OCR
Oxford Cambridge and RSA

Wednesday 20 May 2015 – Morning

AS GCE MATHEMATICS

4722/01   Core Mathematics 2
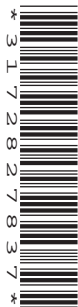
QUESTION PAPER

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.

INSTRUCTIONS TO EXAMS OFFICER/INVIGILATOR

*   Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.

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Turn over

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1 A geometric progression has first term 3 and second term -6.

    (i) State the value of the common ratio. **[1]**

    (ii) Find the value of the eleventh term. **[2]**

    (iii) Find the sum of the first twenty terms. **[2]**

2 **(i)** Use the trapezium rule, with 4 strips each of width 1.5, to estimate the value of

$$\int_4^{10} \sqrt{2x-1}\,\mathrm{d}x,$$

    giving your answer correct to 3 significant figures. **[4]**

   **(ii)** Explain how the trapezium rule could be used to obtain a more accurate estimate. **[1]**

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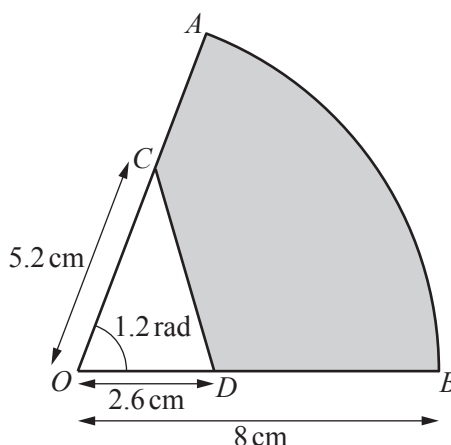
The diagram shows a sector AOB of a circle with centre O and radius $8\,\text{cm}$. The angle AOB is 1.2 radians. The points C and D lie on OA and OB respectively such that $OC = 5.2\,\text{cm}$ and $OD = 2.6\,\text{cm}$. CD is a straight line.

    (i) Find the area of the shaded region $ACDB$. **[4]**

    (ii) Find the perimeter of the shaded region $ACDB$. **[5]**

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

    (ii) In the expansion of $(3 - 5x)(2 + ax)^6$, the coefficient of x is 64. Find the value of a. **[3]**

5 A curve has an equation which satisfies $\dfrac{d^2y}{dx^2} = 3x^{-\frac{1}{2}}$ for all positive values of x. The point $P(4, 1)$ lies on the curve, and the gradient of the curve at P is 5. Find the equation of the curve. **[7]**

6 The cubic polynomial f(x) is defined by f(x) = $x^3 - 19x + 30$.

   (i) Given that $x = 2$ is a root of the equation f(x) = 0, express f(x) as the product of 3 linear factors. **[4]**

   (ii) Use integration to find the exact value of $\int_{-5}^{3} \text{f}(x)\, dx$. **[4]**

   (iii) Explain with the aid of a sketch why the answer to part **(ii)** does not give the area enclosed by the curve $y = \text{f}(x)$ and the x-axis for $-5 \leqslant x \leqslant 3$. **[2]**

7 In an arithmetic progression the first term is 5 and the common difference is 3. The nth term of the progression is denoted by u_n.

   (i) Find the value of u_{20}. **[2]**

   (ii) Show that $\displaystyle\sum_{n=10}^{20} u_n = 517$. **[3]**

   (iii) Find the value of N such that $\displaystyle\sum_{n=N}^{2N} u_n = 2750$. **[6]**

8 **(a)** Use logarithms to solve the equation

$$2^{n-3} = 18000,$$

   giving your answer correct to 3 significant figures. **[4]**

   (b) Solve the simultaneous equations

$$\log_2 x + \log_2 y = 8, \qquad \log_2\left(\frac{x^2}{y}\right) = 7.$$ **[5]**

Question 9 begins on page 4.

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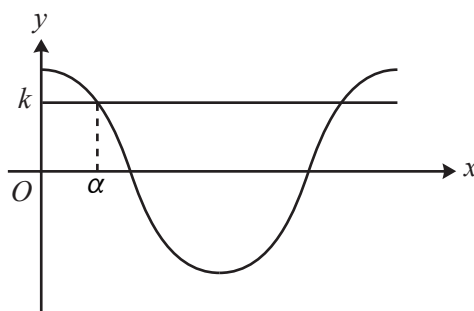
The diagram shows part of the curve $y = 2\cos\frac{1}{3}x$, where x is in radians, and the line $y = k$.

(i) The smallest positive solution of the equation $2\cos\frac{1}{3}x = k$ is denoted by α. State, in terms of α,

    (a) the next smallest positive solution of the equation $2\cos\frac{1}{3}x = k$, **[1]**

    (b) the smallest positive solution of the equation $2\cos\frac{1}{3}x = -k$. **[2]**

(ii) The curve $y = 2\cos\frac{1}{3}x$ is shown in the Printed Answer Book. On the diagram, and for the same values of x, sketch the curve of $y = \sin\frac{1}{3}x$. **[2]**

(iii) Calculate the x-coordinates of the points of intersection of the curves in part **(ii)**. Give your answers in radians correct to 3 significant figures. **[4]**

END OF QUESTION PAPER