Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

Summer 2019

Pearson Edexcel GCE AS Mathematics In Further Mechanics (8FM0_25)

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Introduction

The performance of candidates on this paper covered the full range of marks available. The majority of candidates offered responses to all four questions, but in some scripts it did appear that candidates had not allowed sufficient time to complete the last question.

The best candidates demonstrated a strong understanding of the topics and produced clear, well annotated responses, with diagrams as appropriate.

The weaker candidates often wrote down dimensionally incorrect statements, such as equating forces and power. Their responses were less fluent and often included several attempts to achieve the answer.

Some candidates lost marks through not following the instructions in the question, most notably in question 3, which specified that the work-energy principle should be used. Some marks were lost because candidates miscopied their own work as they moved from one part of a question to the next.

The standard of presentation was often good, but there were scripts where the handwriting was so small as to be almost illegible. There were also several scripts where the candidate had written a second attempt over the first, with both solutions visible in the scan, again making the work virtually illegible.

The rubric is very clear about the value to be used for *g* if a substitution is necessary, but some candidates lost an accuracy mark by using 9.81. Candidates should be **reminded** that after the use of 9.8 the final answer to the question should be given to 2 significant figures or to 3 significant figures, otherwise the **answer** will be marked as an accuracy error.

Question 1

(a) There were four marks available for this part of the question, which should have indicated to candidates that the response required more than simply calculating 16000×25 . The request "Show that …" means that there is some explanation required. In this case, candidates were expected to explain why they were using 16000 N as the driving force. A solution which gave no justification scored a maximum of one mark. In order to score all four marks it was necessary to reach the given answer correctly – some candidates stopped when they got to 400 000 W, and some made errors in the number of zeros in their working.

(b) There were many fully correct solutions to this part of the question. For those candidates who scored the two initial method marks, the most common error was a sign error in the resistance. Candidates should bear in mind that if they use a calculator to solve an incorrect quadratic equation, showing no working, they will not score the method mark for solving the equation. There were several instances of candidates misreading either the question or their own writing. Many of these examples involved gaining or losing zeros in numbers, but there were also people who used a resistance of 640 newtons. This error in the resistance substantially changes the question, so only the first two marks were available to these candidates.

Question 2

(a) Most candidates demonstrated some knowledge of the methods required here, but there were many sign errors. Candidates using the impulse-momentum principle usually recognised that they should be subtracting the initial momentum from the final momentum, but for particle *B*, candidates often did not take account of the change in direction, and for particle *A* they did not use an impulse of $-5mu$. The impact law was usually used with *e* on the correct side, but here again there were sign errors through confusion over directions. Candidates should be encouraged to draw a diagram in a question like this to help to confirm the directions of motion. Candidates need to take care with basic arithmetic and algebra – several solutions were spoiled through errors in manipulating equations. Some candidates created opportunities for error by using the same letter for both of the unknown velocities.

(b) Most candidates who attempted this part of the question used a correct expression for kinetic energy. Many reached the correct answer, or were able to score at least three marks for the correct use of their values from part (a). A few candidates scored no marks because, although they found correct expressions for the initial kinetic energy and the final kinetic energy, they never combined the two to form an expression for the change in kinetic energy. Some candidates found the initial kinetic energy and the final kinetic energy and then "cancelled" the mu^2 before subtracting, so they never had a dimensionally correct expression for the change in kinetic energy and scored no marks. The question asked candidates to find the loss in kinetic energy, so the final answer should be positive.

Question 3

Some candidates used *suvat* equations to obtain a "correct" answer to this question, but they scored no marks because they had not followed the instruction to use the work-energy principle. The majority of candidates did gain credit for finding at least some of the relevant terms. The most common errors were to assume that the initial kinetic energy was zero, or to overlook the work done against the resistance. Having been told that the plane was rough, some candidates engaged in unnecessary work to try to find the coefficient of friction between the particle and the plane.

In forming the work-energy equation, there were some sign errors, some candidates omitted either the work done against the resistance or the change in gravitational potential energy, and some candidates included both the change in gravitational potential energy and the work done by the weight.

The final answer follows the use of 9.8, so it should be given to 2 significant figures or to 3 significant figures.

Question 4

(a) Many candidates made a confident start in this question, with the majority scoring the first four marks for a correct equation using conservation of linear momentum, and for correct use of the impact law. A few candidates, usually those who had not drawn a diagram, lost a mark due to the inconsistent use of the direction of motion for Q.

If there is to be a second collision then the direction of motion of Q must be reversed. Candidates needed to start by finding an expression for the velocity of Q and then form an appropriate inequality. Many candidates did complete this stage correctly. The most common errors were to focus on the velocity of R, or to form an inequality involving the velocity of R.

(b) A small group of candidates gave the correct answer here. Some candidates recognised that the ratio of the masses of the particles involved in the second collision was identical to that in the first collision and simply wrote down the answer. Some candidates worked through the entire process a second time and reached the correct answer. The majority of candidates who worked through the process a second time made arithmetic or algebraic errors in the course of their working.

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