

Please check the examination details below before entering your candidate information

Candidate surname		Other names	
Centre Number		Candidate Number	

Pearson Edexcel International Advanced Level

Time 1 hour 30 minutes **Paper reference** **WME01/01**

Mathematics

International Advanced Subsidiary/Advanced Level

Mechanics M1

You must have:
Mathematical Formulae and Statistical Tables (Yellow), 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.
- 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 8 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.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ►

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Diagram showing a particle P on a smooth inclined plane. The plane is represented by a line segment OP making an angle of 60° with a vertical dashed line. A force FN acts on the particle P perpendicular to the inclined plane, as indicated by the right-angle symbol at P .

A particle P of weight 5 N is attached to one end of a light inextensible string. The other end of the string is attached to a fixed point O . The particle P is held in equilibrium by a force of magnitude F newtons. The direction of this force is perpendicular to the string and OP makes an angle of 60° with the vertical, as shown in Figure 1.

(a) the value of F (3)

(b) the tension in the string.

(3)

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Question 1 continued

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Q1

(Total 6 marks)



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- (a) Find the value of k .

(4)

- (b) Find, in terms of m and u , the magnitude of the impulse exerted on Q in the collision.

(3)

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Q2

(Total 7 marks)



Diagram of a beam with points A , D , C , and B . The total length is 5 m . The distance from D to C is 0.5 m . The distance from D to B is 1.3 m .

A beam $ADCB$ has length 5 m. The beam lies on a horizontal step with the end A on the step and the end B projecting over the edge of the step. The edge of the step is at the point D where $DB = 1.3$ m, as shown in Figure 2.

The boy is modelled as a particle and the beam is modelled as a uniform rod.

- A block of mass X kg is now placed on the beam at A .

The block is modelled as a particle.

- (c) State how you have used the modelling assumption that the block is a particle in your calculations. (1)

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Question 3 continued

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Question 3 continued

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Q3



- The ball is modelled as a particle moving freely under gravity.

(6)

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Q4

(Total 8 marks)



A particle of mass m rests in equilibrium on a fixed rough plane under the action of a force of magnitude X . The force acts up a line of greatest slope of the plane, as shown in Figure 3.

The coefficient of friction between the particle and the plane is μ .

- When $X = 2P$, the particle is on the point of sliding up the plane.
- When $X = P$, the particle is on the point of sliding down the plane.

(8)

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Question 5 continued

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Question 5 continued

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Q5

(Total 8 marks)



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- (2)

(5)

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Question 6 continued

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Q6

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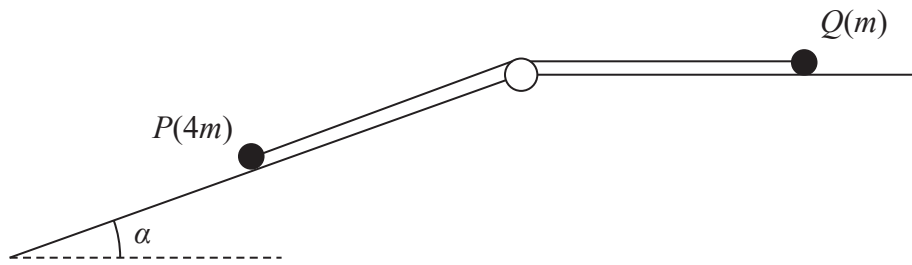


Figure 4

A particle P of mass $4m$ lies on the surface of a fixed rough inclined plane.

The plane is inclined to the horizontal at an angle α where $\tan \alpha = \frac{3}{4}$

The particle P is attached to one end of a light inextensible string.

The string passes over a small smooth pulley that is fixed at the top of the plane. The other end of the string is attached to a particle Q of mass m which lies on a smooth horizontal plane.

The string lies along the horizontal plane and in the vertical plane that contains the pulley and a line of greatest slope of the inclined plane.

The system is released from rest with the string taut, as shown in Figure 4, and P moves down the plane.

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

For the motion before Q reaches the pulley

- write down an equation of motion for Q , (1)
- find, in terms of m and g , the tension in the string, (7)
- find the magnitude of the force exerted on the pulley by the string. (4)
- State where in your working you have used the information that the string is light. (1)

Question 7 continued

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Q7

(Total 13 marks)



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A ship A moves with constant velocity $(3\mathbf{i} - 10\mathbf{j})\text{ km h}^{-1}$

At time $t = 0$, A is at the point with position vector $(13\mathbf{i} + 5\mathbf{j})\text{ km}$.

- (2)

At time $t = 0$, B is at the point with position vector $(3\mathbf{i} - 5\mathbf{j})\text{ km}$.

- $$\overrightarrow{AB} = [(12t - 10)\mathbf{i} + (24t - 10)\mathbf{j}] \text{ km} \quad (4)$$

(6)

- (2)

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TOTAL FOR PAPER: 75 MARKS

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