Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Thursday 7 May 2026

Morning (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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1. Railway truck A has mass $5m$ and railway truck B has mass $3m$. The trucks are moving towards each other in opposite directions along the same straight track when they collide directly. Immediately before the collision the speed of A is u and the speed of B is $1.5u$

As a result of the collision, the trucks couple together.

(a) Find, in terms of u, the common speed of the trucks immediately after the collision.

(3)

(b) Find, in terms of m and u, the magnitude of the impulse exerted on B by A in the collision.

(3)

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Question 1 continued

(Total for Question 1 is 6 marks)

2.

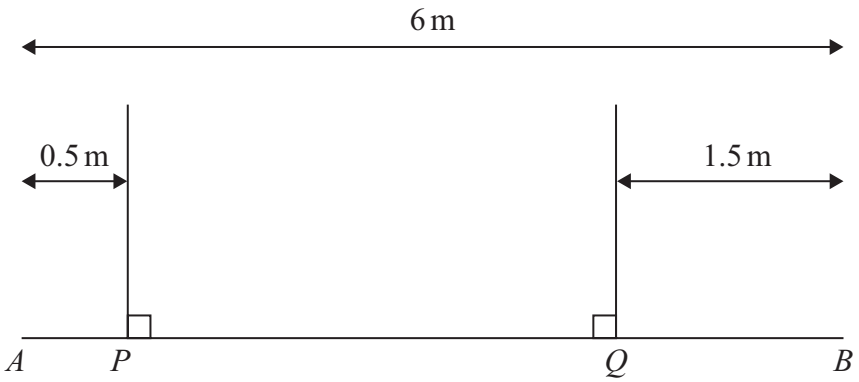


Figure 1

A non-uniform rod AB has mass 20 kg and length 6 m. The rod is held in equilibrium in a horizontal position by two light vertical strings. One string is attached to the rod at P, where $AP = 0.5$ m and the other is attached to the rod at Q, where $QB = 1.5$ m, as shown in Figure 1.

The centre of mass of the rod is 4 m from A.

(a) Find the tension in the string attached to the rod at Q.

(3)

A particle is now attached to the rod at B.

The rod remains in equilibrium in a horizontal position but is on the point of tilting.

The tension in the string attached to the rod at Q is now X newtons.

(b) Find the value of X.

(3)

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Question 2 continued

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Question 2 continued

(Total for Question 2 is 6 marks)

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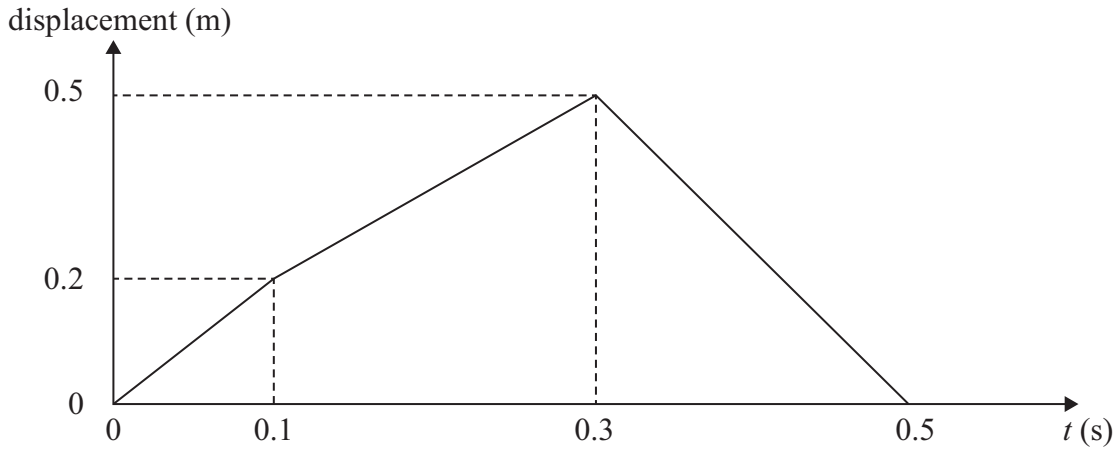


Figure 2

A small ball of mass 0.04 kg moves along a straight line on a pinball table.

At time $t = 0$, the ball passes through the point O

The displacement of the ball is measured from O

Figure 2 shows the **displacement-time** graph for the motion of the ball from $t = 0$ to $t = 0.5$

(a) State the displacement of the ball from O at $t = 0.5$

(1)

(b) Find the total distance moved by the ball between $t = 0$ and $t = 0.5$

(1)

(c) Sketch a velocity-time graph for the motion of the ball from $t = 0$ to $t = 0.5$

(4)

(d) Find the magnitude of the impulse exerted on the ball at $t = 0.3$, stating the units of your answer.

(4)

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Question 3 continued

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Question 3 continued

(Total for Question 3 is 10 marks)

4. The point O is 28.4 m above a horizontal plane. A small ball is projected vertically upwards from O with speed $U\,\text{m s}^{-1}$ and first hits the plane with speed $24\,\text{m s}^{-1}$

Air resistance is assumed to be negligible.

(a) Find the value of U.

(3)

Each time the ball hits the plane, the speed of the ball is instantaneously halved.

(b) Find the **total** time, **after the ball has hit the plane for the first time**, for which the ball is at least 4 m above the plane.

