Please check the examination details below before entering your candidate information		
Candidate surname		Other names
Pearson Edexcel Level 3 GCE	Centre Number	Candidate Number
Thursday 16	May 20	19
Afternoon	Paper R	Reference 8FM0-25
Further Mathe Advanced Subsidiary Further Mathematics options 25: Further Mechanics 1 (Part of options C, E, H and J)		
You must have: Mathematical Formulae and Sta	atistical Tables (Gr	reen), calculator

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.

Turn over ▶







1.	A lorry of mass 16000 kg moves along a straight horizontal road.	
	The lorry moves at a constant speed of 25 m s ⁻¹	
	In an initial model for the motion of the lorry, the resistance to the motion of the lorry is modelled as having constant magnitude $16000~N$.	
	(a) Show that the engine of the lorry is working at a rate of 400 kW.	(4)
	The model for the motion of the lorry along the same road is now refined so that when the speed of the lorry along the same road is $V \text{m s}^{-1}$, the resistance to the motion of the lorry is modelled as having magnitude $640V$ newtons.	
	Assuming that the engine of the lorry is working at the same rate of 400 kW	
	(b) use the refined model to find the speed of the lorry when it is accelerating at 2.1 m s^{-2}	
		(6)

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Question 1 continued	
	(Total for Question 1 is 10 marks)



2. Two particles, $A$ and $B$ , of masses $2m$ and $3m$ respectively, are moving on a substraint plane. The particles are moving in opposite directions towards each along the same straight line when they collide directly. Immediately before the country the speed of $A$ is $2u$ and the speed of $B$ is $u$ . In the collision the impulse of $A$ on magnitude $5mu$ .		other llision	
	(a) Find the coefficient of restitution between <i>A</i> and <i>B</i> .	(9)	
	(b) Find the total loss in kinetic energy due to the collision.	(4)	

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Question 2 continued	
(Tota	l for Question 2 is 13 marks)



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3.	A particle, $P$ , of mass $m$ kg is projected with speed 5 ms ⁻¹ down a line of greatest slope of
	a rough plane. The plane is inclined to the horizontal at an angle $\alpha$ , where $\sin \alpha = \frac{3}{5}$
	The total resistance to the motion of P is a force of magnitude $\frac{1}{5}$ mg
	Use the work-energy principle to find the speed of <i>P</i> at the instant when it has moved a distance 8 m down the plane from the point of projection.
	(7)

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Question 3 continued	
(Total for Quest	ion 3 is 7 marks)



4.	Three particles, $P$ , $Q$ and $R$ , are at rest on a smooth horizontal plane. The particles along a straight line with $Q$ between $P$ and $R$ . The particles $Q$ and $R$ have masses $m$ and $R$ respectively, where $R$ is a constant.	
	Particle $Q$ is projected towards $R$ with speed $u$ and the particles collide directly.	
	The coefficient of restitution between each pair of particles is $e$ .	
	(a) Find, in terms of $e$ , the range of values of $k$ for which there is a second collision.	(9)
	Given that the mass of $P$ is $km$ and that there is a second collision,	
	(b) write down, in terms of $u$ , $k$ and $e$ , the speed of $Q$ after this second collision.	(1)



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Question 4 continued



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(Total for Question 4 is 10 marks)
TOTAL FOR FURTHER MECHANICS 1 IS 40 MARKS