2024 MCAS Informational Webinar on Constructed Responses

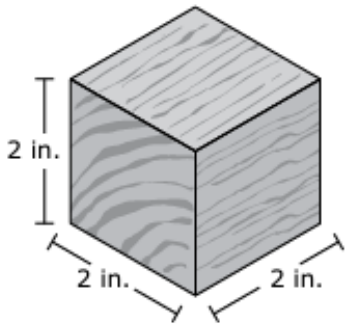
Sample Constructed-Response Scoring Training Pack

Elementary School Mathematics

Question 1 - MCAS Grade 5 Mathematics Question

(*released in 2023*)

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.



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

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.

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.

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.

Constructed Response Sample Response

Part A: 8 cubic inches

- 2 x 2 x 2 = 8

Part B: 2,880 cubic inches

- 12 x 240 = 2880

Part C: 360

- $\frac{2880}{8} = 360$

Part D: $h = 10$, $l = 80$, $w = 10$

- 10 x 80 x 10 = 8000 OR
- any set of dimensions that results in a volume of 8,000 cubic inches and in which each dimension is multiple of 2.

Constructed Response Scoring Guide

Scoring Guide	
Score	**Description**
4	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.
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.

Constructed Response Scoring Notes

Answer-only (*possible in all parts*):

- 4 answers-only = 3 points
- 3 answers-only + 1 part = 3 points
- 1 or 2 answer(s)-only = 1 point
- 1 or 2 answer(s)-only + 1 part = 2 points
- 1 or 2 answer(s)-only + 2 parts = 3 points
- 1 answer-only + 3 correct parts = 4 points *holistically*

Scoring for each part:

Part A:

- Must show 2 x 2 x 2 = 8 or $2^3 = 8$ for full credit.
- Students are given the volume formula so, l x w x h = 8 is answer-only.

Part B:

- Must show 240 x 12 = 2,880 for full credit.
- Students are given the volume formula so, B x h = 2,880 is answer-only.
- Correct strategy with computation error is noted but okay.

Part C:

- Full credit is given for a correct answer based on an incorrect answer in part A and/or part B.
- Correct strategy with computation error is okay.

Part D:

- Full credit is given for a correct answer based on an incorrect answer in part A.
- Full credit for dimensions and a volume of 8,000 without using an incorrect answer from part A.
- Dimensions only is considered answer-only.

Training Set of Student Responses
(*with scores*)

Training Response Score: 4

Part A

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

Part B

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

Part C

$$2880 \div 8 = 360$$

Part D

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

Training Response Score: 3

Part A

The volume of each block is 8 cubic inches.How I got 8 was I multiplied $2 \times 2 \times 2$ and got 8.

Part B

The volume of the carton is 2,880 cubic inches. how I got 2,880 is I multiplied 240×12 because the base area is 240 cubic inches and the height of the carton is 12 cubic inches high.

Part C

The greatest number of blocks that you can fit in one carton is 360 blocks. How I got 360 cubic inches is I divided $2{,}880 \div 8$ and got 360 blocks.

Part D

The measurements in inches of the larger cartons length,width, and height could be 10 (Length) 100 (Width) and 10 (Height) and $10 \times 100 \times 10 = 1{,}000$.

Training Response Score: 2

Part A

$$2 \times 3 = 6$$

Part B

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

Part C

$$2{,}880 \div 6 = 480$$

Part D

$$1{,}000 \times 480 = 120{,}000$$

Training Response Score: 1

Part A

$2 \times 2 \times 2 = 8$

Part B

252 is the volume

Part C

1,000 blocks

Part D

50 In 50 length 40 height

Training Response Score: 0

Part A

16 cubic inches because i can see 2x2x2x $2 = 16$

Part B

The carton has a base of 288 cubic units.

Part C

the greatest number of blocks that can fit in a corton is 160 blocks

Part D

length=350 width=350 height=300

Set of Student Responses

(without scores)

For Educator Practice

Practice Response A Score:

Part A

8 cubic units because 2x2x2 equals 8 and each side is 2 in.

