Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	6	6	3	/	0	1	Signature	

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Wednesday 10 January 2007 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination
Mathematical Formulae (Green)

Items included with question papers
Nil

Calculators may NOT be used in this examination.

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
You must write your answer for each question in the space following the question.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 10 questions in this question paper. The total mark for this question paper is 75.
There are 20 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner. Answers without working may gain no credit.

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1. Given that

$$y = 4x^3 - 1 + 2x^{\frac{1}{2}}, \quad x > 0,$$

find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$.

(4)

Q1

(Total 4 marks)

Leave blank

2. (a) Express $\sqrt{108}$ in the form $a\sqrt{3}$, where a is an integer.

(1)

(b) Express $(2 - \sqrt{3})^2$ in the form $b + c\sqrt{3}$, where b and c are integers to be found.

(3)

(Total 4 marks)

Q2

Leave blank

3. Given that $f(x) = \frac{1}{x}, \quad x \neq 0,$

(a) sketch the graph of $y = f(x) + 3$ and state the equations of the asymptotes.

(4)

(b) Find the coordinates of the point where $y = f(x) + 3$ crosses a coordinate axis.

(2)

Leave blank

Question 3 continued

Q3

(Total 6 marks)

Leave blank

4. Solve the simultaneous equations

$$y = x - 2,$$

$$y^2 + x^2 = 10.$$

(7)

Leave blank

Question 4 continued

Q4

(Total 7 marks)

Leave blank

5. The equation $2x^2 - 3x - (k + 1) = 0$, where k is a constant, has no real roots.

Find the set of possible values of k.

(4)

Q5

(Total 4 marks)

Leave blank

6. (a) Show that $(4+3\sqrt{x})^2$ can be written as $16+k\sqrt{x}+9x$, where k is a constant to be found.

(2)

(b) Find $\int (4+3\sqrt{x})^2 \mathrm{d}x$.

(3)

Q6

(Total 5 marks)

Leave blank

7. The curve C has equation $y = \mathrm{f}(x)$, $x \neq 0$, and the point $P\,(2, 1)$ lies on C. Given that

$$\mathrm{f}'(x) = 3x^2 - 6 - \frac{8}{x^2},$$

(a) find $\mathrm{f}(x)$.

(5)

(b) Find an equation for the tangent to C at the point P, giving your answer in the form $y = mx + c$, where m and c are integers.

(4)

Leave blank

Question 7 continued

Q7

(Total 9 marks)

Leave blank

8. The curve C has equation $y = 4x + 3x^{\frac{3}{2}} - 2x^2, \quad x > 0.$

(a) Find an expression for $\frac{dy}{dx}$.

(3)

(b) Show that the point P (4, 8) lies on C.

(1)

(c) Show that an equation of the normal to C at the point P is

$$3y = x + 20.$$

(4)

The normal to C at P cuts the x-axis at the point Q.

(d) Find the length PQ, giving your answer in a simplified surd form.

(3)

Leave blank

Question 8 continued

Q8

(Total 11 marks)

Leave blank

9. Ann has some sticks that are all of the same length. She arranges them in squares and has made the following 3 rows of patterns:

Row 1 

Row 2 

Row 3 

She notices that 4 sticks are required to make the single square in the first row, 7 sticks to make 2 squares in the second row and in the third row she needs 10 sticks to make 3 squares.

(a) Find an expression, in terms of n, for the number of sticks required to make a similar arrangement of n squares in the nth row.

(3)

Ann continues to make squares following the same pattern. She makes 4 squares in the 4th row and so on until she has completed 10 rows.

(b) Find the total number of sticks Ann uses in making these 10 rows.

(3)

Ann started with 1750 sticks. Given that Ann continues the pattern to complete k rows but does not have sufficient sticks to complete the $(k + 1)$th row,

(c) show that k satisfies $(3k - 100)(k + 35) < 0$.

(4)

(d) Find the value of k.

(2)

Leave blank

Question 9 continued

Leave blank

Question 9 continued

Leave blank

Question 9 continued

Q9

(Total 12 marks)

Leave blank

10. (a) On the same axes sketch the graphs of the curves with equations

(i) $y = x^2(x - 2)$,

(3)

(ii) $y = x(6 - x)$,

(3)

and indicate on your sketches the coordinates of all the points where the curves cross the x-axis.

(b) Use algebra to find the coordinates of the points where the graphs intersect.

(7)

Question 10 continued

Leave blank

Question 10 continued

Leave blank

Q10

(Total 13 marks)

TOTAL FOR PAPER: 75 MARKS

END