

**ADVANCED SUBSIDIARY GCE  
MATHEMATICS**

Core Mathematics 2

**4722**

**QUESTION PAPER**

Candidates answer on the printed answer book.

**OCR supplied materials:**

- Printed answer book 4722
- List of Formulae (MF1)

**Other materials required:**

- Scientific or graphical calculator

**Friday 20 May 2011**

**Afternoon**

**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. 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.
- 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**

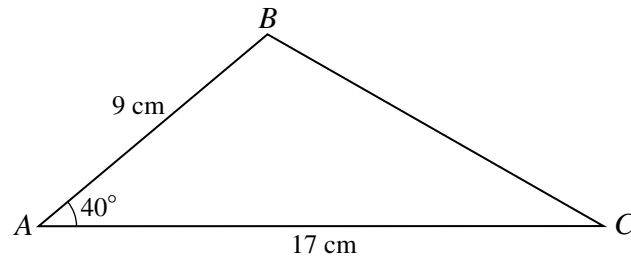
This information is the same on the printed answer book and the question paper.

- 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**

- Do not send this question paper for marking; it should be retained in the centre or destroyed.

1



The diagram shows triangle  $ABC$ , with  $AB = 9$  cm,  $AC = 17$  cm and angle  $BAC = 40^\circ$ .

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

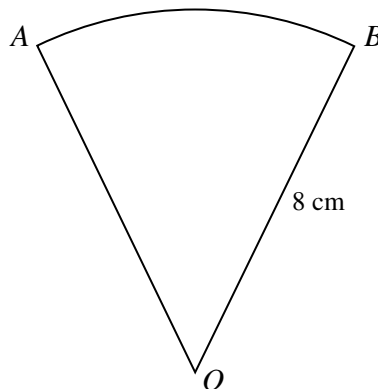
(ii) Find the area of triangle  $ABC$ . [2]

(iii)  $D$  is the point on  $AC$  such that angle  $BDA = 63^\circ$ . Find the length of  $BD$ . [3]

2 (i) Find  $\int (6x^{\frac{1}{2}} - 1) dx$ . [3]

(ii) Hence find the equation of the curve for which  $\frac{dy}{dx} = 6x^{\frac{1}{2}} - 1$  and which passes through the point  $(4, 17)$ . [3]

3

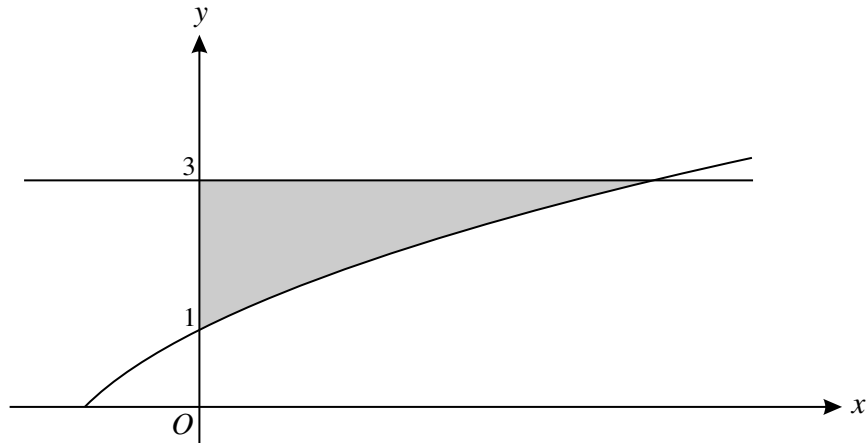


The diagram shows a sector  $AOB$  of a circle, centre  $O$  and radius 8 cm. The perimeter of the sector is 23.2 cm.

(i) Find angle  $AOB$  in radians. [3]

(ii) Find the area of the sector. [2]

4



The diagram shows the curve  $y = -1 + \sqrt{x+4}$  and the line  $y = 3$ .

