

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE
4722
MATHEMATICS
Core Mathematics 2

FRIDAY 18 MAY 2012: Morning
DURATION: 1 hour 30 minutes
plus your additional time allowance

MODIFIED ENLARGED

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
List of Formulae (MF1)

OTHER MATERIALS REQUIRED:

Scientific or graphical calculator

READ INSTRUCTIONS OVERLEAF

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

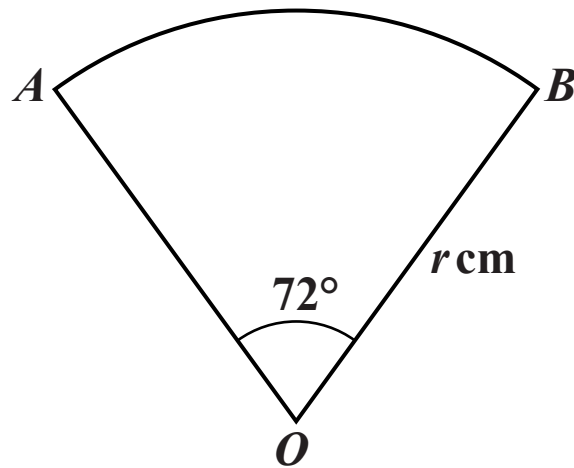
- This information is the same on the Printed Answer Book and the Question Paper.
- The number of marks is given in brackets [] at the end of each question or part question on the Question Paper.
- **YOU ARE REMINDED OF THE NEED FOR CLEAR PRESENTATION IN YOUR ANSWERS.**
- The total number of marks for this paper is 72.

INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

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- 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 Look at the following diagram.



The diagram above 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]

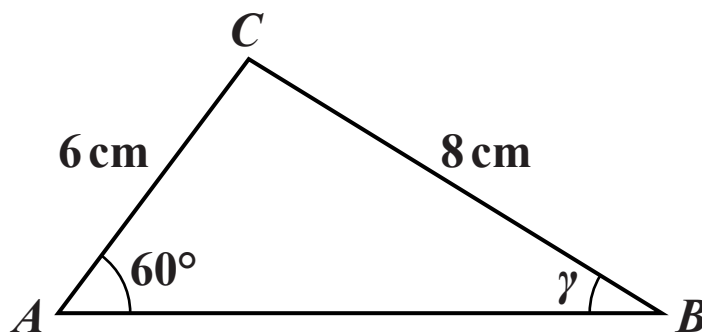
- 6 (i)** Use the trapezium rule, with 2 strips each of width 4, to show that an approximate value of $\int_1^9 4\sqrt{x} \, dx$ is $32 + 16\sqrt{5}$. [3]

(ii) Use a sketch graph to explain why the actual value of $\int_1^9 4\sqrt{x}$ is greater than $32 + 16\sqrt{5}$. [2]

(iii) Use integration to find the exact value of $\int_1^9 4\sqrt{x}$. [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) Look at the following diagram.



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]



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