

CANDIDATE
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MATHEMATICS

9709/43

Paper 4 Mechanics 1 (M1)

October/November 2017

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: List of Formulae (MF9)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** the questions.

Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

Where a numerical value for the acceleration due to gravity is needed, use 10 m s^{-2} .

The use of an electronic calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 50.

This document consists of **11** printed pages and **1** blank page.



2 A lorry of mass 7850 kg travels on a straight hill which is inclined at an angle of 3° to the horizontal. There is a constant resistance to motion of 1480 N.

(i) Find the power of the lorry's engine when the lorry is going up the hill at a constant speed of 10 m s^{-1} . [3]

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(ii) Find the power of the lorry's engine at an instant when the lorry is going down the hill at a speed of 15 m s^{-1} with an acceleration of 0.8 m s^{-2} . [3]

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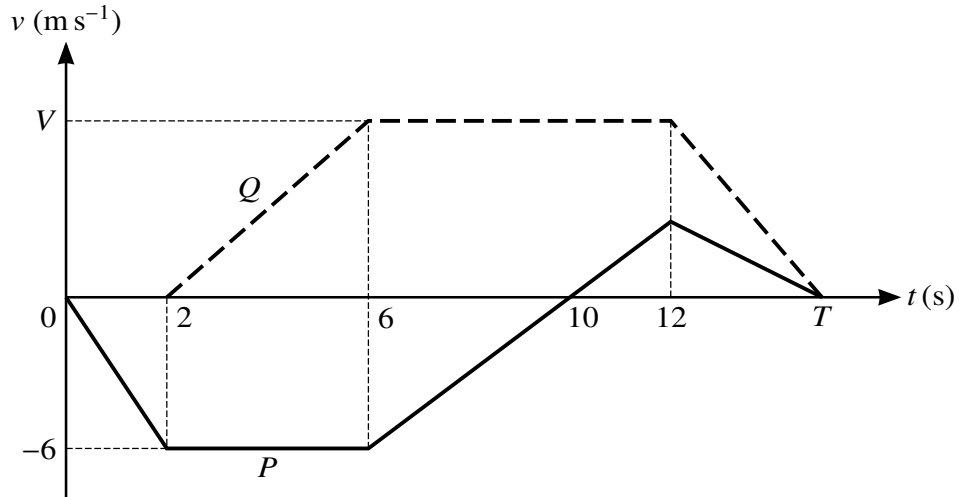
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The diagram shows the velocity-time graphs for two particles, P and Q , which are moving in the same straight line. The graph for P consists of four straight line segments. The graph for Q consists of three straight line segments. Both particles start from the same initial position O on the line. Q starts 2 seconds after P and both particles come to rest at time $t = T$. The greatest velocity of Q is $V \text{ m s}^{-1}$.

- (i) Find the displacement of P from O at $t = 10$. [1]

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- (ii) Find the velocity of P at $t = 12$. [2]

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(iii) Given that the total distance covered by P during the T seconds of its motion is 49.5 m, find the value of T . [3]

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(iv) Given also that the acceleration of Q from $t = 2$ to $t = 6$ is 1.75 m s^{-2} , find the value of V and hence find the distance between the two particles when they both come to rest at $t = T$. [3]

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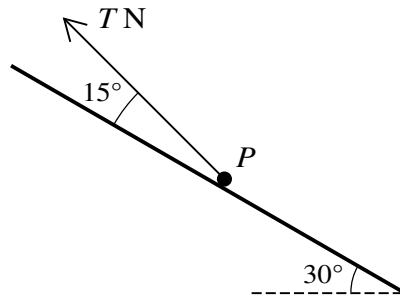
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A particle P of mass 0.2 kg rests on a rough plane inclined at 30° to the horizontal. The coefficient of friction between the particle and the plane is 0.3 . A force of magnitude T N acts upwards on P at 15° above a line of greatest slope of the plane (see diagram).

- (i) Find the least value of T for which the particle remains at rest. [6]

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