Shoe Contest

About how many shoes would it take to fill your entire classroom from floor to ceiling and from wall-to-wall?

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Grade Levels 6 - 8

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Context

One of my students came across this contest in a children's magazine. She brought it in to me and wanted to do it, as the winning class gets free athletic shoes! It looked like it offered excellent measurement opportunities, as well as the chance to work together to write a class solution to an interesting task. At this point, the students have worked in small groups to complete the required measurements and have worked alone or in pairs to write up independent solutions using the whole class measurement data. The next step is to find the time to get them all together and work to unite the best from all the individual tasks together into the winning solution before the deadline. Even without the contest, I think this is an excellent task as it is very engaging, offers a real-world problem setting and includes a lot of measurement and some decision making as to approaches to solving the problem.

What This Task Accomplishes

There is a lot of measurement involved in this task. Both linear and cubic measurements are required. As students begin to measure the room in centimeters and then find the volume of various areas using calculators, they realize that the numbers are too big and require metric conversions. There was a good amount of comparison of results and estimation to decide which of the conflicting measurements made the most sense. There was an obvious need to verify results. There were also many opportunities for decision making as to exactly how to see how many shoes would fit in the room.

What the Student Will Do

My students began by tearing off their shoes and throwing them into the middle of the room. They quickly saw that they were not even close to filling the room! They then considered lining them up along one wall and trying to pile them to the ceiling. That was quickly dismissed as unworkable. There was an empty paper box on the shelf, which someone spotted and suggested we fill to see how many of these nice rectangular boxes would fit into the entire room. There was a lively discussion as to which shoes should go into the box in order to get an authentic sample from the class. My students' benchmarks do not address the process involved in selecting the shoes. The students actually did a class poll of types of shoes and took a proportional sample of these types to fill the box.

Most kids were wearing soccer flats, so they were able to fit many shoes into the box. There were a few high tops, boots and clogs in the mix. Students then divided themselves into groups

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to measure the various areas of the room and compute the volume of the nooks and crannies, as well as the large furniture items that could not be removed. Unfortunately, no one kept the raw data used to compute the volume of these parts of the room. I would suggest that you do so. Students then pooled the data on the flip chart and everyone worked in pairs or independently to calculate how many boxes would fit in this space and eventually how many shoes would fit in the room.

Time Required for Task

Three, 45-minute class periods

Interdisciplinary Links

I did not make any interdisciplinary links for this particular problem. If you find any, I would love to hear from you!

Teaching Tips

I suggest that you appoint a scribe for each measurement group to record all measurements on paper (my students either used the chalk board, scrap paper or keyed the data directly into the calculator and the raw data was lost). I would also appoint a checker to make sure the measurements are accurate and accurately recorded. If you have 24 or so students in the classroom, I do not think you want to have them all making all the measurements as chaos will reign! I found that by giving each group a specific section of the room to measure that all were involved, but not climbing over each other.

Suggested Materials

- Measuring devices- meter sticks and measuring tapes
- Calculators
- You might want to "plant" a box or two in your room.*

*I happened to have a box in the room and it worked well.

Possible Solutions

The solution will obviously vary for every situation. Our best estimate is that with 24 shoes in the box and 7,495 boxes able to fit in the room that we would be able to fit at least 179,880 shoes in the room, and I suspect that we could cram in many more pairs if we wanted to!

Benchmark Descriptors

Novice

I could not find a paper without any evidence of understanding, but this paper has about the least of all. As the measures of the volume of the various parts of the room were posted, a

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student could have copied these down without having much understanding of the concepts involved. I believe that this student did know how the information was generated, but has such poor communication skills that the reader does not see this. His/her numbers are inaccurate and I am not sure why, since his/her explanation of the solution is so incomplete. The mathematical terminology is weak and flawed ("we total them together"). There is no mathematical representation.

Apprentice
These two students worked together to solve the problem and collaborated on writing their solution. If they had drawn a diagram of the room to accompany their second paragraph, it would have been most helpful. They do not have the raw data to support their measures of volume of the various components of the room. While they did use some correct notation, they omitted it on more than one occasion. They use no mathematical representation, passing up a great opportunity to do so. There is evidence of mathematical reasoning shown by their narrative, but there was room for much more than they gave. I believe that their understanding went much deeper than this piece demonstrates.

Practitioner
This student had a broad understanding of the problem and shows understanding of all the major concepts necessary for solving the problem. S/he identifies each step involved in finding the total room volume, but s/he still does not include the raw data needed to check the accuracy of these volume measurements. S/he methodically documents the procedures used to reach his/her solution and his/her reasoning is evident through his/her narrative. His/her explanation is clear and his/her terminology is accurate. His/her attempt at representation falls a little short, but his/her idea to include a room diagram is a good one, even if his/her execution is weak. It is clear to me that this student had at least a reasonable understanding of this task.

Expert
This student shows a deep understanding of the solution of the task and writes an efficient explanation of his/her solution. His/her reasoning is clear and s/he is able to clearly articulate his/her reasoning. This student's explanation is the most efficient of all I received. It does outline the steps taken. I only wish s/he had included the raw measurements taken. His/her math language and notation is accurate. His/her representation is more impressive in the original, as it is in three colors and his/her key is accurate. Measurements on the diagram would be an asset, as would inclusion of the furnishings mentioned in the solution.

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