

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE**

4721/01

**MATHEMATICS
Core Mathematics 1
QUESTION PAPER**

**MONDAY 19 MAY 2014: Morning
DURATION: 1 hour 30 minutes
plus your additional time allowance**

MODIFIED ENLARGED

Candidates answer on the Printed Answer Book or any suitable paper provided by the centre. The Printed Answer Book may be enlarged by the centre.

OCR SUPPLIED MATERIALS:

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

OTHER MATERIALS REQUIRED:

None

NO CALCULATOR CAN BE USED FOR THIS PAPER

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book or on the paper provided by the centre. Please write clearly and in capital letters.

IF YOU USE THE PRINTED ANSWER BOOK WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED.

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.

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

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.

Any blank pages are indicated.

INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

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- 1 Express $5x^2 + 10x + 2$ in the form $p(x + q)^2 + r$, where p , q and r are integers. [4]
- 2 Express each of the following in the form $k\sqrt{3}$, where k is an integer.
- (i) $\frac{6}{\sqrt{3}}$ [1]
- (ii) $10\sqrt{3} - 6\sqrt{27}$ [2]
- (iii) $3^{\frac{5}{2}}$ [2]
- 3 Find the real roots of the equation $4x^4 + 3x^2 - 1 = 0$. [5]
- 4 The curve $y = f(x)$ passes through the point P with coordinates $(2, 5)$.
- (i) State the coordinates of the point corresponding to P on the curve $y = f(x) + 2$. [1]
- (ii) State the coordinates of the point corresponding to P on the curve $y = f(2x)$. [1]
- (iii) Describe the transformation that transforms the curve $y = f(x)$ to the curve $y = f(x + 4)$. [2]
- 5 Solve the following inequalities.
- (i) $5 < 6x + 3 < 14$ [3]
- (ii) $x(3x - 13) \geq 10$ [5]

6 Given that $y = 6x^3 + \frac{4}{\sqrt{x}} + 5x$, find

(i) $\frac{dy}{dx}$, [4]

(ii) $\frac{d^2y}{dx^2}$. [2]

7 A is the point $(5, 7)$ and B is the point $(-1, -5)$.

(i) Find the coordinates of the mid-point of the line segment AB . [2]

(ii) Find an equation of the line through A that is perpendicular to the line segment AB , giving your answer in the form $ax + by + c = 0$ where a , b and c are integers. [5]

8 A curve has equation $y = 3x^3 - 7x + \frac{2}{x}$.

(i) Verify that the curve has a stationary point when $x = 1$. [5]

(ii) Determine the nature of this stationary point. [2]

(iii) The tangent to the curve at this stationary point meets the y -axis at the point Q . Find the coordinates of Q . [2]

QUESTION 9 BEGINS ON PAGE 6

9 A circle with centre C has equation

$$(x - 2)^2 + (y + 5)^2 = 25.$$

(i) Show that no part of the circle lies above the x -axis. [3]

(ii) The point P has coordinates $(6, k)$ and lies inside the circle. Find the set of possible values of k . [5]

(iii) Prove that the line $2y = x$ does not meet the circle. [4]

10 A curve has equation $y = (x + 2)^2(2x - 3)$.

(i) Sketch the curve, giving the coordinates of all points of intersection with the axes. [3]

(ii) Find an equation of the tangent to the curve at the point where $x = -1$. Give your answer in the form $ax + by + c = 0$. [9]

END OF QUESTION PAPER

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