

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
AS GCE  
4722/01  
MATHEMATICS  
Core Mathematics 2  
QUESTION PAPER**

**FRIDAY 18 JANUARY 2013: Afternoon  
DURATION: 1 hour 30 minutes  
plus your additional time allowance  
MODIFIED ENLARGED 24pt**

**Candidates answer on the Printed Answer Book or any suitable paper provided by the centre. The Printed Answer Book may be enlarged by the centre.**

**OCR SUPPLIED MATERIALS:**

**Printed Answer Book 4722/01  
List of Formulae (MF1)**

**OTHER MATERIALS REQUIRED:**

**Scientific or graphical calculator**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

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

- **The Question Paper will be found in the centre of the Printed Answer Book.**
- **Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.**
- **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. HB pencil may be used for graphs and diagrams only.**
- **Answer ALL the questions.**
- **Read each question carefully. Make sure you know what you have to do before starting your answer.**

- You are permitted to use a scientific or 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.**

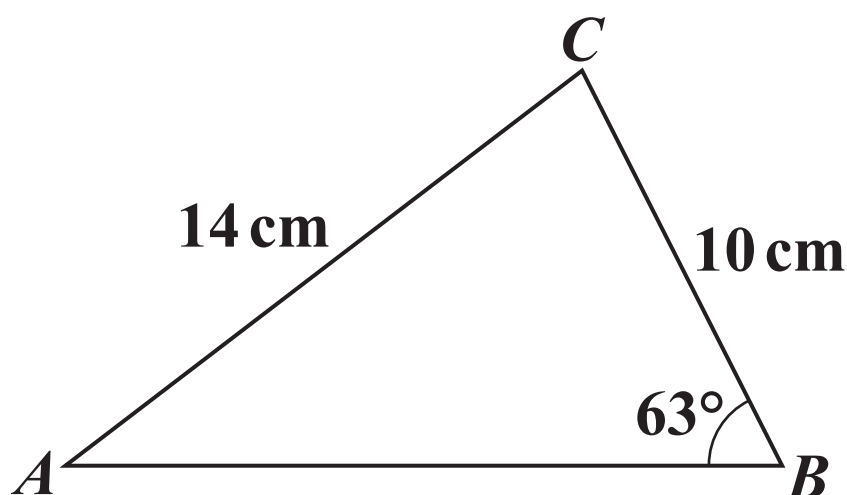
- The number of marks is given in brackets [ ] at the end of each question or part question on the Question Paper.
- **YOU ARE REMINDED OF THE NEED FOR CLEAR PRESENTATION IN YOUR ANSWERS.**
- The total number of marks for this paper is 72.
- The Printed Answer Book consists of 12 pages. The Question Paper consists of 16 pages. Any blank pages are indicated.

## **INSTRUCTIONS TO EXAMS OFFICER/ INVIGILATOR**

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**1 Look at the following diagram.**



**The diagram above shows triangle  $ABC$ , with  $AC = 14\text{ cm}$ ,  $BC = 10\text{ cm}$  and angle  $ABC = 63^\circ$ .**

- (i) Find angle  $CAB$ . [2]**
- (ii) Find the length of  $AB$ . [2]**

**2 A sequence  $u_1, u_2, u_3, \dots$  is defined by**

$$u_1 = 7 \quad \text{and} \quad u_{n+1} = u_n + 4 \quad \text{for } n \geq 1.$$

**(i) Show that  $u_{17} = 71$ . [2]**

**(ii) Show that  $\sum_{n=1}^{35} u_n = \sum_{n=36}^{50} u_n$ . [4]**

**3 A curve has an equation which satisfies**

$$\frac{dy}{dx} = kx(2x - 1) \quad \text{for all values of } x. \quad \text{The point}$$

