AQA

AS MATHEMATICS

MM1B Mechanics 1
Report on the Examination

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General

The students found most questions on the paper accessible and there were relatively few blank responses. There was some very dubious manipulation of vectors in question 7.

Question 1

This question was completed successfully by the vast majority of students. The most common error was to start with an equation such as $P = 40\cos 30°$.

Question 2

Part **(a)** was completed successfully by the vast majority of students. There were a few students who used incorrect masses. Some students incorrectly left their final answer as negative.

Part **(b)** was much more demanding and very few correct responses were seen. Many students were not able to use the relative velocity. Those who did incorporate the relative velocity did so in one of two ways: either taking it as just before or just after the sack was thrown. The mark scheme allowed students who interpreted the question in either way to gain full marks.

Question 3

There were a lot of good responses to both parts of this question. A lot of students used the trigonometric approach in part (a). The most common error was to find AC rather than BC.

In part (b), there were many good responses, but some students used their angle from part (a), instead of finding the new angle that was required.

Question 4

In part (a), there were a lot of good responses. Two main errors were seen: firstly using the incorrect substitution $u = 0$ and $v = 4$, and secondly forming a correct equation, but solving it incorrectly.

Almost all students gained full marks in part (b).

There were a lot of good responses to part (c), but some students introduced an extra term into their equations of motion.

While there were many good responses to part (d), there were also a number of students who stated that the coefficient of friction would remain the same as the surfaces were the same or said that it would be larger, as if the air resistance was due to increased friction.

Question 5

There were many good responses to part (a). However, in parts (b) and (c) there was quite a bit of confusion as to which forces to include and which mass to use. For example, when considering the whole system, some students included the tension. Also, a few students included the weight in their calculations.

Question 6

There were a good number of correct force diagrams. The usual issues of missing out forces or arrow heads, particularly on the tension, were seen. Some students drew in components as if they were forces. A few students drew a diagram that suggested that the box was on an inclined plane.

There were many good responses to part (b), but some students just stated that the normal reaction was $196\ \mathrm{N}$, and some resolved the tension incorrectly.

There were also many good responses to part (c), with the main issues being missing terms or incorrect resolving and in some cases not resolving at all.

In (d)(i), many students gained a method mark, by subtracting 5 from their resultant force from part (c), with a good number of students going on to gain full marks.

There were some very mixed responses to part (d)(ii). While there were some good responses, some students linked increasing air resistance to increasing acceleration rather than increasing speed. Also, some students felt that the box had been modelled as a particle and that this would eliminate air resistance.

Question 7

In part (a) the vast majority of students found the velocity correctly, but quite a large number of these did not go on to find the speed.

There were some good responses to part (b), but these were not seen very often. A lot of students worked with expressions for the displacement of the jet ski and produced a lot of irrelevant working. Some started with an expression for the velocity of the jet ski, often gaining the first two marks, but failed to create an equation to find when the speed was 10. While most successful students formed and solved a quadratic equation, some made use of trial and improvement methods to obtain a speed of 10.

There was evidence of a lot of inappropriate vector manipulation in the working of students for this question, including equating vectors to scalars and dividing vectors.

Question 8

The students found this question quite demanding. In part (a) there were a lot of issues due to poor resolving, for example having the horizontal and vertical components reversed. Also, using the wrong signs in equations was an issue for some students. Some examples are shown below:

$4t + 4.9t^2 = 8$ where the initial velocity was not resolved
$3.2t + 4.9t^2 = 8$ where the horizontal component of the initial velocity was used in error
$2.4t - 4.9t^2 = 8$ where a sign error was present.

In part **(b)**, there were some good responses, but again there was a lot of confusion with components, which could lead to the correct answer from incorrect working. Some students found only the vertical component of the final velocity and did not combine this with the horizontal component.

Very few students gave good responses to part (c). The most common response was to suggest that $\mu \leq 1$.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

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