OCR
RECOGNISING ACHIEVEMENT

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

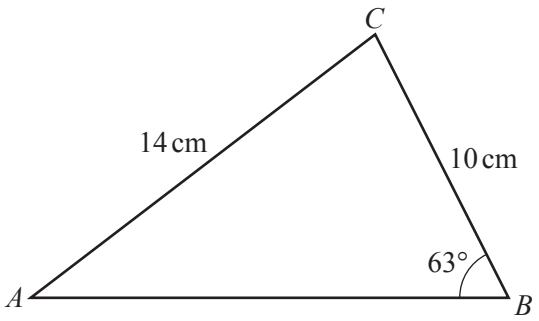
This information is the same on the Printed Answer Book and the Question Paper.

- 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

- Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.

1



The diagram shows triangle ABC, with $AC = 14$ cm, $BC = 10$ cm and angle $ABC = 63°$.

(i) Find angle CAB. **[2]**

(ii) Find the length of AB. **[2]**

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

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

(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 $\frac{\mathrm{d}y}{\mathrm{d}x} = kx(2x - 1)$ 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

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

(ii) Hence solve the equation $2\sin x = \frac{4\cos x - 1}{\tan x}$, giving all values of x between 0° and 360°. **[4]**

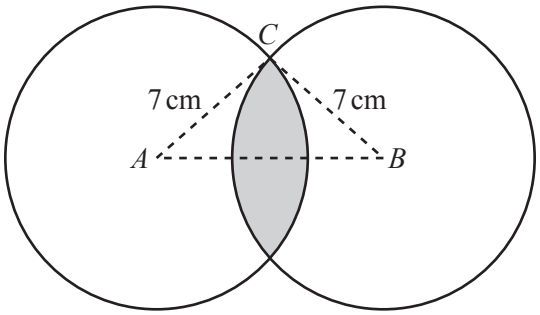
6 **(i)** The first three terms of an arithmetic progression are $2x$, $x + 4$ and $2x - 7$ respectively. Find the value of x. **[3]**

(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



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.

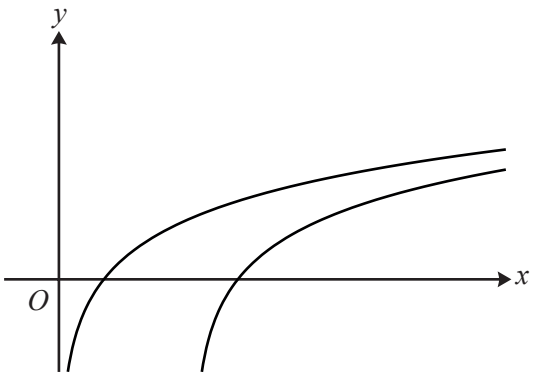
(i) Show that angle CAB is 0.5411 radians, correct to 4 significant figures. **[2]**

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

(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]**