

**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]

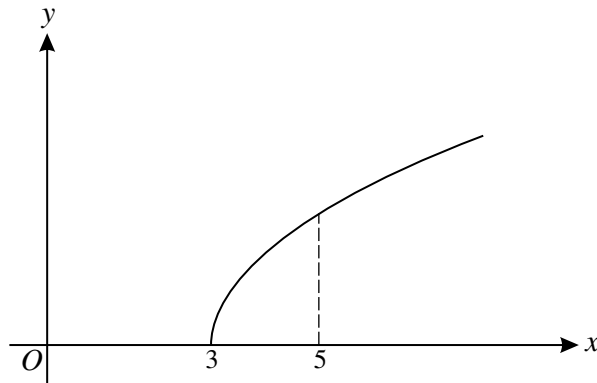
2 A sequence S has terms u_1, u_2, u_3, \dots defined by $u_n = 3n + 2$ for $n \geq 1$.

(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]

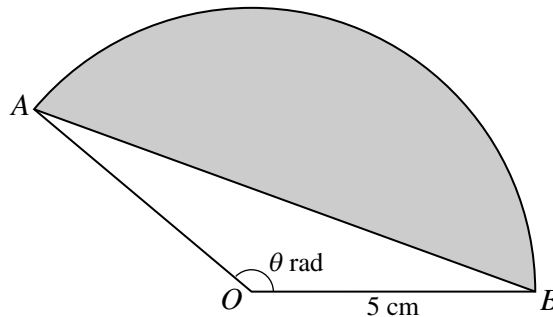
(ii) Deduce the value of $\int_2^{\infty} 6x^{-4} dx$. [1]

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 θ radians. The area of triangle AOB is 8 cm^2 .

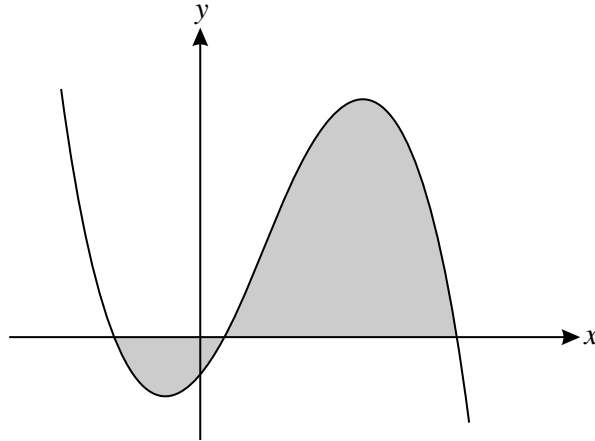
(i) Given that the angle θ is obtuse, find θ . [3]

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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