



Cambridge International AS & A Level

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MATHEMATICS**9709/43**

Paper 4 Mechanics

October/November 2024**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 [].

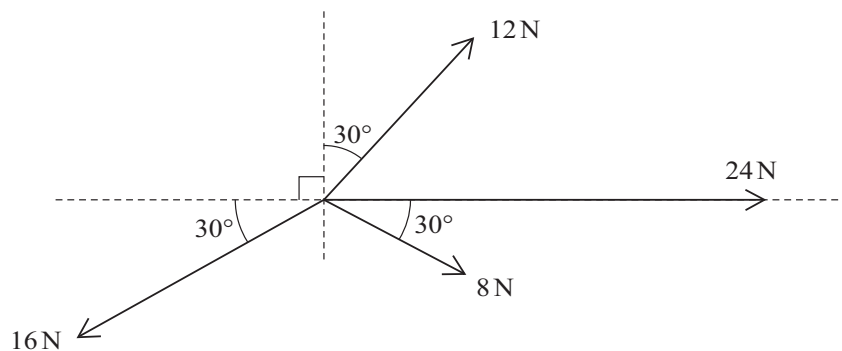
This document has **12** pages. Any blank pages are indicated.





- Find the value of m .

This image shows a full page of white paper with horizontal dotted lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



Coplanar forces of magnitudes 16 N, 12 N, 24 N and 8 N act at a point in the directions shown in the diagram.

Find the magnitude and direction of the single additional force acting at the same point which will produce equilibrium. [6]

[illegible]



- 3 A car of mass 1600 kg travels up a slope inclined at an angle of $\sin^{-1} 0.08$ to the horizontal. There is a constant resistance of magnitude 240 N acting on the car.

- (a) It is given that the car travels at a constant speed of 32 m s^{-1} .

Find the power of the engine of the car.

[3]

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- (b) Find the acceleration of the car when its speed is 24 m s^{-1} and the engine is working at 95% of the power found in (a). [3]

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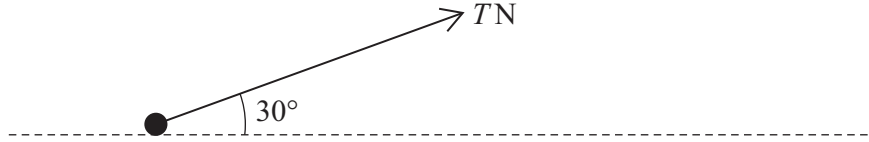
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A particle of mass 12 kg is going to be pulled across a rough horizontal plane by a light inextensible string. The string is at an angle of 30° above the plane and has tension $T\text{ N}$ (see diagram). The coefficient of friction between the particle and the plane is 0.5 .

- (a) Given that the particle is on the point of moving, find the value of T . [5]

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- (b) Given instead that the particle is accelerating at 0.2 m s^{-2} , find the value of T . [3]

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- 6 A particle moves in a straight line. It starts from rest, at time $t = 0$, and accelerates at $0.6t \text{ m s}^{-2}$ for 4 s, reaching a speed of $V \text{ m s}^{-1}$. The particle then travels at $V \text{ m s}^{-1}$ for 11 s, and finally slows down, with constant deceleration, stopping after a further 5 s.

(a) Show that $V = 4.8$. [1]

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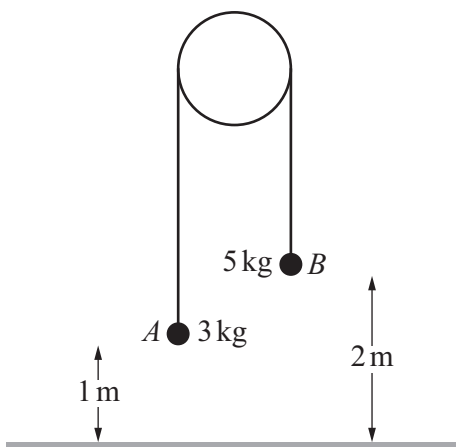
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(b) Sketch a velocity-time graph for the motion. [3]





[Turn over



Two particles, A and B , of masses 3 kg and 5 kg respectively, are connected by a light inextensible string that passes over a fixed smooth pulley. The particles are held with the string taut and its straight parts vertical. Particle A is 1 m above a horizontal plane, and particle B is 2 m above the plane (see diagram).

The particles are released from rest. In the subsequent motion, A does not reach the pulley, and after B reaches the plane it remains in contact with the plane.

- (a) Find the tension in the string and the time taken for B to reach the plane. [6]

[illegible]



(b) Find the time for which A is at least 3.25 m above the plane. [4]



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