



# Cambridge International AS & A Level

CANDIDATE  
NAME
CENTRE  
NUMBER

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  |  |
|--|--|--|--|--|

CANDIDATE  
NUMBER

|  |  |  |  |
|--|--|--|--|
|  |  |  |  |
|--|--|--|--|

**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  $10 \text{ m s}^{-2}$ .

## 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  $0.1\text{ kg}$  and  $0.3\text{ kg}$  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  $2\text{ ms}^{-1}$  and  $Q$  moves with speed  $4\text{ ms}^{-1}$ .

(a) Find the two possible values of  $u$ .

[3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

[2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....





- Find the value of  $X$  and the value of  $T$ .

[4]

Kambridge Math & Physics  
kambridgemp.com

The graph shows the motion of a car starting from rest. The vertical axis represents velocity  $v$  in  $\text{m s}^{-1}$ , and the horizontal axis represents time  $t$  in seconds. The car starts at  $(0,0)$ , accelerates linearly to  $(20, 10)$ , then decelerates linearly to  $(40, 0)$ . It then reverses, accelerating linearly to  $(50, -10)$ , and finally decelerates linearly to  $(T, 0)$ . Dashed lines indicate the peak velocity at  $t = 20$  and the point  $t = 50$  where the velocity is  $-10$ .

(a) Find the value of  $T$ . [5]

**Kambridge Math**

kambridgemp.com

**(b)** Find the acceleration of the particle from  $t = 50$  to  $t = T$ . [2]

.....

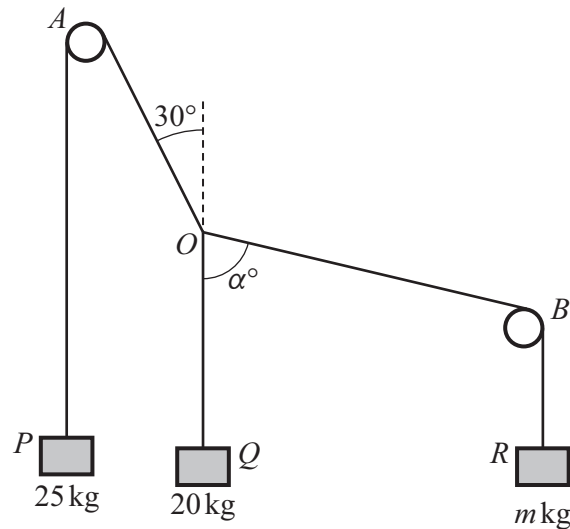
.....

.....

.....



4



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  $30^\circ$  and the angle  $BOQ = \alpha^\circ$  (see diagram).

Find the value of  $m$  and the value of  $\alpha$ .

[6]



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

Cambridge Math & Physics

cambridgeemp.com

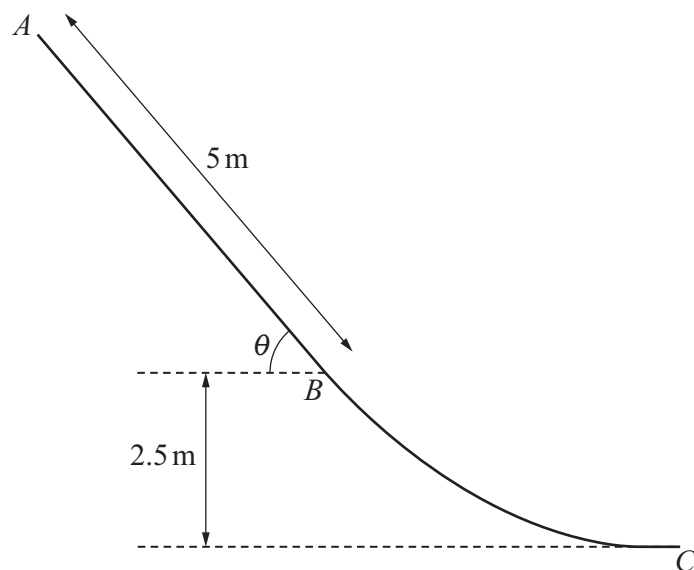


(b) Find the value of  $a$  and the value of  $\theta$ . [5]

Cambridge Math & Physics

kambridgemp.com

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  $\theta$  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]





It is given that there is no change in the speed of the man when passing through  $B$  and that his speed at  $C$  is  $11 \text{ ms}^{-1}$ .

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



- (a) Find the velocity of  $X$  at  $t = 4$ . [2]

---

---

---

---

---

---

**(b) (i)** Find the value of  $T$ . [4]

Cambridge Math & Science

kambridgemp.com



[4]

Cambridge Math & Physics

kambridgemp.com

Kambridge Math & Physics

kambridgemp.com

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.