

PHYSICS – Sample A rainfall and temperature

TOTAL MARKS (out of 24) FOR THIS INVESTIGATION = 9

PERSONAL ENGAGEMENT: Best-fit Mark = 1

Evidence of personal engagement: The idea seems somewhat original although rather basic with no scientific content. Some initiative was used to figure out the sources. (Markband 1)

Justification given for research question: There is just a hint of curiosity here and so with some benefit of doubt, markband 1 is awarded. (Markband 1)

Evidence of personal input and initiative in designing, implantation or presentation: The research question was so straight forward and the approach rather basic, that this Descriptor earns level 1. One could argue that the standard was not reached but the moderator again rewards some initiative here. (Markband 1)

EXPLORATION: Best-fit Mark = 2

Topic of investigation identified, research question described: There is a clear and simple research question. However, more needs to be expressed in order to be a suitable physics IA. Just what a relationship means and why the data was taken as it is needs to be appreciated for a fully focused RQ. As it stands, the RQ is vague and ill defined. (Markband 3)

Background information: There is no background information, and no real science here. The student suggests a correlation but there is no reason given. (Markband 0)

Appropriate methodology, consideration of reliability and sufficiency of data: The student addresses the data in a scientific way, but the student assumes all the unacknowledged variables over three years can be grouped into a simple average. One year there was 0.29 inches of rain in December but in the next year on the same month only 0.03 inches of rain. What does an average mean here? Moreover, a correlation need not be causation. And what about snow? Perhaps this investigation is too simple and the teacher should have guided the student into a more scientific investigation. Given the RQ, the method is acceptable but lacks insight. (Markband 2)

Evidence of significant safety or environmental issues: This Descriptor is an outlier. (Markband NA)

ANALYSIS: Best-fit Mark = 2

Sufficient raw data for a valid conclusion: Taking three years is reasonable, and assuming one-month units of time for average temperatures seems reasonable too. It is not clear what kind of conclusions are to be supported here but given the all-too-general RQ the data seems appropriate. As mentioned above, the variation from year to year for a given month can be significant so affecting the overall results. A better definition of what data is required is needed here. A longer time span would have been appropriate. (Markband 3)

Data processing, accuracy and consistent: There was no processing other than converting to SI units (which, ironically, is not really required here). Temperature uncertainties do not match precision. Error bars on graphs can count as basic processing as well as the various graphs. The graphs are appropriate for what the student is doing. The student should have seen the obvious and presented the data in an alternative way instead of the mechanical linearizing, however. Extrapolating a straight line to either extreme is meaningless and should have been recognized by the student. (Markband 2)

Impact of uncertainties on the analysis: Although error bars are included, the physical relationship is something beyond the mere temperature, month and rainfall data. There is no impact recognizable here other than the obvious that a linear function should not be fit into the data scatter. Minimum and maximum gradients reveals some thought about uncertainties but this is hardly relevant here. Achievement level at the most would be at markband 2. (Markband 2)

Interpretation of processed data: The student is perplexed with their conclusion, and rightly so. The language of 'proportional' and 'linear' are all artifacts of a forced analysis and was not appropriate. (Markband 1)

EVALUATION: Best-fit Mark = 0

Conclusion statement, detailed, justified and supported by data: If we separate the imposed mathematical function with the data then the student is somewhat justified, but only qualitative at best. Logically, the result is meaningless. (Markband 1)

Conclusion and accepted theory, described and justified: There is nothing here, not even an appreciation of the seasons, snow versus rain, and so on. (Markband 0)

Strengths and weaknesses, limitations of data and method: The student addresses some of this but in a superficial and unimaginative way. It probably earns a zero here but with some BOD the moderators give it a 1. (Markband 1)

Realistic and relevant improvements and extensions: The student could have easily suggested extensions to this investigation. (Markband 0)

COMMUNICATION: Best-fit Mark = 4

Presentation of investigation and errors affecting understanding, focus and outcome: This was a straightforward and detailed presentation. The simplicity actually earns the student the top Communication mark. (Markband 4)

Report structure, focused and coherent: The purpose was always in focus, and digressions were procedural and understood as relevant to the student. However, we cannot say that the presentation of the data was in a most coherent way. (Markband 3)

Report relevance, concise, focus on outcome: Given the research question (and the lack of scientific depth) the focus was always on the RQ. (Markband 4)

Terminology, subject specific: This Descriptor earns full marks. (Markband 4)