Examiner's Report
Principal Examiner Feedback

Summer 2018

Pearson Edexcel International A Level
In Core Mechanics M2 (WME02/01)

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General

The vast majority of students seemed to find the paper to be of a suitable length, with no evidence of students running out of time. The paper proved to be accessible to all students, with responses seen to all parts of all of the questions. Question 3 proved to be the best answered with 73% of students scoring full marks and questions 2, 4 and 5 were also very well-answered. The most challenging question was number 6 although 16% of students scored full marks.

In calculations the numerical value of g which should be used is 9.8, as advised on the front of the question paper. Final answers should then be given to 2 (or 3) significant figures – more accurate answers will be penalised, including fractions but exact multiples of g are usually accepted.

If there is a printed answer to show then students need to ensure that they show sufficient detail in their working to warrant being awarded all of the marks available.

In all cases, as stated on the front of the question paper, students should show sufficient working to make their methods clear to the examiner and correct answers without working may not score all, or indeed, any of the marks available.

If a student runs out of space in which to give his/her answer then he/she is advised to use a supplementary sheet – if a centre is reluctant to supply extra paper then it is crucial for the student to say whereabouts in the script the extra working is going to be done.

Question 1

In part (a) students showed a good understanding of the theory but many thought they had to find the magnitude of the impulse and the final mark was often lost through calculating the magnitude of the change in velocity before multiplying by the mass. All that was required was the impulse in vector form.

The common error in the second part was to use ($3\mathbf{i} + 4\mathbf{j}$) instead of the impulse vector. They did use tan to find one or two angles but often found the wrong angles.

Question 2

In the first part, most students were able to correctly take moments about A but there was some sin/cos confusion and also errors in the distances. In part (b) the majority of students correctly gained the B1 mark but there were often errors in the vertical resolution which could've been costly given that the following M mark was dependent. A lot of students did not gain the final A mark as $F = \mu R$ was used instead of an inequality.

Question 3

Part (a) was a standard scenario and all but a small number scored full marks. The second part was also done well, but sometimes spoiled by the over-accuracy of the final answer and/or sign errors in the equation of motion.

Question 4

Most students found part (a) and the first 3 marks of (b) very straightforward. Most commonly the actual areas of the triangles were found, although a small number of students made their equations easier by using similarity to get to an easy ratio of masses. Distances were usually correct, although it was most common to measure distances from A, rather than the line of symmetry. It was generally easier to award marks to students that set out explicitly their masses (or ratios) and distances before forming an equation, especially if something went wrong.

Students found the final 4 marks more tricky, with many failing to find appropriate distances to use, having found distances from *A*. Clear diagrams generally helped students, although many students included right angles that should not have been there, usually losing all of the final marks. It was rare that a student straying from the main mark scheme approach actually produced a valid method, although completely correct use of both the cosine rule and the scalar product was seen.

Question 5

Almost all students gained the first 2 marks for the easy differentiation. Unfortunately, whilst almost everyone then substituted in $t = 4$ and $m = 0.3$, a very large number found the magnitude of the acceleration first, and so never produced a vector for **F**. Given the generous nature of the mark scheme, only requiring a correct method, this was probably the most frustratingly lost mark on the paper.

In (b) the majority of students knew that they needed to equate the **j** components to zero, although a significant number equated the **i** component to zero. Most knew that they needed to integrate and did so correctly. Whilst most did substitute their limits in and (presumably) found a difference, many did not make this explicit, since the result for $t = 2$ ended up as $0\mathbf{i} + \mathbf{0j}$. A reasonably common mistake here was to not substitute into both components, with some students only considering the **j** component. The final 2 marks proved straightforward, with most realising that they needed to use Pythagoras' to find the magnitude. Some students unfortunately found the magnitude of the positions of *A* and *B* and then found the difference. This of course gave the correct answer,but was not a valid approach.

Question 6

Throughout this question marks were lost by not giving answers to an appropriate degree of accuracy. The first part was usually well done, although there were some students who failed to follow the instruction in the question and did not use an energy method and lost all of the marks as a result. In part (b), those who used equations involving angles α and β found it difficult to eliminate β. The third proved to be a problem for many, with the direction of the vertical component of velocity causing problems. In part (d), a correct strategy eluded most but for those who did make progress, the most popular choice of method was Alt 2 on the markscheme.

Question 7

There were two distinct approaches to this question. Students who used the energy information to produce $v = u/3$ tended to make very quick work of part (a). Those that took their standard approach of producing CLM and NIL equations and then trying fit in the energy tended to have far messier solutions, which often led them to a fairly unpleasant quadratic. Thankfully, those that found 2 solutions did dismiss the $e > 1$ solution. The most common mistakes in the use of the energy information were to either say $v = u/9$ or to say that the total energy was reduced to 1/9. The second approach quickly led to confusion.

In part (b) most students did attempt to find Va and Vb and generally went on to form CLM and NIL equations. Unfortunately the algebra and fractions meant that many were not able to work through to a completely correct solution. Whilst most did use the direction information correctly, a significant number reversed the direction of V. In these cases it was extremely rare (I saw one) for the student to use the information that $f < 3/4$ to realise that they needed to swap things around to arrive at the correct positive expression. In fact almost every student assumed that $f < 3/4$ was intended for part (ii), with only a handful of students making use of $f > 0$. As a result hardly any students gained any of the final 2 marks. Given that the students who did use this information were presumably the most able, it was disappointing to see how poorly some of them communicated their reasoning to gain the final 2 marks.

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