(i) Show that  $y = -1 + \sqrt{x+4}$  can be rearranged as  $x = y^2 + 2y - 3$ . [2]

(ii) Hence find by integration the exact area of the shaded region enclosed between the curve, the y-axis and the line  $y = 3$ . [5]

5 The first four terms in the binomial expansion of  $(3 + kx)^5$ , in ascending powers of  $x$ , can be written as  $a + bx + cx^2 + dx^3$ .

(i) State the value of  $a$ . [1]

(ii) Given that  $b = c$ , find the value of  $k$ . [5]

(iii) Hence find the value of  $d$ . [2]

6 The cubic polynomial  $f(x)$  is defined by  $f(x) = x^3 + x^2 - 11x + 10$ .

(i) Use the factor theorem to find a factor of  $f(x)$ . [2]

(ii) Hence solve the equation  $f(x) = 0$ , giving each root in an exact form. [6]

7 (a) The first term of a geometric progression is 7 and the common ratio is  $-2$ .

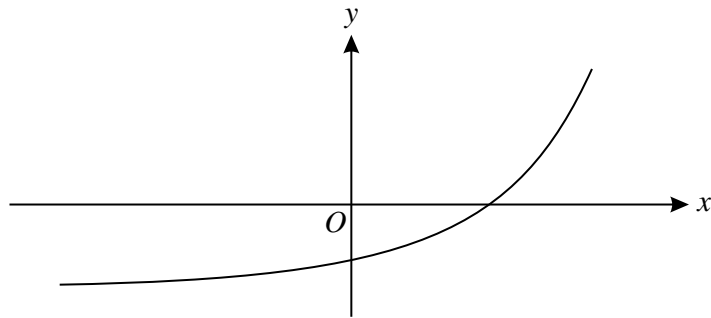
(i) Find the ninth term. [2]

(ii) Find the sum of the first 15 terms. [2]

(b) The first term of an arithmetic progression is 7 and the common difference is  $-2$ . The sum of the first  $N$  terms is  $-2900$ . Find the value of  $N$ . [5]

[Questions 8 and 9 are printed overleaf.]

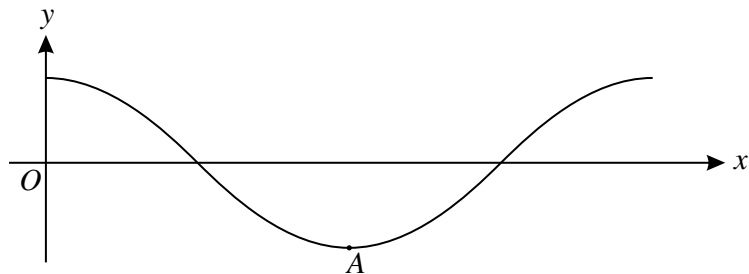
8



The diagram shows the curve  $y = 2^x - 3$ .

- (i) Describe the geometrical transformation that transforms the curve  $y = 2^x$  to the curve  $y = 2^x - 3$ . [2]
- (ii) State the  $y$ -coordinate of the point where the curve  $y = 2^x - 3$  crosses the  $y$ -axis. [1]
- (iii) Find the  $x$ -coordinate of the point where the curve  $y = 2^x - 3$  crosses the  $x$ -axis, giving your answer in the form  $\log_a b$ . [2]
- (iv) The curve  $y = 2^x - 3$  passes through the point  $(p, 62)$ . Use logarithms to find the value of  $p$ , correct to 3 significant figures. [3]
- (v) Use the trapezium rule, with 2 strips each of width 0.5, to find an estimate for  $\int_3^4 (2^x - 3) dx$ . Give your answer correct to 3 significant figures. [3]

9 (a)



The diagram shows part of the curve  $y = \cos 2x$ , where  $x$  is in radians. The point  $A$  is the minimum point of this part of the curve.

- (i) State the period of  $y = \cos 2x$ . [1]
- (ii) State the coordinates of  $A$ . [2]
- (iii) Solve the inequality  $\cos 2x \leq 0.5$  for  $0 \leq x \leq \pi$ , giving your answers exactly. [4]
- (b) Solve the equation  $\cos 2x = \sqrt{3} \sin 2x$  for  $0 \leq x \leq \pi$ , giving your answers exactly. [4]

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