Part B

$240 \times 12 = 2880$

the volume of the carton is 2880 cubic inches

Part C

2880 because the part C was the description of "with no gaps or overlaps"

Part D

length:2

width:5

height:100

i chose that because 2 times 5 is 10 and 10 times 100 is 100

Practice Response B Score:

Part A

$8\ in^3$

I did this by solving 2x2x2.

Part B

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

Part C

$2{,}880\ in^3 \div 8\ in^3 = 360$ blocks.

Part D

$500\ in \times 2\ in \times 8\ in = 8{,}000\ in^3$

Practice Response C Score:

Part A

The volume of each block is 4 cubic inches.

$2 \times 2 = 4$

$4 \times 4 \times 4 = 12$

Part B

2,880 cubic inches

Part C

The greatsest number is 240 I know this because in the part b it said therecwas 240blocks no spaces or gaps.

Part D

The length could be 100 the width could be 10 and the height can be 1.

$(1 \times 10) \times 100$

$10 \times 100 = 1{,}000$

Practice Response D Score:

Part A

$2 + 2 + 2 = 6$

Part B

$240 + 12 = 252$

Part C

252

Part D

$252 + 1{,}000 = 1{,}252$

Practice Response E Score:

Part A

$2 \times 2 \times 2 = 8$ that is the hight the with and the length so if you multiply them together you get you're product.

Part B

$240 \times 12 = 7{,}200$ square inches becuase we took the base and the hight and multiplied them together.

Part C

$7{,}200 \div 8 = 900$ and thas how many cubes can fit in the toys.

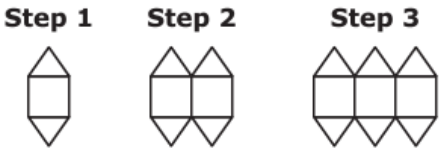
Part D

$500 \times 2 = 1{,}000$ that way they can make 1,000 blocks.

Question 2 - MCAS Grade 4 Mathematics Question

(*released in 2022*)

A student uses squares and triangles to make a pattern. In each step of the pattern, the student adds 1 square and 2 triangles, as shown.



The student continues the pattern.

A. What is the total number of triangles in Step 4 of the pattern?

B. What is the total number of **squares** in Step 6 of the pattern? Explain how you know your answer is correct.

C. What is the total number of **triangles** in Step 9 of the pattern? Explain how you can get your answer by using multiplication.

D. One step in the pattern will have a total of 64 triangles.

What is the total number of **squares** in that step? Show or explain how you got your answer.

Constructed Response Sample Response

Part A: 8 (triangles)

Part B: 6 (squares)

- The number of squares is the same as the step number in the pattern.

Part C: 18 (triangles)

- The number of triangles is always twice as many as the step number in the pattern. So, multiply the step number by 2 to find the number of triangles.
- 2 x 9 = 18 OR
- other valid explanation

Part D: 32 (squares)

- The number of triangles is always twice the number of squares.
- 64 ÷ 2 = 32 OR
- other valid explanation

Constructed Response Scoring Guide

Scoring Guide	
Score	**Description**
4	The student response demonstrates an exemplary understanding of the Operations and Algebraic Thinking concepts involved in generating a number or shape pattern that follows a given rule and identifies apparent features of the pattern that were not explicit in the rule itself. The student correctly determines the next step in a shape pattern, determines how many shapes will be in future steps, and understands relationships between different features of the pattern.
3	The student response demonstrates a good understanding of the Operations and Algebraic Thinking concepts involved in generating a number or shape pattern that follows a given rule and identifies apparent features of the pattern that were not explicit in the rule itself. 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 Operations and Algebraic Thinking concepts involved in generating a number or shape pattern that follows a given rule and identifies apparent features of the pattern that were not explicit in the rule itself. 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 Operations and Algebraic Thinking concepts involved in generating a number or shape pattern that follows a given rule and identifies apparent features of the pattern that were not explicit in the rule itself.
0	The student response contains insufficient evidence of an understanding of Operations and Algebraic Thinking concepts involved in generating a number or shape pattern that follows a given rule and identifies apparent features of the pattern that were not explicit in the rule itself. As a result, the response does not merit any points.

