

# OCR

Oxford Cambridge and RSA

## Wednesday 24 May 2017 – Morning

### AS GCE MATHEMATICS

4722/01 Core Mathematics 2

### QUESTION PAPER

Candidates answer on the Printed Answer Book.

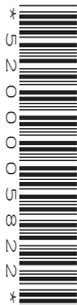
**OCR supplied materials:**

- 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 barcodes.
- 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

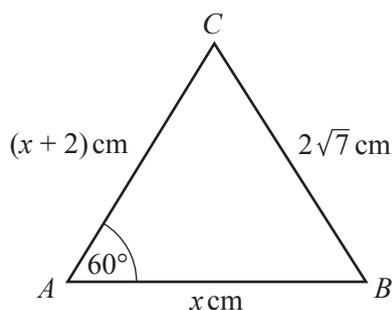
This information is the same on the Printed Answer Book and the Question Paper.

- 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.

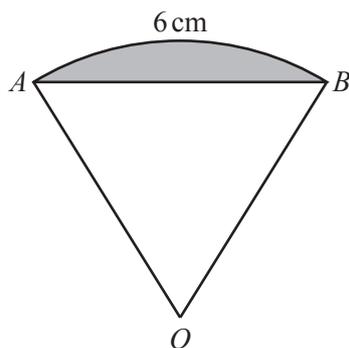
1



The diagram shows triangle  $ABC$ , with  $AB = x$  cm,  $AC = (x + 2)$  cm,  $BC = 2\sqrt{7}$  cm and angle  $CAB = 60^\circ$ .

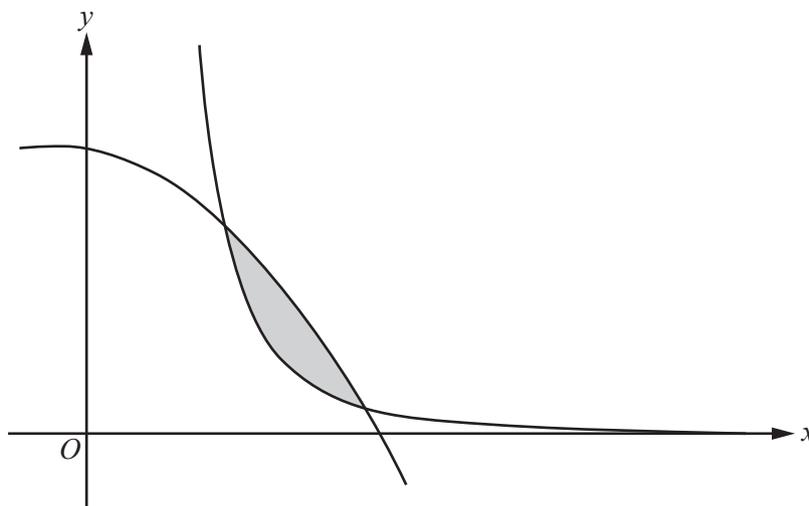
- (i) Find the value of  $x$ . [4]
- (ii) Find the area of triangle  $ABC$ , giving your answer in an exact form as simply as possible. [2]
- 2 (i) Use the trapezium rule, with 4 strips each of width 0.2, to find an estimate for  $\int_0^{0.8} \cos x dx$ , where  $x$  is in radians. Give your answer correct to 3 significant figures. [4]
- (ii) Explain, with the aid of a sketch, why the value from part (i) is an under-estimate. [2]
- 3 (i) Find and simplify the first four terms in the expansion of  $\left(1 + \frac{1}{2}x\right)^8$  in ascending powers of  $x$ . [4]
- (ii) Hence find the coefficient of  $y^2$  in the expansion of  $\left(1 + \frac{1}{2}(y + y^2)\right)^8$ . [2]
- 4 The gradient of a curve is given by  $\frac{dy}{dx} = 5x(\sqrt{x} - 2)$  and the curve passes through the point (4, 11). Find the equation of the curve. [6]

5



The diagram shows a sector  $AOB$  of a circle with centre  $O$ . The length of the arc  $AB$  is 6 cm and the area of the sector  $AOB$  is  $24 \text{ cm}^2$ . Find the area of the shaded segment enclosed by the arc  $AB$  and the chord  $AB$ , giving your answer correct to 3 significant figures. [6]

6



The diagram shows parts of the curves  $y = 11 - x - 2x^2$  and  $y = \frac{8}{x^3}$ . The curves intersect at  $(1, 8)$  and  $(2, 1)$ . Use integration to find the exact area of the shaded region enclosed between the two curves. [7]

- 7 (a) Use logarithms to solve the equation  $3^{x+1} = 2^{500}$ , giving your answer correct to 3 significant figures. [4]
- (b) (i) Show that the equation  $\log_2(y+1) - 1 = 2\log_2 x$  can be written in the form  $y = ax^2 + b$ , where  $a$  and  $b$  are integers. [4]
- (ii) Hence solve the simultaneous equations

$$\log_2(y+1) - 1 = 2\log_2 x, \quad \log_2(y - 10x + 14) = 0. \quad [4]$$

- 8 (a) The seventh term of an arithmetic progression is equal to twice the fifth term. The sum of the first seven terms is 84. Find the first term. [5]
- (b) The seventh term of a geometric progression is equal to twice the fifth term. The sum of the first seven terms is 254 and the terms are all positive. Find the first term, showing that it can be written in the form  $p + q\sqrt{r}$  where  $p$ ,  $q$  and  $r$  are integers. [6]

9 The cubic polynomial  $f(x)$  is defined by  $f(x) = 4x^3 + 9x - 5$ .

(i) Show that  $(2x - 1)$  is a factor of  $f(x)$  and hence express  $f(x)$  as the product of a linear factor and a quadratic factor. [4]

(ii) (a) Show that the equation

$$4 \sin 2\theta \cos 2\theta + \frac{5}{\cos 2\theta} = 13 \tan 2\theta$$

can be expressed in the form

$$4 \sin^3 2\theta + 9 \sin 2\theta - 5 = 0. \quad [4]$$

(b) Hence solve the equation

$$4 \sin 2\theta \cos 2\theta + \frac{5}{\cos 2\theta} = 13 \tan 2\theta$$

for  $0 \leq \theta \leq 2\pi$ . Give each answer in an exact form. [4]

**END OF QUESTION PAPER**

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