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Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Mechanics M1

Advanced/Advanced Subsidiary

Wednesday 6 June 2018 – Morning

Time: 1 hour 30 minutes

Paper Reference

WME01/01**You must have:**

Mathematical Formulae and Statistical Tables (Blue)

Total Marks

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Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. 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). Coloured pencils and highlighter pens must not be used.
- **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 two significant figures or three significant figures.
- When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information

- 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.

Turn over ►

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1. Particle P has mass $3m$ and particle Q has mass m . The particles are moving towards each other in opposite directions along the same straight line on a smooth horizontal plane. The particles collide directly. Immediately before the collision the speed of P is u and the speed of Q is $3u$. In the collision, the magnitude of the impulse exerted by Q on P is $5mu$.
- (i) Find the speed of P immediately after the collision.
- (ii) Find the speed of Q immediately after the collision.

(6)

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Question 1 continued

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Q1

(Total 6 marks)



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2.

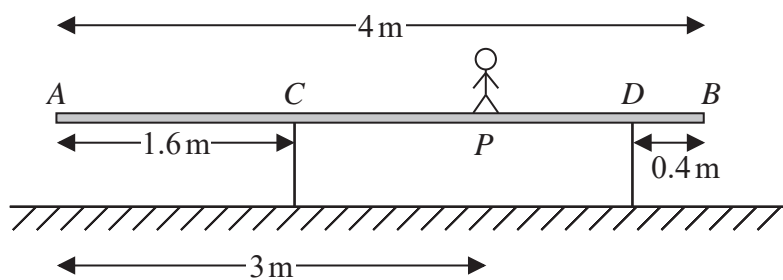


Figure 1

A uniform wooden beam AB , of mass 20 kg and length 4 m, rests in equilibrium in a horizontal position on two supports. One support is at C , where $AC = 1.6$ m, and the other support is at D , where $DB = 0.4$ m. A boy of mass 60 kg stands on the beam at the point P , where $AP = 3$ m, as shown in Figure 1. The beam remains in equilibrium in a horizontal position.

By modelling the boy as a particle and the beam as a uniform rod,

- (a) (i) find, in terms of g , the magnitude of the force exerted on the beam by the support at C ,
- (ii) find, in terms of g , the magnitude of the force exerted on the beam by the support at D .
- (6)

The boy now starts to walk slowly along the beam towards the end A .

- (b) Find the greatest distance he can walk from P without the beam tilting.
- (4)



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Question 2 continued

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3. A cyclist starts from rest at the point *O* on a straight horizontal road. The cyclist moves along the road with constant acceleration 2 ms^{-2} for 4 seconds and then continues to move along the road at constant speed. At the instant when the cyclist stops accelerating, a motorcyclist starts from rest at the point *O* and moves along the road with constant acceleration 4 ms^{-2} in the same direction as the cyclist. The motorcyclist has been moving for *T* seconds when she overtakes the cyclist.

(a) Sketch, on the same axes, a speed-time graph for the motion of the cyclist and a speed-time graph for the motion of the motorcyclist, to the time when the motorcyclist overtakes the cyclist. (4)

(b) Find, giving your answer to 1 decimal place, the value of *T*. (6)

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Question 4 continued

Q4

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Question 5 continued

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Question 6 continued

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Question 6 continued

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Q6

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Figure 2

A washing line $ABCD$ is fixed at the points A and D . There are two heavy items of clothing hanging on the washing line, one fixed at B and the other fixed at C . The washing line is modelled as a light inextensible string, the item at B is modelled as a particle of mass 3 kg and the item at C is modelled as a particle of mass M kg. The section AB makes an angle α with the horizontal, where $\tan \alpha = \frac{3}{4}$, the section BC is horizontal and the section CD makes an angle β with the horizontal, where $\tan \beta = \frac{12}{5}$, as shown in Figure 2. The system is in equilibrium.

- (a) Find the tension in AB . (4)
- (b) Find the tension in BC . (3)
- (c) Find the value of M . (5)

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Q7

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(Total 12 marks)

TOTAL FOR PAPER: 75 MARKS

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