

CANDIDATE
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FURTHER MATHEMATICS

9231/01

Paper 1

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.

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.



- (ii) For the case $k = 4$, find the equations of the asymptotes of C and sketch C , indicating the coordinates of the points where C intersects the coordinate axes. [6]

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(iii) Deduce a quadratic equation, with integer coefficients, having roots $\sec^2(\frac{1}{5}\pi)$ and $\sec^2(\frac{2}{5}\pi)$. [3]

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11 Answer only **one** of the following two alternatives.

EITHER

The points A , B and C have position vectors \mathbf{i} , $2\mathbf{j}$ and $4\mathbf{k}$ respectively, relative to an origin O . The point N is the foot of the perpendicular from O to the plane ABC . The point P on the line-segment ON is such that $OP = \frac{3}{4}ON$. The line AP meets the plane OBC at Q .

(i) Find a vector perpendicular to the plane ABC and show that the length of ON is $\frac{4}{\sqrt{21}}$. [4]

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(ii) Find the position vector of the point Q . [5]

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OR

The curve C has polar equation $r = a(1 - \cos \theta)$ for $0 \leq \theta < 2\pi$.

(i) Sketch C . [2]

(ii) Find the area of the region enclosed by the arc of C for which $\frac{1}{2}\pi \leq \theta \leq \frac{3}{2}\pi$, the half-line $\theta = \frac{1}{2}\pi$ and the half-line $\theta = \frac{3}{2}\pi$. [5]

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