A-LEVEL
MATHEMATICS

MM2B Mechanics 2B
Report on the Examination

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General

The early questions proved to be a pleasant introduction to the paper with most students achieving good marks on these. Questions 8 and 9 were found more demanding and these were designed to discriminate between students at the higher end of the ability spectrum. Frequently students were not careful with the calculations, often finding the numerical answer close but not exactly equal to that required. A few were penalised for not using three significant figures in their answers.

Question 1

Parts (a) was usually answered correctly but a few students made errors in the evaluation of the potential energy gained as the ball fell to the ground

Question 2

Most students showed that they knew the techniques involved in answering this question, but unfortunately a number did not realise that $\cos \pi$ was -1. There were a number of students who found the '$+ c$' in part (b) incorrectly.

Question 3

This question was also usually answered well. However, a significant proportion of students did not take moments correctly, with a number not using $\sin \theta$ or $\cos \theta$ appropriately.

Question 4

In part (a), most students resolved and found the tensions correctly. Unfortunately, again, the need to use $\cos \theta$ or $\sin \theta$ correctly defeated some.

Question 5

Most students correctly found the maximum power. Parts (b) and (c) were often completed badly; students found it difficult to identify the forces acting in each of these two scenarios. In part (c) many students realised that they needed to consider the resistance force, 40×55, the gravitational force, $1600\, g \sin \theta$, and the driving force exerted by the engine, $\frac{81000}{55}$, but unfortunately students often did not always connect all three terms correctly.

Question 6

This question was not answered well. Students frequently did not differentiate clearly between v and U, particularly in their use of the energy equation. They generally knew the two methods required, although a number did not find v when the particle left the surface. They often did not appear to notice that one cannot solve only one equation that contains two variables.

Question 7

A number of students used an incorrect $F = ma$ equation and then invented a minus sign to obtain the printed equation in part (a). The minus caused problems to many students both in parts (a) and part (b).

In part (b) some students separated the terms, incorrectly starting with $\int -15\mathrm{d}t = \int (3v - 20)\mathrm{d}v$. Most students correctly used separation of variables but the simplification of their result, after finding their '+c' , caused problems. The conversion of $\ln(3v - 20) = -\frac{1}{5}t + \ln 25$ into a non-log equation was frequently incorrect.

Question 8

In part (a) many students knew what was required but unfortunately they often failed to use precise mathematical terms, for instance $\int \frac{\lambda e}{l}$ instead of $\int_0^e \frac{\lambda x}{l}\mathrm{d}x$. Parts (b)(i) and (b)(ii) were usually answered well. In part (b)(iii) most students knew that they needed to consider gravitational potential energy, kinetic energy and elastic potential energy during the motion. Some had difficulty in calculating each of these correctly and it was not rare to find the given equation appear from nowhere. Part (b)(iv) was often answered correctly. Many students sensibly used the given equation rather than the equation which they had obtained.

Question 9

This question targeted the students aiming for the top grades, and there were quite a few impressive solutions seen.

Part (a) caused the most difficulty. It was necessary to draw a careful diagram and initially obtain $\sin\theta = \frac{1}{3}$.

In part (b) both resolving and taking moments were needed to obtain two equations from which, with the use of the given value of $\sin 2\theta$, the required result could be found.

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