

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Tuesday 12 January 2021

Afternoon (Time: 1 hour 30 minutes)

Paper Reference **WME02/01**

Mathematics

International Advanced Subsidiary/Advanced Level
Mechanics M2

You must have:

Mathematical Formulae and Statistical Tables (Blue), 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 ►

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1. A particle P of mass 1.5 kg is moving with velocity $(4\mathbf{i} + 6\mathbf{j})\text{ ms}^{-1}$ when it receives an impulse of magnitude 15 Ns . Immediately after P receives the impulse, the velocity of P is $v\mathbf{i}\text{ ms}^{-1}$.

Find the two possible values of v .

(7)

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Question 1 continued

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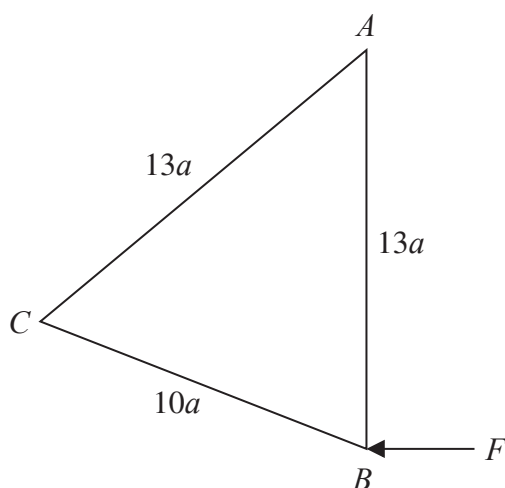
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(Total 7 marks)

Q1



2.

**Figure 1**

The uniform lamina ABC has sides $AB = AC = 13a$ and $BC = 10a$. The lamina is freely suspended from A . A horizontal force of magnitude F is applied to the lamina at B , as shown in Figure 1. The line of action of the force lies in the vertical plane containing the lamina. The lamina is in equilibrium with AB vertical. The weight of the lamina is W .

Find F in terms of W .

(5)

Question 2 continued

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(Total 5 marks)

Q2



3. A car of mass 600 kg travels along a straight horizontal road with the engine of the car working at a constant rate of P watts. The resistance to the motion of the car is modelled as a constant force of magnitude R newtons. At the instant when the speed of the car is 15 ms^{-1} , the magnitude of the acceleration of the car is 0.2 ms^{-2} .

Later the same car travels up a straight road inclined at angle θ to the horizontal, where $\sin \theta = \frac{1}{20}$. The resistance to the motion of the car from non-gravitational forces is modelled as a constant force of magnitude R newtons. When the engine of the car is working at a constant rate of P watts, the car has a constant speed of 10 ms^{-1} .

Find the value of P .

(8)

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(Total 8 marks)

Q3



4.

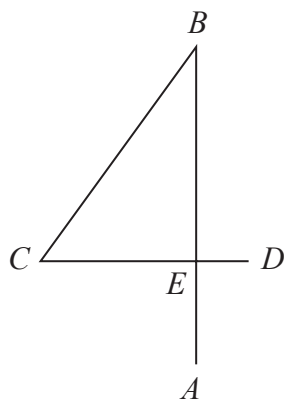


Figure 2

The number “4”, shown in Figure 2, is a rigid framework made from three uniform rods, AB , BC and CD , where

$$AB = 6a, BC = 5a \text{ and } CD = 4a$$

The point E is on AB and CD , where $BE = 4a$, $CE = 3a$ and angle $CEB = 90^\circ$

The three rods are all made from the same material and they all lie in the same plane.

The framework is suspended from B and hangs in equilibrium with BA at an angle θ to the downward vertical.

Find θ to the nearest degree.

(9)



Question 4 continued

Handwriting practice area with 30 horizontal lines.

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Question 4 continued

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Question 4 continued

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(Total 9 marks)

Q4



- (4)

[illegible]

Question 5 continued

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Q5

(Total 11 marks)



P 6 0 7 0 6 A 0 1 5 2 8

6.

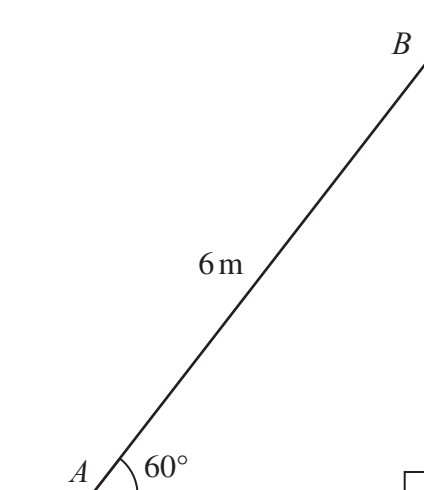


Figure 3

A ladder AB has length 6 m and mass 30 kg. The ladder rests in equilibrium at 60° to the horizontal with the end A on rough horizontal ground and the end B against a smooth vertical wall, as shown in Figure 3.

A man of mass 70 kg stands on the ladder at the point C , where $AC = 2$ m, and the ladder remains in equilibrium. The ladder is modelled as a uniform rod in a vertical plane perpendicular to the wall. The man is modelled as a particle.

- (a) Find the magnitude of the force exerted on the ladder by the ground. (6)

The man climbs further up the ladder. When he is at the point D on the ladder, the ladder is about to slip.

Given that the coefficient of friction between the ladder and the ground is 0.4

- (b) find the distance AD . (4)
- (c) State how you have used the modelling assumption that the ladder is a rod. (1)

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Question 6 continued

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Question 6 continued

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Question 6 continued

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Q6

(Total 11 marks)





Question 7 continued

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Question 7 continued

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Q7

(Total 12 marks)



P 6 0 7 0 6 A 0 2 3 2 8

- (a) Find the coefficient of restitution between A and B .

Given that the coefficient of restitution between B and the wall is $\frac{1}{4}$

- (b) find x in terms of d .

[illegible]

Question 8 continued

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Question 8 continued

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Q8

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