

Please check the examination details below before entering your candidate information

Candidate surname	Other names
Centre Number	Candidate Number
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

Pearson Edexcel International Advanced Level

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 (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 ►

P69290A

©2021 Pearson Education Ltd.

E:1/1/1/1/



Pearson

1.

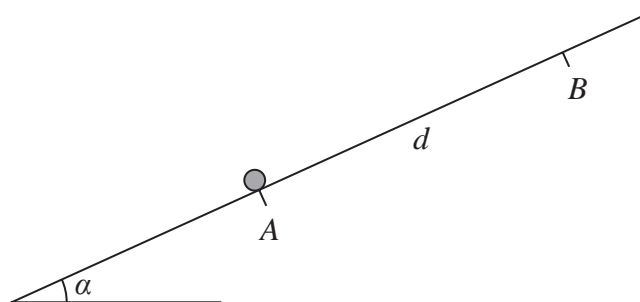


Figure 1

A particle of mass m is held at rest at a point A on a rough plane.

The plane is inclined at an angle α to the horizontal, where $\tan \alpha = \frac{5}{12}$

The coefficient of friction between the particle and the plane is $\frac{1}{5}$

The points A and B lie on a line of greatest slope of the plane, with B above A , and $AB = d$, as shown in Figure 1.

The particle is pushed up the line of greatest slope from A to B .

- (a) Show that the work done against friction as the particle moves from A to B is $\frac{12}{65}mgd$ (3)

The particle is then held at rest at B and released.

- (b) Use the work-energy principle to find, in terms of g and d , the speed of the particle at the instant it reaches A . (4)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Lined writing area for the answer.



Turn over

Question 3 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Lined writing area for the answer to Question 3.

(Total 9 marks)



P 6 9 2 9 0 A 0 9 2 8

Turn over

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

5.

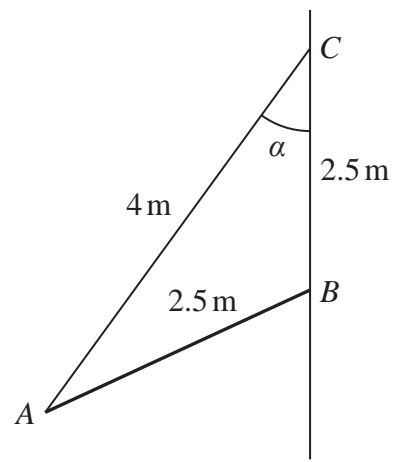


Figure 2

A pole *AB* has length 2.5 m and weight 70 N.
 The pole rests with end *B* against a rough vertical wall. One end of a cable of length 4 m is attached to the pole at *A*. The other end of the cable is attached to the wall at the point *C*. The point *C* is vertically above *B* and *BC* = 2.5 m.
 The angle between the cable and the wall is α , as shown in Figure 2.
 The pole is in a vertical plane perpendicular to the wall.
 The cable is modelled as a light inextensible string and the pole is modelled as a uniform rod.

Given that $\tan \alpha = \frac{3}{4}$

- (a) show that the tension in the cable is 56 N. (4)

Given also that the pole is in limiting equilibrium,

- (b) find the coefficient of friction between the pole and the wall. (6)



Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Lined writing area for the answer to Question 5.



Leave
blank

Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Lined writing area for the answer to Question 5.



7. In this question you may use, without proof, the formula for the centre of mass of a uniform sector of a circle, as given in the formulae book.

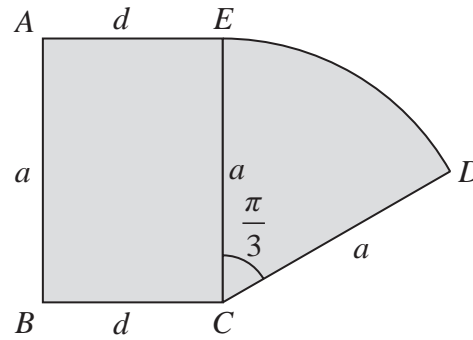


Figure 3

The uniform lamina $ABCDE$, shown shaded in Figure 3, is formed by joining a rectangle to a sector of a circle.

- The rectangle $ABCE$ has $AB = EC = a$ and $AE = BC = d$
- The sector CDE has centre C and radius a
- Angle $ECD = \frac{\pi}{3}$ radians

The centre of mass of the lamina lies on EC .

(a) Show that $a = \sqrt{3}d$ (4)

The lamina is freely suspended from B and hangs in equilibrium with BC at an angle β radians to the downward vertical.

(b) Find the value of β (7)



Leave blank

Question 7 continued

Lined writing area for the answer to Question 7.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave blank

Question 7 continued

Lined writing area for the answer to Question 7.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total 11 marks)



Turn over



P 6 9 2 9 0 A 0 2 3 2 8

8.

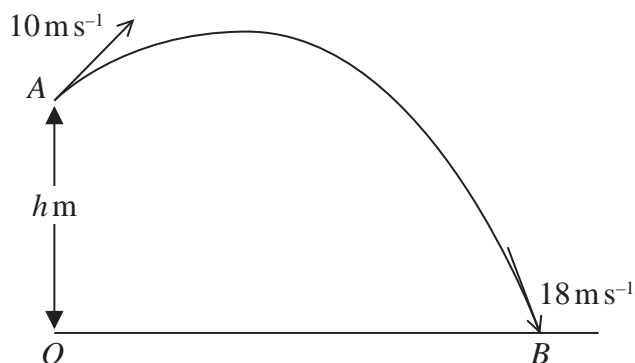


Figure 4

The fixed point A is h metres vertically above the point O that is on horizontal ground. At time $t = 0$, a particle P is projected from A with speed 10 m s^{-1} . The particle moves freely under gravity. At time $t = 2.5$ seconds, P strikes the ground at the point B . At the instant when P strikes the ground, the speed of P is 18 m s^{-1} , as shown in Figure 4.

(a) By considering energy, find the value of h . (3)

(b) Find the distance OB . (5)

As P moves from A to B , the speed of P is less than or equal to 8 m s^{-1} for T seconds.

(c) Find the value of T (6)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Leave blank

Question 8 continued

Handwriting practice lines for Question 8.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



