



Rewarding Learning

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2018

Centre Number

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Candidate Number

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# Mathematics

Assessment Unit M1

*assessing*

Module M1: Mechanics 1



[AMM11]

\*AMM11\*

TUESDAY 29 MAY, MORNING

## TIME

1 hour 30 minutes.

## INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer **all seven** questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Questions which require drawing or sketching should be completed using an H.B. pencil.

All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions. **Answers without working may not gain full credit.**

Answers should be given to three significant figures unless otherwise stated.

You are permitted to use a graphic or scientific calculator in this paper.

## INFORMATION FOR CANDIDATES

The total mark for this paper is 75

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

A copy of the **Mathematical Formulae and Tables booklet** is provided.

Throughout the paper the logarithmic notation used is  $\ln z$  where it is noted that  $\ln z \equiv \log_e z$

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\*28AMM1101\*

**Take  $g = 9.8 \text{ m s}^{-2}$ , unless specified otherwise.**

- 1** A ball of mass  $0.25\text{ kg}$  falls vertically and hits horizontal ground with a speed of  $11\text{ ms}^{-1}$ .  
The ball rebounds vertically with a speed of  $7\text{ ms}^{-1}$ .  
Model the ball as a particle.

- (i) Find the impulse exerted on the ball by the ground during the impact. [3]

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

[2]

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\*28AMM1103\*

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\*28AMM1104\*

- 
- A diagram showing a robot on a platform. The robot is represented by a black rectangle with two small circles below it representing wheels. The platform is a horizontal line. A vertical dashed line with arrows at both ends indicates a height of 2.5 from the ground to the top of the platform. A small black square is positioned on the platform, slightly to the right of the robot.

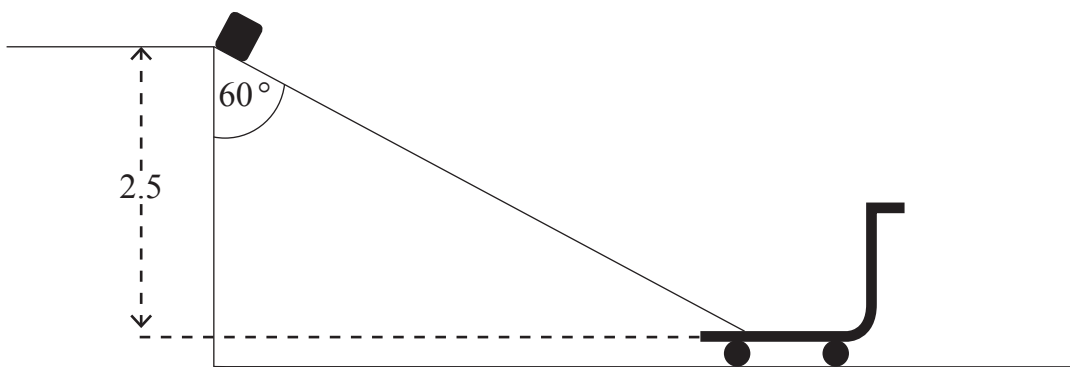
(i) Calculate the time taken for this parcel to fall onto the trolley. [3]

[illegible]

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Noticing that parcels are often damaged when they are loaded this way, Kate constructs a ramp so that the parcels can slide onto the trolley as shown in **Fig. 2** below.



**Fig. 2**

The ramp is inclined at an angle of  $60^\circ$  to the vertical, and the coefficient of friction between the ramp and the parcel is 0.2  
A parcel of mass 2 kg is released down the slope.

- (ii) In the space below draw a diagram showing the external forces acting on this parcel.