**$P(2, 7)$  lies on the curve and the gradient of the curve at  $P$  is 9.**

**(i) Find the value of the constant  $k$ . [2]**

**(ii) Find the equation of the curve. [5]**

**4 (i) Find the binomial expansion of  $(2 + x)^5$ , simplifying the terms. [4]**

**(ii) Hence find the coefficient of  $y^3$  in the expansion of  $(2 + 3y + y^2)^5$ . [3]**

**5 (i) Show that the equation**

**$2 \sin x = \frac{4 \cos x - 1}{\tan x}$  can be expressed in the form**

$$6 \cos^2 x - \cos x - 2 = 0. \quad [3]$$

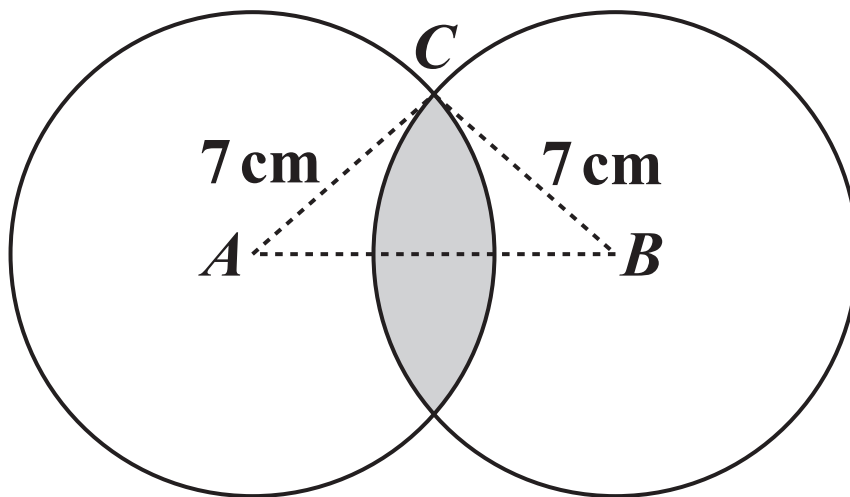
**(ii) Hence solve the equation**

**$2 \sin x = \frac{4 \cos x - 1}{\tan x}$ , giving all values of  $x$  between  $0^\circ$  and  $360^\circ$ . [4]**



- 6 (i) The first three terms of an arithmetic progression are  $2x$ ,  $x + 4$  and  $2x - 7$  respectively. Find the value of  $x$ . [3]**
- (ii) The first three terms of another sequence are also  $2x$ ,  $x + 4$  and  $2x - 7$  respectively.**
- (a) Verify that when  $x = 8$  the terms form a geometric progression and find the sum to infinity in this case. [4]**
- (b) Find the other possible value of  $x$  that also gives a geometric progression. [4]**

**7 Look at the following diagram.**



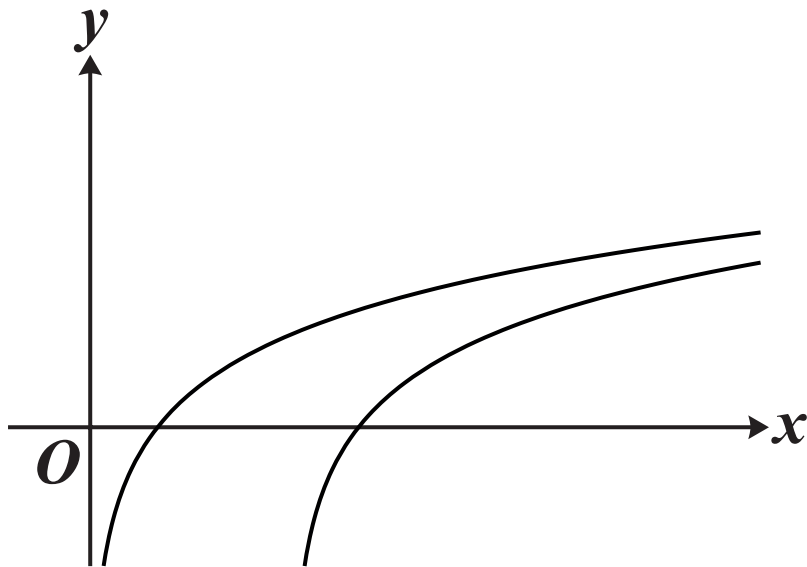
**The diagram above shows two circles of radius  $7\text{ cm}$  with centres  $A$  and  $B$ . The distance  $AB$  is  $12\text{ cm}$  and the point  $C$  lies on both circles. The region common to both circles is shaded.**

- (i) Show that angle  $CAB$  is  $0.5411$  radians, correct to 4 significant figures. [2]**
- (ii) Find the perimeter of the shaded region. [2]**
- (iii) Find the area of the shaded region. [5]**

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**[Questions 8 and 9 are printed overleaf.]**

**8 Look at the following diagram.**



**The diagram above shows the curves  $y = \log_2 x$  and  $y = \log_2(x - 3)$ .**

- (i) Describe the geometrical transformation that transforms the curve  $y = \log_2 x$  to the curve  $y = \log_2(x - 3)$ . [2]**
- (ii) The curve  $y = \log_2 x$  passes through the point  $(a, 3)$ . State the value of  $a$ . [1]**
- (iii) The curve  $y = \log_2(x - 3)$  passes through the point  $(b, 1.8)$ . Find the value of  $b$ , giving your answer correct to 3 significant figures. [2]**

- (iv) The point  $P$  lies on  $y = \log_2 x$  and has an  $x$ -coordinate of  $c$ . The point  $Q$  lies on  $y = \log_2 (x - 3)$  and also has an  $x$ -coordinate of  $c$ . Given that the distance  $PQ$  is 4 units find the exact value of  $c$ . [4]

9 The positive constant  $a$  is such that

$$\int_a^{2a} \frac{2x^3 - 5x^2 + 4}{x^2} dx = 0.$$

- (i) Show that  $3a^3 - 5a^2 + 2 = 0$ . [6]
- (ii) Show that  $a = 1$  is a root of  $3a^3 - 5a^2 + 2 = 0$ , and hence find the other possible value of  $a$ , giving your answer in simplified surd form. [6]

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