

CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
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FURTHER MATHEMATICS

9231/02

Paper 2

For Examination from 2017

SPECIMEN PAPER

3 hours

Candidates answer on the Question Paper.

Additional Materials: List of Formulae (MF10)

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.

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 is necessary, take the acceleration due to gravity to be 10 m s^{-2} .

The use of a calculator is expected, where appropriate.

Results obtained solely from a graphic calculator, without supporting working or reasoning, will not receive credit.

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.

This document consists of **21** printed pages and **1** blank page.



- (iii) In the case where P is released from rest at a distance $0.2a$ m from M , the speed of P is 0.7 m s^{-1} when P is $0.05a$ m from M . Find the value of a . [3]

In the subsequent motion, when OP makes an angle θ with the upward vertical the tension in the string is T .

(iii) Find an expression for T in terms of m , g and θ . [5]

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(iv) Find the value of $\cos \theta$ when the string becomes slack. [2]

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6 A biased coin is tossed repeatedly until a head is obtained. The random variable X denotes the number of tosses required for a head to be obtained. The mean of X is equal to twice the variance of X .

(i) Show that the probability that a head is obtained when the coin is tossed once is $\frac{2}{3}$. [2]

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(ii) Find $P(X = 4)$. [1]

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(iii) Find $P(X > 4)$. [2]

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(iv) Find the least integer N such that $P(X \leq N) > 0.999$. [3]

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(ii) Find the median value of Y .

[2]

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(iii) Find the expected value of Y .

[2]

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