



**Friday 18 January 2013 – Afternoon**

**AS GCE MATHEMATICS**

**4722/01** Core Mathematics 2

**QUESTION PAPER**

Candidates answer on the Printed Answer Book.

**OCR supplied materials:**

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

**Other materials required:**

- Scientific or graphical calculator

**Duration:** 1 hour 30 minutes



**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.
- Do **not** write in the bar codes.
- 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.

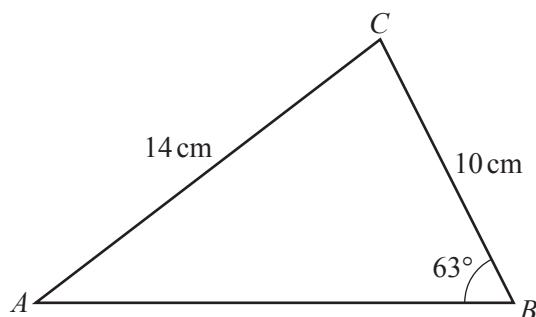
- The number of marks is given in brackets [ ] at the end of each question or part question on the Question Paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question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

**INSTRUCTIONS TO EXAMS OFFICER/INVIGILATOR**

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## 2

1



The diagram shows triangle  $ABC$ , with  $AC = 14$  cm,  $BC = 10$  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  $\frac{dy}{dx} = kx(2x - 1)$  for all values of  $x$ . 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

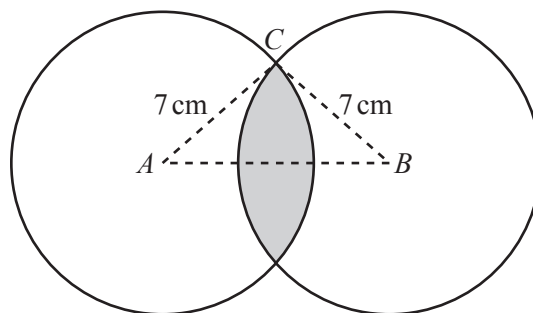
$$6 \cos^2 x - \cos x - 2 = 0. \quad [3]$$

(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]

## 3

- 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

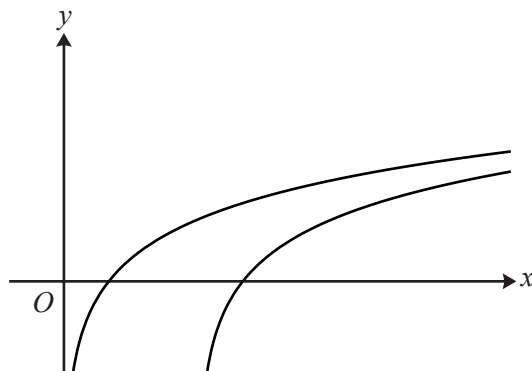


The diagram shows two circles of radius 7 cm with centres  $A$  and  $B$ . The distance  $AB$  is 12 cm and the point  $C$  lies on both circles. The region common to both circles is shaded.

- (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]

[Questions 8 and 9 are printed overleaf.]

8



The diagram 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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