

Friday 18 May 2012 – Morning

AS GCE MATHEMATICS

4722 Core Mathematics 2

QUESTION PAPER

Candidates answer on the Printed Answer Book.

OCR supplied materials:

- Printed Answer Book 4722
- 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.

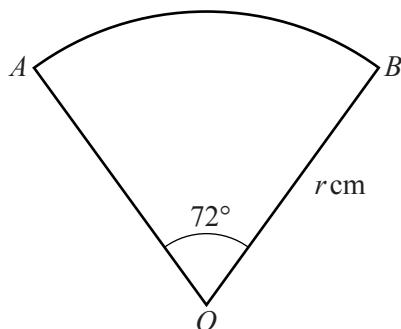
- The number of marks is given in brackets [] at the end of each question or part question on the Question Paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question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

INSTRUCTION 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 (i) Find the binomial expansion of $(3 + 2x)^5$, simplifying the terms. [4]
 (ii) Hence find the binomial expansion of $(3 + 2x)^5 + (3 - 2x)^5$. [2]
- 2 (i) Find $\int (x^2 - 2x + 5) dx$. [3]
 (ii) Hence find the equation of the curve for which $\frac{dy}{dx} = x^2 - 2x + 5$ and which passes through the point $(3, 11)$. [3]

3



The diagram shows a sector AOB of a circle, centre O and radius r cm. Angle AOB is 72° .

- (i) Express 72° exactly in radians, simplifying your answer. [1]

The area of the sector AOB is 45π cm².

- (ii) Find the value of r . [2]
 (iii) Find the area of the segment bounded by the arc AB and the chord AB , giving your answer correct to 3 significant figures. [3]

4 Solve the equation

$$4 \cos^2 x + 7 \sin x - 7 = 0,$$

giving all values of x between 0° and 360° . [6]

5 (a) A sequence u_1, u_2, u_3, \dots is defined by

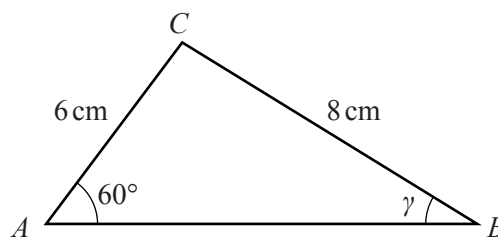
$$u_1 = 4 \quad \text{and} \quad u_{n+1} = \frac{2}{u_n} \quad \text{for } n \geq 1.$$

- (i) Write down the values of u_2 and u_3 . [2]
 (ii) Describe the behaviour of the sequence. [1]
- (b) In an arithmetic progression the ninth term is 18 and the sum of the first nine terms is 72. Find the first term and the common difference. [5]

- 6 (i) Use the trapezium rule, with 2 strips each of width 4, to show that an approximate value of $\int_1^9 4\sqrt{x} \, dx$ is $32 + 16\sqrt{5}$. [3]
- (ii) Use a sketch graph to explain why the actual value of $\int_1^9 4\sqrt{x} \, dx$ is greater than $32 + 16\sqrt{5}$. [2]
- (iii) Use integration to find the exact value of $\int_1^9 4\sqrt{x} \, dx$. [4]

- 7 (a) (i) Given that α is the acute angle such that $\tan \alpha = \frac{2}{5}$, find the exact value of $\cos \alpha$. [2]
- (ii) Given that β is the obtuse angle such that $\sin \beta = \frac{3}{7}$, find the exact value of $\cos \beta$. [3]

(b)



The diagram shows a triangle ABC with $AC = 6$ cm, $BC = 8$ cm, angle $BAC = 60^\circ$ and angle $ABC = \gamma$. Find the exact value of $\sin \gamma$, simplifying your answer. [3]

- 8 Two cubic polynomials are defined by

$$f(x) = x^3 + (a - 3)x + 2b, \quad g(x) = 3x^3 + x^2 + 5ax + 4b,$$

where a and b are constants.

- (i) Given that $f(x)$ and $g(x)$ have a common factor of $(x - 2)$, show that $a = -4$ and find the value of b . [6]
- (ii) Using these values of a and b , factorise $f(x)$ fully. Hence show that $f(x)$ and $g(x)$ have two common factors. [5]
- 9 (a) An arithmetic progression has first term $\log_2 27$ and common difference $\log_2 x$.
- (i) Show that the fourth term can be written as $\log_2 (27x^3)$. [3]
- (ii) Given that the fourth term is 6, find the exact value of x . [2]
- (b) A geometric progression has first term $\log_2 27$ and common ratio $\log_2 y$.
- (i) Find the set of values of y for which the geometric progression has a sum to infinity. [2]
- (ii) Find the exact value of y for which the sum to infinity of the geometric progression is 3. [5]

THERE ARE NO QUESTIONS WRITTEN ON THIS PAGE.



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) 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.