Paper Reference(s)

**6663**

# Edexcel GCE

## Core Mathematics C2

## Advanced Subsidiary

## Set B: Practice Question Paper 7

Time: 1 hour 30 minutes

| Materials required for examination | Items included with question papers |
| --- | --- |
| Mathematical Formulae | Nil |

**Instructions to Candidates**

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 8 questions.

**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.** $$\mathrm{f}(x) = px^3 + 6x^2 + 12x + q.$$

Given that the remainder when $\mathrm{f}(x)$ is divided by $(x - 1)$ is equal to the remainder when $\mathrm{f}(x)$ is divided by $(2x + 1)$,

($a$) find the value of $p$. **(4)**

Given also that $q = 3$, and $p$ has the value found in part ($a$),

($b$) find the value of the remainder. **(1)**

[P3 June 2003 Question 2]

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**2.** ($a$) Expand $(2\sqrt{x} + 3)^2$. **(2)**

($b$) Hence evaluate $\int_1^2 (2\sqrt{x} + 3)^2 \, \mathrm{d}x$, giving your answer in the form $a + b\sqrt{2}$, where $a$ and $b$ are integers. **(5)**

[P1 November 2003 Question 4]

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**3.** Every £1 of money invested in a savings scheme continuously gains interest at a rate of 4% per year. Hence, after $x$ years, the total value of an initial £1 investment is £$y$, where

$$y = 1.04^x.$$

($a$) Sketch the graph of $y = 1.04^x$, $x \geq 0$. **(2)**

($b$) Calculate, to the nearest £, the total value of an initial £800 investment after 10 years. **(2)**

($c$) Use logarithms to find the number of years it takes to double the total value of any initial investment. **(3)**

[P2 November 2003 Question 2]

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**4.** **Figure 1**

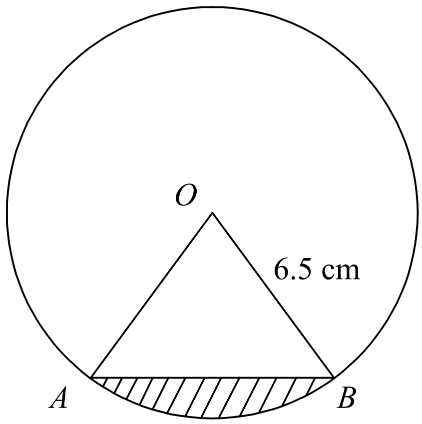


Fig. 1 shows the sector $AOB$ of a circle, with centre $O$ and radius 6.5 cm, and $\angle AOB = 0.8$ radians.

($a$) Calculate, in cm$^2$, the area of the sector $AOB$. **(2)**

($b$) Show that the length of the chord $AB$ is 5.06 cm, to 3 significant figures. **(3)**

The segment $R$, shaded in Fig. 1, is enclosed by the arc $AB$ and the straight line $AB$.

($c$) Calculate, in cm, the perimeter of $R$. **(2)**

[P1 January 2004 Question 2]

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**5.** (*a*) Write down the first 4 terms of the binomial expansion, in ascending powers of $x$, of $(1 + ax)^n$, $n > 2$. **(2)**

Given that, in this expansion, the coefficient of $x$ is 8 and the coefficient of $x^2$ is 30,

(*b*) calculate the value of $n$ and the value of $a$, **(4)**

(*c*) find the coefficient of $x^3$. **(2)**

[P2 November 2003 Question 3]

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**6.** A container made from thin metal is in the shape of a right circular cylinder with height $h$ cm and base radius $r$ cm. The container has no lid. When full of water, the container holds 500 cm$^3$ of water.

