Commentary on candidate 1 evidence (Mass of the Earth)

The evidence for this candidate has achieved the following marks for each section of this course assessment component.

Section	Expected response	Maximum mark	Mark awarded	Commentary
1 Aim	An aim that describes clearly the purpose of the investigation.	1	1	The candidate's aim clearly describes the purpose of the investigation.
2 Underlying physics	An account of physics relevant to the aim of the investigation.	3	3	The candidate has correctly described the physics behind the law of universal gravitation and linked this to g (acceleration due to gravity). In addition, the physics behind both the experiment to measure g and the analysis of the data is included. The descriptions are complete and at an appropriate level. The candidate has demonstrated a good understanding of the physics.
3a Brief summary	A brief summary of the approach(es) used to collect experimental data.	1	1	The candidate has briefly summarised what they are measuring in the experiment and has indicated the measuring instruments used.
3b Sufficient raw data	Sufficient raw data from the candidate's experiment.	1	0	The candidate has made repeated measurements of a. However, the range is limited and produces only four data points, which is insufficient. Five data points would be considered the minimum number for a quantitative analysis. It would not be onerous to take additional data points.

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3c	Data table	Data, including any mean and/or derived values, presented in correctly produced table(s).	1	0	The candidate has presented the experimental data in a table with mean and derived values calculated. However, there are a number of rounding errors in their calculations, and an incorrect unit is used for acceleration (m/s/s is not acceptable at any level).
3d	Relevant data	Data relevant to the experiment from an internet/literature source or data relevant to the aim of the investigation from a second experiment.	1	0	The candidate has included limited data from an internet source. This data, however, in not relevant to the candidate's experiment. Where a candidate has carried out a single experiment the data from the secondary source must be relevant to the experiment, in this case 'measuring acceleration of a trolley down a slope'.
3e	Citation and reference	A citation and reference for a source of internet/literature data or information.	1	1	The source of the internet data has been correctly referenced at the end of the report, and the source has been cited in the report.
4a	Axes scaled	The axes of the graph have suitable scales.	1	1	The axes of the candidate's graph have suitable linear scales.
4b	Axes labels	The axes of the graph have suitable labels and units.	1	1	The axes of the candidate's graph have suitable labels. The unit of acceleration is incorrect but is consistent with the unit given in the table, for which the candidate has already been penalised.
4c	Accurately plotted data points and line of best fit	Accurately plotted data points and,	1	0	The dots used by the candidate to mark data points are excessively large (extending over more than ½ a box), and so it is not possible to check the accuracy of

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	where appropriate, a line of best fit.			the candidate's plotting. The line of best fit is not acceptable for the data points plotted.
5 Uncertainties	Scale reading uncertainties and random uncertainties.	2	0	The candidate has not stated the scale reading uncertainty in the instruments used to measure lengths and acceleration.

The candidate has calculated the random uncertainties in values of acceleration, but there are a number of rounding errors. |
| 6   Analysis | Analysis of experimental data. | 1 | 1 | The calculation of mean and derived values is not part of the analysis section.

The comparison of values stated under the 'analysis' heading is not acceptable analysis at this level. However, the correct calculation of the gradient of the line of best fit on the graph, together with its correct use in the determination of M_{Earth} is suitable analysis of experimental data at Higher level. |
| 7   Conclusion | A valid conclusion that relates to the aim and is supported by all the data in the report. | 1 | 1 | The candidate has made a conclusion that is relevant to the aim and is supported by all the data in the investigation. |
| 8   Evaluation | Evaluation of the investigation. | 3 | 0 | The candidate has made three evaluative statements.

The first statement comments on the reliability of the source of internet data. Reliable as data from NASA may be, the statement does not comment on why |

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				NASA's data is reliable and so is not a valid evaluative statement for this investigation. The second statement links the success of the investigation to the number of repeats (which is insufficient) and the care of measurement. At this level, 'my experiment worked well' is not a sufficiently clear factor on which to base possible improvements or good experimental technique. The third statement, depending on how the digital protractor is used, may be correct. However, since the points on the graph lie close to the line of best fit, there is no indication of the original measurements used to determine the angle being inaccurate and so this is not a valid evaluative statement.
9 Structure	A clear and concise report with an informative title.	1	1	The candidate's report is clear and concise and has an informative title.
Total		**20**	**11**	