

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

--	--	--	--	--

--	--	--	--

Pearson Edexcel International Advanced Level

Time 1 hour 30 minutes

Paper

reference

WME01/01

Mathematics

International Advanced Subsidiary/Advanced Level Mechanics M1

You must have:

Mathematical Formulae and Statistical Tables (Yellow), calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Whenever a numerical value of g is required, take $g = 9.8 \text{ m s}^{-2}$, and give your answer to either 2 significant figures or 3 significant figures.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 8 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ►

P72151A

©2022 Pearson Education Ltd.

B:1/1/1/



Pearson

Leave
blank

1. A railway truck S of mass 20 tonnes is moving along a straight horizontal track when it collides with another railway truck T of mass 30 tonnes which is at rest. Immediately before the collision the speed of S is 4 m s^{-1}
As a result of the collision, the two railway trucks join together.

Find

- (a) the common speed of the railway trucks immediately after the collision, (2)
- (b) the magnitude of the impulse exerted on S in the collision, stating the units of your answer. (3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 1 continued

Q1

(Total 5 marks)



2.

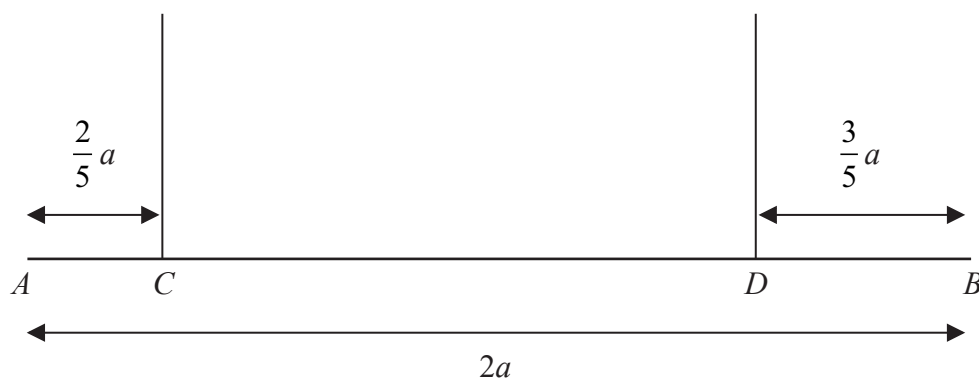


Figure 1

where $AC = \frac{2}{5}a$ and $DB = \frac{3}{5}a$, as shown in Figure 1.

A particle P is placed on the rod at B .

The rod remains horizontal and in equilibrium.

- (a) Find, in terms of M , the largest possible mass of the particle P (3)

Given that the mass of P is $\frac{1}{2}M$

- (b) find, in terms of M and g , the tension in the string that is attached to the rod at C . (3)

Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank**Question 2 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank

Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total 6 marks)

Q2



3.

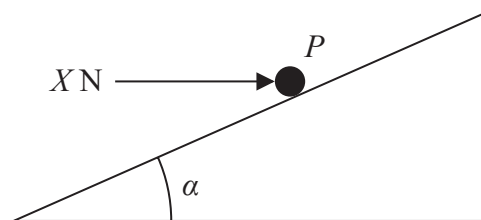


Figure 2

A rough plane is inclined to the horizontal at an angle α , where $\tan \alpha = \frac{3}{4}$

A particle P of mass 2 kg is held in equilibrium on the plane by a horizontal force of magnitude X newtons, as shown in Figure 2. The force acts in a vertical plane which contains a line of greatest slope of the inclined plane.

- (a) Show that when $X = 14.7$ there is no frictional force acting on P (3)

The coefficient of friction between P and the plane is 0.5

- (b) Find the smallest possible value of X . (8)



Question 3 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank**Question 3 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 3 continued

Q3

(Total 11 marks)



Leave
blank**Question 4 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 7 2 1 5 1 A 0 1 3 3 2

Leave
blank**Question 4 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



1

- (a) Find the distance travelled by the ball while its speed is less than 14.7 m s^{-1} (3)
- (b) Find the time for which the ball is moving with a speed of more than 29.4 m s^{-1} (3)
- (c) Sketch a speed-time graph for the motion of the ball from the instant when it is projected from *A* to the instant when it hits the ground. Show clearly where your graph meets the axes. (3)

DO NOT WRITE IN THIS AREA

Leave
blank**Question 5 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 7 2 1 5 1 A 0 1 7 3 2

DO NOT WRITE IN THIS AREA

[illegible]

Leave
blank**Question 5 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total 9 marks)**Q5**

A particle A of mass 0.5 kg is at rest on a smooth horizontal plane.

At time $t = 0$, two forces, $\mathbf{F}_1 = (-3\mathbf{i} + 2\mathbf{j})\text{ N}$ and $\mathbf{F}_2 = (p\mathbf{i} + q\mathbf{j})\text{ N}$, where p and q are constants, are applied to A .

Given that A moves in the direction of the vector $(\mathbf{i} - 2\mathbf{j})$,

(a) show that $2p + q - 4 = 0$ (4)

Given that $p = 5$

(b) find the speed of A at time $t = 4$ seconds. (5)

Leave
blank

Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank**Question 6 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank**Question 6 continued**

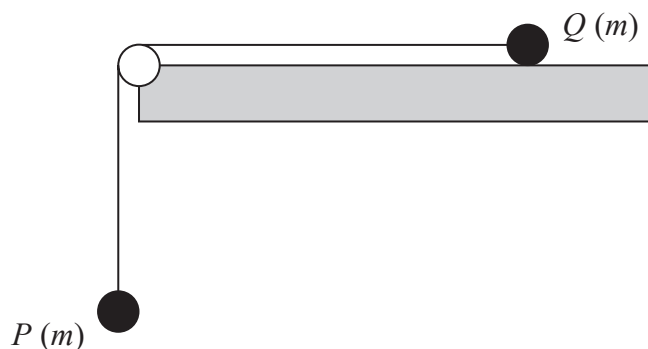
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total 9 marks)**Q6**

7.

**Figure 4**

A particle P of mass m is attached to one end of a light inextensible string. Another particle Q , also of mass m , is attached to the other end of the string. The string passes over a small smooth pulley which is fixed at the edge of a rough horizontal table. Particle Q is held at rest on the table and particle P hangs vertically below the pulley with the string taut, as shown in Figure 4.

The pulley, P and Q all lie in the same vertical plane.

The coefficient of friction between Q and the table is μ , where $\mu < 1$

Particle Q is released from rest.

The tension in the string before Q hits the pulley is kmg , where k is a constant.

(a) Find k in terms of μ .

(7)

Given that Q is initially a distance d from the pulley,

(b) find, in terms of d , g and μ , the time taken by Q , after release, to reach the pulley.

(4)

(c) Describe what would happen if $\mu \geq 1$, giving a reason for your answer.

(2)



Leave
blank**Question 7 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 7 2 1 5 1 A 0 2 5 3 2

Leave
blank**Question 7 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave
blank**Question 7 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total 13 marks)**Q7**

Leave
blank**Question 8 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 7 2 1 5 1 A 0 2 9 3 2

DO NOT WRITE IN THIS AREA

Leave
blank**Question 8 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Q8

TOTAL FOR PAPER: 75 MARKS

32

