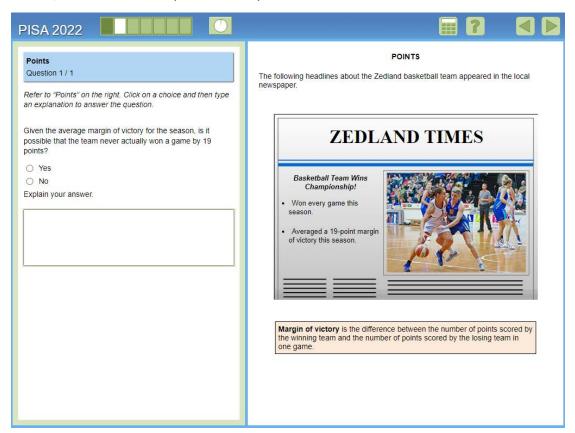# Unit CMA156 – Points

Points, released item #1 (CMA156Q01)

This is the unit *Points* and it is another single-item unit with no introduction screen. For this item, students are presented with a newspaper headline about a local basketball team, which notes that the team won every game this season, and that they averaged a 19-point margin of victory this season. The definition of margin of victory is also given in the stimulus in cases students are not familiar with the term. The question asks is if it is possible that the team never actually won a game by 19 points given that the average margin of victory for the season is 19 points. This is an abstract reasoning item that requires students to evaluate a conjecture based on their conceptual understanding of an average (i.e., an arithmetic mean). They have to select either "Yes" or "No" and provide an explanation to support their selection.

The correct selection is "Yes" that it is possible that the team never actually won a game by 19 points, even though 19 is the average margin of victory. Students can respond by recognising that the mean does not have to be a member of the data set, or they can provide an example data set that has a mean of 19 but which does not contain 19 in the data set. Note that for this latter approach, students can also provide a counterexample based on a value other than 19 because it still represents an appropriate line of reasoning in this context. For example, the arithmetic mean of the data set 6, 9, and 15 is 10, even though 10 is not a member of the data set. Partial-credit responses address the idea that some values in the data set must be greater and some values in the data set must be less than the mean, but do not explicitly mention that the mean does not have to be a member of the data set.

This is also a human-coded item (the coding rubric is shown below) that is very difficult for students to provide a full-credit response to (Level 6 on the proficiency scale). There is partial credit available, but that is also difficult (Level 5 on the scale). The abstract nature of this task may have contributed to the difficulty. That is, students do not have numerical values they can manipulate to know what really happened, so they are forced to reason based on their understanding of a concept in order to devise a way to explain this with respect to the context. 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 #	Points – CMA156Q01
Content Area	Uncertainty and data
Process	Reasoning
Context	Societal
Item Format	Open Response - Human Coded
Answer	Refer to rubric below
Proficiency Levels	6 (full credit) 5 (partial credit)

Full Credit

Code 2: Selects Yes and explanation states or shows that the average does not have to be a member of the data set.

- It is possible because the average does not actually have to be one of the values in your data set. [*Selection of "Yes" is implied here.*]
- [Yes] If the margins of victory create an average of 19, there doesn't necessarily have to be a 19-point margin of victory in any of them. [*Full credit for, "…there doesn't necessarily have to be a 19-point margin of victory in any of them".*]
- [Yes] If one difference was 16 points and another was 22 points, then the average difference would be 19 points, but 19 was not one of the differences.
- [Yes] The mean of the numbers 2, 4, and 9 is 5 but 5 is not one of the numbers.

Partial Credit

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

* [Yes] It is an average difference, so some games were won by more than 19 points and some games were won by fewer than 19 points. [*Incomplete; does not explicitly state that 19 does not need to be one of the values. For a response like this to receive partial credit, winning by both more and by less than 19 points must be explicitly stated in the response*.]

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.

* [No] They need to have won at least one game by 19 points.
* [Yes].
* [Yes] Because the average is all of their margins of victory for the season added together then divided by the number of games they played that season. [*Unacceptable explanation that only describes how to compute a mean*.]
* [Yes] Because it is just an average. [*No reason given for why an average means it is possible they never actually won a game by 19 points*.]
* [Yes] It is an average difference, so some games were won by more than 19 points. [*Unacceptable because winning by less than 19 points was not also explicitly stated in the response*.]

Code 9: Missing