



Cambridge International AS & A Level

CANDIDATE
NAME
CENTRE
NUMBER

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MATHEMATICS

9709/42

Paper 4 Mechanics

February/March 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

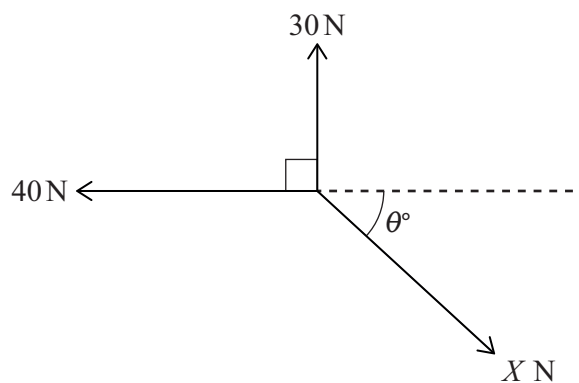
- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages. Any blank pages are indicated.





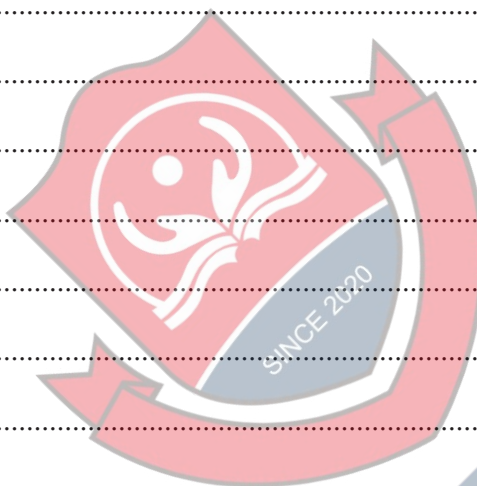
3



Three coplanar forces of magnitudes 40 N, 30 N and X N act at a point in the directions shown in the diagram.

Given that the forces are in equilibrium, find the values of θ and X .

[4]



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- (a) Find the value of V .

[2]

- (b)** Find the total time for which she is in motion from the instant that she passes O .

[3]



(a) The aeroplane is flying horizontally. The aeroplane's engines are producing a constant power of 5500 kW, and the aeroplane experiences a constant horizontal resistance force of 25 kN.

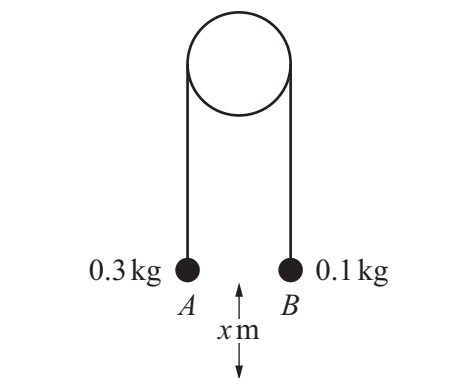
[2]



(b) The aeroplane then ascends 300 m in 50 s, while maintaining the same speed. The resistance force is no longer constant, and the work done against the resistance force in ascending the 300 m is 270 000 kJ. The mass of the aeroplane is 60 000 kg.

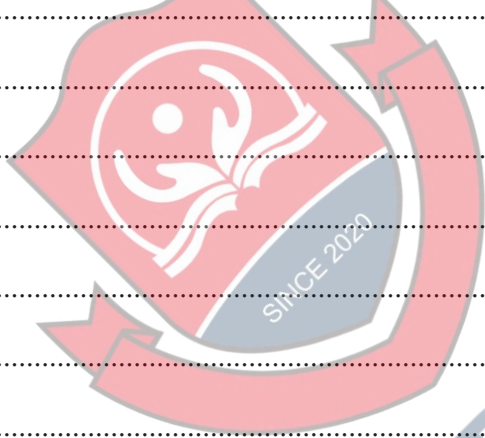
[4]

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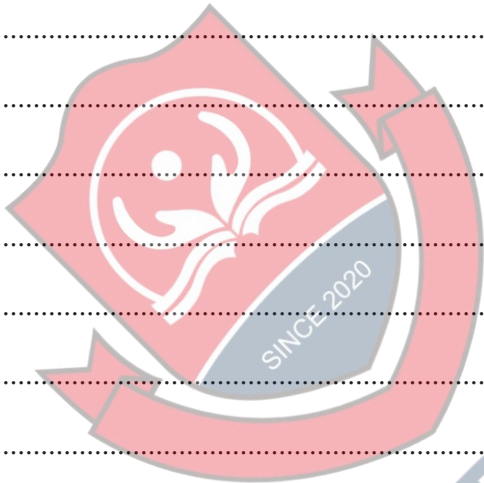


(a) Find the tension in the string and the acceleration of the particles.

