

GCE Examinations  
Advanced Subsidiary

## Core Mathematics C2

Paper 1

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.

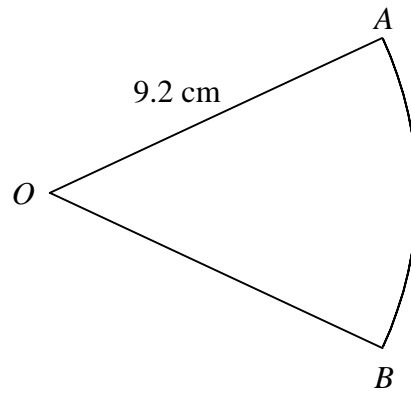
**Figure 1**

Figure 1 shows the sector  $OAB$  of a circle of radius 9.2 cm and centre  $O$ .

Given that the area of the sector is  $37.4 \text{ cm}^2$ , find to 3 significant figures

- (a) the size of  $\angle AOB$  in radians, (2)
- (b) the perimeter of the sector. (2)

2. The first three terms of a geometric series are  $(p - 1)$ , 2 and  $(2p + 5)$  respectively, where  $p$  is a constant.

Find the two possible values of  $p$ . (5)

3. Find the area of the finite region enclosed by the curve  $y = 5x - x^2$  and the  $x$ -axis. (6)

4. Solve the equation

$$\sin^2 \theta = 4 \cos \theta,$$

for values of  $\theta$  in the interval  $0 \leq \theta \leq 360^\circ$ . (7)

5. Given that

$$f(x) = x^3 + 7x^2 + px - 6,$$

and that  $x = -3$  is a solution to the equation  $f(x) = 0$ ,

- (a) find the value of the constant  $p$ , (2)
- (b) show that when  $f(x)$  is divided by  $(x - 2)$  there is a remainder of 50, (2)
- (c) find the other solutions to the equation  $f(x) = 0$ , giving your answers to 2 decimal places. (5)
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6. The circle  $C$  has the equation

$$x^2 + y^2 - 12x + 8y + 16 = 0.$$

- (a) Find the coordinates of the centre of  $C$ . (2)
- (b) Find the radius of  $C$ . (2)
- (c) Sketch  $C$ . (2)

Given that  $C$  crosses the  $x$ -axis at the points  $A$  and  $B$ ,

- (d) find the length  $AB$ , giving your answer in the form  $k\sqrt{5}$ . (4)
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7. Given that for small values of  $x$

$$(1 + ax)^n \approx 1 - 24x + 270x^2,$$

where  $n$  is an integer and  $n > 1$ ,

- (a) show that  $n = 16$  and find the value of  $a$ , (7)
- (b) use your value of  $a$  and a suitable value of  $x$  to estimate the value of  $(0.9985)^{16}$ , giving your answer to 5 decimal places. (3)
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**Turn over**

8. (a) Given that

$$\log_2 (y - 1) = 1 + \log_2 x,$$

show that

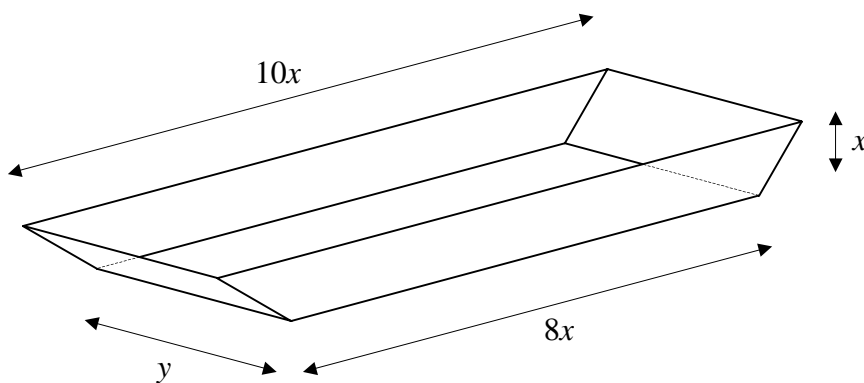
$$y = 2x + 1. \quad (3)$$

- (b) Solve the simultaneous equations

$$\log_2 (y - 1) = 1 + \log_2 x$$

$$2 \log_3 y = 2 + \log_3 x \quad (7)$$

9.



**Figure 2**

Figure 2 shows a tray made from sheet metal.

The horizontal base is a rectangle measuring  $8x$  cm by  $y$  cm and the two vertical sides are trapezia of height  $x$  cm with parallel edges of length  $8x$  cm and  $10x$  cm. The remaining two sides are rectangles inclined at  $45^\circ$  to the horizontal.

Given that the capacity of the tray is  $900 \text{ cm}^3$ ,

- (a) find an expression for  $y$  in terms of  $x$ , (3)
- (b) show that the area of metal used to make the tray,  $A \text{ cm}^2$ , is given by

$$A = 18x^2 + \frac{200(4 + \sqrt{2})}{x}, \quad (4)$$

- (c) find to 3 significant figures, the value of  $x$  for which  $A$  is stationary, (4)
- (d) find the minimum value of  $A$  and show that it is a minimum. (3)

**END**