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 18pt

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

DC (KN/SW) 1465548238 72445/1

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

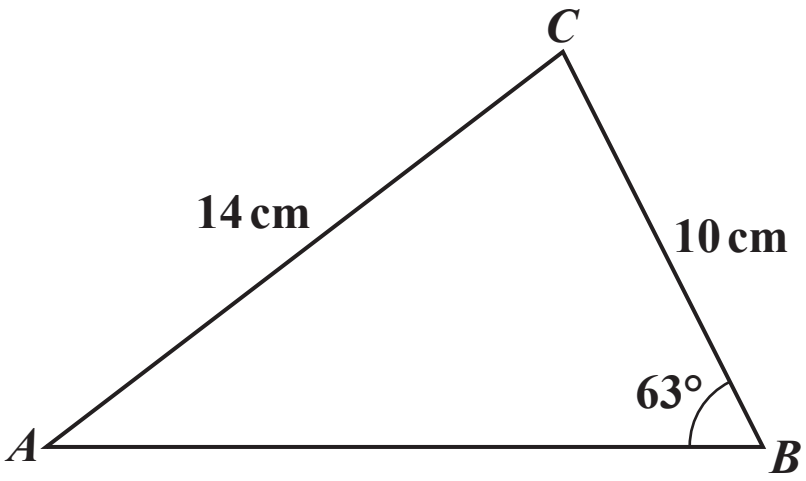
This information is the same on the Printed Answer Book and the Question Paper.

- **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 12 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 Look at the following diagram.



The diagram above 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

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

(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 $\frac{dy}{dx} = kx(2x - 1)$ 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

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

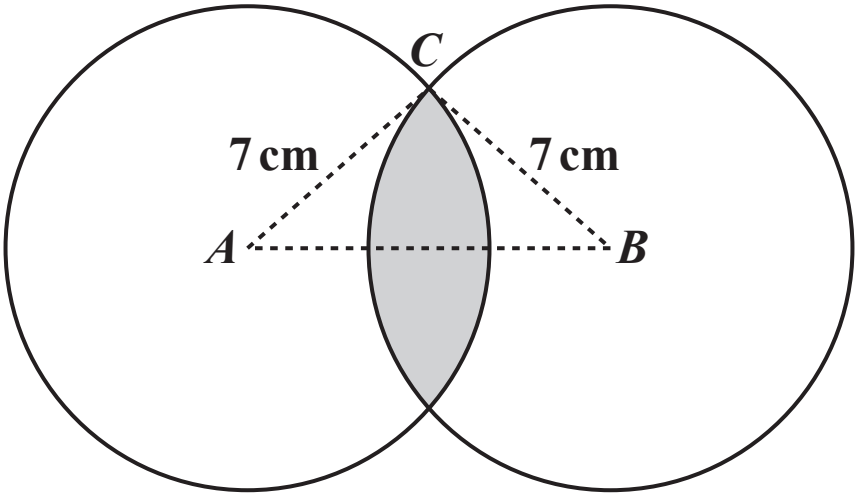
6 (i) The first three terms of an arithmetic progression are $2x$, $x + 4$ and $2x - 7$ respectively. Find the value of x. [3]

(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 Look at the following diagram.



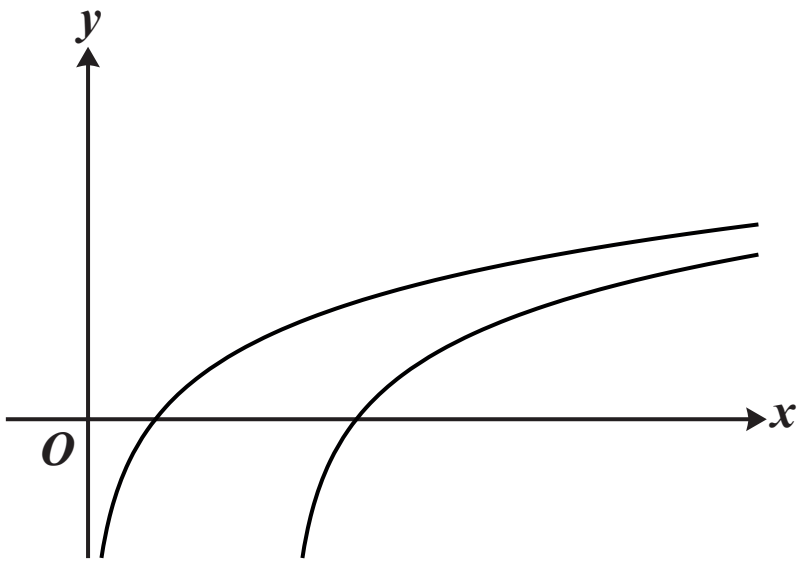
The diagram above shows two circles of radius 7 cm with centres *A* and *B*. The distance *AB* is 12 cm and the point *C* lies on both circles. The region common to both circles is shaded.

(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]

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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