| Centre No. | | | | | | Paper Reference | | | | | | | Surname | Initial(s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Candidate No. | | | | | | 6 | 6 | 6 | 4 | / | 0 | 1 | Signature | |

Paper Reference(s)

**6664/01**

# Edexcel GCE

## Core Mathematics C2

## Advanced Subsidiary

Monday 22 May 2006 – Morning

Time: 1 hour 30 minutes

Examiner's use only

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Team Leader's use only

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| Question Number | Leave Blank |
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**Materials required for examination**
Mathematical Formulae (Green)

**Items included with question papers**
Nil

**Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and/or integration. Thus candidates may NOT use calculators such as the Texas Instruments TI 89, TI 92, Casio CFX 9970G, Hewlett Packard HP 48G.**

### 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.
When a calculator is used, the answer should be given to an appropriate degree of accuracy.
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 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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***Turn over***

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**1.** Find the first 3 terms, in ascending powers of $x$, of the binomial expansion of $(2 + x)^6$, giving each term in its simplest form.

**(4)**

**Q1**

**(Total 4 marks)**

Leave blank

**2.** Use calculus to find the exact value of $\int_1^2 \left(3x^2 + 5 + \frac{4}{x^2}\right) \mathrm{d}x$.

**(5)**

**Q2**

**(Total 5 marks)**



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**3.** (i) Write down the value of $\log_6 36$.

**(1)**

(ii) Express $2 \log_a 3 + \log_a 11$ as a single logarithm to base $a$.

**(3)**

**Q3**

**(Total 4 marks)**



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**4.** $$f(x) = 2x^3 + 3x^2 - 29x - 60.$$

(a) Find the remainder when $f(x)$ is divided by $(x + 2)$.

**(2)**

(b) Use the factor theorem to show that $(x + 3)$ is a factor of $f(x)$.

**(2)**

(c) Factorise $f(x)$ completely.

**(4)**



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**5.** (a) In the space provided, sketch the graph of $y = 3^x$, $x \in \mathbb{R}$, showing the coordinates of the point at which the graph meets the $y$-axis.

**(2)**

(b) Complete the table, giving the values of $3^x$ to 3 decimal places.

| $x$ | 0 | 0.2 | 0.4 | 0.6 | 0.8 | 1 |
|---|---|---|---|---|---|---|
| $3^x$ | | 1.246 | 1.552 | | | 3 |

**(2)**

(c) Use the trapezium rule, with all the values from your table, to find an approximation for the value of $\int_0^1 3^x \mathrm{d}x$.

**(4)**



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**6.** (a) Given that $\sin\theta = 5\cos\theta$, find the value of $\tan\theta$.

**(1)**

(b) Hence, or otherwise, find the values of $\theta$ in the interval $0 \leqslant \theta < 360°$ for which

$$\sin\theta = 5\cos\theta,$$

giving your answers to 1 decimal place.

**(3)**



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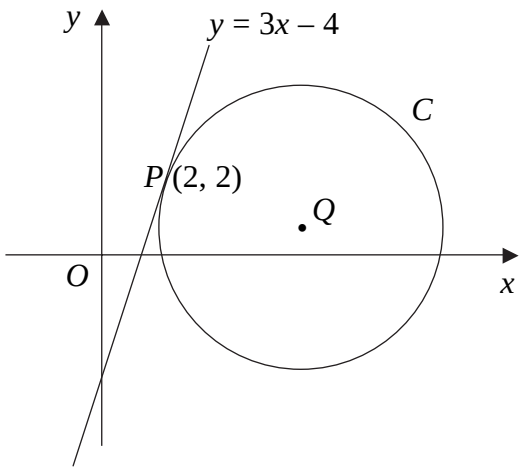
**7.**

**Figure 1**




The line $y = 3x - 4$ is a tangent to the circle $C$, touching $C$ at the point $P\,(2, 2)$, as shown in Figure 1.

The point $Q$ is the centre of $C$.

(a) Find an equation of the straight line through $P$ and $Q$.

**(3)**

Given that $Q$ lies on the line $y = 1$,

(b) show that the $x$-coordinate of $Q$ is 5,

**(1)**

(c) find an equation for $C$.

