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MATHEMATICS

9709/51

Paper 5 Mechanics 2 (M2)

October/November 2019

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: List of Formulae (MF9)

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^{-2} .

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 **12** printed pages.



2 A particle is projected from a point on horizontal ground with speed 15 m s^{-1} at an angle of θ° above the horizontal. The particle strikes the ground 2 s after projection.

(i) Find θ . [2]

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(ii) Calculate the time after projection at which the direction of motion of the particle is 20° below the horizontal. [4]

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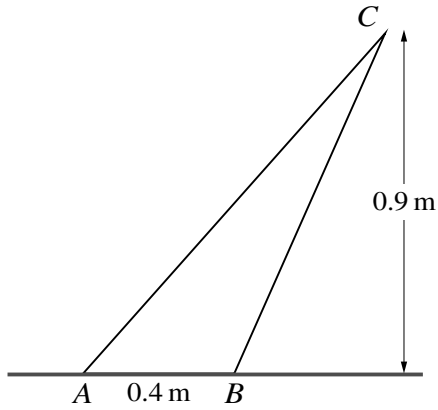
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ABC is the cross-section through the centre of mass of a uniform prism which rests with AB on a rough horizontal surface. $AB = 0.4\text{ m}$ and C is 0.9 m above the surface (see diagram). The prism is on the point of toppling about its edge through B .

- (i) Show that angle $BAC = 48.4^\circ$, correct to 3 significant figures. [3]

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A force of magnitude 18 N acting in the plane of the cross-section and perpendicular to AC is now applied to the prism at C . The prism is on the point of rotating about its edge through A .

(ii) Calculate the weight of the prism. [3]

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(iii) Given also that the prism is on the point of slipping, calculate the coefficient of friction between the prism and the surface. [4]

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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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