AQA

AS
MATHEMATICS

MM1B Mechanics 1B
Report on the Examination

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General

The students seemed to find some questions very accessible, but others later in the paper proved to be more demanding. There were a number of places where poor understanding of vectors was demonstrated: for example, students not realising that a displacement is a vector quantity and attempting to square vectors.

Question 1

There were many correct solutions to this question, but in both parts there were some specific problems that emerged.

In part (a), some students did not realise that the particles were moving in opposite directions and so did not include a negative sign with the velocity of either particle.

In part (b), some students did not cope with the fact that the mass of the combined particle was $(m + 5)$. Some did this correctly but experienced trouble with expanding the brackets, while others did not use the correct mass in their equation: for example, some incorrectly used $5m$ as the combined mass.

Question 2

Part (a) was generally done well, although a few students tried to include the weight of the particle.

Part (b) was also done well, although some students made errors expanding brackets or manipulating equations with negative signs.

Part (c) was done very well, but a large number of students went on to calculate the magnitude of the displacement. On this occasion they were not penalised for this, but they should be discouraged from doing this in the future. It is important to read questions carefully.

Question 3

Part (a) was generally done well, but a few students misquoted, and then used, an incorrect constant acceleration equation.

Part (b) was found to be slightly more difficult than part (a). There were a lot of correct solutions, but some students tried to use speed = distance / time, ignoring the fact that the car was accelerating.

Part (c) was more demanding than the earlier parts of this question and far fewer correct responses were seen. A few students used the principle of resolving correctly. Many students did not seem to know how to start, while other used a trigonometric function with a selection of values from the question, for example 1.08 and 1.5.

Question 4

Parts (a) and (b) of this question were very well done with very few incorrect responses.

Part (c) was more challenging, but many good responses were seen. A high proportion of the students obtained an appropriate angle, such as $8°$ or $82°$, but did not obtain the correct bearing from this. Many final answers, such as $352°$, $82°$ or $172°$, were seen. A few students did not give the final answer to the nearest degree as requested.

Question 5

Part (a) was done well by many students, who clearly showed the two equations of motion as requested in the question. There were some who started with a single equation, such as $7g - 3g = (7 + 3)a$. These students were given partial credit.

In part (b) most of the students took the correct approach, but some used 80 instead 0.8.

In part (c), there were again many good solutions but the most common error was to use an acceleration of 3.92, as in part (b), rather than realising that the particle was moving freely under gravity and that an acceleration of 9.8 was required.

Question 6

In part (a), the correct answer was seen quite often, but responses such as $R = 49 - T\sin 60°$ were very common. It was unusual to see the answer 49 N, but just $T\sin 60°$ was seen occasionally.

In part (b), there were a lot of good starts with statements like $T\cos 60° - F = 5 \times 0.9$. However, there were a lot of errors in the subsequent substitution and manipulation. A common problem was expanding the brackets correctly and statements like the following were seen quite frequently: $T\cos 60° - 0.2(49 + T\sin 60°) = T\cos 60° - 9.8 + 0.2T\sin 60°$.

Question 7

There were some good solutions to part (a). The approach of calculating the time up and the time down was quite frequently used. For those who formed and solved a quadratic equation, common errors included using –1 instead of 1 and occasionally missing out the *t* from the $12\sin 50° t$ term.

In part (b), a lot of students took the correct approach. A few students did use $s = \frac{1}{2}(u + v)t$ with $u = 0$.

Part (c) proved to be very challenging, with very few complete correct solutions. A lot of students gained partial credit by adding 3 to their answer to part (b) and by making either of the following statements: $t = \frac{16.6}{V\cos 50°}$ or $1 = V\sin 50° t - 4.9t^2$. It was not uncommon to see values from earlier in the question substituted for *t*. Those students who did produce a correct starting point often had difficulties with the algebraic manipulation required to complete the solution.

There were very few answers that related to the fact that the ball might hit the edge of the box due to its size. Many students restated the information in the question about the absence of resistance forces.

Question 8

Most students found this question to be very challenging and there were many approaches which did not involve the velocities of the two helicopters and made no valid progress. Some students did write down the two velocities and gained some marks for this. However, this was often followed by an approach that assumed that they were equal, which produced two different and incorrect times. Those who realised that corresponding components of each velocity were in the same ratio often went on to produce a correct solution.

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