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Other names

**Pearson Edexcel**  
**Level 3 GCE**

Centre Number

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Candidate Number

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# Further Mathematics

**Advanced Subsidiary**

**Further Mathematics options**

**25: Further Mechanics 1**

**(Part of options C, E, H and J)**

Thursday 17 May 2018 – Afternoon

Paper Reference

**8FM0-25**

**You must have:**

Mathematical Formulae and Statistical Tables, calculator

Total Marks

**Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. 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.
- Answers should be given to three significant figures unless otherwise stated.

## 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 ►

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Question 1 continued

Lined writing area for the answer to Question 1.

(Total for Question 1 is 8 marks)

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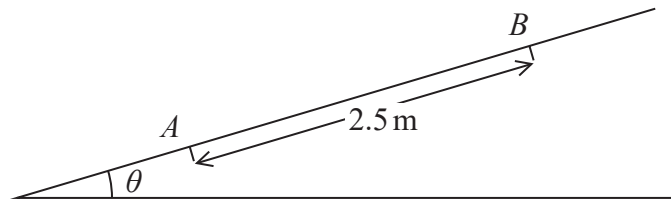


Figure 1

Figure 1 shows a ramp inclined at an angle  $\theta$  to the horizontal, where  $\sin \theta = \frac{2}{7}$

A parcel of mass 4 kg is projected, with speed  $5 \text{ ms}^{-1}$ , from a point  $A$  on the ramp. The parcel moves up a line of greatest slope of the ramp and first comes to instantaneous rest at the point  $B$ , where  $AB = 2.5 \text{ m}$ . The parcel is modelled as a particle.

The total resistance to the motion of the parcel from non-gravitational forces is modelled as a constant force of magnitude  $R$  newtons.

(a) Use the work-energy principle to show that  $R = 8.8$  (4)

After coming to instantaneous rest at  $B$ , the parcel slides back down the ramp. The total resistance to the motion of the particle is modelled as a constant force of magnitude 8.8 N.

(b) Find the speed of the parcel at the instant it returns to  $A$ . (3)

(c) Suggest two improvements that could be made to the model. (2)

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Question 2 continued

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Lined writing area for the answer.

(Total for Question 2 is 9 marks)



3. A van of mass 750 kg is moving along a straight horizontal road. At the instant when the van is moving at  $v \text{ m s}^{-1}$ , the resistance to the motion of the van is modelled as a force of magnitude  $\lambda v \text{ N}$ , where  $\lambda$  is a constant.

The engine of the van is working at a constant rate of 18 kW.

At the instant when  $v = 15$ , the acceleration of the van is  $0.6 \text{ m s}^{-2}$ .

- (a) Show that  $\lambda = 50$

(4)

The van now moves up a straight road inclined at an angle to the horizontal, where

$$\sin \alpha = \frac{1}{15}$$

At the instant when the van is moving at  $v \text{ m s}^{-1}$ , the resistance to the motion of the van from non-gravitational forces is modelled as a force of magnitude  $50v \text{ N}$ .

When the engine of the van is working at a constant rate of 12 kW, the van is moving at a constant speed  $V \text{ m s}^{-1}$ .

- (b) Find the value of  $V$ .

(5)

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Lined writing area for the answer to Question 3.



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**Question 3 continued**

Lined area for student response.

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**Question 3 continued**

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**(Total for Question 3 is 9 marks)**

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Question 4 continued

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Question 4 continued

Lined writing area for the answer to Question 4.

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