Examiners' Report
Principal Examiner Feedback

Summer 2023

Pearson Edexcel GCE
Further Mathematics (8FM0)
Paper 26 Further Mechanics 2

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The candidates' responses to this paper demonstrated understanding of all the topics covered, but not necessarily the confidence and depth of understanding that results from extensive experience of past papers. For example, in question 3 there was understanding of resolving, but terms were often omitted from equations and many candidates had the friction force acting in the wrong direction. In question 4, although the question asks for a distance from *MC*, many candidates did not use this as the axis in their moments equation. There was also a tendency in question 4 to divide the lamina into several pieces, and not simply work with the difference of two triangles described in the question.

Candidates need to explain what they are doing to assist the examiners in determining whether a method is valid. When an equation contains a mixture of correct and incorrect distances, the solution becomes very difficult to follow. In many instances a clearly labelled diagram assists both the candidate and the examiner.

Candidates should remember that when they are working towards a given answer it is particularly important to give full working in support of their conclusion.

Question 1

(a) This question has a given answer, so the working needs to be clear and correct. The majority of candidates achieved this. The most common problem was the inconsistent use of *m*, which needs to be in all terms or in none for the equation to be dimensionally consistent.

(b) Many candidates did the working for part (b) alongside the working for (a) in a vector equation. The answer was usually correct.

(c) The majority of candidates understood that they needed to substitute their coordinates for the centre of mass into the equation of the line. There were a few slips in the algebra and in the arithmetic, but several correct solutions.

(d) Those candidates who realised that the fourth particle must lie on the line scored these marks very easily. Those who did not spot this needed to assign a mass to the new particle and work through from the beginning. Some of these candidates were successful, but the arithmetic and algebra were a problem.

Question 2

There were more candidates than usual who tried to use the *suvat* equations to solve this problem about variable acceleration. Many candidates coped well with the differentiation and integration of the exponential functions. The difficulties arose in the substitution of $t = \ln 2$, particularly in finding the value of e^{2t}. The question asks for the final answer to part (b) to be given to 2 significant figures – over-specified answers were penalised.

Question 3

The majority of candidates recognised that they needed to resolve the forces acting on the cyclist. The first difficulty was to understand that at minimum speed the friction will be acting up the slope (and parallel to the slope). Those candidates who attempted to resolve horizontally and vertically usually obtained equations of the correct form. Only a small number of candidates who attempted to resolve parallel and perpendicular to the slope made any useful progress. Many candidates started with the incorrect equation $R = 55g\cos 15°$, with no indication of any understanding that they needed to include a component of the acceleration in this equation. Most candidates did try to use the equation for motion in a horizontal circle at some point in their response. The solution of this problem requires the substitution of a value for g, so final answers given to more than 3 significant figures were not accepted.

Question 4

(a) Many candidates made this more complicated than necessary, either by dividing the figure into more than two parts, or by using a vertical axis other than *CM*. Using *CM* as the vertical axis makes the working much simpler because the centre of mass of *ABC* lies on *CM*. Many candidates did eventually reach the given answer.

(b) Several candidates were successful in using the answer to part (a) to solve this task. However, many did not appreciate that if they needed to know the tension in the string attached at *B* then the most efficient approach was to take moments about *A*.

(c) To solve this problem, it was necessary to find the vertical distance of the centre of mass of the lamina from *AB*. To this end, a sensible approach was to take moments about *AB*, although with the centre of mass of *ABC* lying on *DE* using this as the axis was also a good tactic. Some candidates who were working on the correct triangle were confused about which angle they needed to use.

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