

**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.

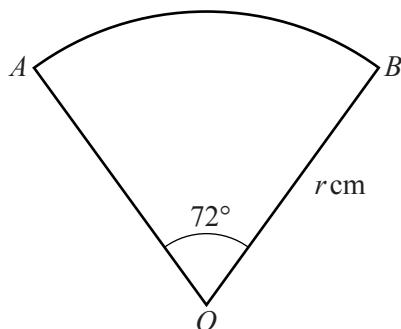
- The number of marks is given in brackets [ ] at the end of each question or part question on the Question Paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question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

- (i) Express  $72^\circ$  exactly in radians, simplifying your answer. [1]

The area of the sector  $AOB$  is  $45\pi$  cm<sup>2</sup>.

- (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  $0^\circ$  and  $360^\circ$ . [6]

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

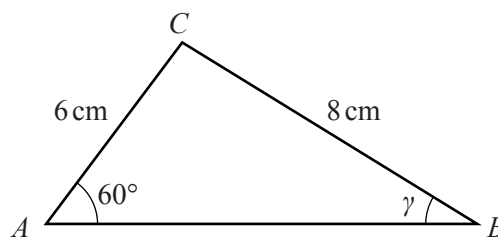
$$u_1 = 4 \quad \text{and} \quad u_{n+1} = \frac{2}{u_n} \quad \text{for } n \geq 1.$$

- (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  $\alpha$  is the acute angle such that  $\tan \alpha = \frac{2}{5}$ , find the exact value of  $\cos \alpha$ . [2]
- (ii) Given that  $\beta$  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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