

MeTEOR Performance Task

Sixth Grade

Mathematics
Souvenir Storage



Performance Task Item: Souvenir Storage

Grade Level: 6th Grade

Focus Area: Volume

Essential Question: What strategies can be used to solve a contextual problem finding the volume of a rectangular prism with fractional edge lengths?

Core Ideas:

- Understands how to find the volume of a right rectangular prism.
- Understands how to multiply fractions to find volume.
- Understands how to apply the formula $V = lwh$.

Learning Targets:

- Students will calculate the volume of a right rectangular prism with fractional lengths.
- Students will reason logically about multiplication of fractions.
- Students will use formula to find the volume of a rectangular prism.

STANDARDS

Domain: Geometry

Content Standards:

- Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths.
- Show that the volume is the same as would be found by multiplying the edge lengths of the prism.
- Apply the formulas $V = lwh$ and $V = Bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

Supporting Standard:

- Multiplication of fractions.

Math Practice Standards:

MP 1: Make sense of problems and persevere in solving them.

MP 3: Construct viable arguments and critique the reasoning of others.

MP 4: Model with mathematics.

MP 6: Attend to precision.

Materials:

- Performance Task
- Pencil
- Paper

Task/Question 1:

DOK Level 1: Recall & Reproduction

Math Practice Standard:

- MP 6: Attend to precision.

- A. What is the *definition* of volume for a 3-dimensional figure?

- B. What is the *formula* for finding volume in right rectangular prism?

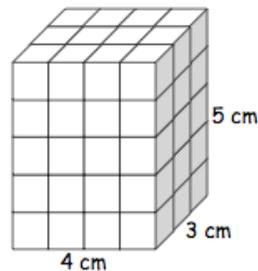
Task/Question 2:

DOK Level 2: Basic Application of Skills and Concepts

Math Practice Standards:

- MP 1: Make sense of problems and persevere in solving them.
- MP 6: Attend to precision.

- A. Calculate the volume of the figure:



- B. If the height of the figure in Part A were doubled, how would that change the volume? Show all calculations.

Task/Question 3:

DOK Level 3: Strategic Thinking and Complex Reasoning

Math Practice Standards:

- MP 1: Make sense of problems and persevere in solving them.
- MP 3: Construct viable arguments and critique the reasoning of others.
- MP 7: Look for and make use of structure.

Souvenir Storage



Jean works at a warehouse company. The store manager, Mrs. Guyton, would like to use an empty box to store 26,000 puzzle cube souvenirs that she will give out to customers. The edge length of the puzzle cube is $\frac{1}{8}$ '. The boxes come in 3 sizes:



Box Sizes

Box A: $2\frac{1}{4}$ ' by $2\frac{1}{2}$ ' by 8'

Box B: $2\frac{1}{4}$ ' by $2\frac{1}{2}$ ' by 12'

Box C: $2\frac{1}{4}$ ' by $2\frac{1}{2}$ ' by 4'



A. Which box should Jean use to store all of the souvenir cubes?

B. Defend your choice using viable mathematical arguments:

Box A	Box B	Box C

Task/Question 4:

DOK Level 4: Extended Thinking

Math Practice Standards:

- MP 1: Make sense of problems and persevere in solving them.
- MP 3: Construct viable arguments and critique the reasoning of others.
- MP 4: Model with mathematics.
- MP 7: Look for and make use of structure

- A.** Look around your home. Find an area and explore the volume of that area (under a bed, under the stairs, in a closet, in the garage etc...).

Use your understanding of volume to design, reorganize, or create a space in your home that becomes more functional than it is currently being used.

Create a presentation of the process, with emphasis on how the understanding of volume assisted you in the redesign.

Complete Performance Task Scoring Rubric *Souvenir Storage*

16-30 Proficient 13-15 Good 10-12 Satisfactory 7-9 Poor 0-6 Unsatisfactory

	Depth of Knowledge Level	Points	Total Possible Points for Task	Total Points Earned by Student
Task 1: A. The amount of space inside a shape measured in cubic units. B. $V = lwh$	1	1 1	2	
Task 2: A. 60 cm^3 B. The volume would double. It would go from 60 cm^3 to 120 cm^3 .	2	1 2	3	
Task 3: A. Box B is the only box that can contain all of the souvenir cubes. B. See Solution Keys on next page.	3	3 12	15	
Task 4: A. Answers will vary. Focus must be on the use of volume for the redesign.	4	10	10	

Possible solution #1

Box A	Box B	Box C
$V = 2\frac{1}{4} \cdot 2\frac{1}{2} \cdot 8$ $V = \frac{9}{4} \cdot \frac{5}{2} \cdot 8 = 45$ <i>v</i> = 45 cubic inches is the volume of Box A.	$V = 2\frac{1}{4} \cdot 2\frac{1}{2} \cdot 12$ $V = \frac{9}{4} \cdot \frac{5}{2} \cdot 12 = 67\frac{1}{2}$ or 67.5 <i>v</i> = 67.5 cubic inches is the volume of Box B	$V = 2\frac{1}{4} \cdot 2\frac{1}{2} \cdot 4$ $V = \frac{9}{4} \cdot \frac{5}{2} \cdot 4 = 22\frac{1}{2}$ or 22.5 <i>v</i> = 22.5 cubic inches is the volume of Box C
$\left(\frac{1}{8}\right)^3 = \frac{1}{512}$ $45 \div \frac{1}{512}$ $45 \times 512 = 23,040$	$\left(\frac{1}{8}\right)^3 = \frac{1}{512}$ $67\frac{1}{2} \div \frac{1}{512}$ $67.5 \times 512 = 34,560$	$\left(\frac{1}{8}\right)^3 = \frac{1}{512}$ $22\frac{1}{2} \div \frac{1}{512}$ $22.5 \times 512 = 11,520$
Box A can storage 23,040 1/8 edge length puzzle cube.	Box B can storage 34,560 1/8 edge length puzzle cube.	Box C can storage 11,520 1/8 edge length puzzle cube.

Possible solution #2

Box A	Box B	Box C
Box A: 2 ¼' by 2 ½' by 8'	Box A: 2 ¼' by 2 ½' by 12'	Box A: 2 ¼' by 2 ½' by 4'
$2\frac{1}{4} \div \frac{1}{8} = 18$	$2\frac{1}{4} \div \frac{1}{8} = 18$	$2\frac{1}{4} \div \frac{1}{8} = 18$
$2\frac{1}{2} \div \frac{1}{8} = 20$	$2\frac{1}{2} \div \frac{1}{8} = 20$	$2\frac{1}{2} \div \frac{1}{8} = 20$
$8 \div \frac{1}{8} = 64$	$12 \div \frac{1}{8} = 96$	$4 \div \frac{1}{8} = 32$
$18 \times 20 \times 64 = 23,040$ cubes	$18 \times 20 \times 96 = 34,560$ cubes	$18 \times 20 \times 32 = 11,520$ cubes
Box A can storage 23,040 1/8 edge length puzzle cube.	Box B can storage 34,560 1/8 edge length puzzle cube.	Box C can storage 11,520 1/8 edge length puzzle cube.

Based on the calculation that box size I will recommend to storage the 26,000 puzzle cube souvenirs with fractional lengths of 1/8 is Box B.



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