

**ADVANCED SUBSIDIARY GCE**

**MATHEMATICS**

Core Mathematics 2

**4722**

**QUESTION PAPER**

Candidates answer on the Printed Answer Book

**OCR Supplied Materials:**

- Printed Answer Book 4722
- List of Formulae (MF1)

**Other Materials Required:**

- Scientific or graphical calculator

**Thursday 27 May 2010**  
**Morning**

**Duration:** 1 hour 30 minutes

**INSTRUCTIONS TO CANDIDATES**

These instructions are the same on the Printed Answer Book and the Question Paper.

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Printed Answer Book.
- **The questions are on the inserted Question Paper.**
- **Write your answer to each question in the space provided in the Printed Answer Book.** Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are permitted to use a graphical calculator in this paper.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.

**INFORMATION FOR CANDIDATES**

This information is the same on the Printed Answer Book and the Question Paper.

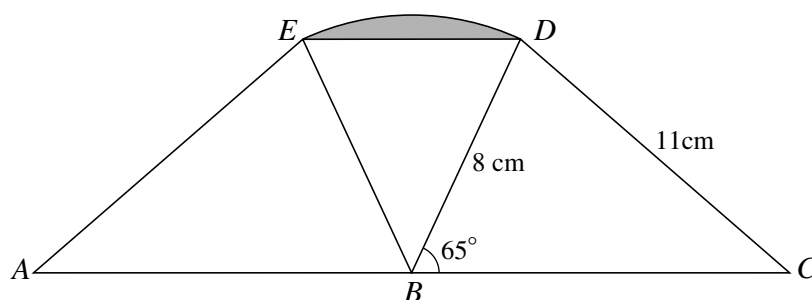
- The number of marks is given in brackets [ ] at the end of each question or part question on the Question Paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **4** pages. Any blank pages are indicated.

**INSTRUCTION TO EXAMS OFFICER / INVIGILATOR**

- Do not send this Question Paper for marking; it should be retained in the centre or destroyed.

- 1 The cubic polynomial  $f(x)$  is defined by  $f(x) = x^3 + ax^2 - ax - 14$ , where  $a$  is a constant.
- (i) Given that  $(x - 2)$  is a factor of  $f(x)$ , find the value of  $a$ . [3]
- (ii) Using this value of  $a$ , find the remainder when  $f(x)$  is divided by  $(x + 1)$ . [2]
- 2 (i) Use the trapezium rule, with 3 strips each of width 3, to estimate the area of the region bounded by the curve  $y = \sqrt[3]{7+x}$ , the  $x$ -axis, and the lines  $x = 1$  and  $x = 10$ . Give your answer correct to 3 significant figures. [4]
- (ii) Explain how the trapezium rule could be used to obtain a more accurate estimate of the area. [1]
- 3 (i) Find and simplify the first four terms in the binomial expansion of  $(1 + \frac{1}{2}x)^{10}$  in ascending powers of  $x$ . [4]
- (ii) Hence find the coefficient of  $x^3$  in the expansion of  $(3 + 4x + 2x^2)(1 + \frac{1}{2}x)^{10}$ . [3]
- 4 A sequence  $u_1, u_2, u_3, \dots$  is defined by  $u_n = 5n + 1$ .
- (i) State the values of  $u_1, u_2$  and  $u_3$ . [1]
- (ii) Evaluate  $\sum_{n=1}^{40} u_n$ . [3]
- Another sequence  $w_1, w_2, w_3, \dots$  is defined by  $w_1 = 2$  and  $w_{n+1} = 5w_n + 1$ .
- (iii) Find the value of  $p$  such that  $u_p = w_3$ . [3]

5



The diagram shows two congruent triangles,  $BCD$  and  $BAE$ , where  $ABC$  is a straight line. In triangle  $BCD$ ,  $BD = 8$  cm,  $CD = 11$  cm and angle  $CBD = 65^\circ$ . The points  $E$  and  $D$  are joined by an arc of a circle with centre  $B$  and radius 8 cm.

- (i) Find angle  $BCD$ . [2]
- (ii) (a) Show that angle  $EBD$  is 0.873 radians, correct to 3 significant figures. [2]
- (b) Hence find the area of the shaded segment bounded by the chord  $ED$  and the arc  $ED$ , giving your answer correct to 3 significant figures. [4]

- 6 (a) Use integration to find the exact area of the region enclosed by the curve  $y = x^2 + 4x$ , the  $x$ -axis and the lines  $x = 3$  and  $x = 5$ . [4]
- (b) Find  $\int (2 - 6\sqrt{y}) \, dy$ . [3]
- (c) Evaluate  $\int_1^{\infty} \frac{8}{x^3} \, dx$ . [4]
- 7 (i) Show that  $\frac{\sin^2 x - \cos^2 x}{1 - \sin^2 x} \equiv \tan^2 x - 1$ . [2]
- (ii) Hence solve the equation
- $$\frac{\sin^2 x - \cos^2 x}{1 - \sin^2 x} = 5 - \tan x,$$
- for  $0^\circ \leq x \leq 360^\circ$ . [6]
- 8 (a) Use logarithms to solve the equation  $5^{3w-1} = 4^{250}$ , giving the value of  $w$  correct to 3 significant figures. [5]
- (b) Given that  $\log_x(5y + 1) - \log_x 3 = 4$ , express  $y$  in terms of  $x$ . [4]
- 9 A geometric progression has first term  $a$  and common ratio  $r$ , and the terms are all different. The first, second and fourth terms of the geometric progression form the first three terms of an arithmetic progression.
- (i) Show that  $r^3 - 2r + 1 = 0$ . [3]
- (ii) Given that the geometric progression converges, find the exact value of  $r$ . [5]
- (iii) Given also that the sum to infinity of this geometric progression is  $3 + \sqrt{5}$ , find the value of the integer  $a$ . [4]

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**MATHEMATICS**

Core Mathematics 2

**4722**

**PRINTED ANSWER BOOK**

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**Thursday 27 May 2010**  
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Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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<b>1 (i)</b>	
<b>1 (ii)</b>	



<b>3 (i)</b>	
<b>3 (ii)</b>	



<b>4 (i)</b>	
<b>4 (ii)</b>	
<b>4 (iii)</b>	

<b>5 (i)</b>	
<b>5 (ii) (a)</b>	
<b>5 (ii) (b)</b>	

<b>6 (a)</b>	
<b>6 (b)</b>	
<b>6 (c)</b>	

<b>7 (i)</b>	
<b>7 (ii)</b>	

<b>8 (a)</b>	

<b>8 (b)</b>	

<b>9 (i)</b>	
<b>9 (ii)</b>	

<b>9 (iii)</b>	

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