

Please check the examination details below before entering your candidate information

Candidate surname		Other names	
Centre Number		Candidate Number	
Pearson Edexcel Level 3 GCE			
Friday 16 May 2025			
Afternoon		Paper reference	8FM0/25
Further Mathematics Advanced Subsidiary Further Mathematics options 25: Further Mechanics 1 (Part of options C, E, H and J)			
You must have: Mathematical Formulae and Statistical Tables (Green), calculator			Total Marks

Candidates may use any calculator allowed by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Unless otherwise indicated, whenever a value of g is required, take $g = 9.8 \text{ m s}^{-2}$ and give your answer to either 2 significant figures or 3 significant figures.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- The total mark for this part of the examination is 40. There are 4 questions.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

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Question 1 continued

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Question 1 continued

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(Total for Question 1 is 8 marks)

2. A particle Q of mass $3m$ is at rest on a smooth horizontal plane. A particle P of mass m is moving along the plane when it collides directly with Q .

The speed of P immediately before the collision is u .

The direction of motion of P is reversed by the collision.

The coefficient of restitution between P and Q is e .

- (a) Show that the speed of P immediately after the collision is $\frac{u(3e-1)}{4}$ (6)

- (b) State the full range of possible values of e . (1)

Given that $e = \frac{1}{2}$

- (c) find, in terms of m and u , the magnitude of the impulse exerted by P on Q in the collision. (3)

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Question 2 continued

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(Total for Question 2 is 10 marks)

3. A plane is inclined to the horizontal at an angle α , where $\tan \alpha = \frac{4}{3}$. A small block of mass m is held at a point A on the plane and released from rest.

Initially the block is modelled as a particle, air resistance is modelled as being negligible and the plane is modelled as being **smooth**.

- (a) Using the model and the principle of conservation of mechanical energy, find the distance of the block from A at the instant when the speed of the block is 7 m s^{-1} (3)

In a refined model, the block is again modelled as a particle and air resistance is modelled as being negligible, but the plane is modelled as being **rough** with the

coefficient of friction between the block and the plane being $\frac{2}{3}$

Using the refined model,

- (b) find, in terms of m and g , the magnitude of the frictional force acting on the block as it slides down the plane, (3)
- (c) find, using the work-energy principle, the distance of the block from A at the instant when the speed of the block is 7 m s^{-1} (4)

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Question 3 continued

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(Total for Question 3 is 10 marks)

4.



Figure 1

A particle A of mass m is moving on a smooth horizontal plane when it collides directly with a fixed vertical wall which is perpendicular to the direction of motion of A . Immediately **after** the collision, the speed of A is $4u$, directly away from the wall, as shown in Figure 1.

The coefficient of restitution between A and the wall is e .

Given that the magnitude of the impulse exerted on A by the wall in the collision is $9mu$,

(a) find the value of e .

(5)

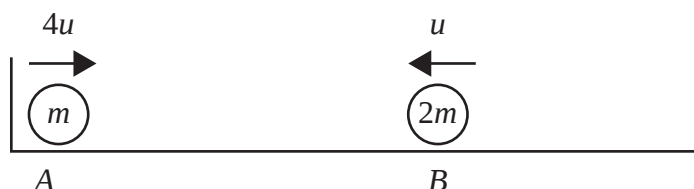


Figure 2

At the instant when A rebounds from the wall, a particle B of mass $2m$ is projected along the plane towards A , as shown in Figure 2.

The particles are moving in opposite directions along the same straight line when they collide directly.

Immediately **before** the collision, the speed of A is $4u$ and the speed of B is u .

Immediately **after** the collision, the total kinetic energy of the two particles is mu^2

(b) Determine, showing your method clearly, whether there are any further collisions between A and the wall.

(7)



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(Total for Question 4 is 12 marks)**TOTAL FOR FURTHER MECHANICS 1 IS 40 MARKS**