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Candidate surname

Other names

Centre Number

Candidate Number

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Pearson Edexcel International Advanced Level

Friday 11 October 2024

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 7 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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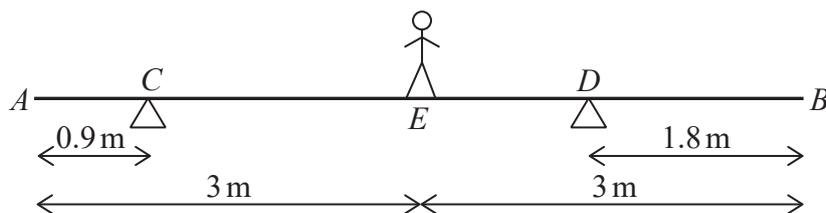


Figure 1

A non-uniform beam AB has length 6 m and mass 50 kg. The beam rests horizontally on two supports at C and D , where $AC = 0.9$ m and $DB = 1.8$ m.

A child of mass 25 kg stands on the beam at E , where $AE = EB = 3$ m, as shown in Figure 1.

The beam is in equilibrium.

The magnitude of the normal reaction between the beam and the support at C is R_C newtons.

The magnitude of the normal reaction between the beam and the support at D is R_D newtons.

The beam is modelled as a rod and the child is modelled as a particle.

The centre of mass of the beam is between C and D and is a distance x metres from D .

Given that $2R_D = 3R_C$

(a) show that $x = 1.38$

(6)

The child remains at E and a block of mass M kg is placed on the beam at B .

The block is modelled as a particle.

Given that the beam is on the point of tilting,

(b) find the value of M .

(3)



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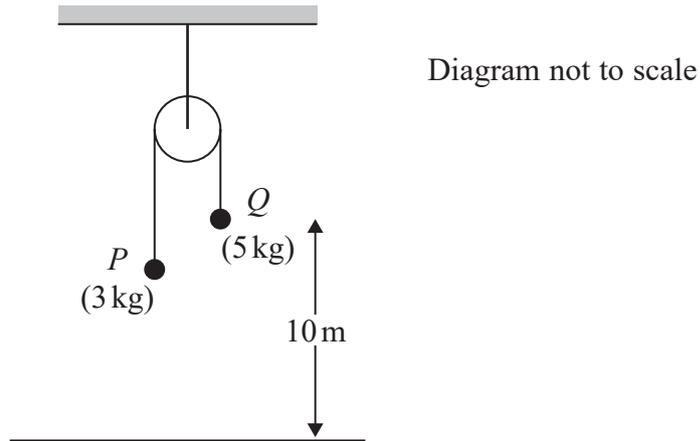


Figure 3

Two particles, P and Q , have masses 3 kg and 5 kg respectively. The particles are connected by a light inextensible string which passes over a small smooth fixed pulley.

The particles are released from rest with the string taut and the hanging parts of the string vertical, as shown in Figure 3.

Immediately after the particles are released from rest, P moves upwards with acceleration $a\text{ m s}^{-2}$ and the tension in the string is T newtons.

(a) Write down an equation of motion for P . (2)

(b) Find the value of T . (4)

The total force acting on the pulley due to the string has magnitude F newtons.

(c) Find the value of F . (2)

Initially, Q is 10 m above horizontal ground and P is more than 2 m below the pulley.

At the instant when Q has descended a distance of 2 m , the string breaks and Q falls to the ground.

(d) Find the speed of Q at the instant it hits the ground. (5)

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