Paper Reference(s)

6664

Edexcel GCE

Core Mathematics C2

Advanced Subsidiary

Wednesday 19 January 2005 – Morning

Time: 1 hour 30 minutes

<u>Materials required for examination</u>	<u>Items included with question papers</u>
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.
This paper has nine questions.
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.

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1. Find the first three terms, in ascending powers of x, of the binomial expansion of $(3 + 2x)^5$, giving each term in its simplest form.

(4)

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2. The points A and B have coordinates $(5, -1)$ and $(13, 11)$ respectively.

(a) Find the coordinates of the mid-point of AB.

(2)

Given that AB is a diameter of the circle C,

(b) find an equation for C.

(4)

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3. Find, giving your answer to 3 significant figures where appropriate, the value of x for which

(a) $3^x = 5$,

(3)

(b) $\log_2 (2x + 1) - \log_2 x = 2$.

(4)

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4. (a) Show that the equation

$$5 \cos^2 x = 3(1 + \sin x)$$

can be written as

$$5 \sin^2 x + 3 \sin x - 2 = 0.$$

(2)

(b) Hence solve, for $0 \leq x < 360°$, the equation

$$5 \cos^2 x = 3(1 + \sin x),$$

giving your answers to 1 decimal place where appropriate.

(5)

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5. $$f(x) = x^3 - 2x^2 + ax + b, \text{ where } a \text{ and } b \text{ are constants.}$$

When $f(x)$ is divided by $(x - 2)$, the remainder is 1.

When $f(x)$ is divided by $(x + 1)$, the remainder is 28.

(*a*) Find the value of a and the value of b.

(6)

(*b*) Show that $(x - 3)$ is a factor of $f(x)$.

(2)

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6. The second and fourth terms of a geometric series are 7.2 and 5.832 respectively.

The common ratio of the series is positive.

For this series, find

(*a*) the common ratio,

(2)

(*b*) the first term,

(2)

(*c*) the sum of the first 50 terms, giving your answer to 3 decimal places,

(2)

(*d*) the difference between the sum to infinity and the sum of the first 50 terms, giving your answer to 3 decimal places.

(2)

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7. **Figure 1**

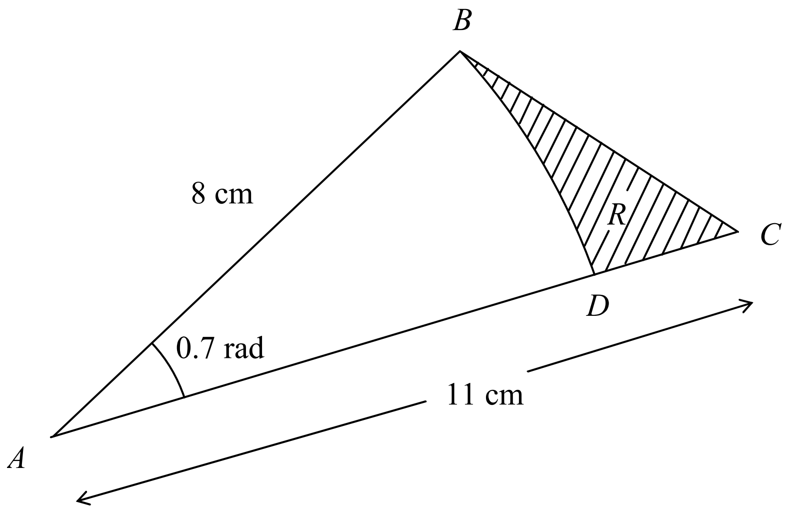


Figure 1 shows the triangle ABC, with $AB = 8$ cm, $AC = 11$ cm and $\angle BAC = 0.7$ radians. The arc BD, where D lies on AC, is an arc of a circle with centre A and radius 8 cm. The region R, shown shaded in Figure 1, is bounded by the straight lines BC and CD and the arc BD.

Find

(*a*) the length of the arc BD,

(2)

