

OCR

Oxford Cambridge and RSA

Wednesday 23 May 2018 – Morning

AS GCE MATHEMATICS

4722/01 Core Mathematics 2

QUESTION PAPER

Candidates answer on the Printed Answer Book.

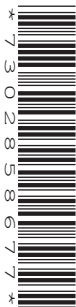
OCR supplied materials:

- 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 barcodes.
- 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.

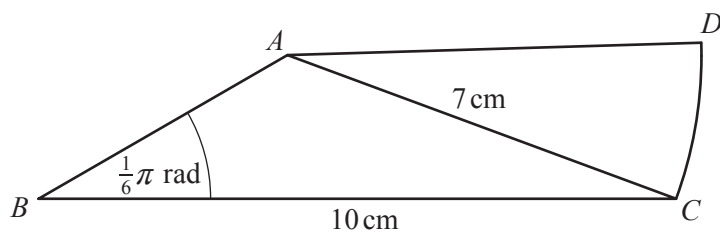
INSTRUCTIONS TO EXAMS OFFICER/INVIGILATOR

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Answer **all** the questions.

- 1 The first three terms in the expansion of $(2 + kx)^5$ are $32 - 40x + cx^2$, where k and c are constants.
- (i) Find the values of k and c . [4]
- (ii) Determine the coefficient of x in the expansion of $(2x - 3)(2 + kx)^5$. [2]
- 2 The seventh term of an arithmetic progression is 3 and the sum of the first twenty terms is 165. Find the first term and the common difference. [5]
- 3 (i) Sketch the graphs of $y = 2 \cos x$ and $y = 3 \tan x$ for $0^\circ \leq x \leq 360^\circ$ on the axes provided. [2]
- (ii) Show that the equation $2 \cos x = 3 \tan x$ can be expressed in the form $2 \sin^2 x + 3 \sin x - 2 = 0$. [3]
- (iii) Hence solve the equation $2 \cos x = 3 \tan x$, giving all values of x between 0° and 360° . [4]
- 4 (a) Find $\int_1^4 (3\sqrt{x} + 5) dx$. [4]
- (b) Find $\int \frac{6x^4 + 4}{x^2} dx$. [3]
- 5 A sequence S has terms u_1, u_2, u_3, \dots defined by
- $$u_1 = 20 \quad \text{and} \quad u_{n+1} = 0.8u_n \quad \text{for } n \geq 1.$$
- (i) Find u_2 and u_3 . State what type of sequence S is. [2]
- (ii) Use logarithms to find the smallest value of N such that $S_N > 99.3$. [5]
- (iii) Find $\sum_{n=1}^{\infty} u_{2n}$. [3]

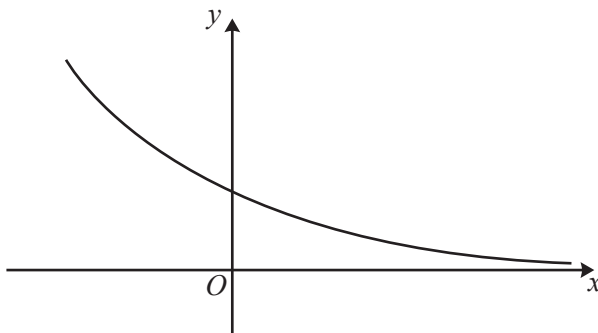
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The diagram shows a triangle ABC and a sector ACD of a circle with centre A . It is given that $AC = 7$ cm, $BC = 10$ cm and angle $ABC = \frac{1}{6}\pi$ radians.

- (i) Find, in radians, the obtuse angle BAC . Give your answer correct to 4 significant figures. [3]
- (ii) Find the area of triangle ABC . [3]
- (iii) Given that the area of the sector ACD is equal to the area of the triangle ABC , find the length of the arc CD . [3]

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The diagram shows the curve $y = a \times b^x$, where a and b are positive constants. The curve passes through the points $(0, 4)$, $(1, \frac{4}{3})$ and $(2, \frac{4}{9})$.

- (i) Use the trapezium rule, with 2 strips each of width 1, to find an approximate value for the area enclosed by the curve, the x -axis, the y -axis and the line $x = 2$. [2]
- (ii) Find the values of the positive constants a and b . [2]
- (iii) The curves $y = a \times b^x$ and $y = a^{3x-1}$ intersect at the point P . Use your values of a and b from part (ii) to show that the x -coordinate of P can be written as $x = \frac{4}{6 + \log_2 3}$. [5]

- 8 A curve passes through the point $(1, 8)$ and has an equation which satisfies $\frac{dy}{dx} = 2x + \frac{a}{x^3} + 3$ for all non-zero values of x . The area enclosed by the curve, the x -axis, the line $x = 1$ and the line $x = 3$ is 30 square units. Find the value of the positive constant a . [9]
- 9 (i) Show that $x = 2$ is a root of the equation $\frac{x}{x-1} = \frac{6}{2x^2-5}$. [1]
- (ii) Use an algebraic method to find the other two roots of the equation $\frac{x}{x-1} = \frac{6}{2x^2-5}$, giving your answers in an exact form. [7]

END OF QUESTION PAPER

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