Constructed Response Scoring Notes

Answer-only (*possible Parts B, C and D*):

- 3 answers-only + part A = 3 points
- 3 answers-only = 2 points
- 1 or 2 answer(s)-only + part A = 2 points
- 1 or 2 answer(s)-only = 1 point

Scoring for each part:

Part B:

- Full credit for finding the total number of squares in steps 1 through 6 if they show the 6 squares in the 6^{th} step in their work/explanation (1 + 2 + 3 + 4 + 5 + 6 = 21).

Part C:

- Does not have to use multiplication to receive full credit (9 + 9 = 18).
- Full credit for finding the total number of triangles in steps 1 through 9 if they show the 18 triangles in the 9^{th} step in their work/explanation (2 + 4 + 6 + 8 + …18 = 90).

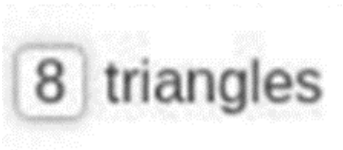
Part D:

- Can use multiplication (2 x 32 = 64).
- Can say that the number of triangles is 2 times the step number.

Training Set of Student Responses
(*with scores*)

Training Response Score: 4

Part A



Part B

6

because each pattarn has one square so step six has 6 squares

Part C

18

$9 \times 2 = 18$

Part D

32 squares because it is step 32 and there is one square everytime it adds up and anything that is 2x is like adding itself 2x and half of 64 is 32 so thats how I got it.

Training Response Score: 3

Part A

8 triangles

Part B

it is 12 because the step number is the amount of squares and each square has 2 triangles on each side. 6 x 2 = 12 so that is why i think it is 12.

Part C

it is 18 because there are 2 triangles on 1 square and there is 9 squares. 9 x 2 = 18.

Part D

there are 32 squares because 32 x 2 = 64.

Training Response Score: 2

Part A

20 triangles

Part B

29

I kept adding the squares up till step 6 after make the squares and triangles.

Part C

18

I mad set 9 and than multiplied 9 by 2 and got 18.

Part D

32

I got this answer by doing the equation $64 \div 2 = 32$

Training Response Score: 1

Part A

12 triangles

Part B

The total number of squares when you they get to step 6 is 21 squares.

Part C

The number of triangles when they are at step 9 will be 172 because that is 18×9

Part D

The number of squares in the step where the triangles are 64 is 32 because $64 \div 2 = 32$

Training Response Score: 0

Part A

7 triangles

Part B

There would be 36 because if you do $18 + 12 + 6$ that would get you to a total of 36.

Part C

My final answer for part c is 54 because if you do $27 + 18 + 9$ you will get to a total of 54.

Part D

I would say step 10 because if the answer to part c is 54 then it's gotta be 64.

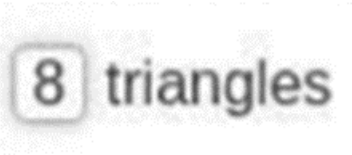
Set of Student Responses

(without scores)

For Educator Practice

Practice Response A Score:

Part A



Part B

$6 \times 1 = 6$

Part C

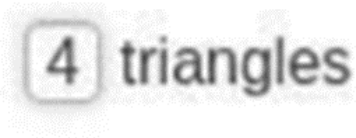
$9 \times 2 = 18$

Part D

$64 \div 2 = 32$

Practice Response B Score:

Part A



Part B

it would be 6 + 5 + 4 +3 + 2 + 1 = 21.

21 is my anwser

Part C

9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 54

Part D

it would be :

10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 64.

Practice Response C Score:

Part A

20 triangles

Part B

after 3 steps you have $6 \times 2 = 12$

Part C

$6 \times 3 = 18$ so 18 is the anwser

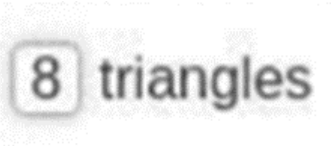
Part D

31 because

$64 \div 2 = 31$

Practice Response D Score:

Part A



Part B

6

Part C

18

Part D

32

Practice Response E Score:

Part A

1 triangles

Part B

3 because the pattern stays the same

Part C

3

Part D

38