Pearson Edexcel

# Examiners' Report

# Principal Examiner Feedback

## Summer 2025

Pearson Edexcel GCE

In A Level Further Mathematics (9FM0)

Paper 4C Mechanics 2

**Edexcel and BTEC Qualifications**

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

**Pearson: helping people progress, everywhere**

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2025
Publications Code 9FM0_4C_2506_ER*

## Introduction

This paper provided a range of opportunities for candidates and responses of all levels were seen on all questions. The number of questions did not seem to prevent most candidates from attempting all the paper.

In general, responses with carefully structured work, explaining the method being used, tend to score more marks both because the examiner can clearly identify what an equation represents and because the candidate can build on their structure as a guide for how to proceed with the solution.

The multi-stage structure of questions allowed many candidates who were unsuccessful in earlier parts of question to make a restart later, often scoring full marks on the final few parts of questions. However, some responses did not take the opportunity to use a printed answer from an earlier part, and this meant that they had more limited success.

When a question has a given answer which is to be shown, responses must be accurate and correct. Several otherwise good responses chose not to include brackets in their solutions, or provided work which was dimensionally inconsistent, with terms disappearing and reappearing and this means that not all marks can be awarded. This was particularly notable on questions 1, 4 and 6.

A proportion of responses indicated that candidates should read the demand of questions carefully: it is important to write the final line of a conclusion **exactly** as printed or follow instructions such as use $g = 10 \text{ ms}^{-2}$

**Question 1**

(a) Responses to this question took a variety of routes to dividing up the shape. A significant proportion of otherwise correct solutions chose to omit to reference $d$ anywhere, which was penalised. Weaker responses confused the horizontal distances of $AC$ and $DE$ or double-counted parts.

(b) Several strong responses were seen which simply wrote $k + 1 = d$ then used a calculator to get the answer. Weaker responses often introduced a surd-form for $M$ or did not simply their moments equation to get a value for $k$.

**Question 2**

(a) While most responses had a clear method, a number did not fully explain their division by $\pi$ and some tried to derive the final expression by simplifying their $d$ rather than subtracting from 4. Some weaker responses just integrated $y$ with respect to $x$ which was not given any credit.

(b) Responses to this suggested that candidates are familiar with this style of demand; nevertheless, a significant proportion of responses used a radius of 0.125 rather than 0.25 for the base.

**Question 3**

Although this was an unstructured question most candidates had good ideas of how to solve it. Stronger responses were rather short and similar to the mark scheme, but a significant proportion made calculation errors at the end or gave an over-accurate answer. Weaker responses tended to either assume equilibrium horizontally or along one of the strings and a number were unsure of the formulae for circular motion.

**Question 4**

(a) Solutions for this question mainly followed the method described in the main mark scheme, but several candidates also chose to divide the shape in various fashions including overlapping rectangles subtracting a triangle. Many responses chose to measure from $AB$ rather than $EF$ but were still able to successfully reach the correct conclusion. Among weaker responses the most common errors involved the triangular folded part – either not doubling its mass or getting its centre of mass wrong.

(b) While most responses mentioned the symmetry a significant proportion also gave too much information, including additional incorrect statements such as claiming that the lamina was uniform.

(c) While most responses opted for a solution similar to the mark scheme, a large proportion assumed the centre of mass was "within" the triangle and so used a denominator of 32 in their $\tan\theta$ expression. Weaker responses often tried to work out a new $y$-bar or similar by taking moments again.

**Question 5**

(a) Most candidates began with an equation of motion. The variation came in the integration: weaker responses struggled to separate or identify the variable to integrate. A significant proportion of candidates used substitution and/or partial fractions rather than quote a standard result, and this was often a successful if longer approach. Some otherwise strong responses made errors with fractions or when manipulating logarithms.

(b) Stronger responses proceeded as per the mark scheme although a number did not include the coefficient of the logarithm in their working so arrived at an incorrect value for $p$. Weaker responses tried to use the printed form and substitute to calculate $q$ but this received no credit.

(c) Several good responses answered as given in the mark scheme or went through a process of eliminating $v = 20$ and $v > 20$ to reach a correct conclusion. Weaker responses focused on either the denominator ($v \neq 20$) or considered "terminal velocity" situations / the limit as $t \to \infty$.

**Question 6**

(a) This question attracted the greatest variety of responses in the paper which suggests that it is a familiar result. Methods were usually one of those listed in the mark scheme, with the fourth particularly popular among those looking for an "efficient" method. Weaker responses made claims about areas of sectors using $\frac{1}{2}r^2 \sin\theta$ but could not justify why their integral might be with respect to $\theta$, particularly when they had a constant centre of mass for each sector of $\frac{2}{3}r$. Several responses used the positive quadrant only and found the centre of mass of the quarter-circle but did not make any attempt to justify why this was also the centre of mass of a semicircle. Several otherwise strong responses omitted to reference $d$ which was penalised via the final mark. The weaker responses simply quoted the formula for the centre of mass of a sector and did not make use of integration at all.

(b) Most responses proceeded as per the main mark scheme although a fair number used incorrect or inconsistent distances for the centres of mass, with sign errors frequently seen. A significant number of responses chose to find the centre of mass of the compound shape *CDEF* then combine it with *ABCD* and while this was less efficient than a single equation it was often successful. Weaker responses double-counted or omitted parts of the shape.

(c) This part attracted several good responses, including from candidates who had not correctly answered previous parts of the question. A number of responses formed a correct equation but did not simplify their answer to a value. Weaker responses had inconsistent distances, often omitting the "2$a$" or made dimensional errors with factors of $a$ on one side of an equation but not the other.

## Question 7

(a) Those candidates who were familiar with the standard formulae for simple harmonic motion made good progress. Weaker responses either used incorrect formulae or tried to backwards engineer the value of $\omega$ from the given period. Several responses did not achieve full credit as they used $-a\omega^2 = 12.5$, usually achieving $a = -2$, without ever justifying the removal of the negative from their solution.

(b) The Least accurate responses here quoted incorrect formulae and achieved no credit. Better responses were able to achieve at least one of the relevant times, but a good proportion then did nothing with it or combined the times in an inappropriate manner. A small number of responses were given in degrees rather than radians. A good proportion of correct responses illustrated their working with graphs of sinusoidal waves to show their thinking.

(c) A great number of candidates were able to respond to this part, including those who had not successfully completed previous parts. Weaker responses usually involved incorrect substitution or forgetting to square either $\omega$ or the velocity. A number of otherwise correct responses made errors in the final calculation step.

## Question 8

(a) Many candidates seemed familiar with the structure of this question. Better responses proceeded as per the mark scheme, but some chose to separate their working into different stages: resolving forces, finding a resultant, using an equation of circular motion, considering kinetic and gravitational energy separately, and then combing. Stronger responses managed this, but a number did not correctly combine their calculations and some of the least accurate had extra terms as a result of double-counting energy or force terms. A significant proportion of candidates missed the instruction to use $g = 10$ but the mark scheme was adjusted to allow all bar the final mark and this gave all responses a fair outcome.

(b) This proved to be the most challenging part of the paper, which makes its positioning at the end suitable. A great proportion of weaker responses found only the radial component of acceleration as 12 then combined with the gravitational acceleration of $g$ without realising that a component of $g$ had already been included. Other weaker responses tried unsuccessfully to combine one component of acceleration with another of force. The strongest responses tended to find the components of acceleration and use Pythagroas' as per the main mark scheme. Again, use of $g = 9.8$ was common and the mark scheme gave much credit to such responses, only penalising the final mark (if achieved).

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom