

OCR

Oxford Cambridge and RSA

Wednesday 20 May 2015 – Morning

AS GCE MATHEMATICS

4722/01 Core Mathematics 2

QUESTION PAPER

Candidates answer on the Printed Answer Book.

OCR supplied materials:

- Printed Answer Book 4722/01
- 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 inside 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.

INSTRUCTIONS TO EXAMS OFFICER/INVIGILATOR

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1 A geometric progression has first term 3 and second term -6 .

(i) State the value of the common ratio. [1]

(ii) Find the value of the eleventh term. [2]

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

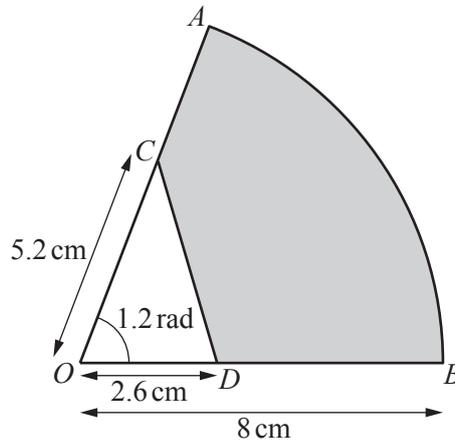
2 (i) Use the trapezium rule, with 4 strips each of width 1.5, to estimate the value of

$$\int_4^{10} \sqrt{2x-1} \, dx,$$

giving your answer correct to 3 significant figures. [4]

(ii) Explain how the trapezium rule could be used to obtain a more accurate estimate. [1]

3



The diagram shows a sector AOB of a circle with centre O and radius 8 cm. The angle AOB is 1.2 radians. The points C and D lie on OA and OB respectively such that $OC = 5.2$ cm and $OD = 2.6$ cm. CD is a straight line.

(i) Find the area of the shaded region $ACDB$. [4]

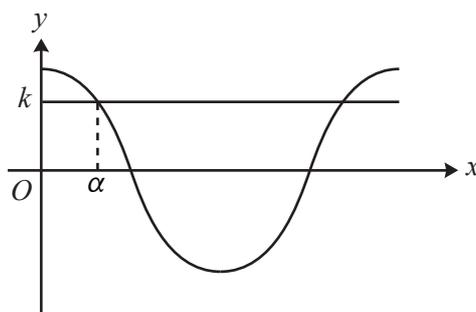
(ii) Find the perimeter of the shaded region $ACDB$. [5]

4 (i) Find and simplify the first three terms in the binomial expansion of $(2 + ax)^6$ in ascending powers of x . [4]

(ii) In the expansion of $(3 - 5x)(2 + ax)^6$, the coefficient of x is 64. Find the value of a . [3]

- 5 A curve has an equation which satisfies $\frac{d^2y}{dx^2} = 3x^{-\frac{1}{2}}$ for all positive values of x . The point $P(4, 1)$ lies on the curve, and the gradient of the curve at P is 5. Find the equation of the curve. [7]
- 6 The cubic polynomial $f(x)$ is defined by $f(x) = x^3 - 19x + 30$.
- (i) Given that $x = 2$ is a root of the equation $f(x) = 0$, express $f(x)$ as the product of 3 linear factors. [4]
- (ii) Use integration to find the exact value of $\int_{-5}^3 f(x) dx$. [4]
- (iii) Explain with the aid of a sketch why the answer to part (ii) does not give the area enclosed by the curve $y = f(x)$ and the x -axis for $-5 \leq x \leq 3$. [2]
- 7 In an arithmetic progression the first term is 5 and the common difference is 3. The n th term of the progression is denoted by u_n .
- (i) Find the value of u_{20} . [2]
- (ii) Show that $\sum_{n=10}^{20} u_n = 517$. [3]
- (iii) Find the value of N such that $\sum_{n=N}^{2N} u_n = 2750$. [6]
- 8 (a) Use logarithms to solve the equation
- $$2^{n-3} = 18000,$$
- giving your answer correct to 3 significant figures. [4]
- (b) Solve the simultaneous equations
- $$\log_2 x + \log_2 y = 8, \quad \log_2 \left(\frac{x^2}{y} \right) = 7. \quad [5]$$

Question 9 begins on page 4.



The diagram shows part of the curve $y = 2\cos\frac{1}{3}x$, where x is in radians, and the line $y = k$.

- (i) The smallest positive solution of the equation $2\cos\frac{1}{3}x = k$ is denoted by α . State, in terms of α ,
- (a) the next smallest positive solution of the equation $2\cos\frac{1}{3}x = k$, [1]
- (b) the smallest positive solution of the equation $2\cos\frac{1}{3}x = -k$. [2]
- (ii) The curve $y = 2\cos\frac{1}{3}x$ is shown in the Printed Answer Book. On the diagram, and for the same values of x , sketch the curve of $y = \sin\frac{1}{3}x$. [2]
- (iii) Calculate the x -coordinates of the points of intersection of the curves in part (ii). Give your answers in radians correct to 3 significant figures. [4]

END OF QUESTION PAPER

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