

2022 MCAS Sample Student Work and Scoring Guide

Grade 4 Mathematics

Question 15: Constructed-Response

Reporting Category: Operations and Algebraic Thinking

Standard: [4.OA.C.5](#) - Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

Item Description: Determine the next step in a shape pattern, identify how many shapes will be in future steps, and demonstrate understanding of the relationships between different features of the pattern.

Calculator: Not allowed

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Scoring Guide

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

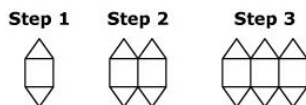
Score*	Description
4A	The student response demonstrates an exemplary understanding of the Operations and Algebraic Thinking concepts involved in generating a number or shape pattern that follows a given rule and identifies apparent features of the pattern that were not explicit in the rule itself. The 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.
4B	
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 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.
0	The student response contains insufficient evidence 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. 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 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.

Part A

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

Enter your answer in the box.

8 triangles

Part B

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

Enter your answer and your explanation in the space provided.

in step 1 theres 1 square in step 2 theres 2 squares and in step 3 theres 3 squares so that means in step six theres six squares

Part C

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

Enter your answer and your explanation in the space provided.

in step 1 theres 2 triangles in step 2 theres 4 triangles so if you times 9 by 2 it equals 18 and that means theres 18 triangles

Part 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.

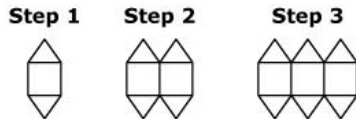
Enter your answer and your work or explanation in the space provided.

in every # of step you times the # by 2 so if theres 64 triangles in that step you can divide it by 2 to find the step # and that # is 32 and to get how many squares there are in a step you times the step # by 1 and thats the answer so if you times 32 by 1 it equals 32 so theres 32 squares (#= number)

Score Point 4B

This question has four parts.

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.

Part A

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

Enter your answer in the box.

triangles

Part B

What is the total number of **squares** in Step 6 of the pattern?

Explain how you know your answer is correct.

Enter your answer and your explanation in the space provided.

6, because $6 \times 1 = 6$ and he adds 1 square to the pattenen.

Part C

What is the total number of **triangles** in Step 9 of the pattern?

Explain how you can get your answer by using multiplication.

Enter your answer and your explanation in the space provided.

18, because $9 \times 2 = 18$ and he adds two triangles to the pattenen.

Part 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.

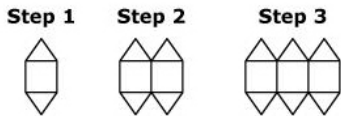
Enter your answer and your work or explanation in the space provided.

32, because $32 \times 2 = 64$ and $32 \times 1 = 32$ and he adds 1 square in the pattenen each time

Score Point 3

This question has four parts.

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.

Part A

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

Enter your answer in the box.

8 triangles

Part B

What is the total number of **squares** in Step 6 of the pattern?

Explain how you know your answer is correct.

Enter your answer and your explanation in the space provided.

There are six squares in step six. I know this because if you add 1 square to each step and do this 6 times you get six

Part C

What is the total number of **triangles** in Step 9 of the pattern?

Explain how you can get your answer by using multiplication.

Enter your answer and your explanation in the space provided.

In each step you add two triangles if you do this 9 times you can multiply $9 \times 2 = 18$ triangles.

Part 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.

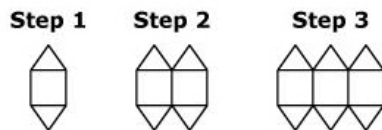
Enter your answer and your work or explanation in the space provided.

The answer is 64 square I got my answer by dividing $64 \div 1 = 64$ and there is one new square in each pattern so there is 64 squares.

Score Point 2

This question has four parts.

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.

Part A

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

Enter your answer in the box.

triangles

Part B

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

Enter your answer and your explanation in the space provided.

the answer is 12 and how i knwo is that $6 + 6 = 12$

Part C

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

Enter your answer and your explanation in the space provided.

the answer is 18 and how i know is $9 + 9 = 18$

Part D

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

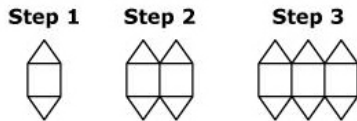
What is the total number of **squares** in that step? Show or explain how you got your answer.

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

Score Point 1

This question has four parts.

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.

Part A

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

Enter your answer in the box.

12 triangles

Part B

What is the total number of **squares** in Step 6 of the pattern?

Explain how you know your answer is correct.

Enter your answer and your explanation in the space provided.

there is going to be 6 squares because in step three there are 3 squares i multiplied 3×2 and i got six but i had to make sure i was right so i drew it and there was 6 squares

Part C

What is the total number of **triangles** in Step 9 of the pattern?

Explain how you can get your answer by using multiplication.

Enter your answer and your explanation in the space provided.

there is 27 triangles because if you multiply 3 9 times you get to 27

Part 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.

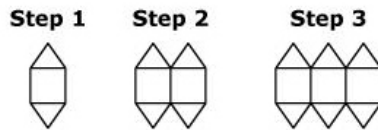
Enter your answer and your work or explanation in the space provided.

i think it is 21 because if you skip count by 3s you might get 64

Score Point 0

This question has four parts.

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.

Part A

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

Enter your answer in the box.

triangles

Part B

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

Enter your answer and your explanation in the space provided.

14 because she adds two every single time.

Part C

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

Enter your answer and your explanation in the space provided.

20 because if you do 18×2 it equals 20.

Part 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.

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

64 because she only adds one square to all of them.