[2]



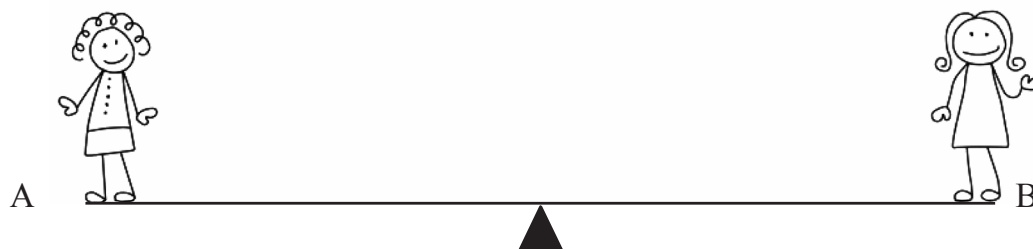
[6]

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\*28AMM1107\*

- 3 A non-uniform plank AB of length 4 m and mass 16 kg is pivoted at its midpoint. Two girls, Sara and Eleanor, have mass 25 kg and 30 kg respectively. Sara stands at end A of the plank and Eleanor stands at end B, as shown in **Fig. 3** below.



**Fig. 3**

The plank rests in equilibrium.

The distance of the centre of mass of the plank is  $x$  metres from A.

Model the two girls as particles.

- (i) In the space below draw a diagram showing the external forces acting on the plank.

[2]





[6]

[illegible]

[1]

.....

**[Turn over**

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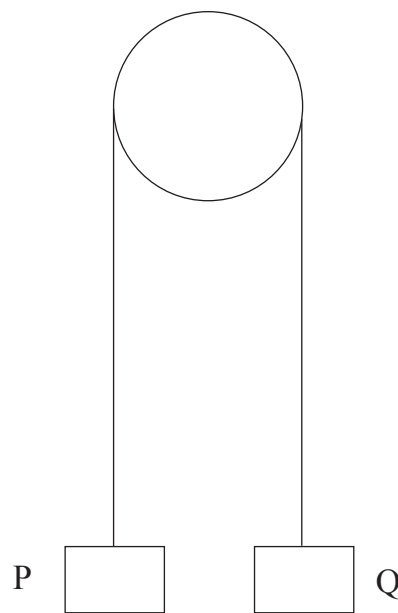


**\*28AMM1109\***

- 4 Two particles P and Q, of masses 4 kg and 6 kg respectively, are connected by a light inextensible string. The string passes over a smooth fixed pulley. Initially, P and Q are at the same level and are held at rest 2 m above a horizontal plane. The system is released from rest.

(i) On the diagram below show the external forces acting on P and Q.

[2]



[5]

**[Turn over**



\*28AMM1111\*

[2]



\*28AMM1112\*

[4]

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\*28AMM1113\*

- 5** The velocity  $v \text{ ms}^{-1}$  of a particle at time  $t$  seconds is given by

$$v = 9 - t^2$$

The particle travels in a straight line and passes through a fixed point O when  $t = 2$

- (i) Find the initial displacement of the particle from O. [4]

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[5]

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\*28AMM1115\*

[3]



\*28AMM1116\*



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**(Questions continue overleaf)**

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**\*28AMM1117\***

- 6 A wooden plank AB has mass  $4m$  and length  $4a$ .  
A force of magnitude  $T$  acts at right angles to the plank at B as shown in Fig. 4 below.

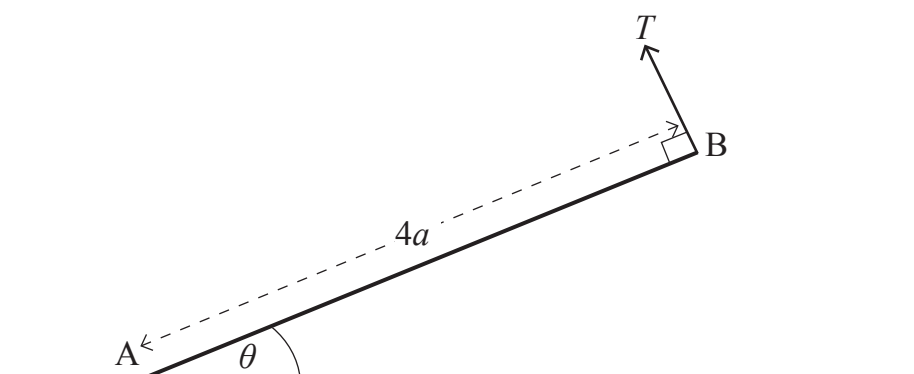


Fig. 4

The end A is freely hinged to horizontal ground.

The plank makes an angle of  $\theta$  with the horizontal, where  $\tan \theta = \frac{3}{4}$

The plank is modelled as a uniform rod lying in a vertical plane.

