

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE**

4722/01

**MATHEMATICS
Core Mathematics 2
QUESTION PAPER**

**THURSDAY 22 MAY 2014: 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. 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.

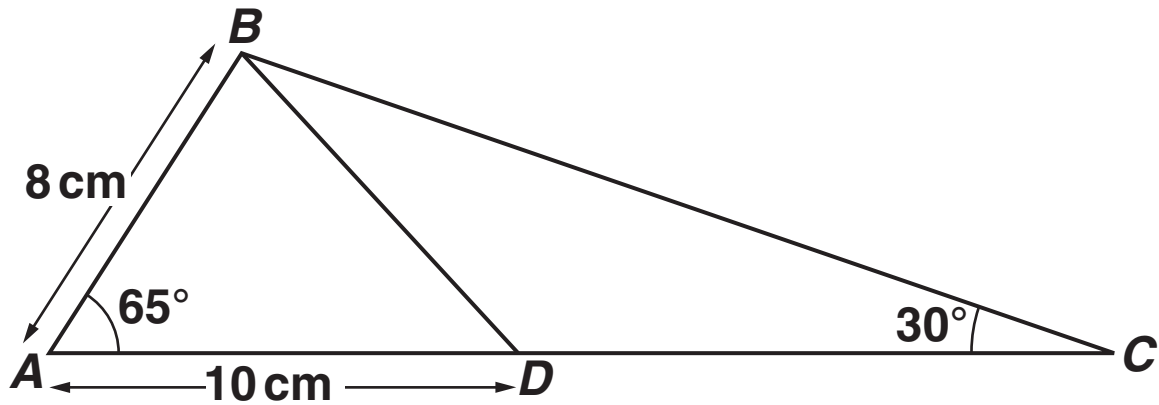
YOU ARE REMINDED OF THE NEED FOR CLEAR PRESENTATION IN YOUR ANSWERS.

The total number of marks for this paper is 72.

INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

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1 Look at the following diagram.



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

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

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

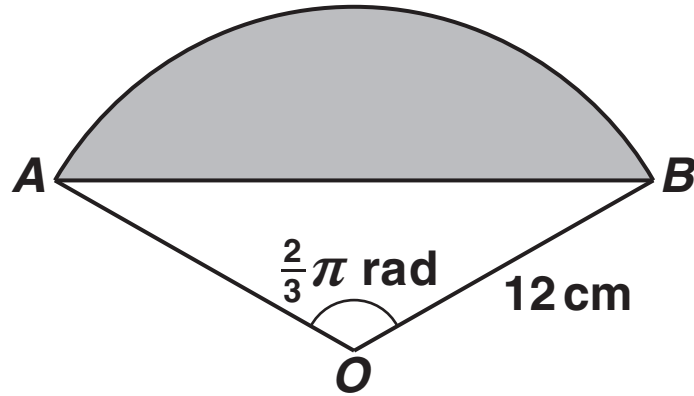
(iii) Find the length of BC . [2]

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 Look at the following diagram.



The diagram above 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

$$\sin x - \cos x = \frac{6 \cos x}{\tan x} \text{ for } 0^\circ \leq x \leq 360^\circ. \quad [4]$$

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]

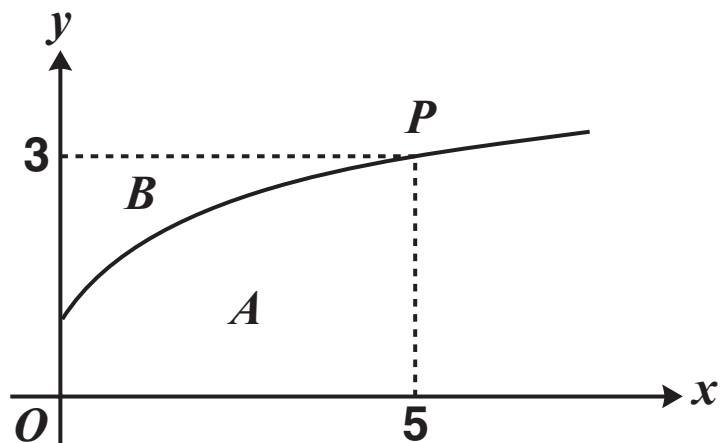
(iii) Express $f(x)$ as the product of a linear factor and a quadratic factor. [3]

(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]

9 Look at the following diagram.



The diagram above 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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