

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE**

4722/01

**MATHEMATICS
Core Mathematics 2
QUESTION PAPER**

**FRIDAY 17 MAY 2013: Morning
DURATION: 1 hour 30 minutes
plus your additional time allowance**

MODIFIED ENLARGED

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:

**Printed Answer Book 4722/01
List of Formulae (MF1)**

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.**
- **Read each question carefully. Make sure you know what you have to do before starting your answer.**
- **Answer ALL the questions.**
- **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

- 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.

INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

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- 1 Use the trapezium rule, with 3 strips each of width 2, to estimate the value of**

$$\int_5^{11} \frac{8}{x} dx. \quad [4]$$

- 2 Solve each of the following equations, for $0^\circ \leq x \leq 360^\circ$.**

(i) $\sin \frac{1}{2}x = 0.8$ [3]

(ii) $\sin x = 3 \cos x$ [3]

- 3 (i) Find and simplify the first three terms in the expansion of $(2 + 5x)^6$ in ascending powers of x . [4]**

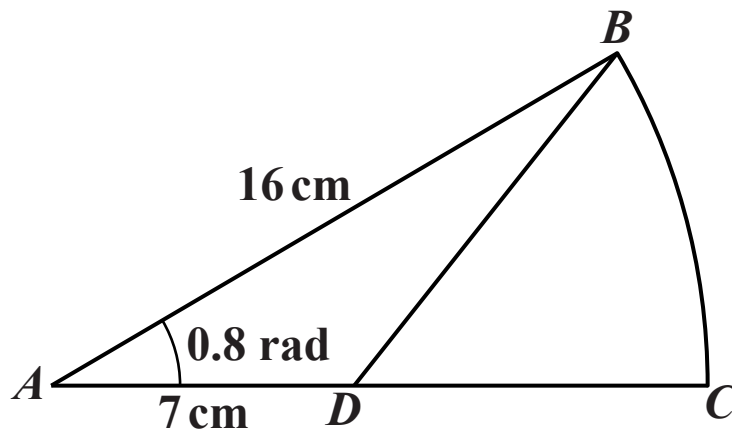
- (ii) In the expansion of $(3 + cx)^2(2 + 5x)^6$, the coefficient of x is 4416. Find the value of c . [3]**

- 4 (a) Find $\int (5x^3 - 6x + 1) dx$. [3]**

(b) (i) Find $\int 24x^{-3} dx$. [2]

- (ii) Given that $\int_a^\infty 24x^{-3} dx = 3$, find the value of the positive constant a . [3]**

5 Look at the following diagram.



The diagram above shows a sector BAC of a circle with centre A and radius 16 cm . The angle BAC is 0.8 radians. The length AD is 7 cm .

- (i) Find the area of the region BDC . [4]**
- (ii) Find the perimeter of the region BDC . [4]**

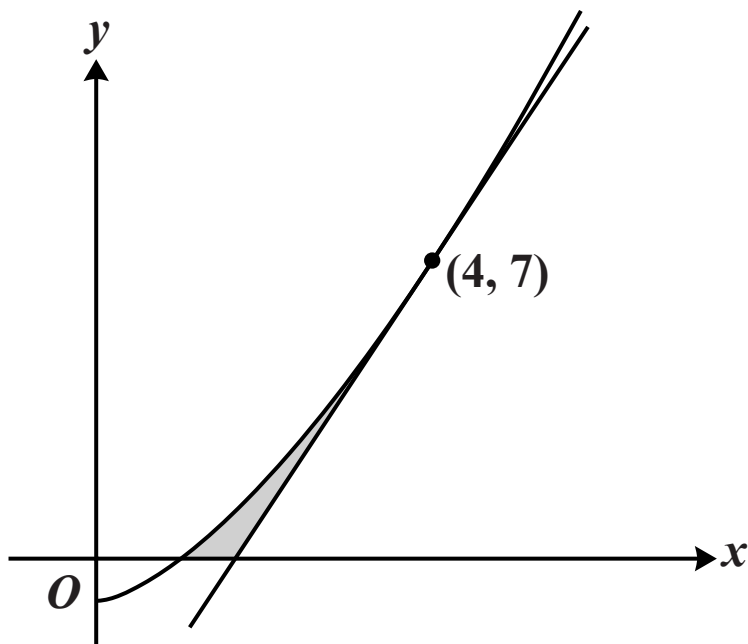
6 Sarah is carrying out a series of experiments which involve using increasing amounts of a chemical. In the first experiment she uses 6 g of the chemical and in the second experiment she uses 7.8 g of the chemical.

