Pearson Edexcel International Advanced Level

Friday 9 January 2026

Morning (Time: 1 hour 30 minutes)

Paper reference **WME01/01A**

▲ △

Mathematics

International Advanced Subsidiary/Advanced Level
Mechanics M1
Question Paper

You must have:
Answer book (sent separately).
Do not return this question paper with the answer book.

Turn over ▶

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Pearson

1. Two particles, P and Q, have masses $2m$ and $3m$ respectively. They are moving towards each other, in opposite directions, along the same straight line, on a smooth horizontal plane. The particles collide.

Immediately before they collide the speed of P is $2u$ and the speed of Q is u.

In the collision the magnitude of the impulse exerted on P by Q is $5mu$.

(a) Find the speed of P immediately after the collision.

(3)

(b) State whether the direction of motion of P has been reversed by the collision.

(1)

(c) Find the speed of Q immediately after the collision.

(3)

(Total for Question 1 is 7 marks)

2. A suitcase of mass 40 kg is being dragged in a straight line along a rough horizontal floor at constant speed using a thin strap.

The strap is inclined at 20° above the horizontal.

The coefficient of friction between the suitcase and the floor is $\frac{3}{4}$

The strap is modelled as a light inextensible string and the suitcase is modelled as a particle.

Find the tension in the strap.

(7)

(Total for Question 2 is 7 marks)

3. A ball is thrown vertically upwards with speed $20\,\text{m s}^{-1}$ from a point A, which is h metres above the ground.

The ball moves freely under gravity until it hits the ground 5 s later.

(a) Find the value of h.

(3)

A second ball is thrown vertically downwards with speed $w\,\text{m s}^{-1}$ from A and moves freely under gravity until it hits the ground.

The first ball hits the ground with speed $V\,\text{m s}^{-1}$ and the second ball hits the ground with speed $\frac{3}{4}V\,\text{m s}^{-1}$

(b) Find the value of w.

(5)

(Total for Question 3 is 8 marks)

4. [*In this question* **i** *and* **j** *are unit vectors directed due east and due north respectively.*]

A particle P is moving with constant velocity $(-6\mathbf{i} + 2\mathbf{j})\,\text{m s}^{-1}$

At time $t = 0$, P passes through the point with position vector $(21\mathbf{i} + 5\mathbf{j})\,\text{m}$, relative to a fixed origin O.

(a) Find the direction of motion of P, giving your answer as a bearing to the nearest degree.

(3)

(b) Write down the position vector of P at time t seconds.

(1)

(c) Find the time at which P is north-west of O.

(3)

(Total for Question 4 is 7 marks)

5.

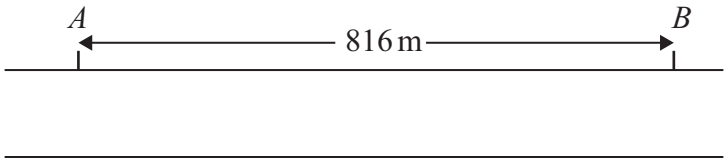

Figure 1

Two posts, A and B, are fixed at the side of a straight horizontal road and are 816 m apart, as shown in Figure 1.
A car and a van are at rest side by side on the road and level with A.
At time $t = 0$, the car and the van start to move in the direction AB.

The car accelerates from rest with constant acceleration for T seconds until it reaches a speed of $24\,\text{m s}^{-1}$
The car then moves at a constant speed of $24\,\text{m s}^{-1}$

The van accelerates from rest with constant acceleration for 12 s until it reaches a speed of $V\,\text{m s}^{-1}$
The van then moves at a constant speed of $V\,\text{m s}^{-1}$

When the car has been moving at $24\,\text{m s}^{-1}$ for 30 s, the van draws level with the car at B, and each vehicle has then travelled a distance of 816 m.

(a) Sketch, on the same diagram, a speed-time graph for the motion of each vehicle from A to B.

(3)

(b) Find the value of T.

(3)

(c) Find the value of V.

(3)

(Total for Question 5 is 9 marks)

6. A car pulls a trailer along a straight horizontal road using a light inextensible towbar. The mass of the car is M kg, the mass of the trailer is 600 kg and the towbar is horizontal and parallel to the direction of motion.
There is a resistance to motion of magnitude 200 N acting on the car and a resistance to motion of magnitude 100 N acting on the trailer.

The driver of the car spots a hazard ahead. Instantly he reduces the force produced by the engine of the car to zero and applies the brakes of the car.
The brakes produce a braking force on the car of magnitude 6500 N and the car and the trailer have a constant deceleration of magnitude $4\,\text{m s}^{-2}$

Given that the resistances to motion on the car and trailer are unchanged and that the car comes to rest after travelling 40.5 m from the point where the brakes were applied,

find

(a) the thrust in the towbar while the car is braking,

(3)

(b) the value of M,

(3)

(c) the time it takes for the car to stop after the brakes are applied.

(3)

(Total for Question 6 is 9 marks)

7.