(*a*) Show that the exterior surface area, $A$ cm$^2$, of the container is given by $A = \pi r^2 + \dfrac{1000}{r}$. **(4)**

(*b*) Find the value of $r$ for which $A$ is a minimum. **(4)**

(*c*) Prove that this value of $r$ gives a minimum value of $A$. **(2)**

(*d*) Calculate the minimum value of $A$, giving your answer to the nearest integer. **(2)**

[P1 November 2003 Question 6]

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**7.**

**Figure 2**

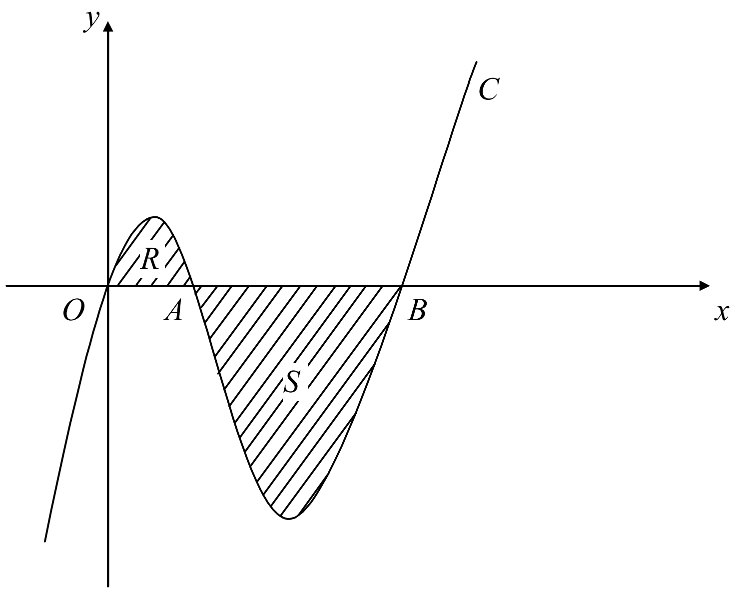


Fig. 2 shows part of the curve $C$ with equation $y = \mathrm{f}(x)$, where $\mathrm{f}(x) = x^3 - 6x^2 + 5x$.
The curve crosses the $x$-axis at the origin $O$ and at the points $A$ and $B$.

(*a*) Factorise $\mathrm{f}(x)$ completely. **(3)**

(*b*) Write down the $x$-coordinates of the points $A$ and $B$. **(1)**

(*c*) Find the gradient of $C$ at $A$. **(3)**

The region $R$ is bounded by $C$ and the line $OA$, and the region $S$ is bounded by $C$ and the line $AB$.

(*d*) Use integration to find the area of the combined regions $R$ and $S$, shown shaded in Fig.2. **(7)**

[P1 November 2003 Question 8]

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**8.** **Figure 3**

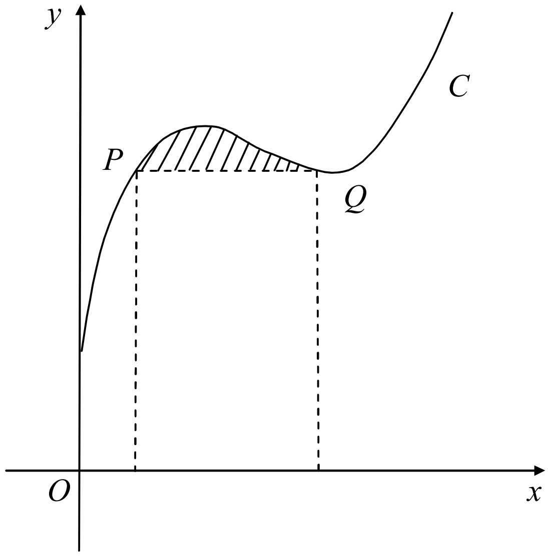


Fig. 3 shows a sketch of part of the curve $C$ with equation $y = x^3 - 7x^2 + 15x + 3, \quad x \geq 0$.

The point $P$, on $C$, has $x$-coordinate 1 and the point $Q$ is the minimum turning point of $C$.

($a$) Find $\frac{\mathrm{d}y}{\mathrm{d}x}$. **(2)**

($b$) Find the coordinates of $Q$. **(4)**

($c$) Show that $PQ$ is parallel to the $x$-axis. **(2)**

($d$) Calculate the area, shown shaded in Fig. 3, bounded by $C$ and the line $PQ$. **(6)**

[P1 June 2004 Question 8]