Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

RAQ Advanced M1 Paper 2

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 $g = 9.8\ \text{ms}^{-2}$, 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 6 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 ▶

RAQ

Pearson

1 [January 2021 Q7]

A helicopter is hovering at rest above horizontal ground at the point H. A parachutist steps out of the helicopter and immediately falls vertically and freely under gravity from rest for 2.5 s. His parachute then opens and causes him to immediately decelerate at a constant rate of 3.9 m s^{-2} for T seconds ($T < 6$), until his speed is reduced to V m s^{-1}. He then moves with this constant speed V m s^{-1} until he hits the ground. While he is decelerating, he falls a distance of 73.75 m. The total time between the instant when he leaves H and the instant when he hits the ground is 20 s.

The parachutist is modelled as a particle.

Using the information given, find, to the nearest metre, the height of the point H above the ground.

(10)

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Question 1 continued

Question 1 continued

(Total for Question 1 = 10 marks)

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2 [June 2011 Q5]

A plank PQR, of length 8 m and mass 20 kg, is in equilibrium in a horizontal position on two supports at P and Q, where $PQ = 6$ m.

A child of mass 40 kg stands on the plank at a distance of 2 m from P and a block of mass M kg is placed on the plank at the end R. The plank remains horizontal and in equilibrium. The force exerted on the plank by the support at P is equal to the force exerted on the plank by the support at Q.

By modelling the plank as a uniform rod, and the child and the block as particles,

(a) (i) find the magnitude of the force exerted on the plank by the support at P,

(ii) find the value of M. **(10)**

(b) State how, in your calculations, you have used the fact that the child and the block can be modelled as particles. **(1)**



Question 2 continued

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Question 2 continued

(Total for Question 2 = 11 marks)

3 [January 2014 Q6]

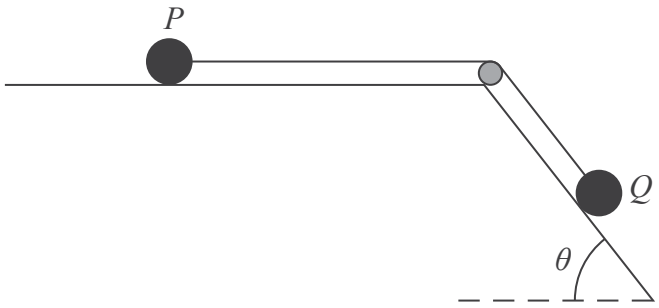


Figure 1

Two particles P and Q have masses 0.1 kg and 0.5 kg respectively. The particles are attached to the ends of a light inextensible string. Particle P is held at rest on a rough horizontal table. The string lies along the table and passes over a small smooth pulley which is fixed to the edge of the table. Particle Q is at rest on a smooth plane which is inclined to the horizontal at an angle θ, where $\tan\theta = \frac{4}{3}$.

The string lies in the vertical plane which contains the pulley and a line of greatest slope of the inclined plane, as shown in Figure 2. The coefficient of friction between P and the table is μ. Particle P is released from rest with the string taut. During the first 0.5 s of the motion P does not reach the pulley and Q moves 0.75 m down the plane.

Using the information given, find the value of μ. **(11)**

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Question 3 continued

Question 3 continued

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4 [January 2014 Q8]

Two trains, A and B, start together from rest, at time $t = 0$, at a station and move along parallel straight horizontal tracks. Both trains come to rest at the next station after 180 s.

Train A moves with constant acceleration $\frac{2}{3}\,\text{m s}^{-2}$ for 30 s, then moves at constant speed for 120 s and then moves with constant deceleration for the final 30 s. Train B moves with constant acceleration for 90 s and then moves with constant deceleration for the final 90 s.

