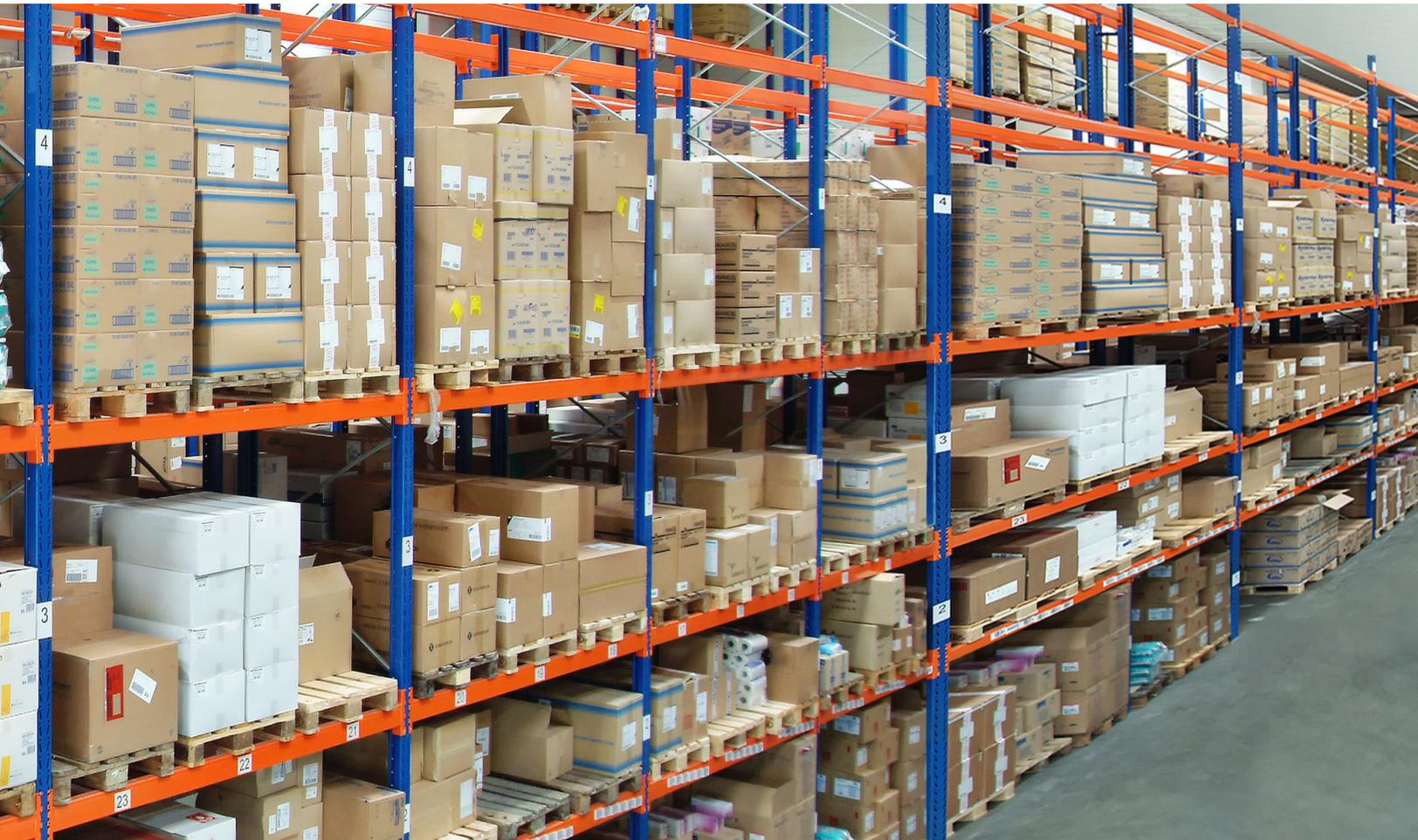


MeTEOR Performance Task Seventh Grade

Mathematics
All About Boxes



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MeTEOR
CONNECTING THE DOTS

Performance Task Item: All about Boxes

Grade Level: 7th grade

Focus Area: Volume and Surface Area

Essential Question: What strategies can be used in determining volume and surface area of right rectangular prisms?

Core Ideas:

- Understands area, surface area, and volume and their differences.
- Understands and analyzes characteristics and properties of three-dimensional geometric shapes and applies appropriate formulas to determine measurements.
- Understands how to read given diagrams of three-dimensional shapes.
- Understands how to calculate, using formulas, area, surface area, and volume.

Learning Targets:

- Students will calculate area, surface area, and volume.
- Students will read given diagrams of three-dimensional shapes.
- Students will explain their reasoning.

STANDARDS

Domain: Geometry

Content Standards:

- Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Supporting 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, and 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.

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.

MP 7: Look for and make use of structure.

Materials:

- Performance Task
- Pencil
- Paper
- Calculator
- Several boxes for demonstration purposes

Task/Question 1:

DOK Level 1: Recall & Reproduction

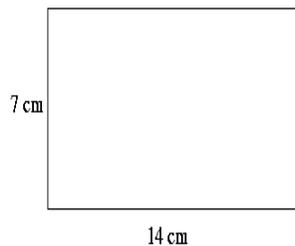
Math Practice Standard:

- MP 6: Attend to precision.
- MP 4: Model with mathematics.

