



**Thursday 22 May 2014 – 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 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**

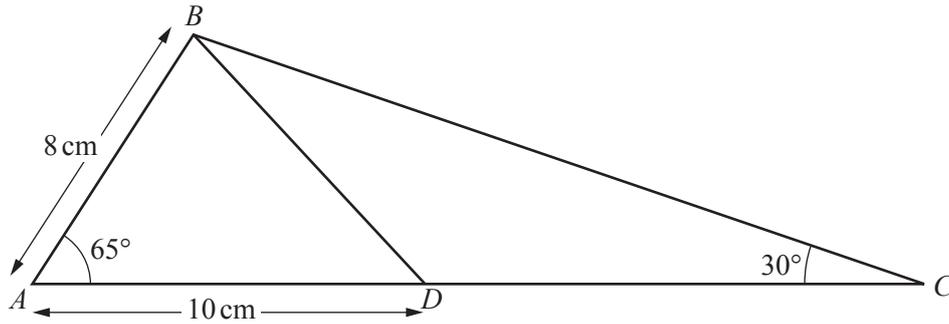
This information is the same on the Printed Answer Book and the Question Paper.

- 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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1



The diagram shows triangle  $ABC$ , with  $AB = 8$  cm, angle  $BAC = 65^\circ$  and angle  $BCA = 30^\circ$ . The point  $D$  is on  $AC$  such that  $AD = 10$  cm.

(i) Find the area of triangle  $ABD$ . [2]

(ii) Find the length of  $BD$ . [2]

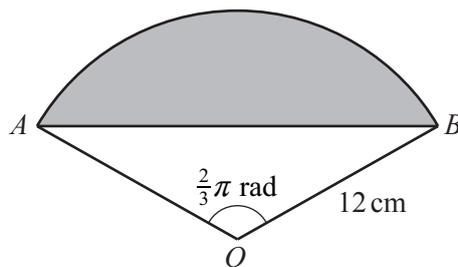
(iii) Find the length of  $BC$ . [2]

2 A sequence  $u_1, u_2, u_3, \dots$  is defined by  $u_n = 3n - 1$ , for  $n \geq 1$ .

(i) Find the values of  $u_1, u_2$  and  $u_3$ . [2]

(ii) Find  $\sum_{n=1}^{40} u_n$ . [3]

3



The diagram shows a sector  $OAB$  of a circle, centre  $O$  and radius 12 cm. The angle  $AOB$  is  $\frac{2}{3}\pi$  radians.

(i) Find the exact length of the arc  $AB$ . [2]

(ii) Find the exact area of the shaded segment enclosed by the arc  $AB$  and the chord  $AB$ . [5]

- 4 (i) Show that the equation

$$\sin x - \cos x = \frac{6 \cos x}{\tan x}$$

can be expressed in the form

$$\tan^2 x - \tan x - 6 = 0. \quad [2]$$

- (ii) Hence solve the equation  $\sin x - \cos x = \frac{6 \cos x}{\tan x}$  for  $0^\circ \leq x \leq 360^\circ$ . [4]

- 5 Solve the equation  $2^{4x-1} = 3^{5-2x}$ , giving your answer in the form  $x = \frac{\log_{10} a}{\log_{10} b}$ . [6]

- 6 (i) Find the binomial expansion of  $\left(x^3 + \frac{2}{x^2}\right)^4$ , simplifying the terms. [5]

- (ii) Hence find  $\int \left(x^3 + \frac{2}{x^2}\right)^4 dx$ . [4]

- 7 The cubic polynomial  $f(x)$  is defined by  $f(x) = 12 - 22x + 9x^2 - x^3$ .

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

- (ii) Show that  $(3 - x)$  is a factor of  $f(x)$ . [1]

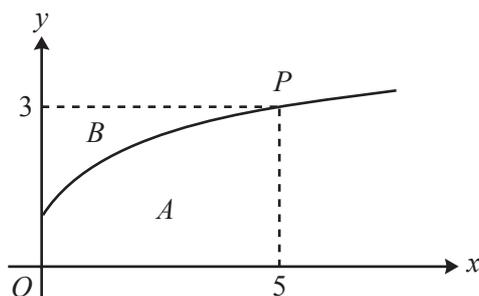
- (iii) Express  $f(x)$  as the product of a linear factor and a quadratic factor. [3]

- (iv) Hence solve the equation  $f(x) = 0$ , giving each root in simplified surd form where appropriate. [3]

- 8 (a) The first term of a geometric progression is 50 and the common ratio is 0.8. Use logarithms to find the smallest value of  $k$  such that the value of the  $k$ th term is less than 0.15. [4]

- (b) In a different geometric progression, the second term is  $-3$  and the sum to infinity is 4. Show that there is only one possible value of the common ratio and hence find the first term. [8]

**Question 9 begins on page 4.**



The diagram shows part of the curve  $y = -3 + 2\sqrt{x+4}$ . The point  $P(5, 3)$  lies on the curve. Region  $A$  is bounded by the curve, the  $x$ -axis, the  $y$ -axis and the line  $x = 5$ . Region  $B$  is bounded by the curve, the  $y$ -axis and the line  $y = 3$ .

- (i) Use the trapezium rule, with 2 strips each of width 2.5, to find an approximate value for the area of region  $A$ , giving your answer correct to 3 significant figures. [3]
- (ii) Use your answer to part (i) to deduce an approximate value for the area of region  $B$ . [2]
- (iii) By first writing the equation of the curve in the form  $x = f(y)$ , use integration to show that the exact area of region  $B$  is  $\frac{14}{3}$ . [7]

**END OF QUESTION PAPER**



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