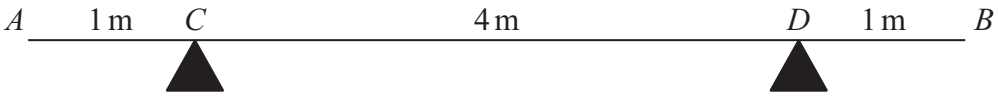

Figure 2

A non-uniform rod AB has length 6 m and mass 8 kg. The rod rests in equilibrium, in a horizontal position, on two smooth supports at C and at D, where $AC = 1$ m and $DB = 1$ m, as shown in Figure 2.

The magnitude of the reaction between the rod and the support at D is twice the magnitude of the reaction between the rod and the support at C.

The centre of mass of the rod is at G, where $AG = x$ m.

(a) Show that $x = \frac{11}{3}$

(6)

The support at C is moved to the point F on the rod, where $AF = 2$ m.

A particle of mass 3 kg is placed on the rod at A. The rod remains horizontal and in equilibrium.

The magnitude of the reaction between the rod and the support at D is k times the magnitude of the reaction between the rod and the support at F.

(b) Find the value of k.

(6)

(Total for Question 7 is 12 marks)

8.

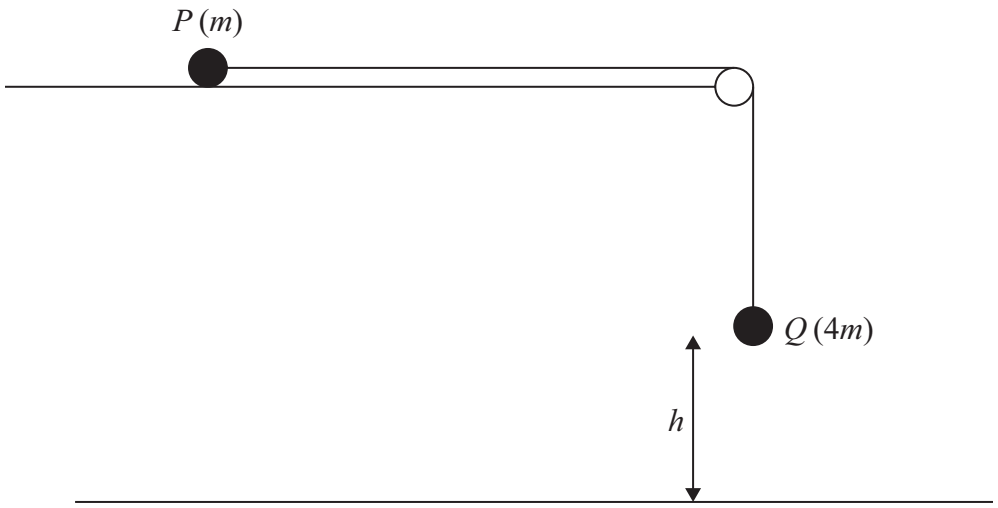

Figure 3

Two particles P and Q have masses m and $4m$ respectively.
Particle P is attached to one end of a light inextensible string and particle Q is attached to the other end.

Particle P is held at rest on a rough horizontal table. The string lies along the table and passes over a small smooth light pulley which is fixed at the edge of the table.
Particle Q hangs at rest vertically below the pulley, at a height h above a horizontal plane, as shown in Figure 3.

The coefficient of friction between P and the table is 0.5

Particle P is released from rest with the string taut and slides along the table.

(a) Find, in terms of mg, the tension in the string when both particles are moving.

(8)

The particle P does not reach the pulley before Q hits the plane.

(b) Show that the speed of Q immediately before it hits the plane is $\sqrt{1.4gh}$

(2)

When Q hits the plane, Q does not rebound and P continues to slide along the table.
Given that P comes to rest before it reaches the pulley,

(c) show that the total length of the string must be greater than $2.4h$

(6)

(Total for Question 8 is 16 marks)

TOTAL FOR PAPER IS 75 MARKS

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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Friday 9 January 2026

Morning (Time: 1 hour 30 minutes)

Paper reference **WME01/01A**

▲ △

Mathematics

International Advanced Subsidiary/Advanced Level
Mechanics M1
Answer Book

You must have:
Question paper (sent separately),
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 $g = 9.8\,\text{m}\,\text{s}^{-2}$ 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.

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Pearson

Question 1

Write the answer to Question 1 on these 2 pages

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Question 1 continued

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(Total for Question 1 is 7 marks)

Question 2

Write the answer to Question 2 on these 2 pages

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DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 2 continued

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(Total for Question 2 is 7 marks)

Question 3

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Question 3 continued

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(Total for Question 3 is 8 marks)

Question 4

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Question 4 continued

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(Total for Question 4 is 7 marks)

Question 5

Write the answer to Question 5 on these 4 pages

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Question 5 continued

Question 5 continued

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Question 5 continued

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(Total for Question 5 is 9 marks)

Question 6

Write the answer to Question 6 on these 4 pages

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Question 6 continued

Question 6 continued

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Question 6 continued

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(Total for Question 6 is 9 marks)

Question 7

Write the answer to Question 7 on these 4 pages

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Question 7 continued

Question 7 continued

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Question 7 continued

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(Total for Question 7 is 12 marks)

Question 8

Write the answer to Question 8 on these 5 pages

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Question 8 continued

Question 8 continued

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Question 8 continued

Question 8 continued

(Total for Question 8 is 16 marks)

TOTAL FOR PAPER IS 75 MARKS

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