- (i) Given that the amounts of the chemical used form an arithmetic progression, find the total amount of chemical used in the first 30 experiments. [3]**
- (ii) Instead it is given that the amounts of the chemical used form a geometric progression. Sarah has a total of 1800 g of the chemical available. Show that N , the greatest number of experiments possible, satisfies the inequality**

$$1.3^N \leq 91,$$

and use logarithms to calculate the value of N . [6]

7 Look at the following diagram.

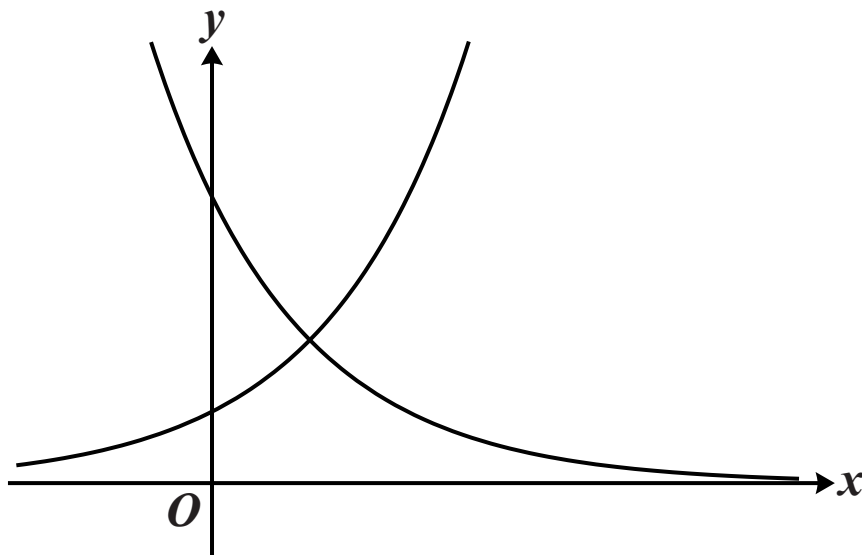


The diagram above shows the curve $y = x^{\frac{3}{2}} - 1$, which crosses the x -axis at $(1, 0)$, and the tangent to the curve at the point $(4, 7)$.

(i) Show that $\int_1^4 (x^{\frac{3}{2}} - 1) dx = 9\frac{2}{5}$. [4]

(ii) Hence find the exact area of the shaded region enclosed by the curve, the tangent and the x -axis. [5]

8 Look at the following diagram.



The diagram above shows the curves $y = a^x$ and $y = 4b^x$.

- (i) (a) State the coordinates of the point of intersection of $y = a^x$ with the y -axis. [1]**
- (b) State the coordinates of the point of intersection of $y = 4b^x$ with the y -axis. [1]**
- (c) State a possible value for a and a possible value for b . [2]**
- (ii) It is now given that $ab = 2$. Show that the x -coordinate of the point of intersection of $y = a^x$ and $y = 4b^x$ can be written as**

$$x = \frac{2}{2\log_2 a - 1}. \text{ [5]}$$

9 The cubic polynomial $f(x)$ is defined by $f(x) = 4x^3 - 7x - 3$.

(i) Find the remainder when $f(x)$ is divided by $(x - 2)$. [2]

(ii) Show that $(2x + 1)$ is a factor of $f(x)$ and hence factorise $f(x)$ completely. [6]

(iii) Solve the equation

$$4\cos^3\theta - 7\cos\theta - 3 = 0$$

for $0 \leq \theta \leq 2\pi$. Give each solution for θ in an exact form. [4]

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