions**.
  Invite students to create "walls" for Harry's cupboard.
  How does the volume of Harry's Cupboard compare with Dudley's? (Consider the area comparison from the first lesson.)

After: I

- **Promote a mathematical community of learners**
  Invite pairs to share under camera their solutions.
- **Listen actively without evaluation**
- **Make connections**
  Is there an extra-special formula that helped you find the volume under stairs?
  Are there bedrooms that require this same treatment? (complex)
  The volume of Harry's Cupboard is 208 cubic feet. Reconstruct his room using 208 centimeter cubes. How does this size compare to bedroom models from the first lesson?
- **Summarize main ideas**
  How can we find the volume of complex shapes?

ASSESSMENT

Observe: Students will provide drawings and calculations to demonstrate their reasoning. Students will defend their conclusions. Students will demonstrate their use of finding the sum of discrete rectangular prisms to find the total interior volume.

Ask: How did you find the volume of Harry's cupboard?
What patterns did you notice?
How does your current method of solving the problem compare with your earlier attempts?

Harry Potter's Cupboard

(Not to scale)