- (i) State how you will use the modelling assumption that the plank is uniform. [1]

.....

.....

- (ii) In the space below draw a diagram showing the external forces acting on the plank. [2]



[4]

**[Turn over**

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\*28AMM1119\*

[6]



**\*28AMM1120\***

[illegible]

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- 7 Alan and Bill are in their cars and both cars are travelling at  $18\text{ms}^{-1}$  in the same direction along a straight horizontal road.

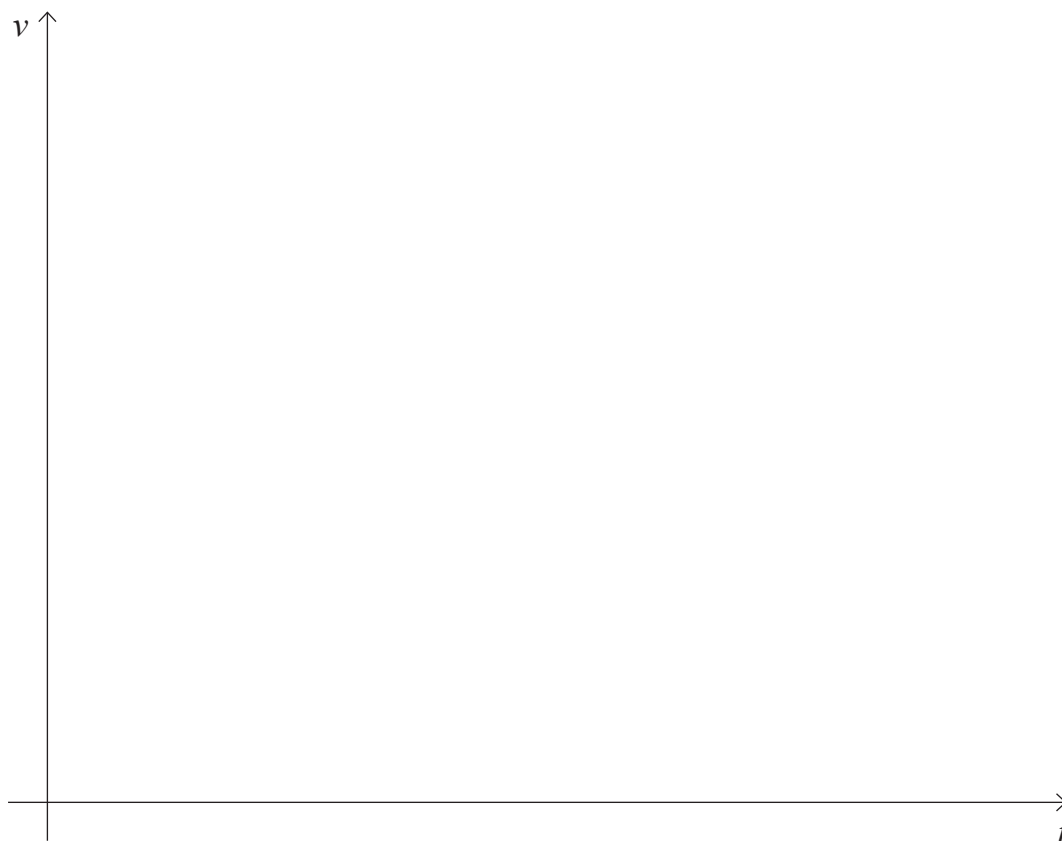
At time  $t = 0$  seconds, Bill is 14.5 metres ahead of Alan.

At  $t = 0$ , Bill starts to brake with a constant retardation of  $6\text{ms}^{-2}$

At  $t = 0.5$  seconds, Alan starts to brake with a constant retardation of  $4\text{ms}^{-2}$

- (i) On the axes below sketch the velocity–time graphs for the two cars.

[3]



[9]

**[Turn over**

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**\*28AMM1123\***

Handwriting practice lines consisting of 20 rows of dotted lines on a solid background.

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\*28AMM1124\*



**THIS IS THE END OF THE QUESTION PAPER**

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For Examiner's use only	
Question Number	Marks
1	
2	
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7	

<b>Total Marks</b>	
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Examiner Number

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