A-LEVEL
FURTHER MATHEMATICS

7367/3M
Report on the Examination

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Question 1

There were many correct responses to this question. The most common error was to select 35 N s

Question 2

There were many correct responses to this question. The most common error was to select 21 600 W, which is the product of the mass and the speed.

Question 3

There were many correct responses to this question. The most common error was to select 28 cm, which is the distance of the centre of mass from *A* rather than the centre of the rod.

Question 4

There were many good responses to this question, especially part (a). There were very few cases of students using units rather than dimensions. Students were generally able to find the dimensions of G correctly, but sometimes had difficulty finding the values of the constants a, b and c with errors in simplifying the indices or solving the resulting equations. The constant a was found correctly most frequently. A small number of students formed incorrect equations with a + sign as shown in the example below.

$$MT^{-2} = \left(MLT^{-2}L^2M^{-2}\right)^a + M^b + L^c$$

Question 5

There were many good responses to this question. The main issue that emerged was in part (a), where some students did not use integration, but simply multiplied the force by x and substituted the value of 0.2 for x. These students often gained marks in part (b) as their expression for the work done was followed through if incorrect.

In part (b), there were again many good responses, but conceptual errors included trying to equate the work done to zero, using momentum instead of energy and others made errors in algebraic manipulation or substitution.

Question 6

Students did well with the differentiation parts of this question, although a few incorrectly used integration. In part (a), some students did not attempt to show that the vectors were perpendicular. There was a mixture of approaches using either the scalar product or the directions of the vectors.

In part (b), there were many good responses, with students successfully showing that the magnitude of the resultant force was constant. A few students lost marks because they did not show all of their working.

Question 7

Many students produced good responses to parts (b) and (c), but the quality of the explanations given in the other parts was very variable, with many students not giving satisfactory explanations.

In part (a), many students did not mention that the components of the momentum perpendicular to the initial momentum were of equal magnitude and that hence the velocity components were of equal magnitude. It was common to see the assumption that the velocity components were equal without suitable justification.

Parts (b) and (c) were often done well by the students who recognised what was required and were able to produce good solutions. The most common error was to not recognise that the components of the momentum were in opposite directions after the collision and to make a sign error.

A great variety of methods were seen in solutions to part (d). Many students compared two suitable quantities but in some cases the argument was not made well enough to gain both marks.

In part (e), many students gave reasonable responses, although in some cases these were stated as criticisms of the model rather than refinements to it. For example, “Include air resistance” is clearly a refinement, while “Air resistance not taken into account” is a criticism of the model.

Question 8

There were some good responses to part (a), but some students found this question quite challenging. The main issues were:

- using the wrong normal reaction, simply taking this to be $60g$
- making errors with the trigonometric terms
- using Newton’s Second Law to find the acceleration and then using a constant acceleration equation, instead of an energy method as requested.

In part (b), many students used the correct energy approach, but many used the wrong normal reaction force, not realising that it was now $60g$ and continuing to use the value from part (a).

There were a few good answers to part (c), from students who realised that air resistance had not been taken into account. Many students found it difficult to write a good explanation and some forgot to comment on the validity of the claim.

Question 9

Many students found this question very challenging and a significant number did not attempt the later parts of the question.

Parts (a) and (b)(i) were done well by many students, who found these an easy introduction to the question, but in some cases did not proceed any further.

In part (b)(ii), the students who realised that they needed to take moments generally made some progress. In a number of cases, they found the reaction force on the top of the rod but did not state that this was of equal magnitude to the horizontal reaction force on the rod at B. Some students tried to use approaches that did not involve moments in any way.

In part (b)(iii), a few students produced good complete solutions. Many students did not attempt this part of the question or made very little progress. A number of students were able to deal with the case when the composite body was on the point of sliding and obtain the correct mass. A few students took the correct approach but did not use the correct reaction force. Those who tried to consider the case of toppling made errors that involved using an incorrect distance or mass or omitting one of the forces acting on the composite body.

Mark Ranges and Award of Grades

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