[4]

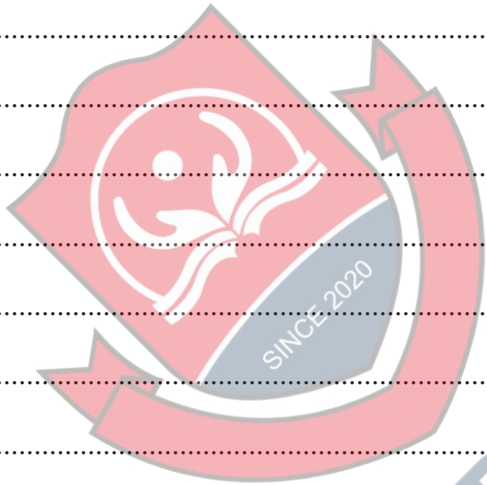


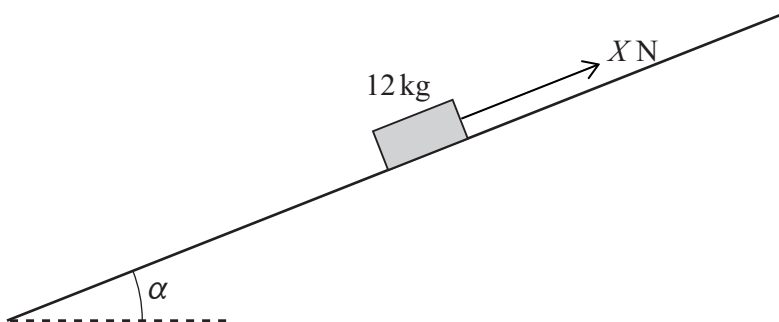
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(a) It is given that $\mu = 0.15$ and $X = 20$.

[6]





- Find the value of μ and the value of X for which the block is on the point of moving **up** the plane. [4]



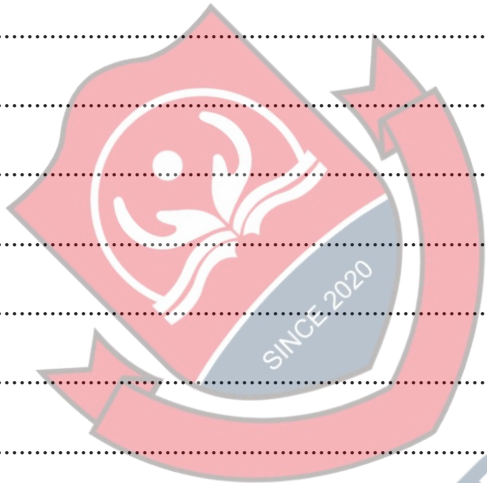
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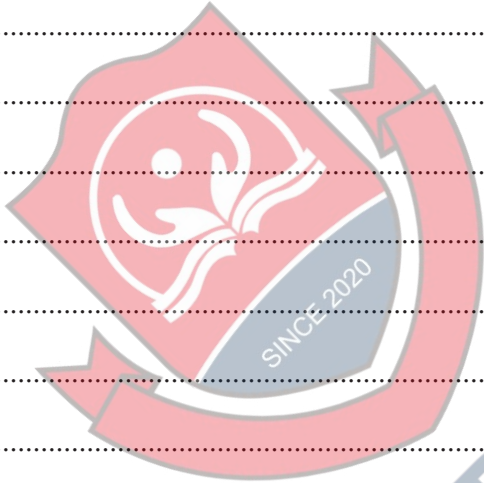
- 7 A particle moves in a straight line. The velocity $v \text{ m s}^{-1}$ of the particle $t \text{ s}$ after leaving a fixed point O is given by $v = k(20 + pt - 6t^2)$, where k and p are constants. The acceleration of the particle at $t = 1$ is 42 m s^{-2} , and the displacement of the particle from O at $t = 1$ is 93 m .

[6]



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