



#### **Cambridge Assessment International Education**

Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						ANDIDATE JMBER			
MATHEMATICS									9709/43
Paper 4 Mechar	nics 1	(M1)				(	)ctober	/Nover	mber 2019
							1	hour 1	5 minutes
Candidates ansv	ver on	the Ques	tion Pa	per.					
Additional Materi	ials:	List of	Formul	ae (MF9	9)				

#### **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 in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.

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<sup>-2</sup>.

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.

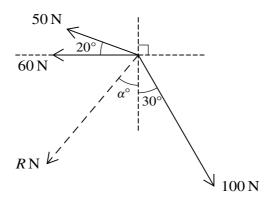


This document consists of 13 printed pages and 3 blank pages.

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a winch. The winch produces a constant pulling force of 2500 N and the crate is speed. Find the coefficient of friction between the crate and the ground.	[
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the train an value of $\alpha$ .	d the trair	does 4 >	< 10° J o	f work	against	this res	istance	force b	etween .	A and E	3. Fin
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Three coplanar forces of magnitudes 50 N, 60 N and 100 N act at a point. The resultant of the forces has magnitude $R$ N. The directions of these forces are shown in the diagram. Find the values of $R$ and $\alpha$ .

4

ce $QR$ is 1.5 times the distance $PQ$ . At point $Q$ the spee	d of the car is 20 ms.
Show that the acceleration of the car is $0.8 \mathrm{ms^{-2}}$ .	[3

	Find the distance $QS$ and hence find the average speed of the car between $Q$ and $S$ .	[
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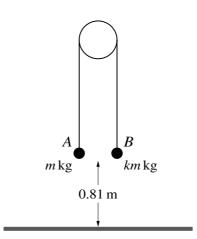
	$10^{-2}$ .	
( <b>i</b> )	Show that the resistance to the cyclist's motion is 16 N.	[3]
	Find the steady speed that the cyclist can maintain if his power output an are both unchanged.	d the resistance force [2]

re	sistance force are still both unchanged. Find his acceleration when he is travelling at 4 n
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6	Particle <i>P</i> travels in a straight line from <i>A</i> to <i>B</i> . The velocity of <i>P</i> at time <i>t</i> s after leaving <i>A</i> is denoted by $v  \text{m s}^{-1}$ , where
	$v = 0.04t^3 + ct^2 + kt.$

Fi	and the values of the constants $c$ and $k$ .	[6
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(ii)	Show that the acceleration of $P$ is a minimum when $t = 2.5$ .	[3]
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Two particles A and B have masses  $m \log a$  and  $k m \log a$  respectively, where k > 1. The particles are attached to the ends of a light inextensible string. The string passes over a fixed smooth pulley and the particles hang vertically below it. Both particles are at a height of  $0.81 \, \mathrm{m}$  above horizontal ground (see diagram). The system is released from rest and particle B reaches the ground  $0.9 \, \mathrm{s}$  later. The particle A does not reach the pulley in its subsequent motion.

)	Find the value of $k$ and show that the tension in the string before $B$ reaches the ground is equate $12m  \text{N}$ .	
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At the instant when B reaches the ground, the string breaks.

(ii)	Show that the speed of $A$ when it reaches the ground is $5.97 \mathrm{m  s^{-1}}$ , correct to 3 significant figures, and find the time taken, after the string breaks, for $A$ to reach the ground. [4]
(iii)	Sketch a velocity-time graph for the motion of particle <i>A</i> from the instant when the system is released until <i>A</i> reaches the ground. [2]

# **Additional Page**

If you use the following lined page to complete the answer(s) to any question(s), the question number(s) must be clearly shown.		

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