



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]

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- 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]

[illegible]



- 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]

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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.

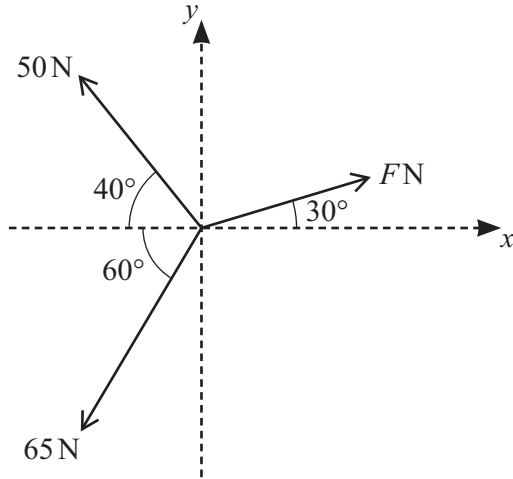
(b) Find the distance AB .

[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]

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- (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.

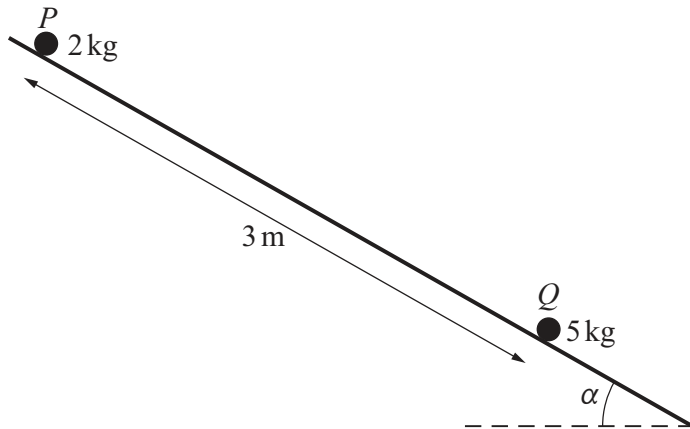
Find the magnitude and direction of the resultant force.

[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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