Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Tuesday 13 October 2026

Afternoon (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.

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P 8 5 7 9 3 A 0 1 3 2

Turn over ▶

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1. Two particles, A and B, are moving towards each other in opposite directions along the same straight line when they collide directly.

Particle A has mass $2m$

Immediately before the collision, the speed of A is u

The magnitude of the impulse exerted on A by B in the collision is $5.4mu$

Find the speed of A immediately after the collision.

(3)

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Question 1 continued

(Total for Question 1 is 3 marks)

2.

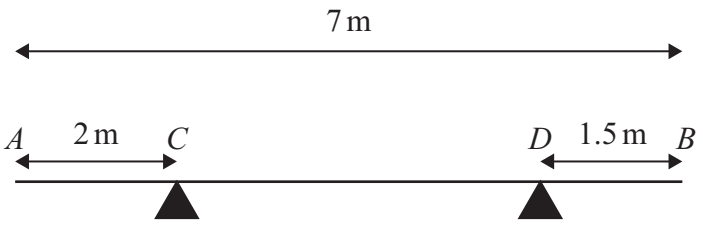

Figure 1

A beam AB has mass 5 kg and length 7 m.

The beam rests in equilibrium in a horizontal position on two supports, one at C, where $AC = 2$ m, and the other at D, where $DB = 1.5$ m, as shown in Figure 1.

When a particle of mass M kg is placed on the beam at ***A***

- the beam remains horizontal and in equilibrium
- the magnitude of the force acting on the beam at D is 7 N

By modelling the beam as a **uniform** rod,

(a) find the value of M.

(3)

The particle of mass M kg is now **removed** from A.

When a **different** particle is placed on the beam at ***B***

- the beam remains horizontal and in equilibrium but is on the point of tilting
- the magnitude of the force acting on the beam at D is now 88.2 N

By modelling the beam as a **non-uniform** rod,

(b) find the distance of the centre of mass of the beam from A.

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Question 2 continued

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Question 2 continued

(Total for Question 2 is 6 marks)

3. A ball of mass 0.2 kg is released at rest from a point A that is h metres above horizontal ground. The ball hits the ground with speed $14\,\text{m}\,\text{s}^{-1}$

- **air resistance** acting on the ball is modelled as being constant and of magnitude 0.56 N in **all** circumstances

(a) Find the value of h.

(5)

When it hits the ground, the ball receives an impulse of magnitude I N s. The ball leaves the ground with speed $2.8\,\text{m}\,\text{s}^{-1}$.

(b) Find the value of I.

(2)

After leaving the ground, the ball comes to instantaneous rest at the point B.

(c) Find the time it takes for the ball to travel from the ground to the point B.

(4)

(d) Sketch a velocity-time graph for the motion of the ball from A to B. You do not need to do any further calculations in order to complete the sketch.

(2)

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Question 3 continued

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Question 3 continued

(Total for Question 3 is 13 marks)

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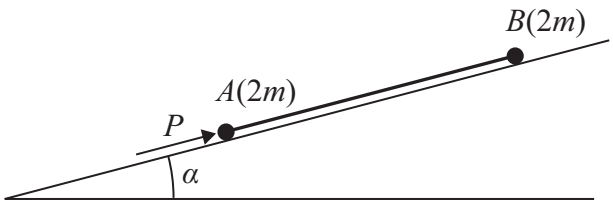

Figure 2

Two particles, A and B, each of mass $2m$, are connected by a light **rod**. The rod is placed on a rough plane, with AB lying along a line of greatest slope of the plane, and A lower than B. The plane is inclined to the horizontal at an angle α, where $\tan\alpha = \frac{3}{4}$

A force of magnitude P is applied to A in the direction AB, as shown in Figure 2.

- the coefficient of friction between each particle and the plane is $\frac{1}{4}$
- the thrust in the rod is T

The particles are in limiting equilibrium and about to slide down the plane.

(a) Find P in terms of m and g.

(6)

(b) Find T in terms of m and g.

(3)

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Question 4 continued

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Question 4 continued

(Total for Question 4 is 9 marks)

5.

