Reference(s)

6664/01

Edexcel GCE

Core Mathematics C2
Advanced Subsidiary

Monday 22 May 2006 – Morning
Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Green)	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

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C2), the paper reference (6664), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
There are 10 questions in this question paper. The total mark for this paper is 75.

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.

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)

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

(5)

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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)

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*) 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*) Copy and 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 tables, to find an approximation for the value of $\int_0^1 3^x \, dx$.

(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 θ in the interval $0 \leq \theta < 360°$ for which

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

giving your answers to 1 decimal place.

(3)

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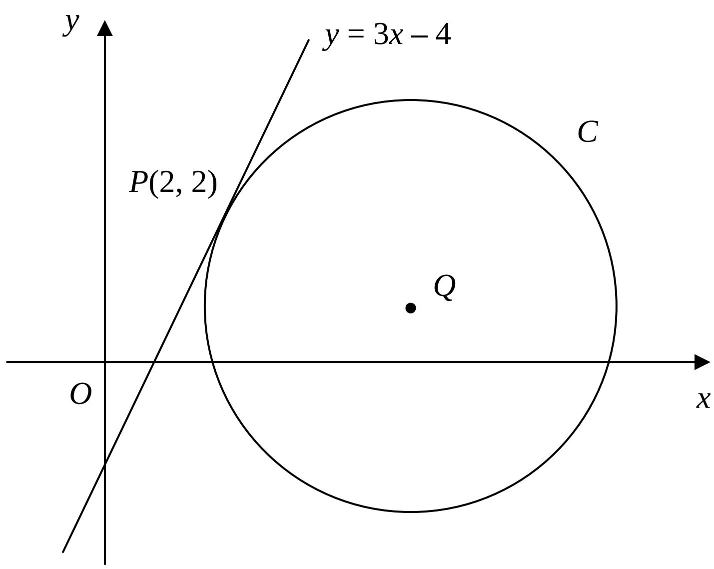
7. **Figure 1**



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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8. **Figure 2**

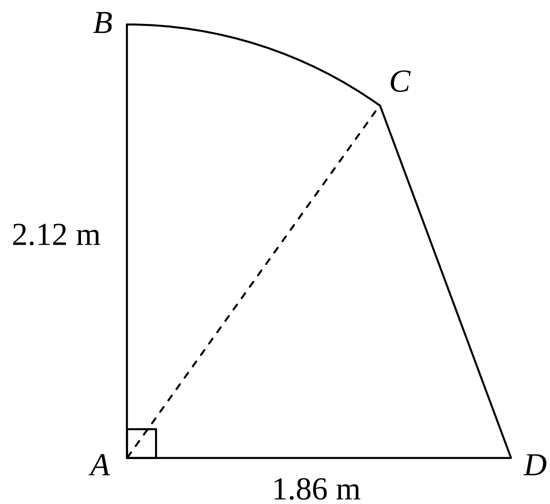

Figure 2 shows the cross-section *ABCD* of a small shed.

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)

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)

10. **Figure 3**

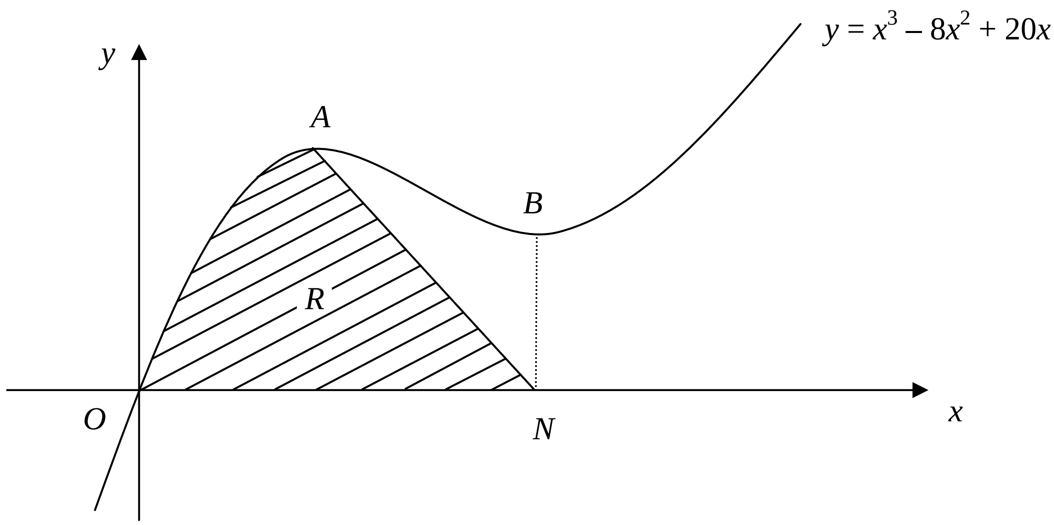

Figure 3 shows a sketch of part of the curve with equation $y = x^3 - 8x^2 + 20x$. The curve has stationary points A and B.

(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)

TOTAL FOR PAPER: 75 MARKS

END