

Mathematics: The Language of STEM

Ship it out!
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CONTENT AND TASK DECISIONS

Grade Level(s): 5th grade

Description of the Task: With a partner, given a specified amount of cubes (30), students will determine dimensions of a box (right rectangular prism) needed to accommodate all cubes. See attached.

Indiana Mathematics Content Standards: 5.M.5 - Apply the formulas $V=L \times W \times H$ for right rectangular prisms with the whole number edge lengths to solve real world problems and other mathematical problems.

Indiana Mathematics Process Standards: PS.4 – Mathematically proficient students apply the mathematics they know to solve problem arising in everyday life, society, and the workplace using a variety of appropriate strategies.

Mathematics Content Goals: Students will understand the formula used to determine volume of a right rectangular prism and the reasoning behind the formulas.

Language Objectives: Using manipulatives, students will discuss verbally with a partner possible dimensions for a box that would accommodate all 30 cubes.

Materials: Students will need unifix cubes (30 per partner pair), paper and pencil.

THE LESSON

Before: Discuss with students how items get from the manufacturer to the store (by being shipped in boxes in semi trucks, on air planes or by train). Explain the importance of the box being the perfect size for the items inside (too big and you pay more than needed for shipping; too small you will need additional boxes which also would increase the price to ship).

- **Activate prior knowledge** How do items get from the place they are made (manufacturer) to the store where you buy them? How are they packaged? What size packages are used?
- **Be sure the problem is understood**, your job is to find the perfect size box for 30 Rubik's cubes. What are the measurements of this box? How do you know?
- **Establish clear expectations:** As you experiment with your cubes to find the dimensions (measurements) of your box, record your trials to help guide your thinking.

During: Students will take the 30 cubes (representing the Rubik's cubes) and make them into a right rectangular prism.

- **Let go:** Students will stack cubes with their task partners to create a right rectangular prism. Students should record their findings in order to evaluate their findings.
- **Listen actively:** Students should be actively listening to each other as they discuss their ideas

for the box. The teacher should be listening to their conversations as he/she circulates from group to group assuring all students are on task and understand the task.

- **Provide appropriate support:** As teachers circulate they can ask...
 - **Can you explain what you have done so far?**
 - **How did you reach that conclusion?**
 - **Can you convince the class that your answer makes sense?**
 - **Are there other possible answers?**
- **Provide worthwhile extensions:** Taking what you learned about the dimensions for a box that holds 30 cubes, what could be the dimensions of a box that holds 90 cubes? What about 120 cubes? If you wanted to ship 960 Rubik's cubes, what is the most effective way to do that?

After:

- **Promote a mathematical community of learners:** Ask two task partner groups to join together forming a group of four. Have each partner pair present to the other their findings to the other. Use the cubes to prove their answer if necessary.
- **Listen actively without evaluation:** As the teacher, be sure to ask additional engaging questions such as:
 - **Does your solution work in a different way?**
 - **What would happen if the numbers are in a different order? Would they still hold 30 cubes?**
 - **If the two task partners got different answers, how are they both correct? PROVE their answer!**
- **Make connections** How does this relate to area? Where in the real world could we use this information other than shipping boxes?
- **Summarize main ideas** In order to find the volume in cubic units of a container, we now know what you need the length, width and height of a container. A formula commonly used is $V=L \times W \times H$.

ASSESSMENT

Observe: As the teacher is circulating, check for understanding to see that all students have determined a length, width and height that when multiplied will equal the 30 cubes given to them.

Ask: Why do we measure volume and label in cubic units. Explain why it is important to be able to calculate volume and understand the meaning.

Ship it out!



TASK: You have 30 Rubik's cubes that need shipped to California ASAP! Your 30 cubes represent the Rubik's cubes. Since you are the shipping coordinator, it is your job to create a box that will hold all 30 Rubik's cubes. The box has to be just the right size; not too big or it will cost too much to ship, but not too small or they won't fit!

Language objective: Discuss with your task partner what possible measurements could be used for this job!

