

**Friday 18 January 2013 – Afternoon**

**AS GCE MATHEMATICS**

**4722/01** Core Mathematics 2

**QUESTION PAPER**

Candidates answer on the Printed Answer Book.

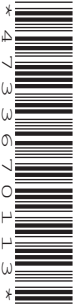
**OCR supplied materials:**

- 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**

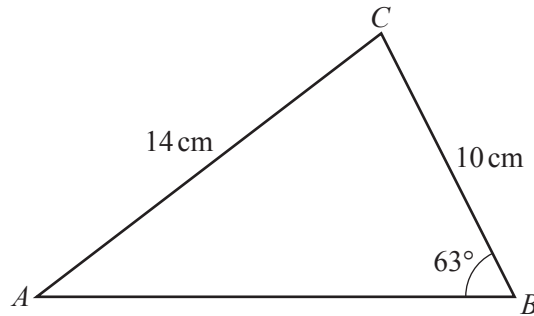
This information is the same on the Printed Answer Book and the Question Paper.

- 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  $ABC = 63^\circ$ .

(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]

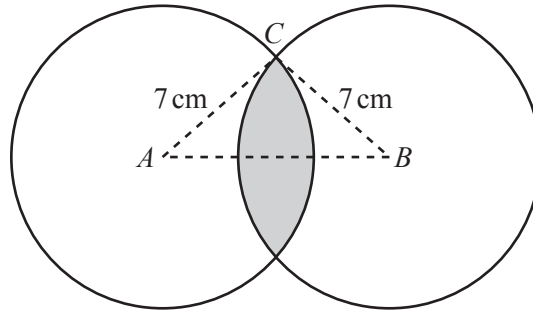
5 (i) Show that the equation  $2 \sin x = \frac{4 \cos x - 1}{\tan x}$  can be expressed in the form

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

(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]

- 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]

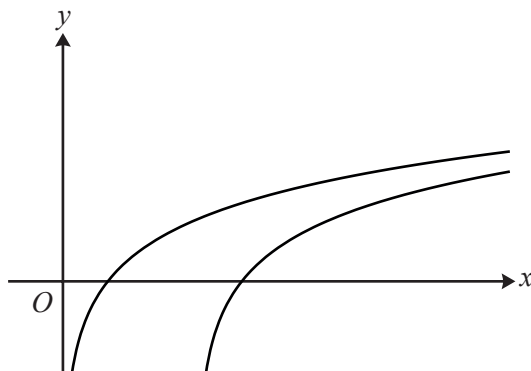
7



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.]



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]

**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.