

GCE Examinations  
Advanced Subsidiary

## **Core Mathematics C2**

Paper B

Time: 1 hour 30 minutes

### *Instructions and Information*

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Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and/or integration.

Full marks may be obtained for answers to ALL questions.

Mathematical formulae and statistical tables are available.

This paper has nine questions.

### *Advice to Candidates*

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You must show sufficient working to make your methods clear to an examiner.  
Answers without working may gain no credit.



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1. Solve the equation

$$\log_5 (4x + 3) - \log_5 (x - 1) = 2. \quad (4)$$

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2. Given that

$$\int_1^3 (x^2 - 2x + k) \, dx = 8\frac{2}{3},$$

find the value of the constant  $k$ . (6)

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3. For the binomial expansion in ascending powers of  $x$  of  $(1 + \frac{1}{4}x)^n$ , where  $n$  is an integer and  $n \geq 2$ ,

(a) find and simplify the first three terms, (3)

(b) find the value of  $n$  for which the coefficient of  $x$  is equal to the coefficient of  $x^2$ . (3)

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4. Solve, for  $0 \leq x < 360$ , the equation

$$3 \cos^2 x^\circ + \sin^2 x^\circ + 5 \sin x^\circ = 0. \quad (7)$$

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5. The circle  $C$  has centre  $(-1, 6)$  and radius  $2\sqrt{5}$ .

(a) Find an equation for  $C$ . (2)

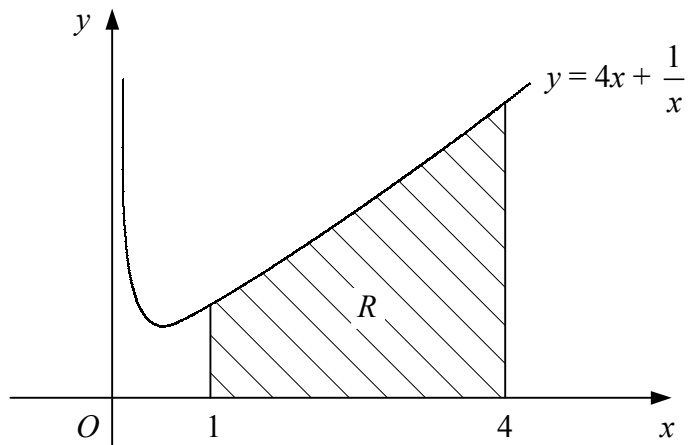
The line  $y = 3x - 1$  intersects  $C$  at the points  $A$  and  $B$ .

(b) Find the  $x$ -coordinates of  $A$  and  $B$ . (4)

(c) Show that  $AB = 2\sqrt{10}$ . (3)

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6.



**Figure 1**

Figure 1 shows the curve with equation  $y = 4x + \frac{1}{x}$ ,  $x > 0$ .

- (a) Find the coordinates of the minimum point of the curve. **(5)**

The shaded region  $R$  is bounded by the curve, the  $x$ -axis and the lines  $x = 1$  and  $x = 4$ .

- (b) Use the trapezium rule with three intervals of equal width to estimate the area of  $R$ . **(5)**

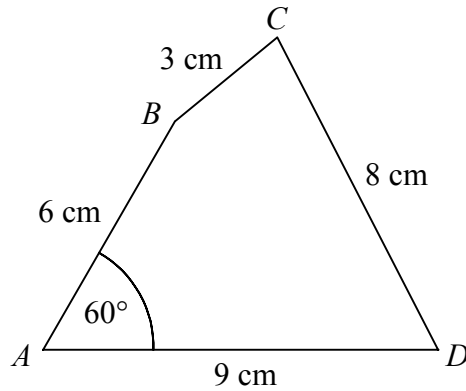
7. A student completes a mathematics course and begins to work through past exam papers. He completes the first paper in 2 hours and the second in 1 hour 54 minutes.

Assuming that the times he takes to complete successive papers form a geometric sequence,

- (a) find, to the nearest minute, how long he will take to complete the fifth paper, **(3)**
- (b) show that the total time he takes to complete the first eight papers is approximately 13 hours 28 minutes, **(3)**
- (c) find the least number of papers he must work through if he is to complete a paper in less than one hour. **(4)**

**Turn over**

8.



**Figure 2**

Figure 2 shows the quadrilateral  $ABCD$  in which  $AB = 6$  cm,  $BC = 3$  cm,  $CD = 8$  cm,  $AD = 9$  cm and  $\angle BAD = 60^\circ$ .

- (a) Using the cosine rule, show that  $BD = 3\sqrt{7}$  cm. (4)
- (b) Find the size of  $\angle BCD$  in degrees. (3)
- (c) Find the area of quadrilateral  $ABCD$ . (3)
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9.

$$f(x) = x^3 - 9x^2 + 24x - 16.$$

- (a) Evaluate  $f(1)$  and hence state a linear factor of  $f(x)$ . (2)
- (b) Show that  $f(x)$  can be expressed in the form

$$f(x) = (x + p)(x + q)^2,$$

where  $p$  and  $q$  are integers to be found. (4)

- (c) Sketch the curve  $y = f(x)$ . (2)
- (d) Using integration, find the area of the region enclosed by the curve  $y = f(x)$  and the  $x$ -axis. (5)
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**END**