

Commentary on candidate 8 evidence (Acceleration of a Trolley)

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 | 2 | <p>Ignoring the reference to Pythagoras, the candidate has applied the maths of the right angled triangle to the situation, and has correctly stated the relationship between weight and the force acting parallel to the slope. The candidate has attempted to resolve <i>weight</i> into components, but has confused the component of weight perpendicular to the slope with the reaction force acting on the mass by the slope. As a result the vector diagram is incorrect.</p> <p>In addition the candidate has ignored frictional forces, which should be included at this level. Despite these, the candidate has demonstrated a reasonable account of the underlying physics.</p> |

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|------------------------|---|--------------|--------------|---|
| 3a Brief summary | A brief summary of the approach(es) used to collect experimental data. | 1 | 0 | The candidate has indicated the variables to be measured, and the instrument to be used to measure angle. The reference to <i>light gate</i> is not a sufficient description of the instrument used to measure the acceleration of the trolley. |
| 3b Sufficient raw data | Sufficient raw data from the candidate's experiment. | 1 | 1 | The candidate's data has five values for the independent variable, with two repeated measurements of the dependent variable for each value. The number of values is acceptable, although their range could have been extended beyond 25°. Also, given the nature of the acceleration measurements, a greater number of repeats would have been possible. However, on balance, the mark is awarded. |
| 3c Data table | Data, including any mean and/or derived values, presented in correctly produced table(s). | 1 | 0 | The candidate has presented their data in a table with correct headings. The units of measurement in the first two columns could have been clearer but are acceptable. However, there are rounding errors in the values of $\sin 15^\circ$ and $\sin 25^\circ$ and so the mark for this section is not awarded. |

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| 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 | 1 | The candidate has included a graph taken from an internet site which displays data relevant to their experiment. |
| 3e Citation and reference | A citation and reference for a source of internet/literature data or information. | 1 | 0 | The source of the internet data has been cited (1) and referenced at the end of the report. The date accessed, however, has been omitted. |
| 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, with correct units. |
| 4c Accurately plotted data points and line of best fit | Accurately plotted data points and, where appropriate, a line of best fit. | 1 | 1 | The candidate has accurately plotted all data points and included a line of best fit. |

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|---------|-------------------|--|--------------|------------|---|
| 5 | Uncertainties | Scale reading uncertainties and random uncertainties. | 2 | 1 | <p>The candidate has stated the scale reading uncertainty in each instrument used, presumably \pm the least significant digit for the TSA unit, and $\pm 2^\circ$ to reflect the difficulty in reading the protractor.</p> <p>The calculations random uncertainty in some values of acceleration, however, are incorrect.</p> |
| 6 | Analysis | Analysis of experimental data. | 1 | 1 | The candidate has correctly calculated the gradient of their graph and has linked this to a physical constant (g). |
| 7 | Conclusion | A valid conclusion that relates to the aim and is supported by all the data in the report. | 1 | 0 | <p>The candidate's conclusion, that 'the acceleration of the trolley is directly proportional to the sine of the angle of the slope' does answer the aim, but is supported neither by the candidate's experimental data, nor by the internet data.</p> <p>Supporting data for this conclusion would include a straight line of best fit passing through the origin.</p> |
| 8 | Evaluation | Evaluation of the investigation. | 3 | 1 | <p>The candidate has made three evaluative statements.</p> <p>The first recognises that the line of best fit 'misses' the origin, but the suggestion of using 'steeper slopes' is unlikely to have rectified the issue. Had the candidate included a recognition of friction contributing to the</p> |

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| | | | | <p>unbalanced force acting on the trolley, then it may have been worthy of a mark.</p> <p>The second statement recognises the large scale reading uncertainty in using the protractor, and makes a suggestion which is likely to lead to an improvement.</p> <p>The third statement does not evaluate the data from the internet source.</p> |
| 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 | 12 | |