

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.

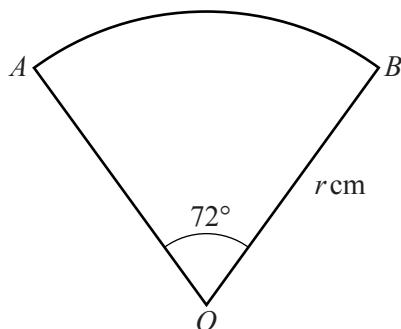
- The number of marks is given in brackets [] at the end of each question or part question on the Question Paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question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

INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

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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



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]

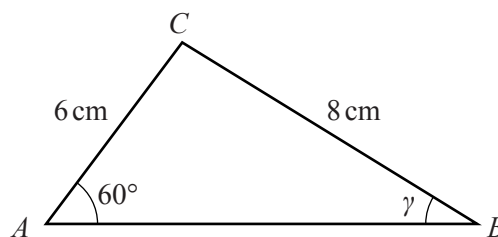
- (ii) Use a sketch graph to explain why the actual value of $\int_1^9 4\sqrt{x} \, dx$ is greater than $32 + 16\sqrt{5}$. [2]

- (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.



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