Paper Reference(s)

6664

Edexcel GCE

Core Mathematics C2

Advanced Subsidiary

Tuesday 10 January 2006 – Afternoon

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

In the boxes on the answer book, 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, other name and signature.
When a calculator is used, the answer should be given to an appropriate degree of accuracy.

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 9 questions on this 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.

N23552A

1. $$f(x) = 2x^3 + x^2 - 5x + c, \text{ where } c \text{ is a constant.}$$

Given that $f(1) = 0$,

(*a*) find the value of c,

(2)

(*b*) factorise $f(x)$ completely,

(4)

(*c*) find the remainder when $f(x)$ is divided by $(2x - 3)$.

(2)

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2. (*a*) Find the first 3 terms, in ascending powers of x, of the binomial expansion of

$$(1 + px)^9,$$

where p is a constant.

(2)

The first 3 terms are 1, $36x$ and qx^2, where q is a constant.

(*b*) Find the value of p and the value of q.

(4)

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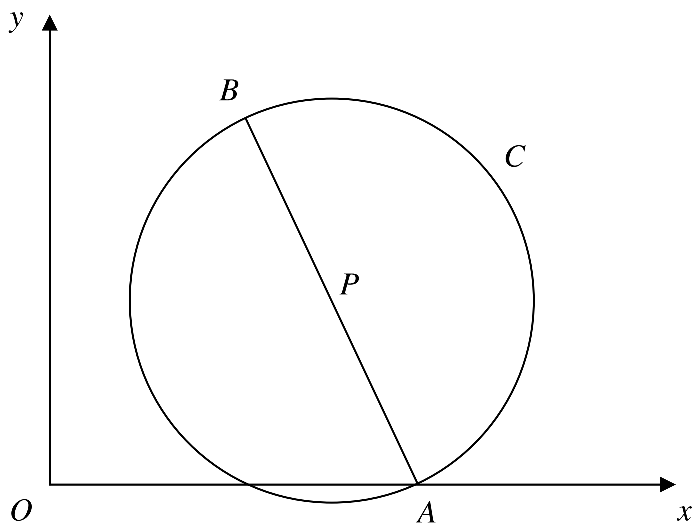
3. **Figure 1**



In Figure 1, $A(4, 0)$ and $B(3, 5)$ are the end points of a diameter of the circle C.

Find

(a) the exact length of AB,

(2)

(b) the coordinates of the midpoint P of AB,

(2)

(c) an equation for the circle C.

(3)

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4. The first term of a geometric series is 120. The sum to infinity of the series is 480.

(a) Show that the common ratio, r, is $\frac{3}{4}$.

(3)

(b) Find, to 2 decimal places, the difference between the 5th and 6th terms.

(2)

(c) Calculate the sum of the first 7 terms.

(2)

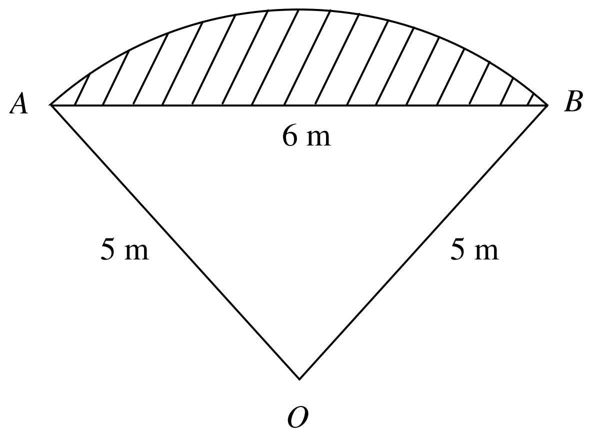
The sum of the first n terms of the series is greater than 300.

(d) Calculate the smallest possible value of n.

(4)

5.

Figure 2



In Figure 2 OAB is a sector of a circle, radius 5 m. The chord AB is 6 m long.

(a) Show that $\cos A\hat{O}B = \frac{7}{25}$.

(2)

(b) Hence find the angle $A\hat{O}B$ in radians, giving your answer to 3 decimal places.

(1)

(c) Calculate the area of the sector OAB.

(2)

(d) Hence calculate the shaded area.

(3)

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6. The speed, v m s^{-1}, of a train at time t seconds is given by

$$v = \sqrt{(1.2^t - 1)}, \qquad 0 \leq t \leq 30.$$

The following table shows the speed of the train at 5 second intervals.

t	0	5	10	15	20	25	30
v	0	1.22	2.28		6.11		

(a) Complete the table, giving the values of v to 2 decimal places.

(3)

The distance, s metres, travelled by the train in 30 seconds is given by

$$s = \int_0^{30} \sqrt{(1.2^t - 1)} \ \ \mathrm{d}t\,.$$

(b) Use the trapezium rule, with all the values from your table, to estimate the value of s.

(3)

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7. The curve C has equation

$$y = 2x^3 - 5x^2 - 4x + 2.$$

(a) Find $\dfrac{dy}{dx}$.

(2)

(b) Using the result from part (a), find the coordinates of the turning points of C.

(4)

(c) Find $\dfrac{d^2y}{dx^2}$.

(2)

(d) Hence, or otherwise, determine the nature of the turning points of C.

(2)

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8. (a) Find all the values of θ, to 1 decimal place, in the interval $0° \leq \theta < 360°$ for which

$$5 \sin (\theta + 30°) = 3.$$

(4)

(b) Find all the values of θ, to 1 decimal place, in the interval $0° \leq \theta < 360°$ for which

$$\tan^2 \theta = 4.$$

(5)

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9. **Figure 3**

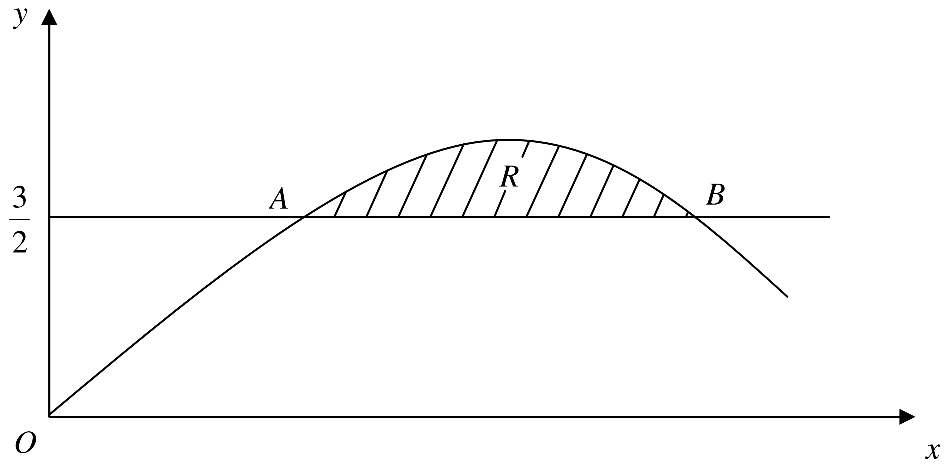

Figure 3 shows the shaded region R which is bounded by the curve $y = -2x^2 + 4x$ and the line $y = \frac{3}{2}$. The points A and B are the points of intersection of the line and the curve.

Find

(a) the x-coordinates of the points A and B,

(4)

(b) the exact area of R.

(6)

TOTAL FOR PAPER: 75 MARKS

END