



Cambridge International AS & A Level

CANDIDATE
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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.

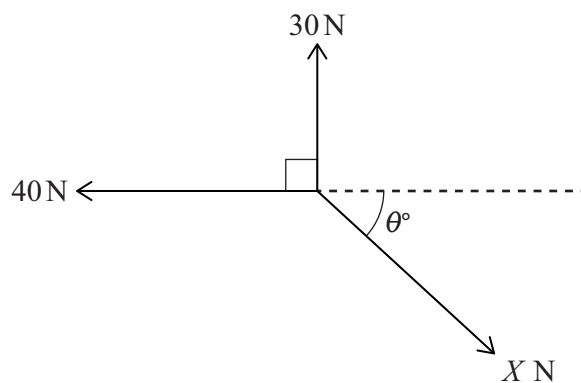


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3



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]

[illegible]

- (b)** Find the total time for which she is in motion from the instant that she passes O . [3]

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3 An aeroplane is flying at a constant speed.

- (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.

Find the speed of the aeroplane.

[2]

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- (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.

Find the average power of the aeroplane's engines.

[4]

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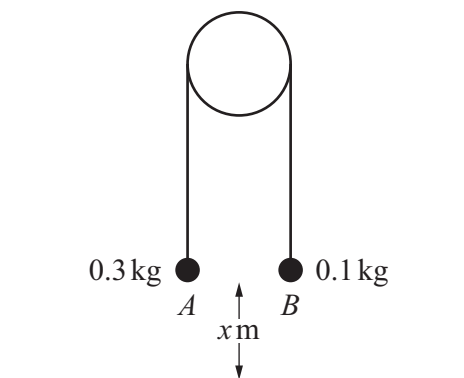
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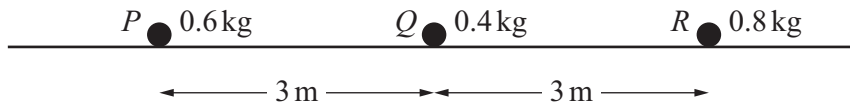


Two particles A and B have masses 0.3 kg and 0.1 kg respectively. The particles are attached to the ends of a light inextensible string. The string passes over a fixed smooth pulley, and the particles hang vertically below the pulley. Both particles are initially at a height of $x\text{ m}$ above horizontal ground (see diagram). The system is released from rest.

- (a) Find the tension in the string and the acceleration of the particles. [4]

[illegible]

- [illegible]



Three particles P , Q and R , of masses 0.6 kg , 0.4 kg and 0.8 kg respectively, are at rest in a straight line on a smooth horizontal plane. The distance from P to Q is 3 m , and the distance from Q to R is also 3 m (see diagram). P is projected directly towards Q with speed 3 m s^{-1} . After P and Q collide, P continues to move in the same direction with speed 1.5 m s^{-1} .

- (a) Find the speed of Q after the collision.

[2]

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In the subsequent collision between Q and R , these particles coalesce.

- (b) Find the speed of the combined particle after this collision.

[1]

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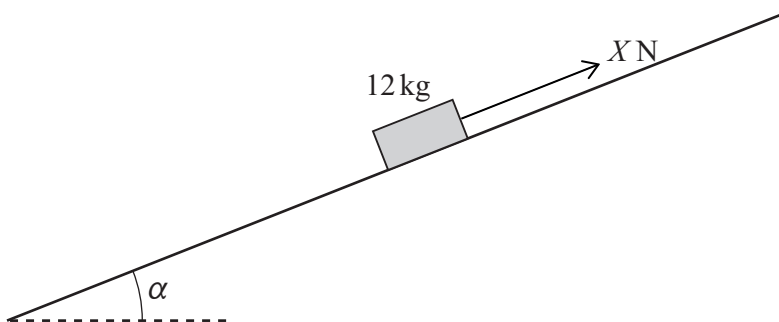
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- [illegible]



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

[6]

[illegible]



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

[illegible]

- (a)** Show that $k = 3$ and $p = 26$.

[6]

[illegible]



This image shows a full page of a document template designed for handwriting practice or general note-taking. It consists of approximately 28 evenly spaced, horizontal dotted lines extending across the width of the page. The lines are light gray and provide a guide for letter height and placement. There is no pre-printed text, margins, or other graphical elements present on the page.

[illegible]





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