# Wednesday 13 May 2015 - Morning <br> AS GCE MATHEMATICS 

## 4721/01 Core Mathematics 1

## QUESTION PAPER

## Candidates answer on the Printed Answer Book.

OCR supplied materials:
Duration: 1 hour 30 minutes

- Printed Answer Book 4721/01
- List of Formulae (MF1)

Other materials required:
None

## INSTRUCTIONS TO CANDIDATES

These instructions are the same on the Printed Answer Book and the Question Paper.

- The Question Paper will be found inside the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- Write your answer to each question in the space provided in the Printed Answer Book. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer all the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Do not write in the bar codes.
- You are not permitted to use a calculator in this paper.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.


## INFORMATION FOR CANDIDATES

This information is the same on the Printed Answer Book and the Question Paper.

- The number of marks is given in brackets [ ] at the end of each question or part question on the Question Paper.
- You are reminded of the need for clear presentation in your answers.
- The total number of marks for this paper is 72.
- The Printed Answer Book consists of 12 pages. The Question Paper consists of 4 pages. Any blank pages are indicated.


## INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

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1 Express $\frac{8}{\sqrt{3}-1}$ in the form $a \sqrt{3}+b$, where $a$ and $b$ are integers.

2 (i) Sketch the curve $y=-\frac{1}{x}$.
(ii) The curve $y=-\frac{1}{x}$ is translated by 2 units parallel to the $x$-axis in the positive direction. State the equation of the transformed curve.
(iii) Describe a transformation that transforms the curve $y=-\frac{1}{x}$ to the curve $y=-\frac{1}{3 x}$.

3 Express each of the following in the form $5^{k}$.
(i) $25^{4}$
(ii) $\frac{1}{\sqrt[4]{5}}$
(iii) $(5 \sqrt{5})^{3}$

4 Solve the equation $x^{\frac{2}{3}}-x^{\frac{1}{3}}-6=0$.

5 The points $A$ and $B$ have coordinates $(2,1)$ and $(5,-3)$ respectively.
(i) Find the length of $A B$.
(ii) Find an equation of the line through the mid-point of $A B$ which is perpendicular to $A B$, giving your answer in the form $a x+b y+c=0$ where $a, b$ and $c$ are integers.

6 Solve the simultaneous equations

$$
\begin{equation*}
2 x+y-5=0, \quad x^{2}-y^{2}=3 \tag{5}
\end{equation*}
$$

7 (a) Given that $\mathrm{f}(x)=\left(x^{2}+3\right)(5-x)$, find $\mathrm{f}^{\prime}(x)$.
[4]
(b) Find the gradient of the curve $y=x^{-\frac{1}{3}}$ at the point where $x=-8$.

8 (i) Sketch the curve $y=2 x^{2}-x-3$, giving the coordinates of all points of intersection with the axes. [4]
(ii) Hence, or otherwise, solve the inequality $2 x^{2}-x-3>0$.
(iii) Given that the equation $2 x^{2}-x-3=k$ has no real roots, find the set of possible values of the constant $k$.

9 The curve $y=2 x^{3}-a x^{2}+8 x+2$ passes through the point $B$ where $x=4$.
(i) Given that $B$ is a stationary point of the curve, find the value of the constant $a$.
(ii) Determine whether the stationary point $B$ is a maximum point or a minimum point.
(iii) Find the $x$-coordinate of the other stationary point of the curve.

10 A circle with centre $C$ has equation $x^{2}+y^{2}-10 x+4 y+4=0$.
(i) Find the coordinates of $C$ and the radius of the circle.
(ii) Show that the tangent to the circle at the point $P(8,2)$ has equation $3 x+4 y=32$.
(iii) The circle meets the $y$-axis at $Q$ and the tangent meets the $y$-axis at $R$. Find the area of triangle $P Q R$.

## END OF QUESTION PAPER

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