(a) Sketch, on the same axes, the speed–time graphs for the motion of the two trains between the two stations. **(3)**

(b) Find the distance between the trains 96 s after they start. **(10)**

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Question 4 continued

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Question 4 continued

(Total for Question 4 = 13 marks)



5 [June 2017 Q8]

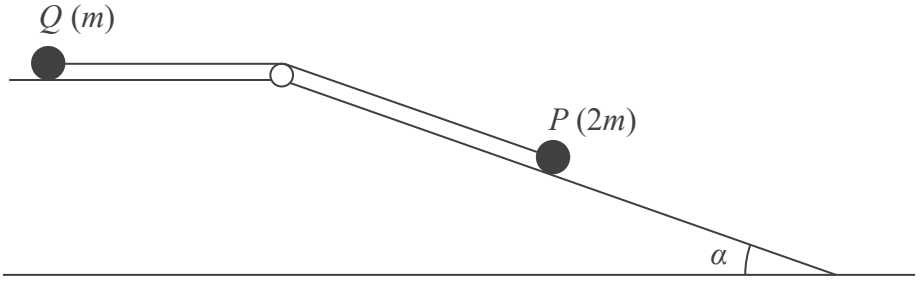


Figure 2

Two particles, P and Q, with masses $2m$ and m respectively, are attached to the ends of a light inextensible string. The string passes over a small smooth pulley which is fixed at the edge of a rough horizontal table. Particle Q is held at rest on the table and particle P is on the surface of a smooth inclined plane. The top of the plane coincides with the edge of the table. The plane is inclined to the horizontal at an angle α, where $\tan\alpha = \frac{3}{4}$, as shown in Figure 2. The string lies in a vertical plane containing the pulley and a line of greatest slope of the plane. The coefficient of friction between Q and the table is $\frac{1}{2}$. Particle Q is released from rest with the string taut and P begins to slide down the plane.

(a) By writing down an equation of motion for each particle,

(i) find the initial acceleration of the system,

(ii) find the tension in the string. **(10)**

Suppose now that the coefficient of friction between Q and the table is μ and when Q is released it remains at rest.

(b) Find the smallest possible value of μ. **(4)**

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Question 5 continued

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Question 5 continued

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6 [January 2011 Q8]

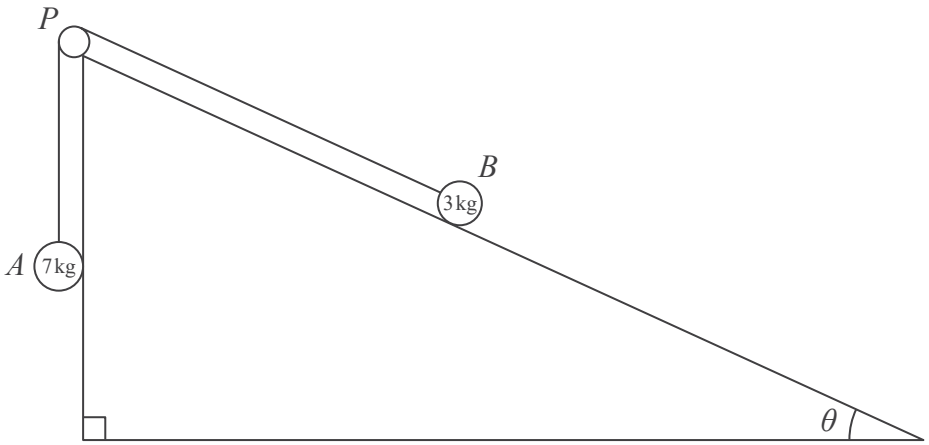


Figure 3

Two particles A and B, of mass 7 kg and 3 kg respectively, are attached to the ends of a light inextensible string. Initially B is held at rest on a rough fixed plane inclined at angle θ to the horizontal, where $\tan\theta = \frac{5}{12}$. The part of the string from B to P is parallel to a line of greatest slope of the plane. The string passes over a small smooth pulley, P, fixed at the top of the plane. The particle A hangs freely below P, as shown in Figure 4. The coefficient of friction between B and the plane is $\frac{2}{3}$. The particles are released from rest with the string taut. During the first 0.5 s of the motion B moves 1 m up the plane and the string breaks. In the subsequent motion B does not reach P.

Using the information given, find the time between the instants when the string breaks and when B comes to instantaneous rest. **(16)**

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Question 6 continued

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Question 6 continued

(Total for Question 6 = 16 marks)

TOTAL FOR PAPER = 75 MARKS

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