



**Friday 17 May 2013 – 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 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. 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.

**INSTRUCTION TO EXAMS OFFICER/INVIGILATOR**

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## 2

- 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]

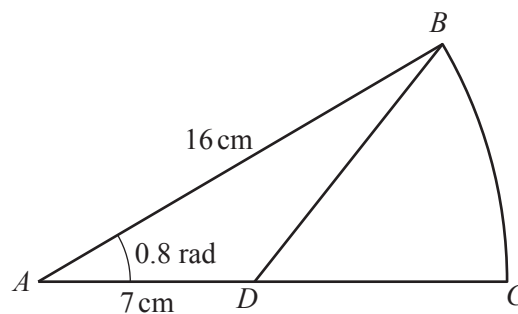
(ii) In the expansion of  $(3 + cx)^2(2 + 5x)^6$ , the coefficient of  $x$  is 4416. Find the value of  $c$ . [3]

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



The diagram 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]

## 3

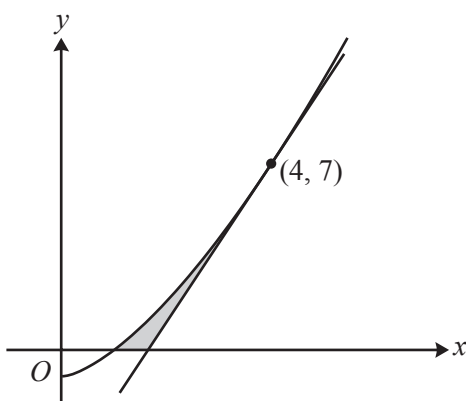
6 Sarah is carrying out a series of experiments which involve using increasing amounts of a chemical. In the first experiment she uses 6 g of the chemical and in the second experiment she uses 7.8 g of the chemical.

- (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

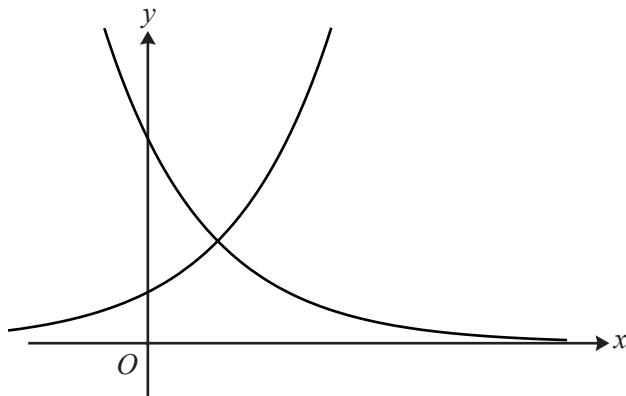


The diagram shows the curve  $y = x^{\frac{3}{2}} - 1$ , which crosses the  $x$ -axis at  $(1, 0)$ , and the tangent to the curve at the point  $(4, 7)$ .

- (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]

4

8



The diagram 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

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

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  $\theta$  in an exact form. [4]

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