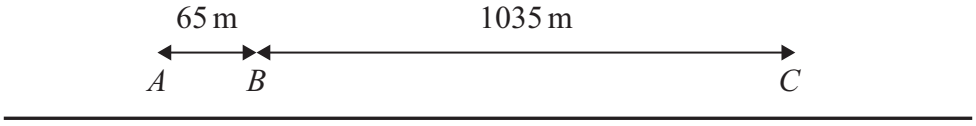

Figure 3

A car is moving along a straight road with constant acceleration $a\,\text{m s}^{-2}$

There are three signposts at the points A, B and C, next to the road, where $AB = 65\,\text{m}$ and $BC = 1035\,\text{m}$, as shown in the sketch in Figure 3.

The car passes A with speed v, then 5 s later passes B, then 45 s after passing B, passes C.

(a) show that

$$5a + 2v = 26$$

(2)

(b) Find the value of a.

(3)

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Question 5 continued

Question 5 continued

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Question 5 continued

(Total for Question 5 is 5 marks)

6. [*In this question* **i** *and* **j** *are horizontal unit vectors.*]

A particle lies on a smooth horizontal plane.

- the particle is acted upon by two forces, $\mathbf{F}_1$ N and $\mathbf{F}_2$ N
- $\mathbf{F}_1 = (\mathbf{i} - 3\mathbf{j})$
- $\mathbf{F}_2 = (\lambda\mathbf{i} + \mu\mathbf{j})$, where λ and μ are constants
- the resultant of the two forces is **R** N

Given that **R** acts in the direction of the vector $(-3\mathbf{i} + 5\mathbf{j})$

(a) find, to the nearest degree, the angle between the direction of **R** and the vector $(\mathbf{i} + \mathbf{j})$

(3)

(b) show that $5\lambda + 3\mu - 4 = 0$

(4)

Given also that $\lambda + \mu - 6 = 0$ and the mass of the particle is 0.5 kg,

(c) find the exact magnitude of the acceleration of the particle.

(4)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 11 marks)

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

Two particles, P and Q, are moving with constant velocity in a horizontal plane.

At time $t = 0$

- particle P is at the point with position vector $(2\mathbf{i} - 4\mathbf{j})$ m
- particle P is moving with velocity $(\mathbf{i} + 2\mathbf{j})\,\text{m s}^{-1}$

At time t seconds

- particle Q has position vector $[(2t - 4)\mathbf{i} + (t + 1)\mathbf{j}]$ m

(a) Show that, at time t seconds,

$$\overrightarrow{PQ} = [(t - 6)\mathbf{i} + (5 - t)\mathbf{j}]\,\text{m}$$

(3)

(b) Find the exact shortest distance between P and Q.

(3)

(c) Find the time when the bearing of Q from P is $(180° + \alpha)$, where $\tan\alpha = \frac{2}{3}$

(3)

(d) Find the position vector of the point where the paths of P and Q cross.

(4)

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Question 7 continued

Question 7 continued

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Question 7 continued

(Total for Question 7 is 13 marks)

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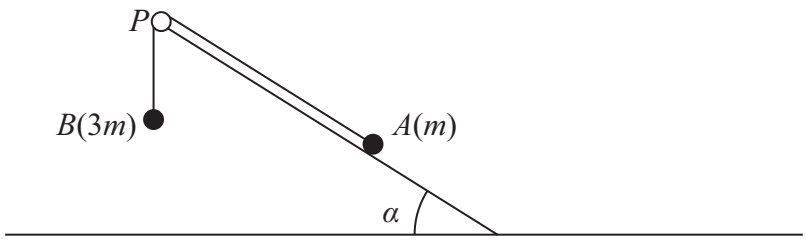

Figure 4

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

The coefficient of friction between A and the inclined plane is $\frac{1}{2}$

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 system is released from rest with the string taut and B begins to move **downwards**.

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

(4)

- **both particles** are subject to constant **air resistance** of magnitude $\frac{1}{5}mg$

By writing down an equation of motion for each particle,

(b) show that the tension in the string is $\frac{8}{5}mg$

(7)

(c) If the string was **not** modelled as being inextensible, state how this would affect the acceleration of the particles.

(1)

(d) Find, in terms of m and g, the magnitude of the vertical component of the resultant force exerted on the pulley by the string.

(3)

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Question 8 continued

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Question 8 continued

Question 8 continued

(Total for Question 8 is 15 marks)

TOTAL FOR PAPER IS 75 MARKS

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