

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE
4721

MATHEMATICS
Core Mathematics 1
QUESTION PAPER

MONDAY 14 JANUARY 2013: Morning

DURATION: 1 hour 30 minutes
plus your additional time allowance

MODIFIED ENLARGED 18pt

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
List of Formulae (MF1)

OTHER MATERIALS REQUIRED:

None

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

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

- **The Question Paper will be found in the centre of 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.**
- **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 8 pages. Any blank pages are indicated.**

INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

- **Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.**

1 (i) Solve the equation $x^2 - 6x - 2 = 0$, giving your answers in simplified surd form. [3]

(ii) Find the gradient of the curve $y = x^2 - 6x - 2$ at the point where $x = -5$. [2]

2 Solve the equations

(i) $3^n = 1$, [1]

(ii) $t^{-3} = 64$, [2]

(iii) $(8p^6)^{\frac{1}{3}} = 8$. [3]

3 (i) Sketch the curve $y = (1 + x)(2 - x)(3 + x)$, giving the coordinates of all points of intersection with the axes. [3]

(ii) Describe the transformation that transforms the curve $y = (1 + x)(2 - x)(3 + x)$ to the curve $y = (1 - x)(2 + x)(3 - x)$. [2]

4 (i) Solve the simultaneous equations

$$y = 2x^2 - 3x - 5, \quad 10x + 2y + 11 = 0. \quad [5]$$

(ii) What can you deduce from the answer to part (i) about the curve $y = 2x^2 - 3x - 5$ and the line $10x + 2y + 11 = 0$? [1]

- 5 (i) Simplify $(x + 4)(5x - 3) - 3(x - 2)^2$. [3]
- (ii) The coefficient of x^2 in the expansion of $(x + 3)(x + k)(2x - 5)$ is -3 . Find the value of the constant k . [3]
- 6 (i) The line joining the points $(-2, 7)$ and $(-4, p)$ has gradient 4. Find the value of p . [3]
- (ii) The line segment joining the points $(-2, 7)$ and $(6, q)$ has mid-point $(m, 5)$. Find m and q . [3]
- (iii) The line segment joining the points $(-2, 7)$ and $(d, 3)$ has length $2\sqrt{13}$. Find the two possible values of d . [4]
- 7 Find $\frac{dy}{dx}$ in each of the following cases:
- (i) $y = \frac{(3x)^2 \times x^4}{x}$, [3]
- (ii) $y = \sqrt[3]{x}$, [3]
- (iii) $y = \frac{1}{2x^3}$. [2]

- 8** The quadratic equation $kx^2 + (3k - 1)x - 4 = 0$ has no real roots. Find the set of possible values of k . [7]
- 9** A circle with centre C has equation $x^2 + y^2 - 2x + 10y - 19 = 0$.
- (i) Find the coordinates of C and the radius of the circle. [3]
 - (ii) Verify that the point $(7, -2)$ lies on the circumference of the circle. [1]
 - (iii) Find the equation of the tangent to the circle at the point $(7, -2)$, giving your answer in the form $ax + by + c = 0$, where a , b and c are integers. [5]
- 10** Find the coordinates of the points on the curve $y = \frac{1}{3}x^3 + \frac{9}{x}$ at which the tangent is parallel to the line $y = 8x + 3$. [10]

BLANK PAGE

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

