

Triangular Pattern, released item #3 (CMA150Q03)

PISA 2022

Triangular Pattern
Question 3 / 3

Refer to "Triangular Pattern" on the right. Click on a choice and then type an explanation to answer the question.

Alex is going to add more rows to his pattern.

He claims that the percentage of blue triangles in the pattern will always be less than 50%.

Is Alex correct?

Yes

No

Explain your answer.

TRIANGULAR PATTERN

Alex drew the following pattern of red and blue triangles.

The first four rows of the pattern are shown below.

This is the final item in this unit, and it builds off the previous two items to now generalise with the pattern. The task for the students is to evaluate a claim that the percentage of blue triangles in the pattern will always be less than 50% as more rows are added. Students have to select either "Yes" or "No" to indicate if the claim is or is not true, but then they also have to provide an explanation to support their selection. This is a reasoning item that requires students to analyse the pattern to recognise a relationship between the number of red and the number of blue triangles in each row, and then use that relationship to support their selection.

The correct selection is "Yes," that the claim is true, and an acceptable explanation recognises that the number of red triangles in each row will always be greater than the number of blue triangles in each row. Note that students can phrase their response in terms of either the number of blue triangles being fewer or the number of red triangles being greater, as long as there is some language indicating that this relationship is true for every row. Partial-credit responses to this item generally either focus on just the first row, which contains only a red triangle, or do not clearly communicate that the relationship between the number of each color triangle applies to every row.

This is a human-coded item (the coding rubric is shown below) that is difficult (Level 5) for students to provide a full-credit response. There is partial credit available, but that is still moderately difficult (Level 4) for students. Note that the coding rubric does not contain an exhaustive list of responses at any credit level. However, the sample responses in the rubric are representative of how students typically respond to this item.

Unit Name – Item #	Triangular Pattern – CMA150Q03
Content Area	Change and relationships
Process	Reasoning
Context	Scientific
Item Format	Open Response - Human Coded
Answer	Refer to rubric below
Proficiency Levels	5 (full credit) 4 (partial credit)

Full Credit

Code 2: Selects Yes and provides an acceptable explanation for why there will always be more red (or fewer blue) triangles. [*An acceptable explanation must state “in each row” (or use similar wording for that concept).*]

- He is correct because there is always one more red triangle than blue triangle in each row. [*Selection of “Yes” is implied here.*]
- [Yes] There will always be one less blue triangle in each row.
- [Yes] There is one more red triangle than blue in each row. [*Benefit of the doubt given for not specifying “always” in the response since it is already stated in the question stem.*]
- [Yes] Because red triangles are on the outside of each row and inside it alternates red and blue triangles. [*Acceptable explanation that establishes there are more red than blue in each row.*]

Partial Credit

Code 1: Selects Yes and explanation is partially correct but incomplete.

- [Yes] Because the first row has only a red triangle.
- [Yes] There are no blue triangles in the first row.
- [Yes] There is one more red triangle than blue triangle. [*Response does not specify “in each row”. Compare to Code 2, dot point 3.*]
- [Yes] Because red triangles are on the outside of each row and the blue triangles stay inside. [*Explanation is incomplete because the red triangles in the interior are not addressed. Compare to Code 2, dot point 4.*]

No Credit

Code 0: Other responses, including selecting Yes but giving an incorrect explanation or without giving an explanation OR selecting No with or without an explanation.

- [Yes] red = 62.5% and blue = 37.5%. [*Percentage of each colour triangle in the first four rows.*]
- [Yes].

Code 9: Missing