



Cambridge International Examinations

Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	
MATHEMATICS			9709/43
Paper 4 Mechanics	1 (M1)	Octo	ober/November 2017
			1 hour 15 minutes
Candidates answer o	n 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.

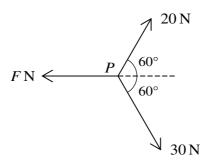
You are reminded of the need for clear presentation in your answers.

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.





Three coplanar forces of magnitudes F N, 20 N and 30 N act at a point P , as shown in the diagram. The resultant of the three forces acts in a direction perpendicular to the force of magnitude F N. Find the value of F .

Find the power of the lorry's engine when the lorry is going up the hill at a con	
$10 \mathrm{m s^{-1}}$.	stant speed
	•••••
	••••••
of $15 \mathrm{ms^{-1}}$ with an acceleration of $0.8 \mathrm{ms^{-2}}$.	
	•••••

(i)	Find the acceleration of the particle.	
ii)	Find the distance travelled by the particle in the first 3 s after it is released.	
		••••••
		•••••

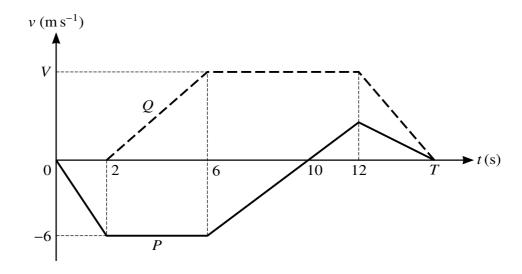
Two particles A and B have masses 0.35 kg and 0.45 kg respectively. The particles are attached to the

horiz	of a light inextensible string which passes over a small fixed smooth pulley which is 1 m above contal ground. Initially particle A is held at rest on the ground vertically below the pulley, with tring taut. Particle B hangs vertically below the pulley at a height of 0.64 m above the ground cle A is released.
(i)	Find the speed of A at the instant that B reaches the ground.
• `	
	Assuming that B does not bounce after it reaches the ground, find the total distance travelled B between the instant that B reaches the ground and the instant when the string becomes tagain.

A particle starts from a fixed origin with velocity $0.4\,\mathrm{m\,s^{-1}}$ and moves in a straight line. The

) \$	Show that the value of k is 0.1.	
•		
•		
		•••••
		•••••
•		
		•••••
•		
•		•••••
•		

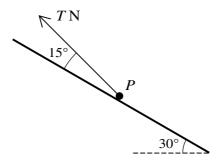
	d an expr			•		•				
					•••••					
•••••		•••••			•••••					•••••
			,							
•••••		••••••		••••••	•••••	•••••	••••••	•••••	•••••	•••••
•••••		•••••			•••••					
•••••		•••••		••••••	•••••			•••••		•••••
•••••	••••••	•••••		••••••	•••••	•••••	•••••	•••••	••••••	•••••
•••••	••••••	••••••	•••••	••••••	•••••	•••••	••••••		••••••	••••••
•••••										
•••••	••••••	•••••	•••••	•••••	•••••	•••••				
IIam	n a a vamifu	that tha	montiala	ia aaain	at the a	miain at t	_ 2			
пеп	nce verify	mat me	particle	is again	at the o	rigin at <i>i</i>	= 2.			
					•••••					
•••••				••••••			•			
•••••		•••••		••••••	•••••			•••••		•••••
	••••••	•••••		••••••	•••••	•••••	•••••	•••••	••••••	•••••
•••••										
				• • • • • • • • • • • • • • • • • • • •						
	••••••		•	••••••						
									••••••	



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

		•••••		•••••	•••••	•••••		•••••	•••••
					•••••				•••••
									•••••
•••••					•••••				•••••
									•••••
•••••	•••••	•••••	••••••	••••••	•••••	••••••	•••••	••••••	•••••
•••••			•••••			••••••	•••••	••••••	•••••
								••••••	•••••
•••••		•••••	•••••	•••••	•••••	••••••			
•••••					•••••				
Ci	d d	1				1.752			
			of Q from	t = 2 to	t = 6 is	$1.75\mathrm{ms^{-2}}$, find th	e value	of V
			of Q from	t = 2 to	t = 6 is	$1.75\mathrm{ms^{-2}}$, find th	e value	of V
			of Q from	t = 2 to	t = 6 is	$1.75\mathrm{ms^{-2}}$, find th	e value	of V
Given also nence find t			of Q from	t = 2 to	t = 6 is	$1.75\mathrm{ms^{-2}}$, find th	e value	of V
			of Q from	t = 2 to	t = 6 is	$1.75\mathrm{ms^{-2}}$, find th	e value	of V
			of Q from	t = 2 to	t = 6 is	$1.75\mathrm{ms^{-2}}$, find th	e value	of V
			of Q from	t = 2 to	t = 6 is	$1.75\mathrm{ms^{-2}}$, find th	e value	of V
			of Q from	t = 2 to	t = 6 is	$1.75\mathrm{ms^{-2}}$, find th	e value	of V
			of Q from	t = 2 to	t = 6 is	$1.75\mathrm{ms^{-2}}$, find th	e value	of V
			of Q from	t = 2 to	t = 6 is	$1.75\mathrm{ms^{-2}}$, find th	e value	of V



A particle P of mass $0.2 \,\mathrm{kg}$ 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]
		•••••
		•••••
		•••••
		•••••
		•••••
		•••••
		•••••
		•••••
		•••••
		•••••
		•••••
		•••••
		•••••
		•••••
		• • • • • •

The force of magnitude T N is now removed. A new force of magnitude 0.25 N acts on P up the plane, parallel to a line of greatest slope of the plane. Starting from rest, P slides down the plane. After moving a distance of 3 m, P passes through the point A.

(ii)	Use an energy method to find the speed of P at A .	[5]

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.