

# Cambridge International AS & A Level

CANDIDATE  
NAME

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CENTRE  
NUMBER

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**MATHEMATICS****9709/43**

Paper 4 Mechanics

**May/June 2023****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.













6 An elevator is pulled vertically upwards by a cable. The elevator accelerates at  $0.4 \text{ m s}^{-2}$  for 5 s, then travels at constant speed for 25 s. The elevator then decelerates at  $0.2 \text{ m s}^{-2}$  until it comes to rest.

(a) Find the greatest speed of the elevator and hence draw a velocity-time graph for the motion of the elevator. [3]

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(b) Find the total distance travelled by the elevator. [2]

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The mass of the elevator is 1200 kg and there is a crate of mass  $m$  kg resting on the floor of the elevator.

- (c) Given that the tension in the cable when the elevator is decelerating is 12 250 N, find the value of  $m$ . [3]

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- (d) Find the greatest magnitude of the force exerted on the crate by the floor of the elevator, and state its direction. [3]

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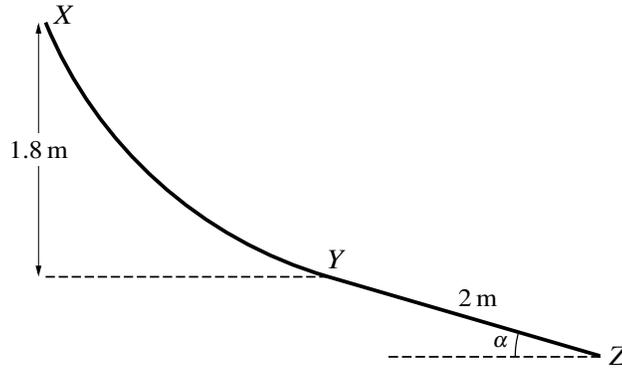
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The diagram shows the vertical cross-section  $XYZ$  of a rough slide. The section  $YZ$  is a straight line of length  $2\text{ m}$  inclined at an angle of  $\alpha$  to the horizontal, where  $\sin \alpha = 0.28$ . The section  $YZ$  is tangential to the curved section  $XY$  at  $Y$ , and  $X$  is  $1.8\text{ m}$  above the level of  $Y$ . A child of mass  $25\text{ kg}$  slides down the slide, starting from rest at  $X$ . The work done by the child against the resistance force in moving from  $X$  to  $Y$  is  $50\text{ J}$ .

(a) Find the speed of the child at  $Y$ . [4]

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