Version 1.0

General Certificate of Education (A-level)
June 2012

Mathematics MM1B

(Specification 6360)

Mechanics 1B

Report on the Examination

General

The paper contained a number of questions that all of the candidates were able to access and also some more challenging questions which provided a greater degree of challenge, in particular question 7.
In some questions, there was evidence of candidates rounding their answers in intermediate working to 3 sf and then continuing to work with these values. This sometimes leads to inaccurate final answers. Candidates should be encouraged to work to more than 3sf when obtaining intermediate answers and only round their final answers to 3sf.

Question 1

There were many good answers to this question. Part (a) was almost always answered correctly, but in part (b) finding the bearing proved to be more difficult. Many candidates were able to obtain $21.8°$ or $68.2°$, but less than half of the candidates could obtain the correct bearing and lost the final mark.

Question 2

This question was done very well, with many candidates gaining full marks. The candidates who did not progress on this question had difficulties setting up the equation for the conservation of momentum.

Question 3

There were many good attempts at this question. In part (a) (i), many candidates were able to obtain the correct answer although some found the time and then the acceleration. There were only a few cases of candidates confusing u and v in their equations. In part (a)(ii), there were again many good responses, but in some cases inappropriate information was used, for example using a distance of 75m or a final speed of 10m s^{-1}.
In part (a)(iii) there were again many correct answers, but quite a few candidates did not find the magnitude of the force and gave negative answers. This was also the case in part (b), where candidates also sometimes added the 200 to their previous answer instead of subtracting it from it.

Question 4

This question was done very well by candidates and there were many full correct solutions. The main source of errors in part (a) was due to using incorrect combinations of $\sin$ or $\cos$ and the angle that the candidates decided to work with. In part (b) some candidates used trigonometry while other used Pythagoras' Theorem. In the final part some candidates multiplied by 9.8 rather than dividing by it.

Question 5

Part (a) was done well by some candidates, but there were a significant number who proceeded as if this was a two particles connected by a string over a peg type of problem. Many times a pair of equations such as $18g - T = 18a$ and $T - 12g = 12a$ were seen. This made it impossible for candidates to complete this part of the question.
In part (b) (i), some candidates were able to get back on track, as they had the correct equation for the $18\ \mathrm{kg}$ particle, but some did use the acceleration from part (a) instead of $3\ \mathrm{ms}^{-2}$. In (b)(ii), there were many correct responses, but a few gave the answer 36 N, suggesting that there was some confusion between "reaction force" and "resultant force".
The responses to part (b) (iii) were quite mixed with some good solutions. It was not uncommon for candidates to simply assume that the friction was equal to 36 N. Other candidates tried to find the difference between a "tension" which was often incorrect and the 36 N.
There were a number of good answers to part (c), but some were too vague. For example just writing "particles" was not enough as it did not make the connection that it was the block that was being modelled as a particle.

Question 6

The force diagram asked for in part (a) was generally well drawn, but some candidates did lose marks for not including arrow heads or appropriate labels. The candidates who understood that they should resolve vertically to find the reaction force did well although some ended up with $R = 78.4 + 0.5T$ or equivalent. Others produced very confused responses.
Those who had a correct expression for the normal reaction often made some progress in part (c). There were quite a number of candidates who made promising starts but then made algebraic errors when solving for T. There were a range of errors that were made in setting up an equation of motion. These included only using the friction force, using T instead of $T\cos 30°$ and omitting the ma term.

Question 7

There were some very varied responses to this question. Part (a) was often done well and the candidates who attempted to find the position vector generally gained the marks available. However, quite a few gave the velocity instead of the position vector. Those who had a velocity vector in part (a) then generally used this in part (b) and scored no marks. Some who had a correct position vector in part (a), used the wrong component to try to answer part (b).
Part (c) was altogether more challenging and many candidates worked with position vectors rather than velocity vectors. This clearly was the wrong approach, but some expended a lot of effort solving the quadratic equations that they produced. Some candidates came up with the correct velocity, but without showing how they had obtained their answer. It is important that working is justified. Sometimes a trial and improvement method led candidates to the correct answer.

Question 8

There were many correct answers to part (a) and the candidates were clearly helped by the presence of the printed answer. In most cases the arguments given were sound, but in others this was not the case. For example some candidates simply wrote statements such as $22.4\sin\theta - 19.6$ and never included an equals sign or a zero. This was regarded as an important omission.
There were also lots of good answers to part (b), but some basic errors, such as the omission of a negative sign with *g* or the use of $\sin(0875)$. In part (c) there were also some good answers. Some candidates did not realise that the time of flight could be found by doubling the 2 seconds that was given, and did quite a lot of work finding the time of flight. In some cases there were errors in the calculation of the distance. For example an incorrect application of $s = \frac{1}{2}(u+v)t$ was seen with statements such as $s = \frac{1}{2}(10.8+0)\times 4$.
The approaches to part (d) were many and varied. There were quite a number of good responses, but often candidates did not really get very far with this part of the question. The most common error was to see candidates use a distance for example $19.6 - 5 = 14.6$, with the initial speed of $22.4\sin\theta$.
In the final part, there was a tendency for the candidates to find the resultant of two velocity components, as they did not realise that for the minimum speed the vertical component would be zero. In some case the correct final answer was obtained from expressions such as $\sqrt{10.8^2 + 0^2}$.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results statistics page of the AQA Website. UMS conversion calculator www.aqa.org.uk/umsconversion