

ADVANCED SUBSIDIARY GCE MATHEMATICS

4721/01

Core Mathematics 1

WEDNESDAY 9 JANUARY 2008

Afternoon

Time: 1 hour 30 minutes

Additional materials: Answer Booklet (8 pages)

List of Formulae (MF1)

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the spaces provided on the answer booklet.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Answer all the questions.
- 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.
- You are not permitted to use a calculator in this paper.

INFORMATION FOR CANDIDATES

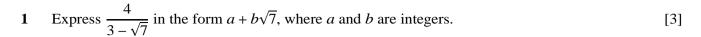
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is 72.
- You are reminded of the need for clear presentation in your answers.



WARNING

You are not allowed to use a calculator in this paper.

This document consists of 4 printed pages.



- **2** (i) Write down the equation of the circle with centre (0, 0) and radius 7. [1]
 - (ii) A circle with centre (3, 5) has equation $x^2 + y^2 6x 10y 30 = 0$. Find the radius of the circle.
- Given that $3x^2 + bx + 10 = a(x+3)^2 + c$ for all values of x, find the values of the constants a, b and c.
- 4 Solve the equations

(i)
$$10^p = 0.1$$
,

(ii)
$$(25k^2)^{\frac{1}{2}} = 15$$
, [3]

(iii)
$$t^{-\frac{1}{3}} = \frac{1}{2}$$
. [2]

- 5 (i) Sketch the curve $y = x^3 + 2$. [2]
 - (ii) Sketch the curve $y = 2\sqrt{x}$. [2]
 - (iii) Describe a transformation that transforms the curve $y = 2\sqrt{x}$ to the curve $y = 3\sqrt{x}$. [3]
- 6 (i) Solve the equation $x^2 + 8x + 10 = 0$, giving your answers in simplified surd form. [3]
 - (ii) Sketch the curve $y = x^2 + 8x + 10$, giving the coordinates of the point where the curve crosses the y-axis. [3]
 - (iii) Solve the inequality $x^2 + 8x + 10 \ge 0$. [2]
- 7 (i) Find the gradient of the line l which has equation x + 2y = 4. [1]
 - (ii) Find the equation of the line parallel to l which passes through the point (6, 5), giving your answer in the form ax + by + c = 0, where a, b and c are integers. [3]
 - (iii) Solve the simultaneous equations

$$y = x^2 + x + 1$$
 and $x + 2y = 4$. [4]

- 8 (i) Find the coordinates of the stationary points on the curve $y = x^3 + x^2 x + 3$. [6]
 - (ii) Determine whether each stationary point is a maximum point or a minimum point. [3]
 - (iii) For what values of x does $x^3 + x^2 x + 3$ decrease as x increases? [2]

© OCR 2008 4721/01 Jan08

9 The points A and B have coordinates (-5, -2) and (3, 1) respectively.

(i) Find the equation of the line AB, giving your answer in the form ax + by + c = 0. [3]

(ii) Find the coordinates of the mid-point of AB. [2]

The point C has coordinates (-3, 4).

(iii) Calculate the length of AC, giving your answer in simplified surd form. [3]

(iv) Determine whether the line AC is perpendicular to the line BC, showing all your working. [4]

10 Given that $f(x) = 8x^3 + \frac{1}{x^3}$,

(i) find
$$f''(x)$$
, [5]

(ii) solve the equation f(x) = -9. [5]

© OCR 2008 4721/01 Jan08

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

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.

© OCR 2008 4721/01 Jan08