

**ADVANCED SUBSIDIARY GCE  
MATHEMATICS**

Core Mathematics 2

**4722**

**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

**Friday 14 January 2011  
Afternoon**

**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. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- 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 destroyed.

1 (i) Find and simplify the first three terms, in ascending powers of  $x$ , in the binomial expansion of  $(1 + 2x)^7$ . [3]

(ii) Hence find the coefficient of  $x^2$  in the expansion of  $(2 - 5x)(1 + 2x)^7$ . [3]

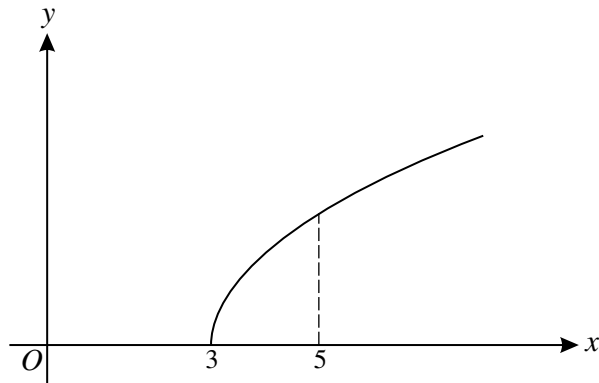
2 A sequence  $S$  has terms  $u_1, u_2, u_3, \dots$  defined by  $u_n = 3n + 2$  for  $n \geq 1$ .

(i) Write down the values of  $u_1, u_2$  and  $u_3$ . [2]

(ii) State what type of sequence  $S$  is. [1]

(iii) Find  $\sum_{n=101}^{200} u_n$ . [3]

3



The diagram shows the curve  $y = \sqrt{x - 3}$ .

(i) Use the trapezium rule, with 4 strips each of width 0.5, to find an approximate value for the area of the region bounded by the curve, the  $x$ -axis and the line  $x = 5$ . Give your answer correct to 3 significant figures. [4]

(ii) State, with a reason, whether this approximation is an underestimate or an overestimate. [2]

4 (a) Use logarithms to solve the equation  $5^{x-1} = 120$ , giving your answer correct to 3 significant figures. [4]

(b) Solve the equation  $\log_2 x + 2 \log_2 3 = \log_2(x + 5)$ . [4]

5 In a geometric progression, the sum to infinity is four times the first term.

(i) Show that the common ratio is  $\frac{3}{4}$ . [3]

(ii) Given that the third term is 9, find the first term. [3]

(iii) Find the sum of the first twenty terms. [2]

6 (a) Find  $\int \frac{x^3 + 3x^{\frac{1}{2}}}{x} dx$ . [4]

(b) (i) Find, in terms of  $a$ , the value of  $\int_2^a 6x^{-4} dx$ , where  $a$  is a constant greater than 2. [3]

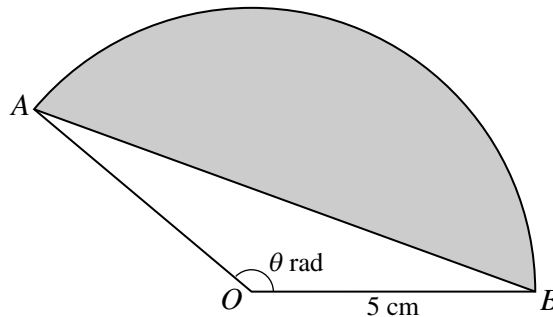
(ii) Deduce the value of  $\int_2^{\infty} 6x^{-4} dx$ . [1]

7 Solve each of the following equations for  $0^\circ \leq x \leq 180^\circ$ .

(i)  $3 \tan 2x = 1$  [3]

(ii)  $3 \cos^2 x + 2 \sin x - 3 = 0$  [5]

8



The diagram shows a sector  $AOB$  of a circle with centre  $O$  and radius 5 cm. Angle  $AOB$  is  $\theta$  radians. The area of triangle  $AOB$  is  $8 \text{ cm}^2$ .

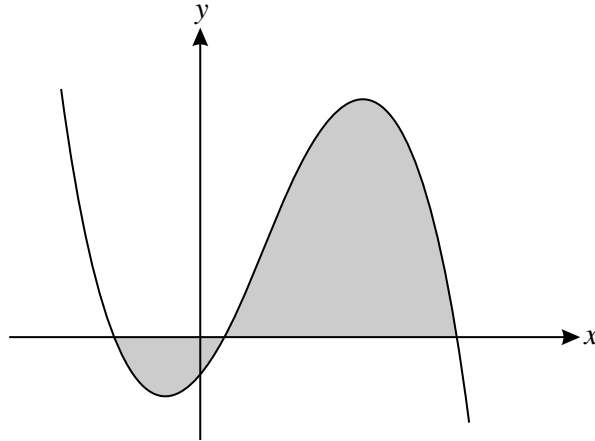
(i) Given that the angle  $\theta$  is obtuse, find  $\theta$ . [3]

The shaded segment in the diagram is bounded by the chord  $AB$  and the arc  $AB$ .

(ii) Find the area of the segment, giving your answer correct to 3 significant figures. [3]

(iii) Find the perimeter of the segment, giving your answer correct to 3 significant figures. [4]

[Question 9 is printed overleaf.]



The diagram shows the curve  $y = f(x)$ , where  $f(x) = -4x^3 + 9x^2 + 10x - 3$ .

- (i) Verify that the curve crosses the  $x$ -axis at  $(3, 0)$  and hence state a factor of  $f(x)$ . [2]
- (ii) Express  $f(x)$  as the product of a linear factor and a quadratic factor. [3]
- (iii) Hence find the other two points of intersection of the curve with the  $x$ -axis. [2]
- (iv) The region enclosed by the curve and the  $x$ -axis is shaded in the diagram. Use integration to find the total area of this region. [5]

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