**(4)**



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**Question 7 continued**

**Q7**

**(Total 8 marks)**

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**8.** **Figure 2**

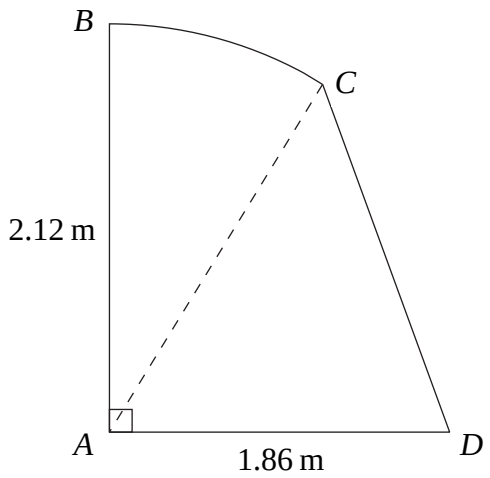


Figure 2 shows the cross section *ABCD* of a small shed.
The straight line *AB* is vertical and has length 2.12 m.
The straight line *AD* is horizontal and has length 1.86 m.
The curve *BC* is an arc of a circle with centre *A*, and *CD* is a straight line.
Given that the size of $\angle BAC$ is 0.65 radians, find

(a) the length of the arc *BC*, in m, to 2 decimal places,

**(2)**

(b) the area of the sector *BAC*, in $m^2$, to 2 decimal places,

**(2)**

(c) the size of $\angle CAD$, in radians, to 2 decimal places,

**(2)**

(d) the area of the cross section *ABCD* of the shed, in $m^2$, to 2 decimal places.

**(3)**



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**Question 8 continued**

**Q8**

**(Total 9 marks)**

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**9.** A geometric series has first term $a$ and common ratio $r$.
The second term of the series is 4 and the sum to infinity of the series is 25.

(a) Show that $25r^2 - 25r + 4 = 0$.

**(4)**

(b) Find the two possible values of $r$.

**(2)**

(c) Find the corresponding two possible values of $a$.

**(2)**

(d) Show that the sum, $S_n$, of the first $n$ terms of the series is given by

$$S_n = 25(1 - r^n).$$

**(1)**

Given that $r$ takes the larger of its two possible values,

(e) find the smallest value of $n$ for which $S_n$ exceeds 24.

**(2)**



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**Question 9 continued**

**(Total 11 marks)**

**Q9**

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**10.** **Figure 3**

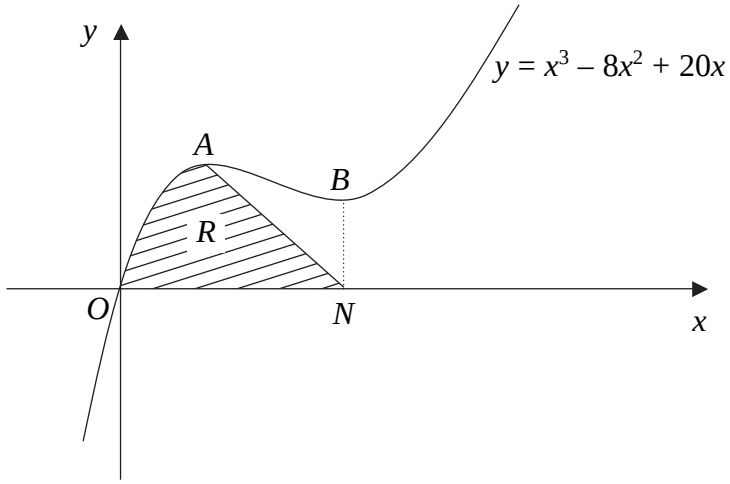


Figure 3 shows a sketch of part of the curve with equation $y = x^3 - 8x^2 + 20x$.
The curve has stationary points $A$ and $B$.

(a) Use calculus to find the $x$-coordinates of $A$ and $B$.

**(4)**

(b) Find the value of $\frac{d^2y}{dx^2}$ at $A$, and hence verify that $A$ is a maximum.

**(2)**

The line through $B$ parallel to the $y$-axis meets the $x$-axis at the point $N$.
The region $R$, shown shaded in Figure 3, is bounded by the curve, the $x$-axis and the line from $A$ to $N$.

(c) Find $\int (x^3 - 8x^2 + 20x)\,dx$.

**(3)**

(d) Hence calculate the exact area of $R$.

**(5)**



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**Question 10 continued**

**Q10**

**(Total 14 marks)**

**TOTAL FOR PAPER: 75 MARKS**

**END**



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