(6)

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Question 4 continued

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Question 4 continued

(Total for Question 4 is 9 marks)

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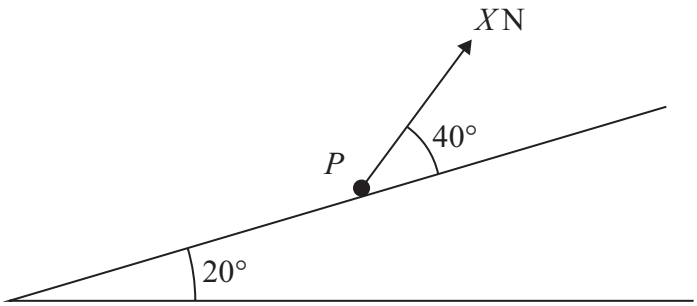


Figure 3

A particle P, whose weight is 50 N, is at rest on a rough plane. The plane is inclined to the horizontal at 20° and the coefficient of friction between P and the plane is 0.3

The particle P is held in equilibrium by a force of magnitude X newtons.

The line of action of the force makes an angle of 40° with the plane, as shown in Figure 3. The line of action of the force lies in a vertical plane which contains a line of greatest slope of the plane.

Given that P is on the point of sliding **down** the plane, find the value of X.

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Question 5 continued

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Question 5 continued

(Total for Question 5 is 6 marks)

6. The resultant **R** of two forces $\mathbf{F}_1$ N and $\mathbf{F}_2$ N is $(-5\mathbf{i} + 6\mathbf{j})$ N.

(a) Find the magnitude of **R**.

(2)

(b) Find, in degrees, the angle between the direction of **R** and the direction of the vector $(2\mathbf{i} + \mathbf{j})$. Show your method clearly.

(3)

Given that $\mathbf{F}_1$ is parallel to the vector $(-\mathbf{i} + 2\mathbf{j})$ and that $\mathbf{F}_2$ is parallel to the vector $(2\mathbf{i} - 3\mathbf{j})$,

(c) find $\mathbf{F}_1$ and $\mathbf{F}_2$

(4)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 9 marks)

7. [*In this question* **i** *and* **j** *are horizontal unit vectors directed due east and due north respectively and position vectors are given relative to a fixed origin O.*]

A boat, which is modelled as a particle, is moving with constant velocity $(-2\mathbf{i} + \mathbf{j})\,\text{km h}^{-1}$

At time $t = 1.5$ hours after noon, the boat passes through the point with position vector $(11\mathbf{i} + 3.5\mathbf{j})\,\text{km}$.

(a) Show that, at time t hours after noon, the position vector of the boat is

$$[(14 - 2t)\mathbf{i} + (2 + t)\mathbf{j}]\,\text{km}$$

(3)

The boat is visible from O when it is 9 km or less from O.

(b) Find the length of time for which the boat is visible from O, showing your method clearly.

(4)

(c) Find the value of t when the boat is northwest of O.

(2)

At the instant when the boat is at the point P, OP is perpendicular to the direction in which the boat is moving.

(d) Show that $OP = \dfrac{18\sqrt{5}}{5}$ km

(*Solutions relying on calculator technology are not acceptable.*)

(6)

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Question 7 continued

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Question 7 continued

(Total for Question 7 is 15 marks)

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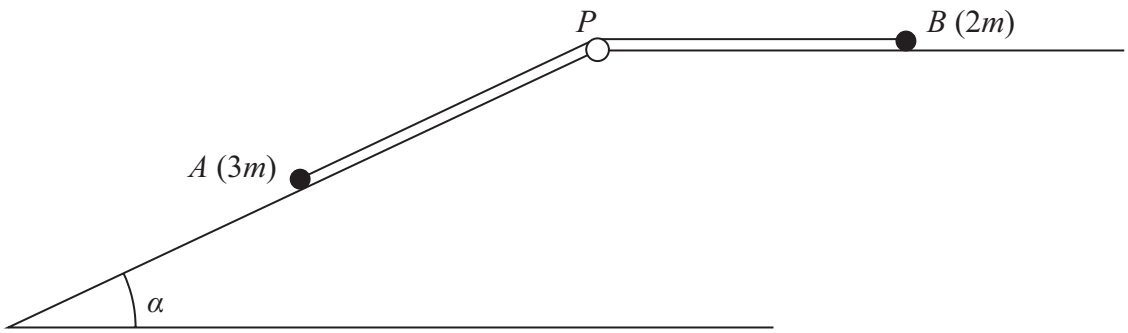


Figure 4

One end of a light inextensible string is attached to a particle A of mass $3m$. The other end of the string is attached to a particle B of mass $2m$. Particle A lies on a **rough** plane which is inclined to the horizontal at an angle α, where $\tan\alpha = \frac{3}{4}$. Particle B lies on a **smooth** horizontal plane. The string passes over a small smooth pulley P which is fixed at the top of the inclined plane, as shown in Figure 4.

The two particles, the string and the pulley all lie in the same vertical plane. The portion of the string between A and P lies along a line of greatest slope of the inclined plane.

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

The system is released from rest with the string taut and A begins to move down the inclined plane.

(a) Find, in terms of m and g, the magnitude of the frictional force acting on A.

(3)

(b) Write down an equation of motion for B.

(1)

(c) Show that the tension in the string is $\frac{12mg}{25}$

(4)

(d) State how you have used the fact that the string is inextensible.

(1)

The force exerted on the pulley by the string is **S**.

(e) State clearly, giving your answer in terms of α, the direction of **S**.

(1)

(f) Find, in terms of m and g, the magnitude of **S**.

(4)

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Question 8 continued

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Question 8 continued

Question 8 continued

(Total for Question 8 is 14 marks)

TOTAL FOR PAPER IS 75 MARKS

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