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General Certificate of Education

Mathematics 6360

MM1A Mechanics 1A

Report on the Examination

2007 examination - January series

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Written Component

General

The majority of candidates found the paper accessible and were able to make attempts at each question. Some candidates lost a mark by not giving their answers to three significant figures as instructed on the front cover. In questions where right-angled trigonometry was required, some candidates tried to use the sine or cosines rules, making life more difficult for themselves.

Question 1

The candidates produced many good solutions to both parts of this question, with a high proportion of candidates gaining full marks. There were three main errors that were observed on the scripts. Some candidates did not realise that one of the particles had a negative velocity before the collision and produced equations that would have applied if the particles had both been moving in the same direction. A few candidates found the momentum after the collision, but did not divide this by the appropriate mass to find the velocity. Some candidates made algebraic or arithmetic errors. For example in part (a), some candidates gave the answer 1.25, obtained by dividing 5 by 4, instead of the correct answer of 0.8.

Question 2

This question was done very well by the vast majority of candidates. Many produced completely correct solutions. There were a number of minor arithmetic or algebraic errors in some solutions.

Question 3

The candidates found this question demanding, especially part (a). The few candidates who considered the forces acting on the caravan had few difficulties and often found the correct force. Many candidates tried to consider the two bodies as a single particle and made little progress. Some candidates were able to do part (b), even if they had made little or no progress with part (a). As well as considering the forces on the wrong body, some candidates introduced a variety of sign errors into their equations. The real problem for the candidates in answering this question was that they did not recognise when to consider the two bodies separately and when to consider them as a single body.

Question 4

There were a fair number of good attempts at parts (a) and (b) of this question, but part (c) was found to be more demanding. In part (a), there were three main sources of error: introducing a sign error; using $\cos$ instead of $\sin$; and not applying the quadratic equation formula correctly.

There were many good answers to part (b), with some candidates using the time given in part (a) when they had been unable to obtain it for themselves.

There were very few complete answers to part (c). Some candidates did not make any form of serious attempt at this part of the question. Some candidates only found one component of the velocity, but not the other; most often they found the vertical component, but not the horizontal component.

Question 5

While there were many good solutions to question 5, some candidates did find parts of the question quite difficult. Part (a) was generally done very well. In part (b), some candidates found the 'wrong angle', giving an answer of $18.4°$. There was also an issue for some candidates who used their rounded answer from part (a) to obtain the angle.

An example of this would be $\cos^{-1}\left(\frac{0.1}{0.32}\right) = 71.8°$; these candidates would lose the final accuracy mark. In part (c), it was very common to see candidates use the resultant velocity and the width of the river to find the time. These candidates produced the result $t = \frac{15}{0.316} = 47.5\,\text{s}$ rather than $t = \frac{15}{0.3} = 50\,\text{s}$. Part (d) was often done well, but some candidates used the constant acceleration equation $s = \frac{1}{2}(u+v)t$, with $u = 0$ and $v = \sqrt{0.1}$ or 0.316.

Question 6

In part (a) there were many good diagrams, but also a number that included extra forces, especially parallel to the slope. On some diagrams the arrows or labels were missing. Part (b) was done well and the vast majority of candidates did show enough working to gain all of the marks. Some candidates clearly used the given answer to correct their working. Part (c) was more demanding. When finding the acceleration, the main errors were not dividing the resultant force by the mass; making a sign error to obtain $a = -0.171$; not considering both forces, to produce equations like $100a = 68.4$; and not resolving the weight correctly.

In the last part, there were some good explanations, but there were also a lot that were not acceptable. Some candidates wrote about the resistance being related to the acceleration, rather than to the speed or velocity. A few also thought that the resistance would depend on the slope.

Question 7

Many candidates made good attempts at parts (a) and (b). The majority of errors were due to errors made manipulating the vectors. Some candidates did write down correct equations or expressions to begin their solutions, but made errors in manipulating their expressions. In part (b), a few candidates included a $75\mathbf{i}$ term.

Several candidates simply did not attempt part (c) of the question. Of those that did, some tried to find a time using expressions for the position of the particle rather than its velocity, while other candidates tried to use the equation $v^2 = u^2 + 2as$.

Coursework Component

There were a few transcription and addition errors made when totalling the scripts. The final marks should be carefully checked prior to submission to AQA and for moderation. Scripts should be marked in red pen and calculations checked for accuracy.

The majority of marks submitted were to be carried forward from a previous session.

Candidates should interpret their results clearly and try to relate these to the 'real-life' situations being modelled.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.