



**General Certificate of Education (A-level)  
June 2012**

**Mathematics**

**MM03**

**(Specification 6360)**

**Mechanics 3**

***Report on the Examination***

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## General

Candidates were generally well prepared for this paper and worked through it with confidence, making good attempts at questions 3 and 5. The topic which many candidates found particularly challenging was relative motion (Questions 6 and 7(d)), although there were some excellent and well written responses from some candidates. Many candidates seemed not to understand the definition of the coefficient of restitution and were unable to apply the law of restitution correctly.

There was no evidence of lack of time for the candidates to attempt all of the questions.

### Question 1

Most candidates found this question straightforward. However, some candidates made sign errors in writing the change of momentum of the ice-hockey player and using the impulse-momentum principle in answering part (b).

### Question 2

This question was answered very well and proved to be an easy source of marks for many candidates. However, some candidates used  $MLT^{-2}$  instead of  $LT^{-2}$  for the dimensions of  $g$  or  $T$  instead of  $L$  for the dimension of  $s$ . A small number of candidates gave  $\frac{5}{2}MLT^{-2}$  as their simplified result for the dimensions of the expression. These candidates lost the accuracy mark available for the question.

### Question 3

The great majority of the candidates were able to answer both parts of this question correctly. However, a small number of candidates lost the last accuracy mark which was available for part (b) by not showing enough working. Centres should advise their candidates to show sufficient evidence of working when the answer to a question is given on the question paper.

### Question 4

This question was answered fairly well by candidates. Part (b) of the question proved to be challenging for some candidates, where sign errors were often a source of mistake. For part (d), many candidates were unable to give a valid explanation of how they had used the assumption that the cushion was smooth in their answer. Some candidates made irrelevant comments about “line of centres”.

### Question 5

It was pleasing to see excellent responses to this question by many candidates who gained full marks for their work. For part (a), a small number of candidates found one half of the time taken by the particle to travel from  $O$  to  $A$  instead of the full time of flight. However, many of these candidates were able to gain follow-through marks for their responses to part (b). Some candidates were unable to recognise that the law of restitution was only applicable to the component of the velocity of the particle perpendicular to the inclined plane.

## Question 6

This was a challenging question for many candidates. Often candidates were unable to sketch diagrams to assist their attempts to answer either part of the question. Many candidates attempted to use vectors to answer the question. This was often prone to mistakes, either because of rounding or truncating their vector components at an early stage or because of slips they made in differentiating their relative position vector. Very few candidates were able to answer part (a) by using vectors. Most candidates who used the sine and cosine rules were able to answer both parts correctly.

## Question 7

Many candidates answered part (a) of the question correctly. Because the answer to part (b) was given, candidates were expected to show their method fully in order to gain the method mark available. For part (c), many candidates seemed not to understand the definition of the coefficient of restitution and were unable to apply the law of restitution along the line of centres. These candidates often expressed the coefficient of restitution as a ratio of two vectors. Part (d) of the question proved too difficult for the majority of candidates, including some of those candidates who performed strongly on the rest of the paper.

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