

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE
4722/01
MATHEMATICS
Core Mathematics 2
QUESTION PAPER**

**WEDNESDAY 20 MAY 2015: Morning
DURATION: 1 hour 30 minutes
plus your additional time allowance
MODIFIED ENLARGED 24pt**

Candidates answer on the Printed Answer Book or any suitable paper provided by the centre. The Printed Answer Book may be enlarged by the centre.

**OCR SUPPLIED MATERIALS:
List of Formulae (MF1)
Insert for question 9(ii)**

**OTHER MATERIALS REQUIRED:
Scientific or graphical calculator**

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book or on the paper provided by the centre. Please write clearly and in capital letters.

IF YOU USE THE PRINTED ANSWER BOOK 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.

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.

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]

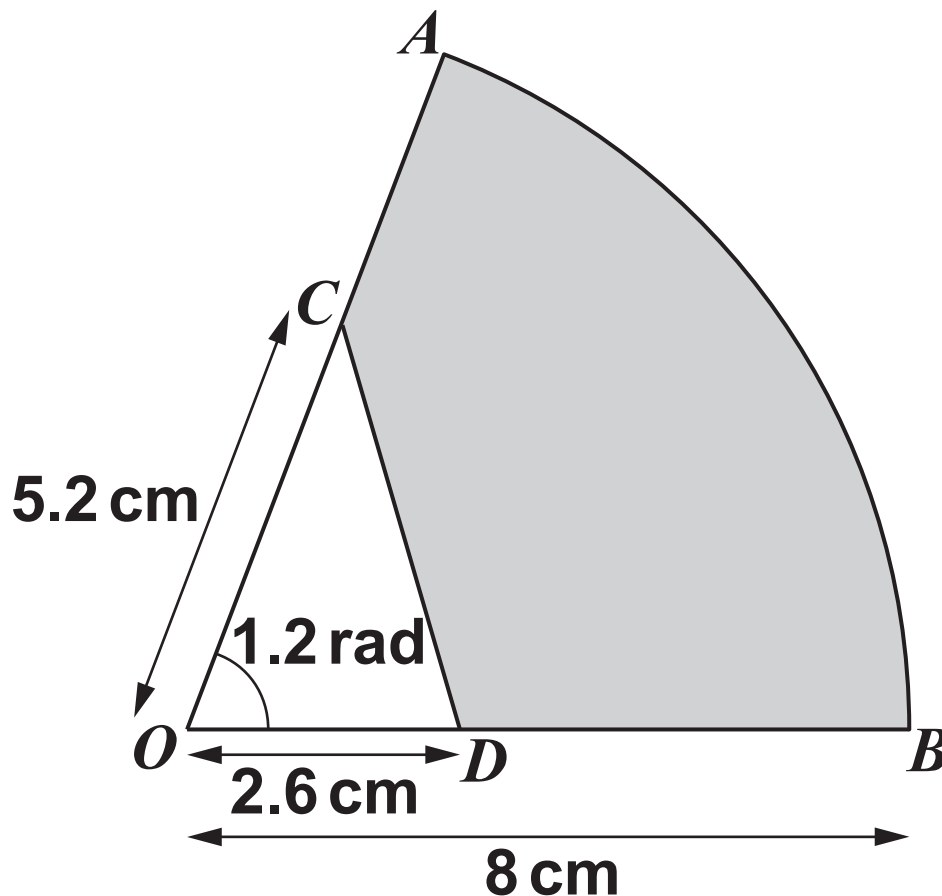
2 (i) Use the trapezium rule, with 4 strips each of width 1.5, to estimate the value of

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

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 below 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 $OC = 5.2\text{ cm}$ and $OD = 2.6\text{ cm}$. 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

$$\sum_{n=N}^{2N} u_n = 2750. \quad [6]$$

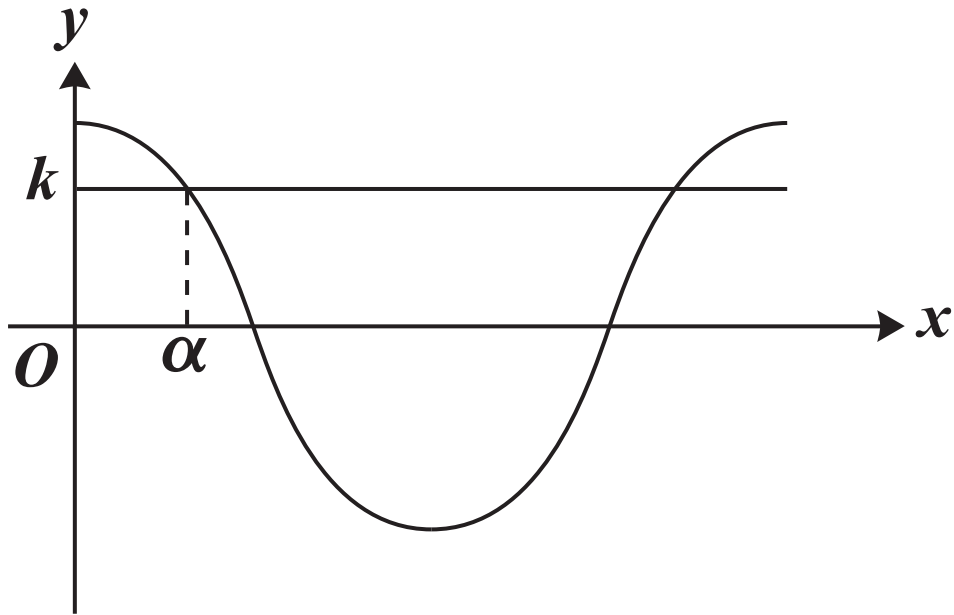
- 8 (a) Use logarithms to solve the equation**

$$2^{n-3} = 18000,$$

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

(b) Solve the simultaneous equations

$$\log_2 x + \log_2 y = 8, \quad \log_2 \left(\frac{x^2}{y} \right) = 7. \quad [5]$$



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 and in the Insert. 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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