

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel
Level 3 GCE**

Centre Number

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Candidate Number

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Thursday 11 June 2020

Afternoon (Time: 1 hour 30 minutes)

Paper Reference **9FM0/3C**

Further Mathematics

Advanced

Paper 3C: Further Mechanics 1

You must have:

Mathematical Formulae and Statistical Tables (Green), calculator

Total Marks

Candidates may use any calculator permitted 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 numerical 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.
- There are 7 questions in this question paper. The total mark for this paper is 75.
- 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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6. A light elastic string with natural length l and modulus of elasticity kmg has one end attached to a fixed point A on a rough inclined plane. The other end of the string is attached to a package of mass m .

The plane is inclined at an angle θ to the horizontal, where $\tan \theta = \frac{5}{12}$

The package is initially held at A . The package is then projected with speed $\sqrt{6gl}$ up a line of greatest slope of the plane and first comes to rest at the point B , where $AB = 3l$.

The coefficient of friction between the package and the plane is $\frac{1}{4}$

By modelling the package as a particle,

- (a) show that $k = \frac{15}{26}$ (6)
- (b) find the acceleration of the package at the instant it starts to move back down the plane from the point B . (5)



7.

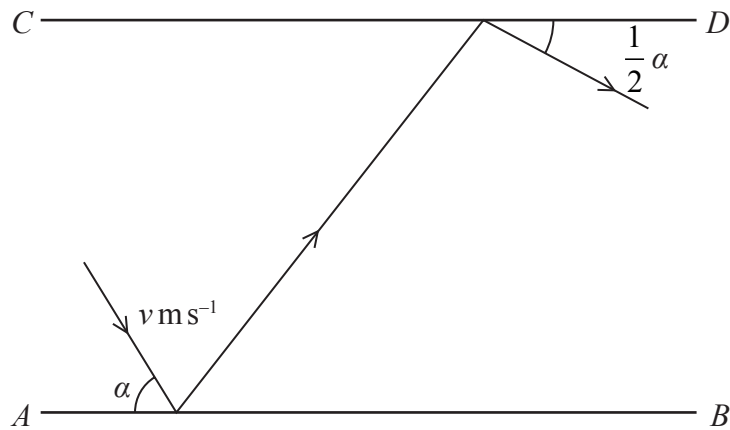


Figure 2

Figure 2 represents the plan view of part of a horizontal floor, where AB and CD represent fixed vertical walls, with AB parallel to CD .

A small ball is projected along the floor towards wall AB . Immediately before hitting wall AB , the ball is moving with speed $v \text{ m s}^{-1}$ at an angle α to AB , where $0 < \alpha < \frac{\pi}{2}$

The ball hits wall AB and then hits wall CD .

After the impact with wall CD , the ball is moving at angle $\frac{1}{2}\alpha$ to CD .

The coefficient of restitution between the ball and wall AB is $\frac{2}{3}$

The coefficient of restitution between the ball and wall CD is also $\frac{2}{3}$

The floor and the walls are modelled as being smooth. The ball is modelled as a particle.

(a) Show that $\tan\left(\frac{1}{2}\alpha\right) = \frac{1}{3}$ (7)

(b) Find the percentage of the initial kinetic energy of the ball that is lost as a result of the two impacts. (4)

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