



Cambridge International AS & A Level

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MATHEMATICS

9709/43

Paper 4 Mechanics

May/June 2026
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. Do **not** use correction fluid or tape.
- 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.



- 1 A particle is projected vertically upwards with speed $u \text{ ms}^{-1}$ from a point on horizontal ground. The height of the particle above the ground after 4 seconds is equal to its height above the ground after 6 seconds.

(a) Find the value of u .

[2]

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(b) Find the greatest height of the particle above the ground.

[2]

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- 2 A particle P moves in a straight line. The velocity of P at time t s is $v \text{ ms}^{-1}$, where

$$v = 2t^2 - 6t - 3.$$

- (a) Find the time at which the acceleration of P is zero.

[2]

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- (b) Given that P is not at rest in the interval $0 \leq t \leq 3$, find the distance travelled by P in this interval. [4]

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- 3** A block of mass m kg is pulled up a rough plane inclined at an angle of 30° to the horizontal by a constant force of magnitude 20 N. This force acts parallel to a line of greatest slope of the plane. The acceleration of the block is 2 ms^{-2} . The coefficient of friction between the block and the plane is 0.4.

Find the value of m .

[4]

[illegible]



- 4 A train is travelling along a straight track with constant acceleration $a \text{ m s}^{-2}$. It passes through points A , B and C on the track in that order. The distances AB and BC are 280 m and 170 m respectively. The speed of the train at B is 32 m s^{-1} . The time it takes the train to travel from A to B is $2t$ s and from B to C is t s.

Find the value of a and the value of t .

[5]

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- 5** A lorry of mass 13 500 kg is towing a trailer of mass 2500 kg along a straight horizontal road. The lorry and the trailer are connected by a light rigid tow-bar which is parallel to the road.
- (a)** At a particular instant, the power of the lorry's engine is 80 kW and the resistance forces on the lorry and trailer are 2400 N and 400 N respectively. At this instant, the speed of the lorry is 25 m s^{-1} .

Find the tension in the tow-bar.

[5]

This image shows a full page of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page, providing a template for handwriting practice or general writing. There are no margins, text, or other markings on the page.



The lorry and trailer now descend a straight hill inclined at an angle of 5° to the horizontal. As the lorry and trailer descend from a point A to a point B on the hill, the speed of the lorry increases from 27 ms^{-1} to 30 ms^{-1} . The lorry's engine is no longer working at 80 kW and instead the work done by the driving force of the lorry as it travels from A to B is 55 kJ . The resistance forces on the lorry and trailer are now 2500 N and 500 N respectively.

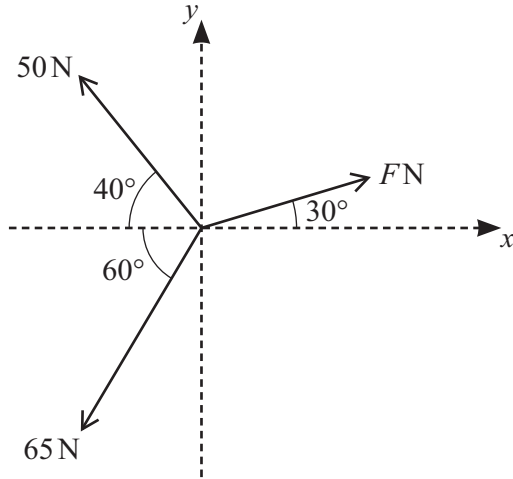
(b) Find the distance AB .

[5]

[illegible]



6



Three coplanar forces of magnitudes F N, 65 N and 50 N act at a point in the directions shown in the diagram.

- (a)** It is initially given that $F = 40$.

Find the magnitude and direction of the resultant force.

[5]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



- (b)** It is given instead that the value of F is such that the component of the resultant force in the y -direction is zero.

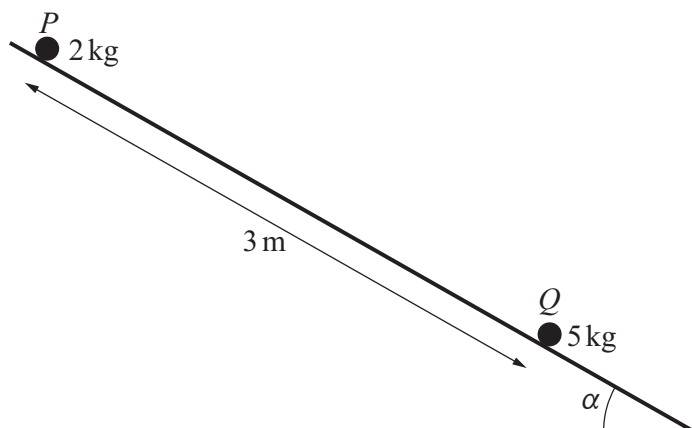
Find the magnitude and direction of the resultant force.

[3]

[illegible]



7



Particles P and Q have masses 2 kg and 5 kg respectively. The particles are initially held at rest 3 m apart on the same line of greatest slope of a rough plane. The plane is inclined at an angle α to the horizontal, where $\sin \alpha = 0.28$ (see diagram). The coefficient of friction between P and the plane and the coefficient of friction between Q and the plane are both 0.2.

Particle P is projected directly towards Q with speed 8 ms^{-1} . At the same instant, Q is projected directly towards P with speed $u \text{ ms}^{-1}$. The particles collide 0.25 s after they are projected.

- (a) Show that the acceleration of P is 0.88 ms^{-2} , and find the value of u . [8]

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- (b) When the particles collide, P rebounds up the plane, and Q rebounds down the plane with speed 0.5 ms^{-1} .

Find the distance that P travels from the point of collision, until it comes to instantaneous rest. [5]

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