2023 MCAS Sample Student Work and Scoring Guide

Grade 5 Mathematics
Question 5: Constructed-Response

Reporting Category: Measurement and Data
Standard: 5.MD.C.5 - Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume.
Item Description: Determine the volumes of right rectangular prisms and find the possible dimensions of a prism with a given volume.
Calculator: Not allowed

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Scoring Guide
*Select a score point in the table below to view the sample student response.*

Score*	Description
4A	The student response demonstrates an exemplary understanding of the Measurement and Data concepts involved in relating volume to the operations of multiplication and addition and solving real-world and mathematical problems involving volume. The student correctly determines the area of a cube and a right rectangular prism given their dimensions, uses the volumes of prisms to solve a real-world problem, and finds the possible dimensions of a rectangular prism with a given volume.
4B	
3	The student response demonstrates a good understanding of the Measurement and Data concepts involved in relating volume to the operations of multiplication and addition and solving real-world and mathematical problems involving volume. Although there is significant evidence that the student was able to recognize and apply the concepts involved, some aspect of the response is flawed. As a result, the response merits 3 points.
2	The student response demonstrates a fair understanding of the Measurement and Data concepts involved in relating volume to the operations of multiplication and addition and solving real-world and mathematical problems involving volume. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student merits 2 points.
1	The student response demonstrates a minimal understanding of the Measurement and Data concepts involved in relating volume to the operations of multiplication and addition and solving real-world and mathematical problems involving volume.
0	The student response contains insufficient evidence of an understanding of the Measurement and Data concepts involved in relating volume to the operations of multiplication and addition and solving real-world and mathematical problems involving volume. As a result, the response does not merit any points.

*Letters are used to distinguish between sample student responses that earned the same score (e.g., 4A and 4B).

Score Point 4A

This question has four parts.

A toy company produces wooden blocks. Each block is in the shape of a cube with an edge length of 2 inches (in.), as shown in this diagram.

2 in.

2 in. 2 in.
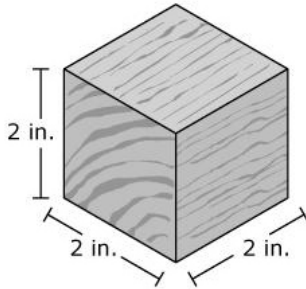
Part A

What is the volume, in cubic inches, of each block? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

> The volume of each block is 8 cubic inches.
>
> $2 \times 2 \times 2 = 8$

Part B

The toy company packs the blocks in cartons. Each carton is in the shape of a right rectangular prism and is completely filled, with no gaps or overlaps.

- The carton has a base area of 240 square inches.
- The carton has a height of 12 inches.

What is the volume, in cubic inches, of the carton? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

> The volume of the carton is 2880 cubic inches.
>
> $240 \times 12 = 2880$

Part C

What is the greatest number of blocks that can fit in one carton, with no gaps or overlaps? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

> The greatest number of blocks that can fit in one carton is 360.
>
> $2880 \div 8 = 360$

Part D

The toy company plans to start making a larger carton that holds exactly $1,000$ blocks, with no gaps or overlaps.

What could be the measurements, in inches, of the larger carton's length, width, **and** height? Show or explain how you got your answers.

Enter your answers and your work or explanation in the space provided.

> The measurements of the carton's length could be 10 cubic in. The measurements of the carton's width could be 10 cubic in. The measurements of the carton's height could be 80 cubic in.
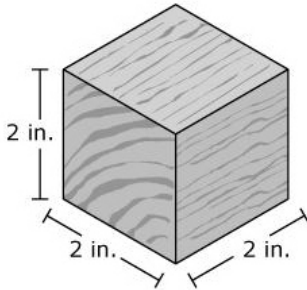>
> $10 \times 10 \times 80 = 8000$
>
> $8000 \div 8 = 1000$

Score Point 4B

This question has four parts.

A toy company produces wooden blocks. Each block is in the shape of a cube with an edge length of 2 inches (in.), as shown in this diagram.

2 in.

2 in.   2 in.

Part A

What is the volume, in cubic inches, of each block? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

$$2^3 = 8 \, \text{in. cubed}$$

Part B

The toy company packs the blocks in cartons. Each carton is in the shape of a right rectangular prism and is completely filled, with no gaps or overlaps.

- The carton has a base area of 240 square inches.
- The carton has a height of 12 inches.

What is the volume, in cubic inches, of the carton? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

$$240 \, \text{in} \times 12 \, \text{in} = 2880 \, \text{in. cubed}$$

Part C

What is the greatest number of blocks that can fit in one carton, with no gaps or overlaps? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

$$2880 \div 8 = 360$$

Part D

The toy company plans to start making a larger carton that holds exactly $1,000$ blocks, with no gaps or overlaps.

What could be the measurements, in inches, of the larger carton's length, width, **and** height? Show or explain how you got your answers.

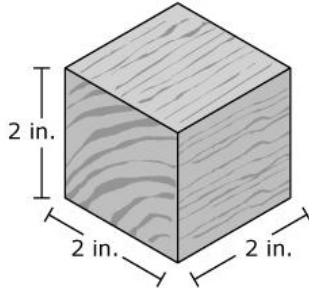Enter your answers and your work or explanation in the space provided.

$L = 40 \quad W = 20 \quad H = 10$
$(40 \times 20) \times 10 = 8000$

Score Point 3

This question has four parts.