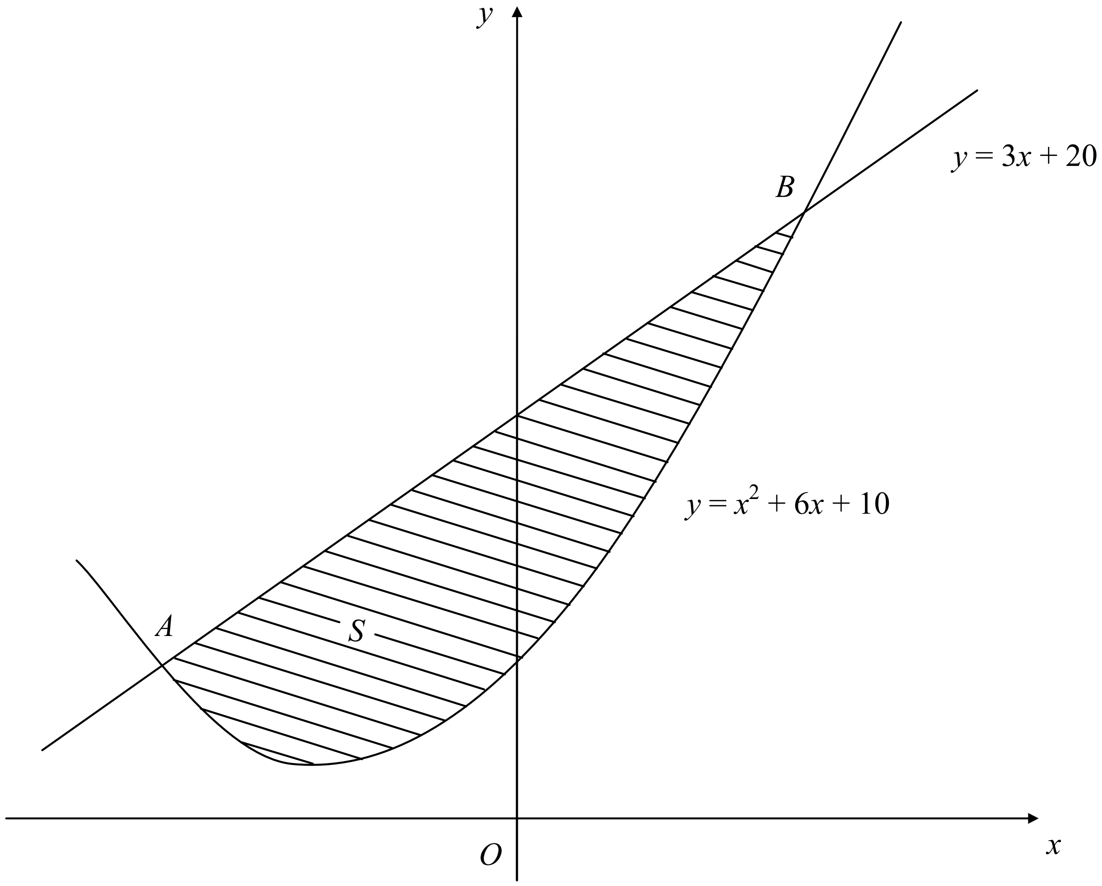
(*b*) the perimeter of R, giving your answer to 3 significant figures,

(4)

(*c*) the area of R, giving your answer to 3 significant figures.

(5)

8. **Figure 2**



The line with equation $y = 3x + 20$ cuts the curve with equation $y = x^2 + 6x + 10$ at the points A and B, as shown in Figure 2.

(a) Use algebra to find the coordinates of A and the coordinates of B.

(5)

The shaded region S is bounded by the line and the curve, as shown in Figure 2.

(b) Use calculus to find the exact area of S.

(7)

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9. **Figure 3**

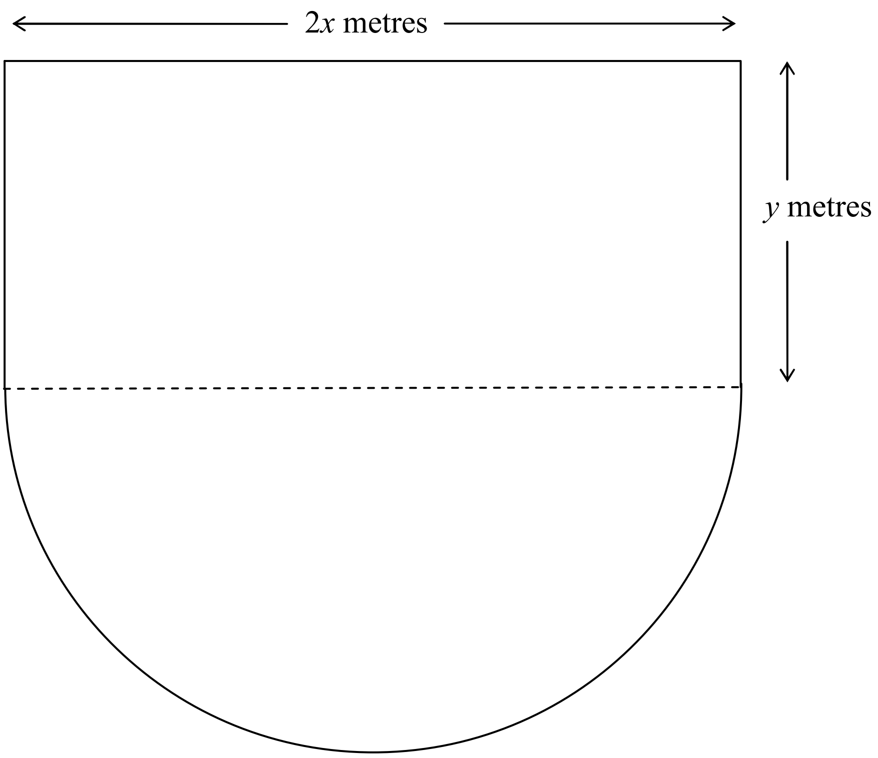

Figure 3 shows the plan of a stage in the shape of a rectangle joined to a semicircle. The length of the rectangular part is $2x$ metres and the width is y metres. The diameter of the semicircular part is $2x$ metres. The perimeter of the stage is 80 m.

(*a*) Show that the area, A m^2, of the stage is given by

$$A = 80x - \left(2 + \frac{\pi}{2}\right)x^2.$$

(4)

(*b*) Use calculus to find the value of x at which A has a stationary value.

(4)

(*c*) Prove that the value of x you found in part (*b*) gives the maximum value of A.

(2)

(*d*) Calculate, to the nearest m^2, the maximum area of the stage.

(2)

TOTAL FOR PAPER: 75 MARKS

END