A. Write the formula for the volume of a right rectangular prism:

B. Describe what the surface area of a figure represents:

C. Determine the area of the following figure:



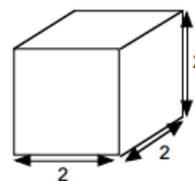
Task/Question 2:

DOK Level 2: Basic Application of Skills and Concepts

Math Practice Standards:

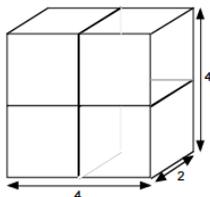
- MP 1: Make sense of problems and persevere in solving them.
- MP 6: Attend to precision.

A. Billy has a set of building blocks. Each block is 2 inches long, 2 inches wide and 2 inches high. What is the volume of the block in cubic inches?



B. Explain how you determined the volume in Part A:

C. Billy has built this shape from his $2 \times 2 \times 2$ blocks. What is the new surface area of the shape in square inches?



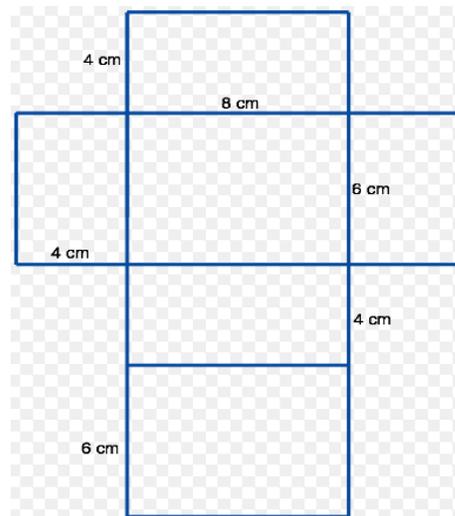
Task/Question 3:

DOK Level 2: Basic Application of Skills and Concepts

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.

A. A grocer wants to sell fruit in boxes. He wants to make the boxes from cardboard as shown below.



Calculate the volume of the box:

B. Calculate the surface area of the box in part A. Show your work.

Task/Question 4:

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 4: Model with mathematics.
- MP 7: Look for and make use of structure.

You are hired as a new design engineer for Emoji Cereal Company. It is your job to design the next cereal box. The new cereal box must have a volume of 4000 cm^3 . Your task will be to create a flier that contains your proposal for the best cereal box design for the cereal that Emoji Cereal Co. will sell.

- A.** Create two different-sized cereal boxes that would hold a volume of 4000 cm^3 of cereal. Draw each box below and label its dimensions. Show your work to verify that the boxes you drew would hold 4000 cm^3 of cereal.

Cereal Box 1	Cereal Box 2

B. Find the surface area of each box you created in Part A. Show all your work.

Cereal Box 1	Cereal Box 2

C. It costs \$0.0002 per cm^2 for the cardboard used to make the boxes. How much will it cost to produce each box you created in part A? Defend your math.

Cereal Box 1	Cereal Box 2

D. The shelves at Super Size Mart that will sell your cereal are each 30 cm wide, 40 cm high and 600 cm long. There are 4 shelves in each unit. Based on this information, would you recommend producing either of the boxes you designed to hold the cereal? Defend your reasoning with mathematical arguments.

Complete Performance Task Scoring Rubric

All about Boxes

19-21 Proficient 14-18 Good 9-13 Satisfactory 5-8 Poor 0-4 Unsatisfactory

	Depth of Knowledge Level	Points	Total Possible Points for Task	Total Points Earned by Student
Task 1: A. $V = lwh$ or $V = Bh$ B. The total outside area of a surface; the area of such an outer part or uppermost layer. C. 98 cm^2	1	1 1 1	3	
Task 2: A. 8 cm^3 . B. $2 \times 2 \times 2$: $V = lwh$. C. 64 cm^2	2	1 1 1	3	
Task 3: A. 192 cm^3 . B. 208 cm^2 : Bottom and Top are each 48 cm^2 (8×6), total for them is 96 cm^2 . Front and Back are each 32 cm^2 (8×4), total for them is 64 cm^2 . Left and Right are each 24 cm^2 (6×4), total for them is 48 cm^2 . Total Surface can be found by adding area of all sides.	2	1 2	3	
Task 4: A. Answers will vary. Student Volume calculations should show an understanding of $V = lwh$. Each box designed should have a volume of 4000 cm^3	3	2	12	

<p>B. Answers will vary. However, the student should demonstrate understanding of how to calculate Total Surface Area.</p>		2		
<p>C. Answers will vary. Student should multiply answers in part B to \$0.0002.</p>		3		
<p>D. Answers will vary. Students should use volume to compare the space each box would take up. It is not necessary for the students to multiply by four because of the amount of shelves. Student answers should include the ability to place more boxes on each shelf; therefore they are looking for the box with the least volume as their choice.</p>		5		
TOTAL POINTS:				



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