A toy company produces wooden blocks. Each block is in the shape of a cube with an edge length of 2 inches (in.), as shown in this diagram.

2 in.

2 in.   2 in.

Part A

What is the volume, in cubic inches, of each block? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

$2 \times 2 \times 2 = 8$

Answer: 8 cubic inches

Part B

The toy company packs the blocks in cartons. Each carton is in the shape of a right rectangular prism and is completely filled, with no gaps or overlaps.

- The carton has a base area of 240 square inches.
- The carton has a height of 12 inches.

What is the volume, in cubic inches, of the carton? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

$240 = length \times width$
$240 \times 12 = 2,880$

Answer: 2,880 cubic inches

Part C

What is the greatest number of blocks that can fit in one carton, with no gaps or overlaps? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

$2880 \div 8 = 360$

Answer: 360 cubes

Part D

The toy company plans to start making a larger carton that holds exactly $1,000$ blocks, with no gaps or overlaps.

What could be the measurements, in inches, of the larger carton's length, width, **and** height? Show or explain how you got your answers.

Enter your answers and your work or explanation in the space provided.

$1000 \div 4 = 250$
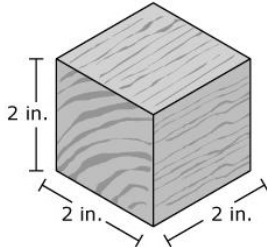
Length: 250 cubic inches

Height: 250 cubic inches

Width: 250 cubic inches

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Score Point 2

This question has four parts.

A toy company produces wooden blocks. Each block is in the shape of a cube with an edge length of 2 inches (in.), as shown in this diagram.

2 in.

2 in.   2 in.

Part A

What is the volume, in cubic inches, of each block? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

$2 \times 2 \times 2 = 8$ cubic inches

Part B

The toy company packs the blocks in cartons. Each carton is in the shape of a right rectangular prism and is completely filled, with no gaps or overlaps.

- The carton has a base area of 240 square inches.
- The carton has a height of 12 inches.

What is the volume, in cubic inches, of the carton? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

$240 \times 12 = 2{,}880$ cubic inches

Part C

What is the greatest number of blocks that can fit in one carton, with no gaps or overlaps? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

2,880 cubes

Part D

The toy company plans to start making a larger carton that holds exactly $1{,}000$ blocks, with no gaps or overlaps.

What could be the measurements, in inches, of the larger carton's length, width, **and** height? Show or explain how you got your answers.
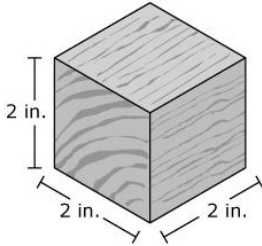
Enter your answers and your work or explanation in the space provided.

$10 \times 10 \times 10 = 1{,}000$

Score Point 1

This question has four parts.

A toy company produces wooden blocks. Each block is in the shape of a cube with an edge length of 2 inches (in.), as shown in this diagram.

2 in.

2 in.   2 in.

Part A

What is the volume, in cubic inches, of each block? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

> The volume is 6 cubic inches I know this because I added up the 3, 2 inches and got 6.

Part B

The toy company packs the blocks in cartons. Each carton is in the shape of a right rectangular prism and is completely filled, with no gaps or overlaps.

- The carton has a base area of 240 square inches.
- The carton has a height of 12 inches.

What is the volume, in cubic inches, of the carton? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

> I got 2880 cubic inches i got this by multiplying $240 \times 12 = 2880$.

Part C

What is the greatest number of blocks that can fit in one carton, with no gaps or overlaps? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

> The greatest number of blocks can be 9 or 12 in one carton

Part D

The toy company plans to start making a larger carton that holds exactly 1,000 blocks, with no gaps or overlaps.

What could be the measurements, in inches, of the larger carton's length, width, **and** height? Show or explain how you got your answers.
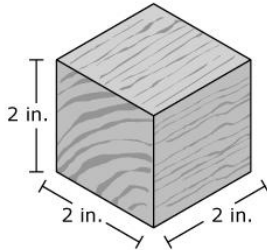
Enter your answers and your work or explanation in the space provided.

> The height of the carton can be 500 and the width can be 20.

Score Point 0

This question has four parts.

A toy company produces wooden blocks. Each block is in the shape of a cube with an edge length of 2 inches (in.), as shown in this diagram.

2 in.

2 in.   2 in.

Part A

What is the volume, in cubic inches, of each block? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

$2 + 2 + 2 = 6$

Part B

The toy company packs the blocks in cartons. Each carton is in the shape of a right rectangular prism and is completely filled, with no gaps or overlaps.

- The carton has a base area of 240 square inches.
- The carton has a height of 12 inches.

What is the volume, in cubic inches, of the carton? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

$240 + 12 = 252$

Part C

What is the greatest number of blocks that can fit in one carton, with no gaps or overlaps? Show or explain how you got your answer.

Enter your answer and your work or explanation in the space provided.

2x2x2 8

Part D

The toy company plans to start making a larger carton that holds exactly 1,000 blocks, with no gaps or overlaps.

What could be the measurements, in inches, of the larger carton's length, width, **and** height? Show or explain how you got your answers.

Enter your answers and your work or explanation in the space provided.

1,000 is 2x2x2