A-LEVEL
MECHANICS 1
Mathematics MM1B
Report on the Examination

6360
June 2015

Version: 1.0

General Comments

Candidates generally found the paper quite accessible and there were very few blank responses to questions. Candidates were able to make attempts at all of the questions.

The most common issue to emerge was the poor responses to the modelling questions which were more demanding in this paper.

Question 1

This was done very well by the vast majority of candidates with very many correct solutions. The main error was for candidates not to take account of the negative velocity and produced equations like $48\times1.2+16m=0$, rather than $48\times1.2-16m=0$. This resulted in a negative mass, which was 'dealt with' by dropping a negative sign in their working.

Question 2

Most candidates found part (a) very straightforward and almost all found the correct speed. In part (b), almost all candidates found angles of 18° or 72°, but many were unable to give the correct bearing.

Question 3

There were some very good responses to this question. The most common error was to resolve incorrectly in part (a). Many candidates used cosine instead of sine when resolving perpendicular to the path and the equation $100000\cos 25° = T\cos 20°$ was seen frequently on scripts. In a few cases the weight was also included in equations.

In part (b), candidates often produced reasonable equations using an incorrect tension from part (a). The most common errors were to fail to resolve or to only consider one of the forces. A few candidates had problems dealing with the 500 tonnes.

Question 4

There were very many good responses to this question. Part (a) was done particularly well, with almost all candidates gaining full marks.

Part (b) was also done well, with some candidates stopping when they had obtained the displacement. They did not fully complete this part by calculating the distance as required. A few spurious methods were seen which often stemmed from attempts to use the equation $v^2=u^2+2as$ with vectors. Some candidates worked with each component and then put their two results back into vector form.

Part (c) frequently produced the answer 6.8 m s^{-1} with no sign of any vector work. This was often seen following a correct response to part (b). Often those who did not find the distance in part (b) gave the correct vector answer. Only the better candidates realised that a scalar answer was required for (b) and that a vector answer was required for (c).

Question 5

This question proved to be more demanding. The most difficult parts were (a) and (c) where numerous issues arose in the formulation of the equations of motion. The vast majority of candidates tried to form two equation, one for each object, and did not try to use "whole string" approaches.

In part (a) the main issues were incorrect use of the masses or the inclusion of tension for both bodies. For example equations like $T - 3mg = 3ma$ were seen instead of $T = 3ma$.. Problems with the mass produced equations like $2mg - T = 2a$ or $2g - T = 2a$ rather than $2mg - T = 2ma$.

Part (c) produced similar issues, often related to the friction force giving expressions like $F = 2.4g$ instead of $F = 2.4mg$.

In parts (b) and (d), many candidates used correct approaches and were able to gain method marks even if they were using incorrect accelerations.

There were very few good responses to part (e), but there were some very good explanations about the issue of moving from the smooth section to the rough section. There were a lot of comments about air resistance and the surface area of the block. The surface area comments illustrated a clear misunderstanding of the friction law in many cases.

Question 6

Where candidates were able to form a correct equation for the time of flight, they were able to produce good responses to parts (a) and (b). The main issue in part (a) was the use of incorrect distances in the equation for the time of flight. A common example was to see $0.7 = 8\sin 30°t - 4.9t^2$ instead of $-0.7 = 8\sin 30°t - 4.9t^2$. Other errors included not resolving the velocity to find the vertical component or having incorrect signs, such as $-0.7 = 8\sin 30°t + 4.9t^2$.

Most candidates realised that for (b) they needed to multiply the horizontal component of the initial velocity by their time from part (a).

Part (c) proved to be more demanding than expected. While some candidates realised that the answer required was 0.5,quite a lot of candidates tried to work out a height, which was not correct. The most common incorrect answer was 2.02 metres, which is the maximum height of the ball above the ground.

The responses to part (d) were very mixed. The candidates who realised what was required found this to be quite straightforward and produced a concise solution. Other candidates produced quite a bit of spurious working. Some candidates stopped when they had found the vertical component of the velocity of the ball.

Question 7

There were some good force diagrams, but also some that did not include a friction force. In some cases two friction forces were included. In some cases marks were lost due to poor labels or not using arrows to represent the forces.

There were some good responses to part (b), but answers such as 50*g* were also seen.

Part (c), was more demanding, but some very good explanations were seen. If candidates applied the friction law correctly they often had all the information required to obtain a correct solution. Many candidates understood how to apply the friction law, but a few assumed that the maximum value of the friction force would act and that the crate would accelerate due to the friction force. A few candidates considered the possibility of vertical motion as well as horizontal motion.

There were some good answers to part (d) but also some poor ones. Answers sometimes related to the crate breaking or being deformed in some way. There were also responses about air resistance which were not appropriate as the crate remains at rest.

Question 8

Part (a) was often done well, but some candidates did not state that B had travelled further even though they had calculated the 16 metres correctly.

Part (b) was more demanding. If candidates found the accelerations of both trains, they often went on to produce a correct solution. The main problems were that some candidates tried to work from the point where the trains had the same speed, but forgot to take account of the 16 metres between them at this time. Another common error was to have the 9 on the wrong side of the quadratic equation that they used to find the time. For example $t + 0.3t^2 + 9 = 5t + 0.005t^2$ rather than $t + 0.3t^2 - 9 = 5t + 0.005t^2$.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator