



Cambridge International AS & A Level

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MATHEMATICS**9709/43**

Paper 4 Mechanics

May/June 2025**1 hour 15 minutes**

You must answer on the question paper.

You will need: List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- Where a numerical value for the acceleration due to gravity (g) is needed, use 10 m s^{-2} .

INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [].

This document has **12** pages.



- 1 Two particles P and Q , of masses 0.1 kg and 0.3 kg respectively, are at rest on a smooth horizontal plane. P is projected directly towards Q with speed $4u \text{ ms}^{-1}$. At the same instant, Q is projected directly towards P with speed $u \text{ ms}^{-1}$. After P and Q collide, P moves with speed 2 ms^{-1} and Q moves with speed 4 ms^{-1} .

(a) Find the two possible values of u .

[3]

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(b) Find the largest possible loss of kinetic energy in the collision.

[2]

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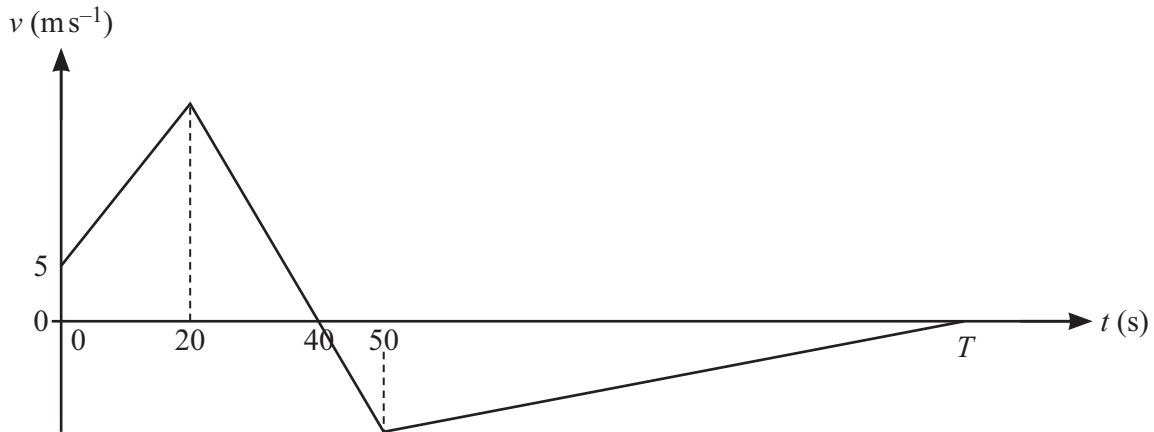




- Find the value of X and the value of T . [4]

[illegible]

3



The diagram shows a velocity-time graph which models the motion of a particle. The graph consists of 3 straight line segments. The velocity of the particle at time t s after passing a fixed point O is v ms^{-1} . The particle leaves O with a velocity of 5 ms^{-1} and accelerates at 0.75 ms^{-2} for 20 s. The particle then decelerates for the next 30 s. At $t = 40$, the velocity of the particle is zero. After $t = 40$, the particle starts to travel back to O , coming to rest at O at time T s.

(a) Find the value of T .

[5]

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(b) Find the acceleration of the particle from $t = 50$ to $t = T$.

[2]

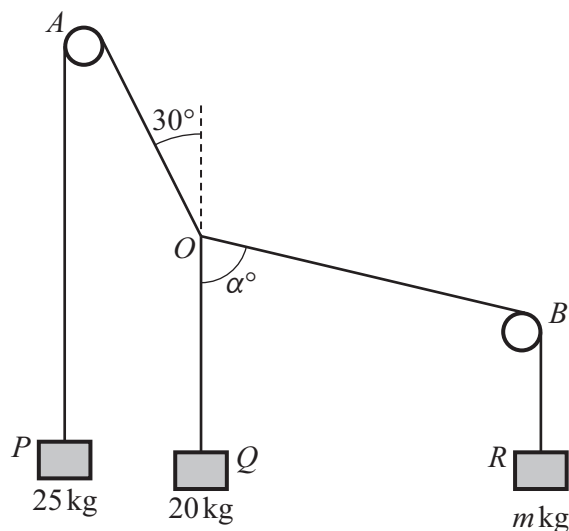
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Three blocks P , Q and R , of masses 25 kg, 20 kg and m kg respectively, are held in equilibrium by three light inextensible strings OP , OQ and OR . The strings OP and OR both pass over small fixed smooth pulleys A and B respectively, with P and R hanging vertically below the pulleys. The block Q hangs vertically below the point O . The angle between OA and the vertical is 30° and the angle $BOQ = \alpha^\circ$ (see diagram).

Find the value of m and the value of α .

[6]

[illegible]

- Show that $k = 0.5$, and find the acceleration of the van when its speed is 25 ms^{-1} on this straight horizontal road. [4]

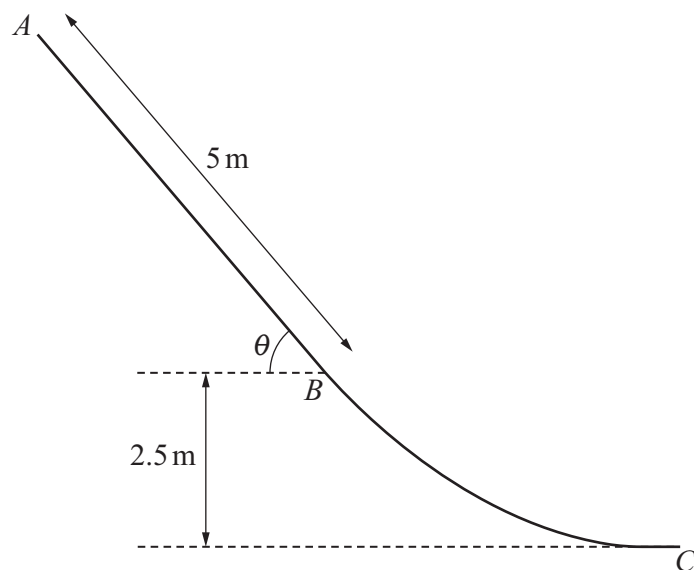
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(b) Find the value of a and the value of θ . [5]

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6



The diagram shows the vertical cross-section ABC of a rough waterslide. The section AB is a straight line of length 5 m inclined at an angle of θ to the horizontal, where $\sin \theta = 0.8$. The point B is 2.5 m above the level of C . A man of mass 80 kg, modelled as a particle, slides down the waterslide, starting from rest at A . The coefficient of friction between the man and the straight section of the waterslide is 0.1.

- (a) Find the speed of the man at B . [5]

[illegible]



(b) Find the work done against the resistance force as the man moves from B to C . [4]

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[illegible]

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[illegible]



[4]

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This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

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