

# 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

 $\int_{5}^{1}$ 

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

$$\int \frac{11}{x} \frac{8}{x} dx.$$
 [4]

[3]

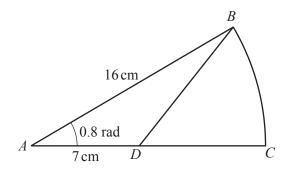
[4]

- 2 Solve each of the following equations, for  $0^{\circ} \le x \le 360^{\circ}$ .
  - (i)  $\sin \frac{1}{2}x = 0.8$  [3]
  - (ii)  $\sin x = 3\cos x$

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]





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*.

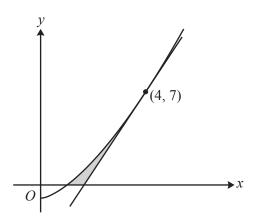
- 6 Sarah is carrying out a series of experiments which involve using increasing amounts of a chemical. In the first experiment she uses 6 g of the chemical and in the second experiment she uses 7.8 g of the chemical.
  - (i) Given that the amounts of the chemical used form an arithmetic progression, 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

$$1.3^N \le 91$$
,

and use logarithms to calculate the value of N.

[6]

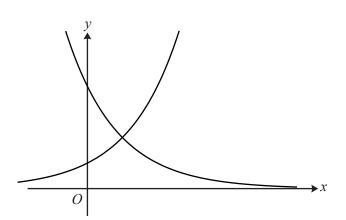
7



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

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*.
- (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

$$x = \frac{2}{2\log_2 a - 1}.$$

[2]

- 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  $0 \le \theta \le 2\pi$ . Give each solution for  $\theta$  in an exact form.

[4]



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